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

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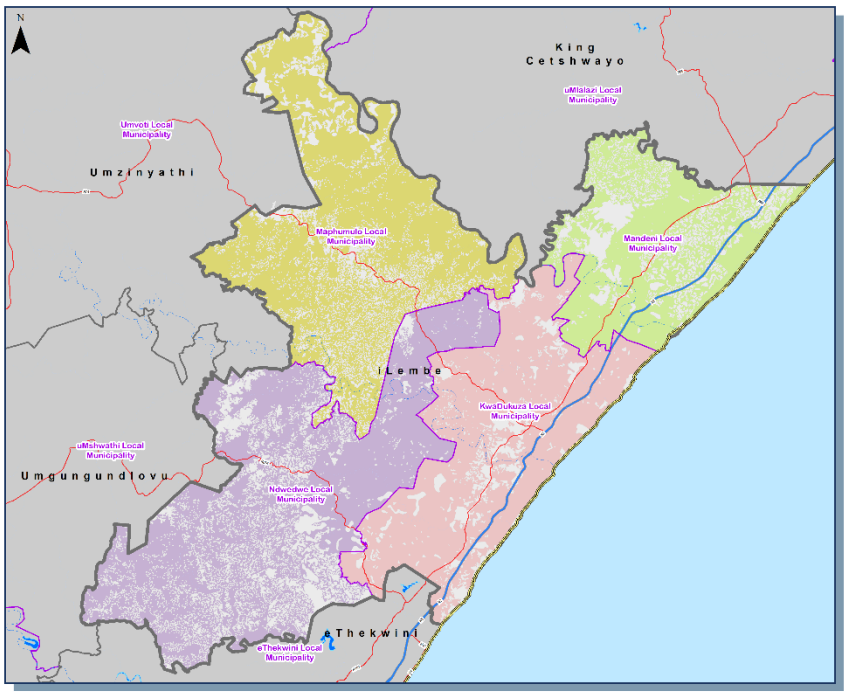

Reconnaissance Report

January 2021

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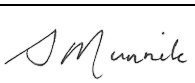
1/Checked by:	S Munnik	Project Leader		2021/01/29
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EXECUTIVE SUMMARY

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 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.

B. Demographics

The iLembe District Municipality (DC29) lies on the east coast of KwaZulu-Natal, between eThekwini Metro in the south and King Cetshwayo District in the North. To the west, iLembe is bordered by two (2) Districts; uMgungundlovu and uMzinyathi. At 3 260km², this is the smallest of the 10 KZN District Municipalities with a total population of approximately 657 612 people (Statistics SA Community Survey 2016). iLembe District is constituted by four Local Municipalities (IDM, IDP 2018/2020):

- ✓ KwaDukuza Local Municipality (KDM, KZN292);
- ✓ Mandeni Local Municipality (MLM, KZN291);
- ✓ Maphumulo Local Municipality (MPLM, KZN294); and
- ✓ Ndwedwe Local Municipality (NLM, KZN293).

The total population for iLembe WSA is approximately 657 613 people. The population and household figures per Local Municipality are tabled in Table B-1 below.

Table B-1: Population & Growth rates for IDM

LM Name	Population 2016	Population Growth	Growth Rate pa
KwaDukuza	276 719	45 532	4.08
Mandeni	147 808	9 730	1.55
Maphumulo	89 969	-6 755	-1.64
Ndwedwe	143 117	2 297	0.37
Total, Growth Rate Average	657 613	50 804	1.09

Source: StatsSA, 2016 Community Survey

The most significant changes were firstly in the KwaDukuza and secondly in the Mandeni LMs, both situated on the coastal area of the WSA. The inland Local Municipalities of Maphumulo and Ndwedwe experienced a negative or very small population growth rate respectively.

It is very likely the urban development and infrastructure available in the coastal municipalities that drew more people to the areas. The KwaDukuza LM is strategically located as the two highly developed areas, KwaDukuza town and Ballito, are only 10 to 30 minutes' drive on the N2 from the King Shaka International Airport and Dube Tradeport Special Economic Zone. Therefore, attracting trade, development and investment in the area. Ballito is also a very popular tourist destination, situated on the coast.

Population growth was determined until 2050 that resulted in the projected number of people residing within iLembe will be approximately 892 000 people.

The projected population per Municipality is tabled within Table B-2 below.

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

Local Municipality	2020	2025	2030	2035	20405	2045	2050
KwaDukuza	259,395	269,553	278,849	292,949	307,762	323,324	339,673
Mandeni	154,897	160,963	166,514	174,934	183,779	193,072	202,835
Maphumulo	108,524	112,774	116,663	122,562	128,759	135,270	142,110
Ndwedwe	157,996	164,183	169,845	178,433	187,456	196,935	206,893
Total	680,811	707,472	731,871	768,878	807,756	848,601	891,510

Source: Water Demand Model, UAP Phase III, 2020

C. Service Levels

C.1 Water

Approximately 32.2% of the households do not have access to formal water supply. The WSA reports on the status of water and sanitation service levels at the Intergovernmental Relations (IGR) forum that is held every second month. The information is provided per infrastructure sector: water and sanitation, for the number of households (HH).

Table C-1 WSA Water Backlogs (June 2019)

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Water	129 747	67.8	61 622	32.2	191 369

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

Table C-2 WSA Water Targets for end 2019/2020

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Water	134 514	70.3	56 855	29.7	191 136

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

C.2 Sanitation

Approximately 32.5% of the households do not have access to basic sanitation. The WSA reports on the status of water and sanitation service levels at the Intergovernmental Relations (IGR) forum that is held every second month. The information is provided per infrastructure sector: water and sanitation, for the number of households (HH).

Table C-3 WSA Sanitation Backlogs (June 2019)

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Sanitation	129 134	67.5	62 235	32.5	191 136

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

Table C-4 WSA Sanitation Targets for end 2019/2020

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Sanitation	132 214	69.1	59 155	30.9	191 136

Source: WSA IGR Municipal Infrastructure Forum Report February 2020

D. Existing Water Supply Schemes and Water Requirements

The WSA falls in the Pongola Mtamvuna Water Management Area (WMA), one of nine WMAs that divides the large catchment areas of South Africa. The Pongola Mtamvuna WMA covers the whole of the KZN province, except a small part in the south, that falls within the Mzimvubu Tsitsikamma WMA. Prior to 2014, the WSA would have included the coastal and lower portions of the Usutu to Mhlatuze, Thukela and Usutu to Mhlatuze WMAs.

The most prominent rivers in the WSA are the Tugela (Thukela) and Mvoti Rivers. The only dam used for municipal water supply is the iMvutshane Dam. Other dams are for small scale private domestic, or agricultural use. There are no major dams in the WSA.

D-1 Tugela River

The total MAR of the Tugela River catchment is high ~ 3 799 million m³/a but can be highly variable. The ISP listed the following Key Areas for the WMA:

- ✓ Upper Thukela (tertiary catchments V11, V12, V14 and quaternaries, V60G, H and J);
- ✓ Little Thukela (tertiary catchment V13);
- ✓ Bushmans (tertiary catchment V70);
- ✓ Sundays (quaternary catchments V60A, B, C, D, E and F);
- ✓ Mooi (tertiary catchment V20);
- ✓ Buffalo (tertiary catchments V31, V32 and quaternaries, V33A and B);
- ✓ Lower Thukela (tertiary catchments V40, V50 and quaternaries, V33C, D and V60K);

The IDM comprises all or part of the following tertiary catchments: U30, U40, U50, V50 and W11. The W11 catchment forms part of the previously-demarcated Usutu to uMhlatuze WMA.

D-2 Mvoti River

According to the Mvoti to Mzimkulu ISP, the Mvoti River is poorly developed and have not kept up with increases in surrounding developments and corresponding water requirements. However, feasibility studies have been conducted and potentially three dams identified for future development: the Mvotipoort Dam, Isithundu Dam and the Welverdient Dam (UW Infrastructure Master Plan, 2018). The DWS to provide inputs on the potential future development options of these water resources.

Currently the Mvoti River supplies water to a small area in the town of KwaDukuza via the Mvoti WTP, the remainder being supplied from the LTBWSS. SAPPI Mill Gledhow is also one of the larger abstractors from the Mvoti River. Illegal sand dune mining interferes with the availability of water and flow of the river (Lower Mvoti Catchment Forum Meeting minutes, May 2018). The MAR of the Mvoti Key area is relatively high at 435 million m³/a, but due to the high sediment load and unfavourable conditions, storage development is likely to be costly.

D-3 iMvutshane Dam

The iMvutshane Dam, constructed in 2015, is on the iMvutshane River, a tributary of the Hlimbitwa River. The dam has a design capacity of 3.2million m³ but due to the drought conditions during 2015 till 2017, the dam was not fully impounded. However, since then, the dam levels have increased and the current level reported on the Umgeni Water website (May 2019) for the dam is 89%. The dead storage is given as 0.32million m³ in the latest Umgeni Water IMP (2019). The stochastic yield of the dam is 2.4million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2018), however it excludes the Ecological Reserve.

The iMvutshane Dam is supply the Maphumulo Bulk Water Supply Scheme. If necessary, a transfer scheme (planned for implementation by 2025) will be constructed from the Hlimbitwa River to augment the volume of the iMvutshane Dam.

D-4 Other Surface Water Sources

The other surface water sources are smaller, secondary rivers or privately-owned or smaller dams. The Hlimbitwa River flows through Maphumulo LM and joins the Mvoti River just south of the iMvutshane Dam which is a tributary of the Hlimbitwa River. The Nonoti River in the KwaDukuza LM was used as water supply to the Darnall WSS, but this area is now supplied from the LTBWSS.

D-5 Proposed Potential Surface Water Sources

The following are proposed potential dams within the WSA:

- ✓ Welverdient Dam on the Mvoti River, less than 5km from the town of KwaDukuza;
- ✓ Isithundu Dam on the Mvoti River, some 30km north-west of the town of KwaDukuza, in the neighbouring Umvoti LM; and
- ✓ Mvotipoort Dam on the Mvoti River, 10km south-east of Greytown, in the neighbouring Umvoti LM.

The development of new surface water resources will depend detailed evaluations on the water requirements, economic and environmental costs and social benefits amongst other considerations (UAP Phase II, 2016).

D-6 Groundwater Sources

The existing groundwater resources in the WSA are classified as minor. However, some of the rural areas are supplied from groundwater sources, such as in the Macambini WSS and other areas in the Macambini Tribal Authority areas, but plans are to connect this scheme to the Sundumbili WSS.

D-7 External Water Sources

The southern portions of the WSA – KDM and NLM, are supplied from the Umgeni Water North Coast system, which is obtaining water from the neighbouring tertiary catchment U20, which includes the Hazelmere Dam, located on the Mdloti River as main source of water.

The full supply capacity of the Hazelmere Dam is 17.86million m³ and the stochastic yield of the dam is 20million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2018), however it excludes the Ecological Reserve. The updated Umgeni Water Infrastructure Master Plan (2020) reports the Hazelmere Dam full supply capacity as 37.1million m³, once the raising of the dam wall is complete. The Hazelmere Dam can currently impound 21million m³.

Since the LTBWSS as well as the North Coast System are both bi-directional, water can be supplied into the WSA as well as out of the WSA.

D8 -Water supply schemes

Bulk water supply schemes can be identified as schemes with a large geographic footprint, or with a Water Treatment Plant (WTP) of a design capacity of 2Mℓ/d or more. A summary of the Water Treatment Plants is provided in Table D-1

Table D-1: Summary of WTPs

LM Name	Plant Name	Owner	Design Capacity (Mℓ/d)	Annual Average Production (Operational) (Mℓ/d)	Class of Plant
KwaDukuza	Mvoti	IDM	16	11	B
	Lower Tugela	Umgeni Water	55	25-30	A
	Mandeni (decommissioned, using pumps only)	IDM	6.6	0	
	SAPPI (on the Tugela River)	SAPPI	unknown	unknown	unknown
	SAPPI (at SAPPI)	SAPPI	unknown	unknown	unknown
Mandeni	Sundumbili	IDM	40	18	A
	Maphumulo package plant*	Umgeni Water	3	3	
	Maphumulo	Umgeni Water	6	6	B
Maphumulo	Ngcebo	IDM	4	1.6	C
	Esidumeni	IDM	1.5	1	C
	Montebello Hospital	Montebello Hospital	0.15	0.15	C
Ndwedwe	Ntuze	IDM	2	0.25-0.30	C
Total Capacity			134.25	40.75	
eThekwini Metro	Hazelmere (Mdloti System)	Umgeni Water	75	50	B

Source: iLembe DM correspondence received and from interviews (June, 2019); Umgeni Water (2020)

* The Maphumulo package plant is operated as an additional module to the Maphumulo WTP

The operations at the Maphumulo WTP and package plant are hampered during times of drought and electricity outages and are then not able to meet the demands of consumers. The remaining WTPs generally have spare operating capacity to meet future water demand.

The water requirements for the IDM are presented per Local Municipality within Table D-2. 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 IDM would require by the year 2050, 222.29Mℓ/day.

Table D-2 Water Demand Projections per LM, Mℓ/d

	Population				Water Demands (Mℓ/d)			
LM Name	**2020**	**2030**	**2040**	**2050**	**2020**	**2030**	**2040**	**2050**
KwaDukuza	279,867	307,956	343,372	382,859	69.56	78.50	88.91	100.78
Mandeni	167,203	183,985	205,144	228,735	33.80	38.66	43.65	49.38
Maphumulo	117,146	128,904	143,728	160,256	21.34	23.79	26.92	30.52
Ndwedwe	170,548	187,666	209,248	233,311	24.89	32.36	36.65	41.61
Total	**734,764**	**808,512**	**901,491**	**1,005,162**	**149.58**	**173.31**	**196.13**	**222.29**

Source: Water Demand Model, UAP Phase III, 2020

The KwaDukuza LM, being the most urbanised and developed, has the highest water requirements, representing 47% of the total water demands of 2020 and 45% of the total water demands of 2050. The KwaDukuza LM also has the highest growth in water demands, representing an increase of 31.22Mℓ/d from 2020 to 2050. The Ndwedwe LM has the second-highest growth in requirements of 16.72Mℓ/d from 2020 to 2050, followed by the Mandeni LM with an increase in requirements of 15.59Mℓ/d. The Maphumulo LM has an increase of 9.18Mℓ/d from 2020 to 2050.

E. Existing Sanitation Schemes

There are 17 Wastewater treatment plants within the IDM that serves the major towns but all of them are in need of refurbishment and improved operations and maintenance. Three (3) works has achieved Green Drop status in 2014. Three (3) of these WTPs are owned and operated by Siza Water Concession.

F. Planned and Implementation Projects

The existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints. 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 IDM amount to R 996,7 million. However, the proposed cost requirement for bulk water supply services within IDM is R 5,14 billion and would represent a wall to wall coverage of the total need. IDM currently has one (1)

existing bulk interventions currently in planning under the Regional Bulk Infrastructure Grant earmarked over the next three (3) years to the value of R 135 million.

G. Bulk Water Supply Interventions Considered

This study aims to ensure that the IDM 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, population and their water requirements are illustrated within Table G-1, the water resource requirements illustrated in Table G-2 and the costs illustrated in Table G-3.

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

WSIA No	WSIA Name	Population 2020	Population 2050	Demand2020 (Mℓ/d)	Demand 2050 (Mℓ/d)
ILE009	Ngcebo WSS	16 721	22 875	3.04	4.36
ILE016, ILE017 and ILE013	Macambini	44 881	61 397	8.20	11.73
	Ndulinde WSS	50 499	69 083	9.17	13.13
	Sundumbili WSS	48 234	65 985	11.05	15.88
Sub-Total Sundumbili WSS		**143 615**	**196 466**	**28.42**	**40.75**
ILE002, ILE003, ILE010, ILE012 and ILE015	Dwedwe	53 617	73 348	7.81	13.66
	Emalangeni	25 110	34 350	3.47	5.97
	Nkwambase	19 018	26 016	3.24	4.81
	Ozwathini	47 595	65 110	6.48	11.03
	Umgeni Northern Feeder	168 990	231 179	38.02	56.05
Sub-Total Hazelmere system		**314 329**	**430 004**	**59.01**	**91.52**
ILE001, ILE006, ILE007, ILE005 and ILE014	Lower Tugela Bulk WSS (extended Darnall)	45 016	61 583	10.19	14.76
	Mandeni WSS	7 548	10 326	2.61	3.62
	Maphumulo WSS	104 866	143 457	18.72	26.94
	Mvoti WSS (KwaDukuza-Stanger)	58 531	80 070	19.74	27.76
	Tugela South	11 880	16 252	1.93	3.78
Sub-Total Lower Tugela BWS		**227 841**	**311 688**	**53.19**	**76.86**

WSIA No	WSIA Name	Population 2020	Population 2050	Demand2020 (Mℓ/d)	Demand 2050 (Mℓ/d)
ILE004	Glendale	9 499	12 995	1.71	2.50
ILE011	Ntunjambili	8 708	11 913	1.66	2.37
iLembe DM		**720 714**	**985 941**	**147.03**	**218.37**

Source: Water Demand Model, UAP Phase III, 2020

The highest demands are in the areas supplied from the Hazelmere system as well as the Lower Tugela Bulk system.

Then, the IDM is working with Umgeni Water on the planning and future implementation of the uMshwathi Regional Bulk WSS (Midmar WTP), which is being executed in six phases (Umgeni Water Infrastructure Master Plan, 2018) within the uMgungundlovu DM and IDM. Should this scenario option be considered, the following WSIAs fall within the uMshwathi Regional Bulk WSS, in the iLembe DM:

- ILE002 Dwedwe;
- ILE003 Emalangeni;
- ILE001 Lower Tugela Bulk WSS (extended Darnall);
- ILE007 Maphumulo WSS;
- ILE005 Nkwambase; and
- ILE012 Ozwathini.

Table G-2: Water Resources Required vs proposed WSI

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	[A] Existing Resources (Mm^3/a)*	[B] Proposed Additional Demand under UAP Phase III (Mm^3/a)	[A+B] Total Demand (Mm^3/a)	Balance (Mm^3/a)
ILE009	Ngcebo WSS	22 875	4.36	1.59		0.48	0.48	
ILE016, ILE017 and ILE013	Macambini	61 397	11.73	4.28	14.6	1.29	15.89	
	Ndulinde WSS	69 083	13.13	4.79	14.6	1.45	16.05	
	Sundumbili WSS	65 985	15.88	5.80	14.6	1.77	16.37	
Sub-Total:		196 466	40.75	14.87		4.50	19.10	
ILE002, ILE003, ILE010, ILE012 and ILE015	Dwedwe		13.66	4.99	22	2.14	24.14	
	Emalangeni	73 348	5.97	2.18	22	0.91	22.91	
	Nkwambase	34 350	4.81	1.76	22	0.58	22.58	
	Ozwathini	26 016	11.03	4.03	22	1.66	23.66	
	Umgeni Northern Feeder	65 110	56.05	20.46	22	6.58	28.58	
Sub-Total		231 179	91.52	33.41	22	11.87	33.87	
ILE001, ILE006, ILE007, ILE005 and ILE014	Lower Tugela Bulk WSS (extended Darnall)	430 004	14.76	5.39	40.15	1.67	41.82	
	Mandeni WSS		3.62	1.32	40.15	0.37	40.52	
	Maphumulo WSS	61 583	26.94	9.83	2.4 & 40.15	3.00	45.55	
	Mvoti WSS (KwaDukuza-Stanger)	10 326	27.76	10.13	6.57	2.93	9.50	
	Tugela South	143 457	3.78	1.38	40.15	0.67	40.82	
Sub-Total		80 070	76.86	28.06		8.64	8.64	
ILE004	Glendale	12 995	2.50	0.91	2.4	0.29	2.69	
ILE011	Ntunjambili	11 913	2.37	0.87	2.4	0.26	2.66	
TOTAL		985 941	218.37	79.70				

* The Historic Firm Yield from the Hazelmere Dam is 22Mm³/a, however the total yield cannot be allocated to the areas supplied from the Hazelmere WTP. The stochastic yield of the iMvutshane dam is 2.4million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2018), however it excludes the Ecological Reserve. The planned allocation to the Lower Tugela WTP from the Tugela River totals 110Mℓ/d (40.15Mm³/a). The allocation to the Sundumbili WTP from the Tugela River totals 40Mℓ/d (14.6Mm³/a). Umgeni Water applied for an abstraction licence of 6.57 million m³/annum (18Mℓ/day) from the Mvoti River for the Mvoti WTP. The yield from groundwater used by the scheme areas is not known.

The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.

Table G-3: Total Cost requirement

A total estimate of R6.14 billion is required to address the total bulk water supply requirement within the IDM by 2050.

For the Scenario Option: From the uMshwathi Regional Bulk WSS, the total bulk cost requirement is R3 396.67 million (excl VAT), which includes the UAP Phase III planning and costing for the Dwedwe, Emalangeni and Nkwambase schemes, as well as reviewed planning and costing under this scenario, for the Lower Tugela Bulk WSS (extended Darnall), Maphumulo and Ozwathini schemes.

Should all schemes under Scenario Option: From the uMshwathi Regional Bulk WSS be grouped under the UAP Phase III planning and costing, the total bulk cost requirement comes to R3 322.69 million (excl VAT).

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
ILE009	Ngcebo WSS	R20 448 000	R143 653 000	R63 902 000	R22 800 300	R250 803 300
ILE016, ILE017 and ILE013	Macambini	R24 266 000	R5 597 000	R143 855 000	R17 371 800	R191 089 800
	Ndulinde WSS	R42 892 000	R66 189 000	R122 728 000	R23 180 900	R254 989 900
	Sundumbili WSS	R43 627 000	R59 435 000	R151 665 000	R25 472 700	R280 199 700
Sub-Total:		**R110 785 000**	**R131 221 000**	**R418 248 000**	**R66 025 400**	**R726 279 400**
ILE002, ILE003, ILE010, ILE012 and ILE015	Dwedwe	R84 338 000	R139 011 000	R160 787 000	R38 413 600	R422 549 600
	Emalangeni	R92 760 850	R14 602 000	R77 478 000	R18 484 085	R203 324 935
	Nkwambase	R21 000 000	R36 428 000	R96 294 000	R15 372 200	R169 094 200
	Ozwathini	R0	R150 043 000	R180 587 000	R33 063 000	R363 693 000
	Umgeni Northern Feeder	R5 742 000	R180 235 000	R503 298 000	R68 927 500	R758 202 500
Sub-Total		**R203 840 850**	**R520 319 000**	**R1 018 444 000**	**R174 260 385**	**R1 916 864 235**
ILE001, ILE006, ILE007, ILE005 and ILE014	Lower Tugela Bulk WSS (extended Darnall)	R271 049 500	R995 423 000	R43 115 000	R130 958 750	R1 440 546 250
	Mandeni WSS	R27 381 000	R3 801 000	R42 890 000	R7 407 200	R81 479 200
	Maphumulo WSS	R49 767 000	R331 740 000	R273 180 000	R65 468 700	R720 155 700
	Mvoti WSS (KwaDukuza-Stanger)	R4 753 000	R38 083 000	R222 200 000	R26 503 600	R291 539 600
	Tugela South	R516 920 000	R39 086 000	R1 332 000	R55 733 800	R613 071 800
Sub-Total		**R869 870 500**	**R1 408 133 000**	**R582 717 000**	**R286 072 050**	**R3 146 792 550**
ILE004	Glendale	R0	R2 438 000	R36 941 000	R3 937 900	R43 316 900
ILE011	Ntunjambili	R23 770 000	R22 897 000	R1 538 000	R4 820 500	R53 025 500
Total		**R1 228 714 350**	**R2 228 661 000**	**R2 121 790 000**	**R557 916 535**	**R6 137 081 885**

Source: Water Demand Model, UAP Phase III, 2020

H. Conclusions and Recommendations

The IDM 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. 18% of the consumers within IDM does not have access to reliable water supply across the whole of the IDM'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 IDM 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 IDM 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 fourteen 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 IDM as the WSA. The IDM 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 IDM to take this process further.

The proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within IDM and are as follows, with an indicative grouping of schemes:

- ✓ ILE009 Ngcebo WSS;
- ✓ From the Sundumbili WTP: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS;
- ✓ From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder;
- ✓ From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South;
- ✓ ILE004 Glendale.; and
- ✓ ILE011 Ntunjambili.

Although all six (6) area interventions would be an implementation priority for the WSA, it is proposed to consider the following three (3) priorities detailed within Table H-1.

It is also proposed to follow a phased approach for implementation, pending water resource availability and human settlement development. However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

Table H-1 Proposed Implementation Order

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Estimated Project Value (Excl VAT)
1	ILE002, ILE003, ILE010, ILE012 & ILE015	Dwedwe, Emalangeni, Nkwambase, Ozwathini and Umgeni Northern Feeder	Hazelmere WTP augmentation to ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder	R1 916 864 235
2	ILE001, ILE005, ILE006, ILE007 & ILE014	Lower Tugela Bulk WSS (extended Darnall), Mvoti WSS (KwaDukuza-Stanger), Mandeni WSS, Maphumulo WSS and Tugela South	Lower Tugela Bulk WTP augmentation to ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South	R3 146 792 550
3	ILE016, ILE017 & ILE013	Macambini, Ndulinde WSS and Sundumbili WSS	Sundumbili WTP augmentation to ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS	R726 279 400

For the Scenario Option: From the uMshwathi Regional Bulk WSS, the total bulk cost requirement is R3 396.67 million (excl VAT), which includes the UAP Phase III planning and costing for the Dwedwe, Emalangeni and Nkwambase schemes, as well as reviewed planning and costing under this scenario, for the Lower Tugela Bulk WSS (extended Darnall), Maphumulo and Ozwathini schemes.

Should all schemes under Scenario Option: From the uMshwathi Regional Bulk WSS be grouped under the UAP Phase III planning and costing, the total bulk cost requirement comes to R3 322.69 million (excl VAT). This may prompt a detailed feasibility investigation into the options of water supply to compare this to the uMshwathi Regional Bulk WSS costing of R3 396.67 million (excl VAT). The feasibility should include full infrastructure life cycle costing and operational costs.

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LIST OF ABBREVIATIONS

ADM	Amajuba District Municipality
CoGTA	Department of Cooperative Governance and Traditional Affairs
CoU	City of uMhlathuze
CR	Command Reservoir
DM	District Municipality
DWS	Department of Water and Sanitation
EMF	Environmental Management Framework
GIS	Geographical Information System
IDM	iLembe District Municipality
IDP	Integrated Development Plan
IRDP	Integrated Residential Development Programme
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
MIG	Municipal Infrastructure Grant
Mℓ/day	Mega liter per day
Mm^3	Million Cubic meter
Mm^3	Million Cubic Meters
Mm^3/a	Million Cubic Meters per annum
NLM	Newcastle Local Municipality
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
UKDM	Umkhanyakude District Municipality
UTDM	uThukela District Municipality
VAT	Value Added Tax
WMA	Water Management Area
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSI	Water Supply Intervention
WSIA	Water Supply Intervention Area
WSIG	Water Services Infrastructure Grant
WSP	Water Service Provider
WSS	Water Supply Scheme
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. OBJECTIVES AND METHODOLOGY

This report is the Bulk Water Master Plan for the study titled "Universal Access Plan Phase III – Progressive Development of a Regional Concept Secondary Bulk Water Master Plan for the iLembe District Municipality (IDM) – 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) 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 (Pty) Ltd), in association with JTN Consulting in November 2018 to review the UAP Phase II process by 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

Since the completion of the UAP Phase II study report for the WSA, the following studies and activities have been initiated and / or completed, that will be considered for UAP Phase III:

- ✓ iLembe District Municipality Water and Sanitation Master Plan, 2016;
- ✓ Development and Implementation of Water Conservation / Water Demand Management in iLembe District Municipality: Bulk Water Meter Audit Report, 2016;
- ✓ StatsSA Community Survey, 2016;
- ✓ Regional Bulk Project: Lower Tugela Bulk Water Supply System, Phase 1 implemented in 2018;
- ✓ iLembe District Municipality Non-Revenue Water Master Plan Strategy for 2018/19 – 2022/23 Financial Year;
- ✓ Submission of monthly water balance reports to the DWS;
- ✓ KZN Water Conservation and Water Demand Management Handbook. iLembe District Municipality, 2018;
- ✓ Umgeni Water Infrastructure Master Plans, 2017, 2018, 2019 and 2020;

- ✓ Eskom Satellite Building Count (SBC), 2015;
- ✓ iLembe District Integrated Development Plan, 2019/2020;
- ✓ iLembe District Integrated Development Plan, 2018/2019;
- ✓ iLembe District Integrated Development Plan, 2017/2018;
- ✓ All Towns Reconciliation Strategies Studies (Department of Water and Sanitation, 2012 or 2016), where possible.

More information will be provided in this report, in the relevant sections. It is possible that more studies and activities have been initiated or completed and will be included in the UAP Phase III study as and when required, such as updated Water Services Development Plans or DWS water resource studies.

1.4 Stakeholder Engagement

During the UAP Phase III study, the stakeholders from the IDM and other relevant water institutions were identified and engaged. A stakeholder list was prepared with the names and contact persons of the institutions.

Umgeni Water is providing bulk services and operational support in the IDM and the relevant officials are included in the stakeholder list.

Stakeholder engagements include site visits during the Inception process; follow-up engagements (site visits, email, telephonic) to elicit comments and information relevant to this study; and the presentation of the Due Diligence Reports.

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 connections 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:

    - Category 1 (Very High Income): Households with a house connection and an income more than R 1 228 000 per year;
    - Category 2 (Upper Middle Income): Households with a house connection and an income between R 153 601 and R 1 228 000 per year;
    - Category 3 (Average Middle Income): Households with a house connection and an income of between R 38 401 and R 153 600 per year;
    - Category 4 (Low Middle Income): Households with a house connection and an income of between R 9 601 and R 38 400 per year;
    - Category 5 (Low Income): Households with a house connection and an income between R1 and R 9 600 per year;
    - Category 6 (Yard Connections): all Households with a Yard Connection;
    - Category 7 Households with access to interim services and
    - Category 8 Households with access to below interim services.

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

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

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

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

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

    - 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				
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
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 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 are 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 economic development opportunities. A map of the study area is provided in Figure 2-1 Study Area.

2.1 CONTEXT

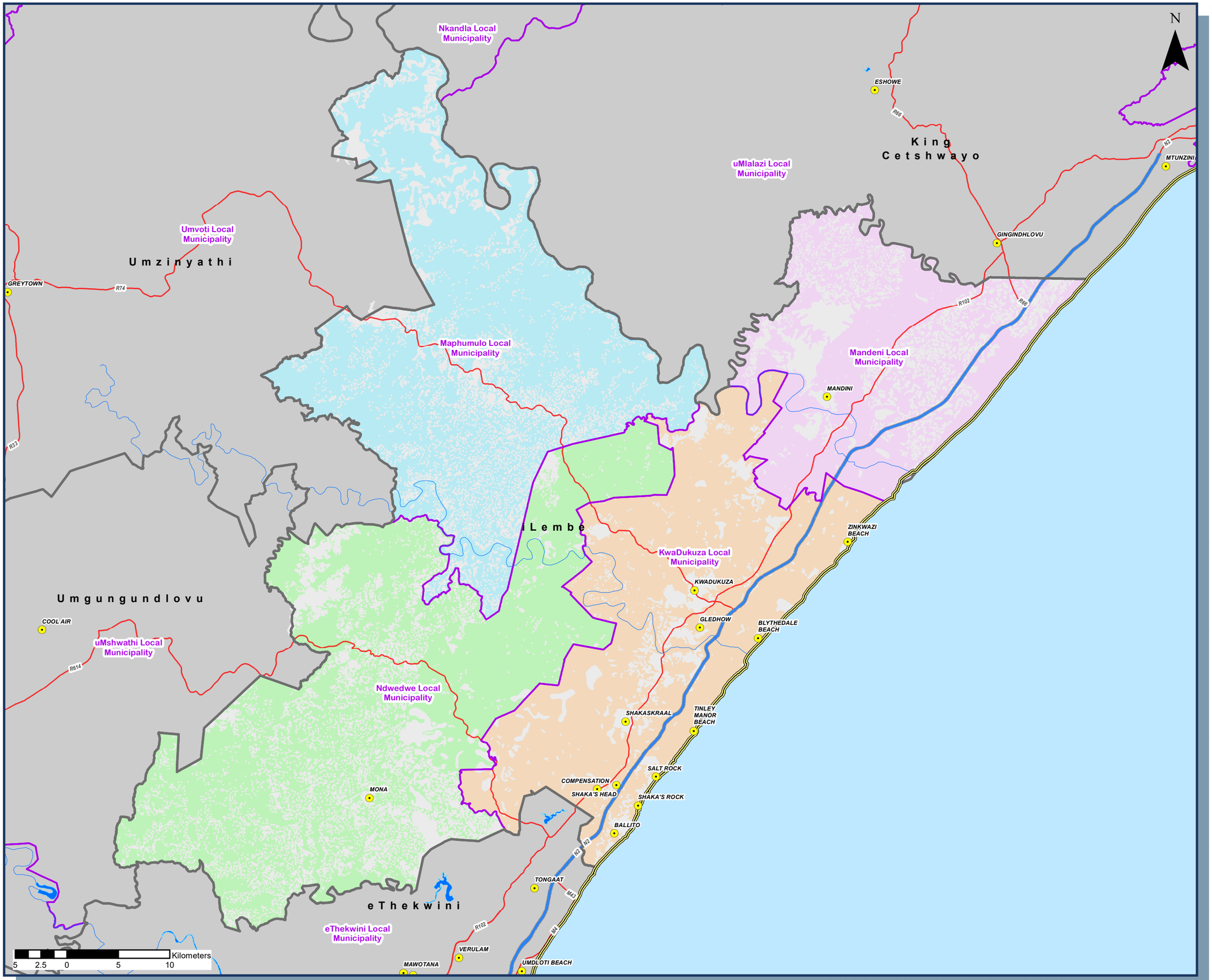
The iLembe District Municipality (DC29) is one of the ten (10) District Municipalities and one (1) Metropolitan Municipality that constitute the KwaZulu-Natal Province. It lies on the east coast of KwaZulu-Natal, between eThekwini Metro in the south and King Cetshwayo District in the North. To the west, iLembe is bordered by two Districts; uMgungundlovu and uMzinyathi. At 3 260km², this is the smallest of the 10 KZN District Municipalities with a total population of approximately 657 612 people (Statistics SA Community Survey 2016). iLembe District is constituted by four Local Municipalities (IDM, IDP 2018/2020):

- ✓ KwaDukuza Local Municipality (KDM, KZN292);
- ✓ Mandeni Local Municipality (MLM, KZN291);
- ✓ Maphumulo Local Municipality (MPLM, KZN294); and
- ✓ Ndwedwe Local Municipality (NLM, KZN293).

The IDM is located between two of Africa's busiest ports, Durban and Richards Bay, on the primary economic development corridor in the province along the N2 highway, and is therefore well positioned not only to local, but also international markets. The King Shaka International Airport and the Dube Trade Port, just a few kilometres from the southern border of iLembe, have amplified what was already a prime investment destination (IDM IDP, 2019/2020).

Approximately 63% of the land area of the IDM falls under the administration of traditional authorities. The northern areas of the NLM, the central corridor of MLM and KDM are the commercial farming hubs of the District, mainly under privately owned sugar cane. Areas of urbanisation in the District comprise of KwaDukuza / Stanger, Mandeni, then along the Dolphin Coast and Nkwazi. These areas are well-developed and well-served with infrastructure. Industrial development is concentrated in KwaDukuza, the IsiThebe Industrial Park and Darnall. Most notably are the Gledhow and Darnall sugar milling operations at Stanger and the Sappi Paper mills at Mandeni (IDM IDP, 2019/2020).

The Dolphin Coast forms part of the East Coast tourism region and very popular due to its moderate to warm climate throughout the year. Tourism development plays an important primary and secondary role in economic growth and development in the region.



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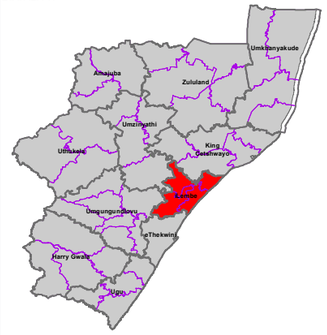
Legend

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

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

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PROJECT TITLE

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

MAP TITLE:

Study Area

iLembe District Municipality

DATE COMPLETED: Friday, 12 June 2020

MAP NO.: **DC29: Figure 2.1**

The IDM, with the State Secretariat of Economic Affairs of the Swiss Confederation (SECO) and the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs, established the Vuthela iLembe LED Support Programme (Vuthela). The programme responds to the urgent need to address unemployment, poverty and inequality in the iLembe District Municipality by accelerating inclusive local economic development and growth aligned with the National Development Plan 2030, the provincial and district Growth and Development Plans, as well as the Integrated Development Plans and Local Economic Development strategies of the family of local municipalities in the district (Vuthela brochure, 2018).

2.2 Physical Characteristics of the Study Area

The following sections provide a brief description of the physical characteristics of the local municipalities in the study area.

2.2.1 KwaDukuza Local Municipality (KDM)

The municipality is a category B municipality and is on the east coast of KwaZulu-Natal with the most prominent towns being KwaDukuza (previously known as Stanger), Nkobongo, Ballito and Groutville. The KDM covers an area of approximately 633km² and the Municipality stretches from the Zinkwazi River in the north to the Tongati River in the south. KwaDukuza (previously known as Stanger) is the district node and dominant commercial centre in the iLembe District (KDM IDP, 2019/2020).

The municipality is linked with a well-developed network of road and rail infrastructure. The key feature of KDM is the N2 Development Corridor traversing north-south near the coast and providing access to the King Shaka International Airport in the south, next to Ballito, a well-known tourist destination on the Dolphin Coast, and the Richard's Bay Industrial Zone in the north.

The population of KDM has grown by 37.8 % since 2011 from 231 187 to 276 719 in 2016 (Statistics South Africa, 2016). Furthermore, it has been speculated that during peak seasons, KDM's population reaches up to 320 000 people due to the influx of tourists. The main contributors to the KDM's local economy are agriculture, of which the majority is sugarcane farming and processing; light industry, including engineering, and manufacturing of paper and packaging as well as tourism (KDM IDP, 2019/2020).

It is also within the KDM that the water concessionaire, Siza Water, operates.

2.2.2 Mandeni Local Municipality (MLM)

The municipality is a category B municipality and is on the east coast of KwaZulu Natal with the most prominent towns being Mandini and Sundumbili. The MLM covers an area of 545.5km² and the municipality stretches from the Zinkwazi River in the south, to the Matigulu Lagoon on the Matigulu River in the north. It lies along the N2 national and provincial corridor, as well as the north-south rail link connecting the economic hubs of Durban and Richards Bay. As such, the municipality is strategically located to provide services to, and derive economic benefits from, these economic hubs (MLM IDP, 2019/2020).

The MLM has a total population of 147 808 in 2016 and there are four (4) traditional authorities in the MLM. The MLM's population increased by 7% from 138 079 in 2011. In contrast, the inland rural municipalities of Ndwedwe and Maphumulo experienced a net population decline. Population growth in Mandeni Municipality exerts pressure on existing services and leads to the densification of settlements located around Mandeni Town, and along major transport routes. Informal settlements with limited to no facilities or infrastructural services occur on the periphery of the developed areas, and within the iSithebe Industrial Area and Sundumbili Township (MLM IDP, 2019/2020).

The iSithebe Industrial Estate is one of the main industrial areas / nodes within the iLembe District offering cost-effective production space, with import and export commodities outside this region. The SAPPI Tugela Mill and the iSithebe Industrial Estate (ISithebe) provide opportunities to grow and attract large-scale manufacturing and heavy industry to the MLM. The MLM further aims to develop the tourist sector and promote investor confidence thereby attracting more development to the area (MLM IDP 2019/2020).

2.2.3 Maphumulo Local Municipality (MPLM)

The municipality is a category B municipality and is one of the inland municipalities of the IDM, on the east coast of KwaZulu-Natal. The MPLM is bounded to the north by the Tugela River and extends approximately 30km to its southern boundary with Ndwedwe Local Municipality. It is situated on the R74 Road from KDM to Kranskop, bordered by NLM in the south; linked through the P711. The primary administrative centre of the Municipality is the town of Maphumulo, which is located approximately 38km north-west of KDM. The MPLM has a population of 89 969 people and 20 524 households (2016) and covers an area of about 896km² (MPLM IDP, 2019/2020). The population has declined since 2011, compared to 2011 when there were 96 724 people in the MPLM.

The MPLM is characterized by its predominantly rural character with agriculture as the main economic activity to such an extent that 50% (10 048) of households are involved in agricultural activities. Almost all the land is associated with Ingonyama Trust and a small percentage by private ownership. There are numerous opportunities for tourism which include many natural assets such as the main rivers such as the Tugela which meanders along KwaShushu, Mvoti River and the Die Kop Mountain. There are also nine Iron Age sites and historical battle grounds MPLM IDP, 2018/2019).

2.2.4 Ndwedwe Local Municipality (NLM)

The municipality is a category B municipality and is one of the inland municipalities of the IDM, on the east coast of KwaZulu-Natal. The NLM abuts eThekwini Metro to the south, where the King Shaka International Airport and Dube Trade port is about 20kms away from the NLM; Maphumulo LM to the north, and KwaDukuza LM to the east. The NLM is a rural area located in the close proximity of Verulam, Tongaat, Shakaskraal, Stanger and Groutville towns. The urban areas are found only in KDM. The municipality is characterized mainly by disadvantaged areas. The main land uses are for primary and secondary education facilities, health facilities, community halls, administration offices, sports fields and a police station (NLM IDP, 2019/2020).

Ndwedwe town functions as the primary node, with the Tafamasi, Montebello, Qinisani, Bhamshela and Sonkombo areas as secondary nodes. The NLM has a population in the region of 143 117 people (Community Survey, 2016) and is 1 153km² in size (NLM IDP, 2019/2020). This shows a nominal growth in population when compared to 2011 when there were 140 808 people in the NLM.

The local economy is largely defined by the service sector where most people are employed in the public sector; the informal economic sector and SMMEs; and the public transport sector. There are commercial agriculture activities in the north-east. The area has enormous potential in tourism, agriculture and the commercial development sector (NLM IDP 2019/2020).

2.3 Climate and Climate Change

The IDM lies in a summer rainfall area and along the warm Indian Ocean Benguela current, which results in the sub-tropical climate along the coast and near inland areas. The climate of the greater part of the region may be described as humid sub-tropical with warm and humid summers and mild, dry winters. The daytime temperatures are typically between 18 and 26°C with summer maximum temperatures reaching the mid-thirties. Night-time temperatures selfdom fall below ten degrees during winter. Annual rainfall ranges from 900mm in the lower-lying coastal areas in the east, to 600mm in the higher-lying western regions (WSDP, 2014.

The WSA has prepared a Draft Climate Change Response Plan (CCRP) 2018, as part of the Local Government Climate Change Support Program (LGCCSP), an initiative of the Department of Environmental Affairs and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

The Draft CCRP addresses various potential threats and impacts of climate change on the WSA. The CCRP used various models to provide information on predicted changes in precipitation and temperature. The report states the following: “Climate change predictions include the shifting of biomes across South Africa. In the iLembe District Municipality, it is projected that, that under a medium risk climate scenario, the Indian Ocean Coast Belt Biome will decrease slightly and shift further inland in some areas; the Savanna Biome will expand slightly and shift closer to the coast in some areas; and the patch of Grassland Biome will be replaced by the Savanna Biome. Under a high risk climate scenario, it is projected that the Indian Ocean Coast Belt Biome will disappear entirely and be replaced by the Savanna Biome.”

Furthermore, potential threats in this area, related to water include:

- Deterioration in water quality due to increased salt concentrations in dams, wetlands and soil/plant systems from enhanced evaporation rates;
- More frequent floods result in increased effluent overflow into rivers. Increased drought means less water is available to dilute wastewater discharges and irrigation return flows to rivers;
- Increased periods of drought mean less water is available;

- Human health and ecosystem impacts, associated with increased rainfall intensities, flash floods and regional flooding resulting in litter and washed-off debris blocking water and sanitation systems; and
- Increased freshwater fish mortality due to reduced oxygen concentrations in aquatic environments and mortality of temperature-sensitive fish species.

Responses to these threats include improved water resource management and management of water services infrastructure and other supporting infrastructure such as stormwater systems. Also, soft measures such as the review and update of by-laws to improve protection of ecological systems as well as infrastructure and review and updating of infrastructure master plans.

The drought during the 2015-2017 summer seasons had an impact on the water security in terms of water availability in this area. The consumers, whether residential, commercial, industrial or agricultural are therefore vulnerable to climate change and extreme weather events.

It is critical that the WSA improves the water security by means of improved water services operation and management, to ensure sustainable services.

Consumer education and awareness will also be critical to ensure information dissemination and improved understanding of the importance to conserve water, improve water stewardship and enhancing the resilience of the WSA and consumers to deal with uncertainties regarding climate change or unforeseen events.

The Department of Environment's Climate Change Adaptation Strategy (2017) denotes that there has been an overall increase in temperature throughout South Africa, but most predominantly in the drier western and north-eastern parts of the country, extending to the east coast of KwaZulu-Natal.

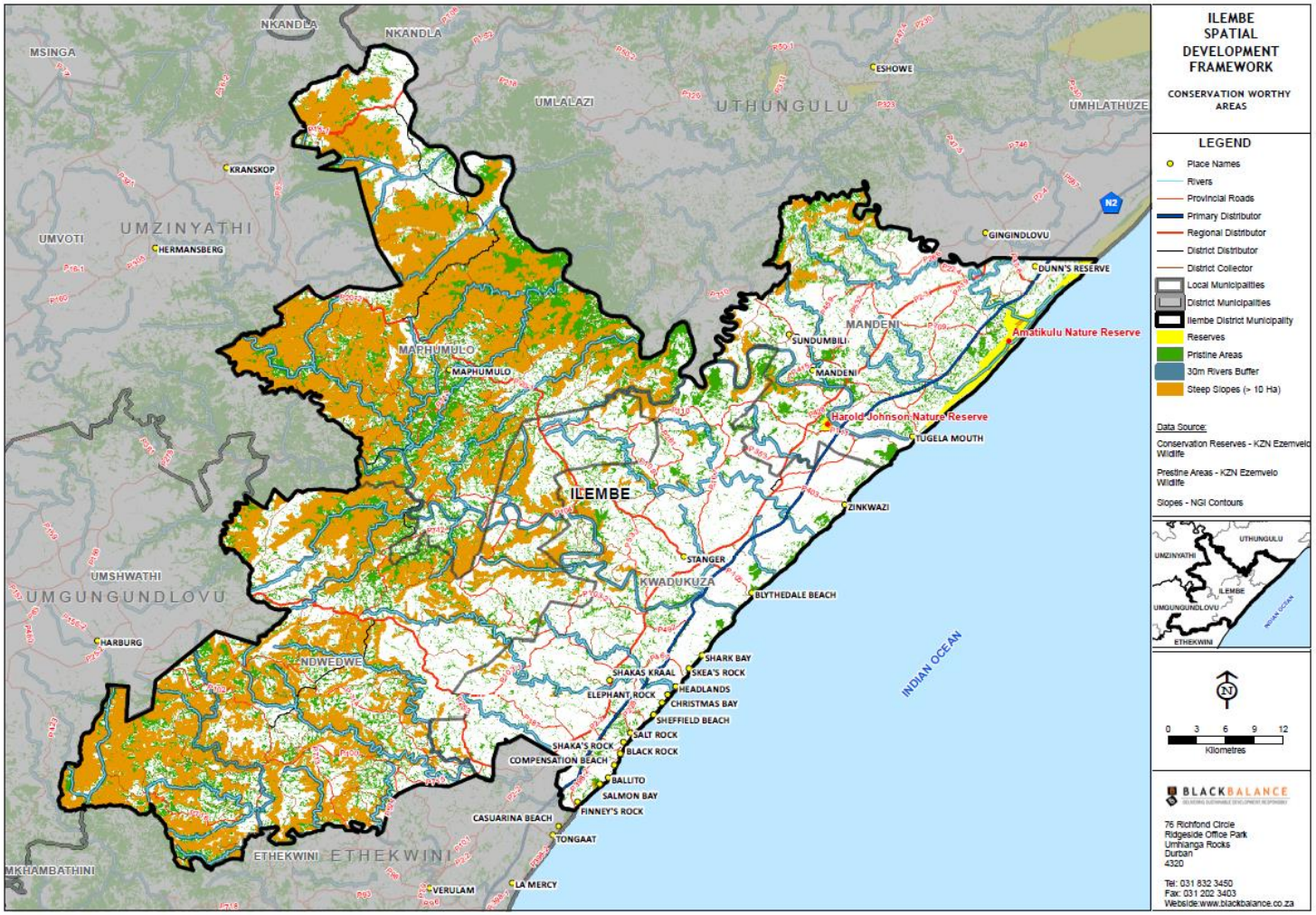
Studying the trends in rainfall since 1921-2015, it appears that there is a positive trend in the central southern interior, but no significant trend in other parts of the country. It is still expected that variability will increase.

2.4 Topography, Geology and Soils

The Municipality is characterised by incised valleys, river systems, hilly slopes and mountains. High altitude areas are found mainly on the western parts of the District with slopes greater than 10ha located in Ndwedwe and Maphumulo LMs. The steep slopes in these two municipalities have justified the dispersed settlement pattern present in these areas and negatively impacted on service provision and development in these Municipal areas.

The most flat slopes are found along the coastal strip within the KwaDukuza and Mandeni Local Municipalities. This allows room for development and agricultural practices to take place in these two Municipalities (IDM SDF, 2015). There are also many Conservation-Worthy Areas identified and mapped as illustrated in Figure 2-2.

Figure 2-2 Map of Conservation-Worthy Areas



The extensive commercial and subsistence farming activities, including large tracts of sugar cane plantations, attest to the rich soil conditions in the IDM. There are however no suitable information and descriptive texts in any of the spatial and planning documentation such as the IDP and WSDP.

2.5 ENVIRONMENT

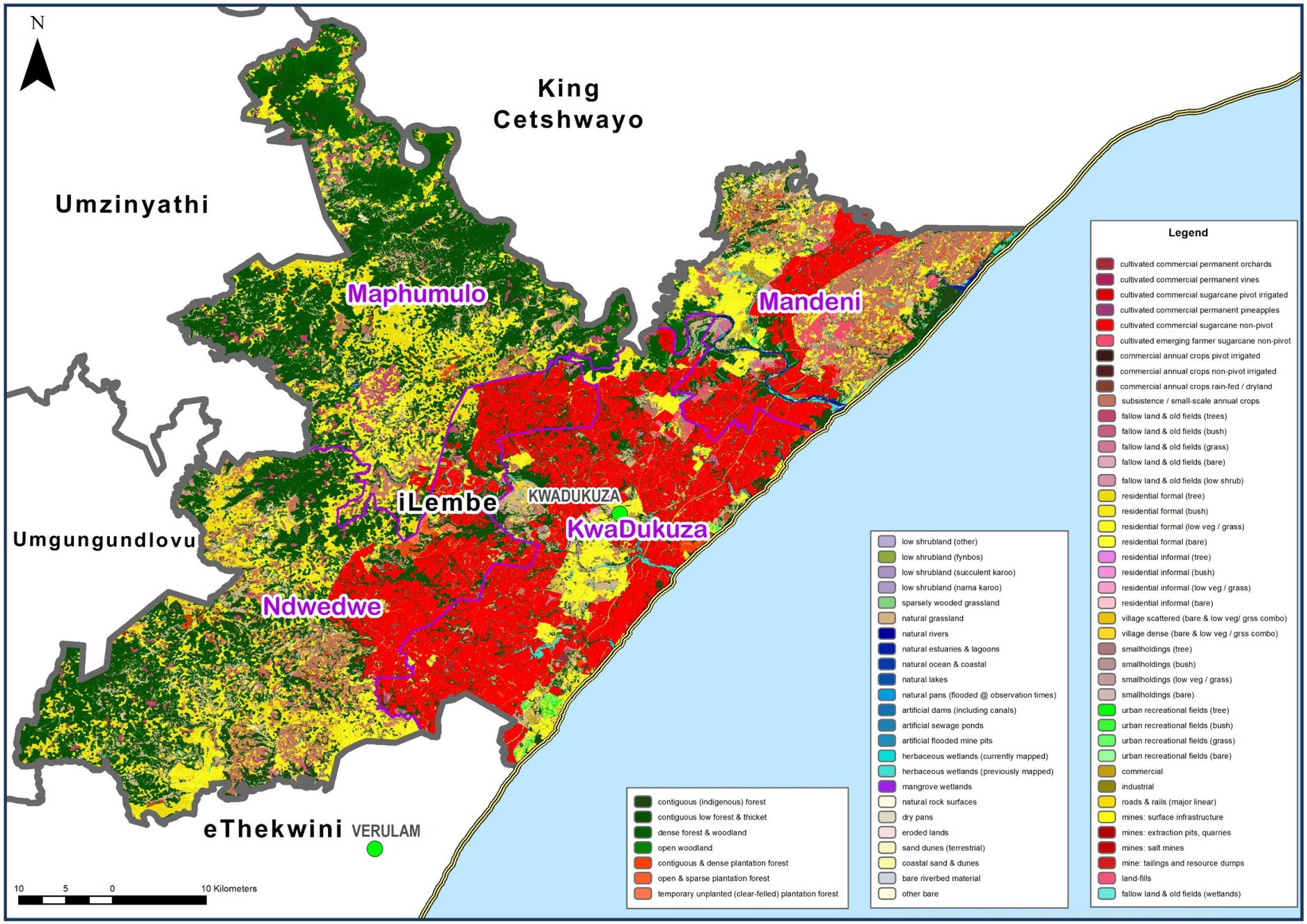
The information in this section was sourced from the IDM SDF, 2015. Water resources are described separately in the Water Resources section of this document. However, it is noted that the IDM contains several wetland areas, which play an important role in providing environmental services and maintaining biodiversity.

The IDM has three types of biomes, namely Grassland, Indian Ocean Coastal Belt and Savanna. The IDP 2014/2015 listed vegetation types such as Eastern Valley Bushland, KwaZulu-Natal Coastal Belt, KwaZulu-Natal Hinterland Thornveld, KwaZulu-Natal Sandstone Sourveld, Midlands Mistbelt Grassland and Ngongoni Veld, Scarp Forest, Maputuland Coastal Belt, Northern Coastal Forest, Subtropical Coastal Lagoons, and Subtropical Dune Thicket. There are parts of the terrestrial ecosystems threatened by human activities.

It is reported in the iLembe IDP 2014/15 that the District is characterized by nine estuaries which forms part of the Coastal belt. The largest and most prominent estuarine includes the Tongati, Mvoti, Zinkwazi, Amatikulu / Nyoni and Thukela.

KDM exhibits high levels of transformation and degradation as a result of extreme development pressure in the coastal zone and the predominance of commercial sugarcane cultivation, see Figure 2-3, illustrating the land cover (Department of Environment, 2018), with the red areas indicating sugar cane plantations and the dark green bush and woodland.

Figure 2-3 Land Cover



By contrast, Mandeni LM is characterised by more subsistence agriculture and less transformation of natural areas. Cultural and heritage resources are concentrated in the greater Mandeni area, with culturally significant landmarks such as the Ultimatum Tree being located on the banks of the Thukela River.

North of the Thukela River, natural areas predominate the coastal zone of Mandeni, in large part due to the presence of the Red Hill and Amatikulu Nature Reserves which stretch for approximately 16 km up the coast and are 1 614 ha in extent. Urban nodes are concentrated in the south, with the most densely populated coastal areas being located between Ballito and Sheffield Beach. North of Sheffield Beach, smaller urban nodes are found at Princes Grant, Umvoti Mouth and Zinkwazi Beach.

There is a lack of biodiversity information for the inland municipalities of Maphumulo and Ndwedwe and uncontrolled human settlement development threatens some of the ecosystems. There is however high potential for eco-tourism in these areas.

2.6 Institutional Arrangements for Water Supply

The IDM is the Water Services Authority (WSA) for its area of jurisdiction and is also performing the majority of bulk and reticulated water services as Water Services Provider.

Umgeni Water is the primary bulk water services provider where the IDM obtains water from the Mdloti WSS (Hazelmere Dam on the Mdloti River) and the Lower Tugela Bulk WSS (Tugela River). Furthermore, Umgeni Water owns and operates the Maphumulo WTP that supplies into the Maphumulo BWSS. There is also a package plant adjacent to the Maphumulo WTP, owned and operated by Umgeni Water.

2.7 Economic Development Opportunities

The following information is presented from the recently-updated document: Review of iLembe District LED Strategy and LED Institutional Arrangements. Composite Report for the iLembe District LED Strategy and Implementation Framework, January 2020.

The main economic sectors in the IDM are agriculture, tourism, manufacturing, and construction and property development. There is a noticeable difference in the level of economic and human settlement development between the two coastal municipalities versus that of the inland municipalities with the latter being characteristically more rural and with higher levels of poverty.

Factors that impact on the economy are the long-term decline of the sugar industry, the social unrest in especially Mandeni LM at the Isithebe Industrial Estate, falling tourism numbers, high levels of crime and a general delay in the approval of development applications in most of the Local Municipalities.

The IDM, as with many other areas in the country, face challenges in a slow-growth economic environment. It has however the following advantages and opportunities:

- Its unique spatial location, located between eThekwini Metro and Richards Bay, iLembe DM has relatively easy access to two significant harbours, the King Shaka International Airport and Dube Trade Port and therefore also to provincial, national and international markets and transport infrastructure;
- The IDM has a well-developed tourism sector along the coastal areas catering mainly for the domestic market but also has good access to the international markets through the road and air route networks;
- The IDM has a strong commercial agricultural sector along the coastal zone. However, it is mainly based on the sugar industry that has its own transformation challenges that need to be addressed;
- The Isithebe Industrial Estate, the largest single industrial estate in South Africa. Not without its own challenges, Isithebe creates a base for the further growth and development of the manufacturing sector in the District; and
- The construction and property development sector in especially the greater Ballito area and further along the coast, is well developed and has the potential to be developed even further.

Furthermore, the IDM is in a position to explore and exploit other economic domains such as the green economy and blue economy, supported by the fourth Industrial Revolution.

The LED Strategy identified key strategic interventions, to be implemented by Enterprise iLembe, the municipal entity established to unlock economic development in the IDM and its family of local municipalities. Of potential interest to the UAP Phase III, are the following:

- ✓ Agricultural development;
- ✓ Tourism development;
- ✓ Manufacturing development;
- ✓ Construction and Property development;
- ✓ Economic infrastructure (enabling infrastructure to attract further development & investment);
- ✓ Emerging Economies development; and
- ✓ Investment Attraction (finalisation of the developers' contribution policy for municipalities, support to address unrests at Isithebe Industrial Estate and fast-track priority tourism investments).

The Vuthela iLembe LED Support Programme (2017-2022) is providing assistance to the IDM and its family of local municipalities to create an enabling environment for investment and inclusive economic growth. This is facilitated through five (5) components of support: Public Finance Management; Municipal Infrastructure; Private Sector Development; Building Inclusive Growth; and Partnerships and Coordination.

3. DEMOGRAPHICS

This section presents the current and projected demographics for the WSA. A map of population distribution is provided in Figure 3-1.

Note that the next national census will be conducted in 2021[1].

3.1 EXISTING POPULATION DISTRIBUTION

3.1.1 Community Survey 2016

The 2016 Community Survey, issued by StatsSA, reported the estimated population and household figures as well as socio-demographic information such as health, infrastructure services, etc. for the whole of South Africa.

The following population figures are presented from the 2016 Community Survey for the WSA:

Table 3-1: Population: 2011 and 2016

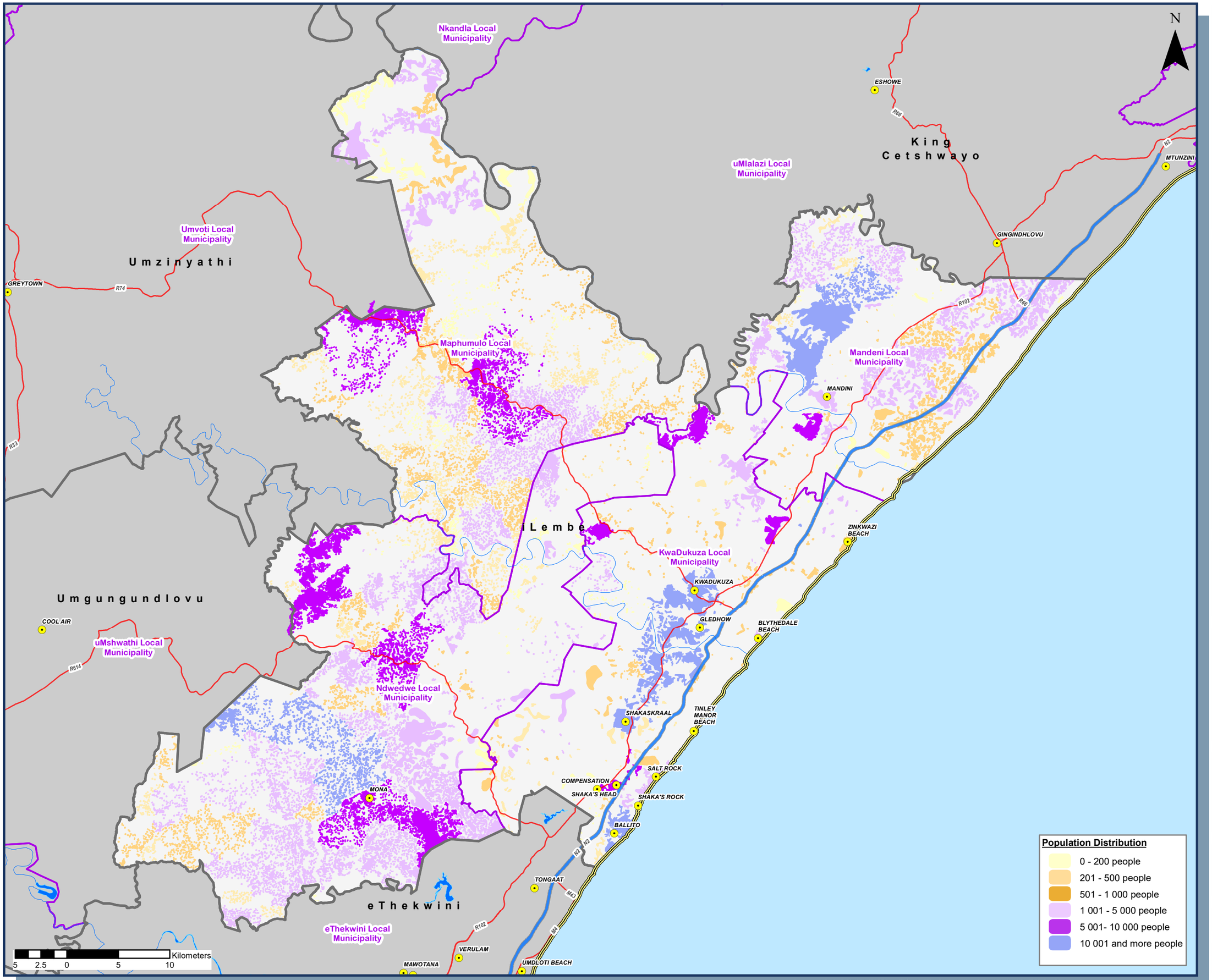
LM Name	Population 2011	Population 2016	Population Growth	Growth Rate p/a
KwaDukuza	231 187	276 719	45 532	4.08
Mandeni	138 078	147 808	9 730	1.55
Maphumulo	96 724	89 969	-6 755	-1.64
Ndwedwe	140 820	143 117	2 297	0.37
Total, Growth Rate Average	606 809	657 613	50 804	1.09

Source: StatsSA, 2016 Community Survey

The most significant changes were firstly in the KwaDukuza and secondly in the Mandeni LMs, both situated on the coastal area of the WSA. The inland Local Municipalities of Maphumulo and Ndwedwe experienced a negative or very small population growth rate respectively.

It is very likely the urban development and infrastructure available in the coastal municipalities drew more people to the areas. The KwaDukuza LM is strategically located as the two highly developed areas, KwaDukuza town and Ballito, are only 10 to 30 minutes' drive on the N2 from the King Shaka International Airport and Dube Tradeport Special Economic Zone. Therefore, attracting trade, development and investment in the area. Ballito is also a very popular tourist destination, situated on the coast.

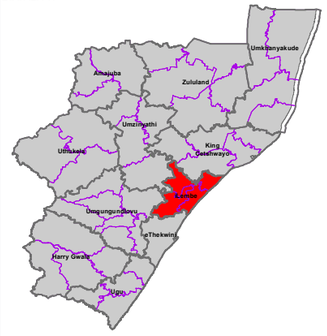
[1] The timing and undertaking the 2021 or next national census may be affected by the COVID19 pandemic.



Legend

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

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Population Distribution

iLembe District Municipality

DATE COMPLETED: Friday, 12 June 2020

MAP NO.: **DC29: Figure 3.1**

Document Path: D:\27814_UAPPhaseIII\Spatial\MapProjects\iLembe\27814_200612_IDM_PopDistr.mxd

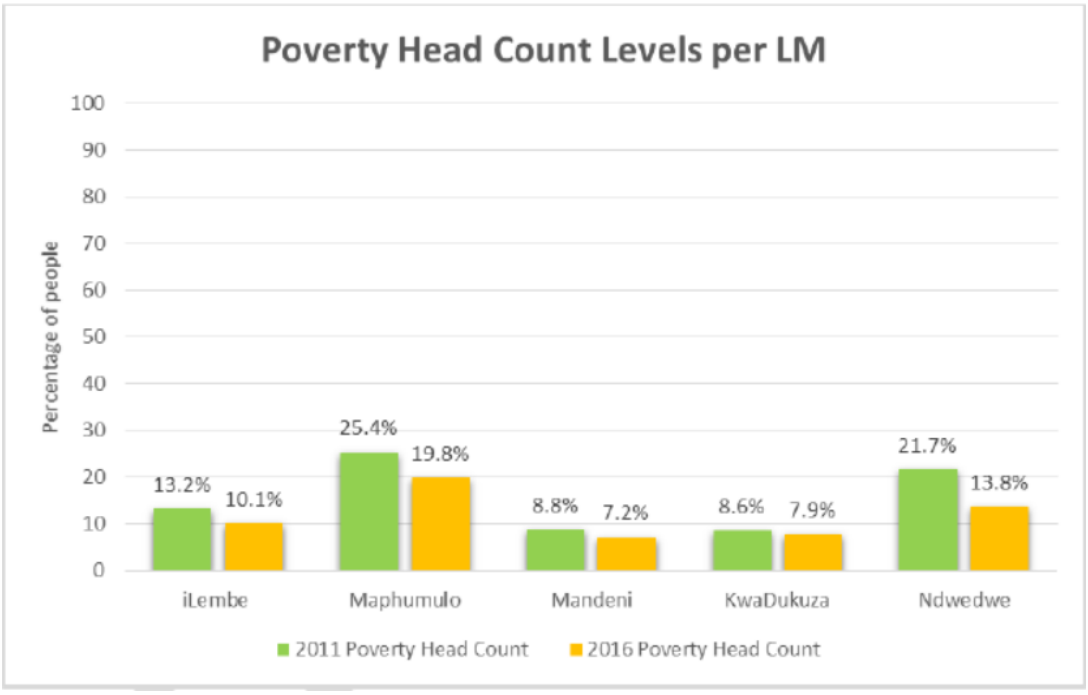
3.2 Social and Economic Indicators

The information for this section was sourced from the IDM Integrated Development Plan, 2019/2020. The IDM is in the process of reviewing its Growth and Development Strategy and should have a first draft by the fourth quarter of 2020. The IDM is assisted by the Vuthela iLembe LED Support programme in this regard.

The poverty levels of each municipality are illustrated in Figure 3-2, indicating the percentages of people living below the national poverty line within each LM and the IDM.

There is an overall decrease within the district in the number of people experiencing such poverty as per the South African Multidimensional Poverty Index (MPI). The indicators include unemployment, years of schooling, child mortality, type of dwelling, etc. Maphumulo and Ndwedwe local municipalities, even though having experienced a decrease of over 5 percent in the head count, still have the highest number of people living in extreme poverty and can be ascribed to the rural nature of these two LMs.. The results for Mandeni and KwaDukuza have decreased by less than 2 percent for both municipalities whilst on the other hand, these areas have experienced significant population growth between 2011 and 2016.

Figure 3-2 Poverty Levels per Municipality



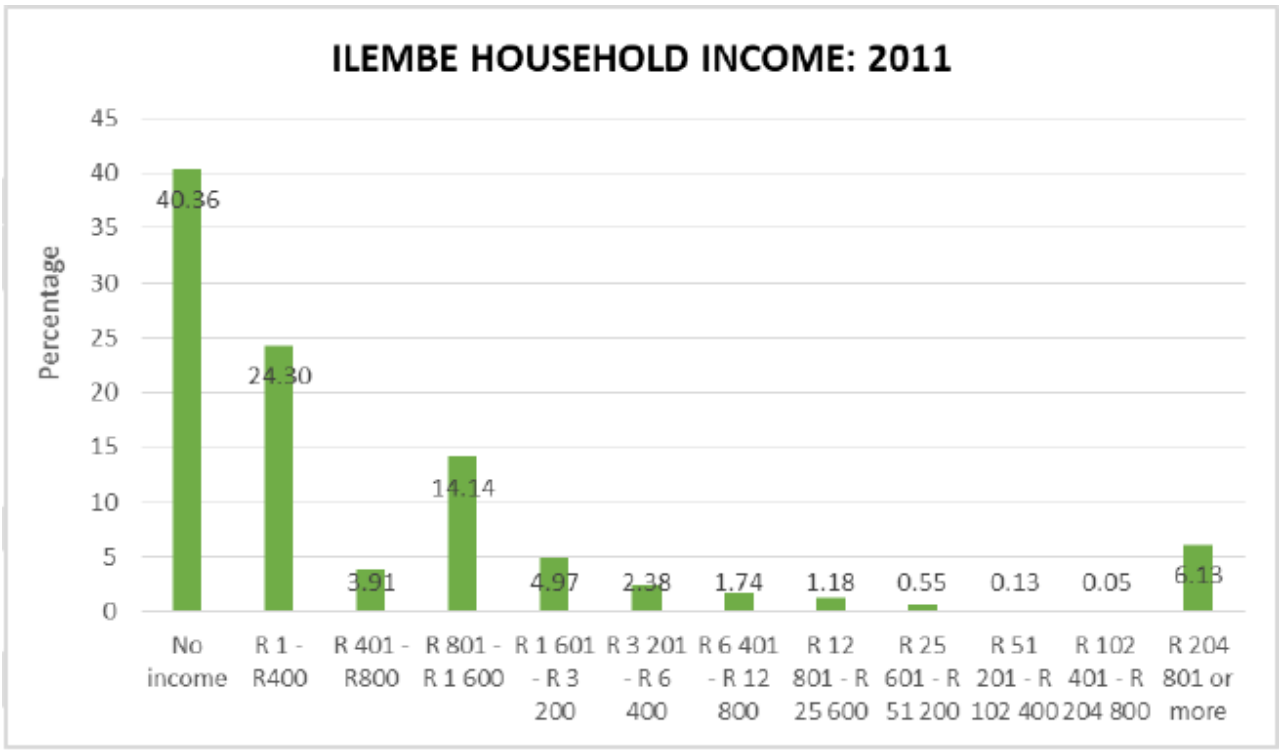
Source: Statistics SA Census (2011) & Community Survey (2016)

While the employment rate for the IDM and the formal/informal sectors are on a par with the province, the IDM, has fewer skilled or highly skilled workers. The formal employment rate was 76.81% in 2011 for iLembe and 76.98% for KZN province. There was a slight decrease in formal employment in the district having had a

formal employment rate of 78.32 % in 2010. The strict unemployment rate increased in the district from 22.39% to 30.6% in 2011 while the province's strict unemployment rate stood at 33%. The strict unemployment rate does not accommodate the discouraged work seekers and therefore these figures are quite conservative and a different picture could be painted with a broad definition of unemployment.

Household incomes in the district are extremely low with about 40% of the households earning no income at all and a majority of population surviving on less than R500 a month, as illustrated in Figure 3-3. This scenario has potential to perpetuate reliance on social grants which are a vital anti-poverty measure but divert resources from other state responsibilities. Higher incomes for the residents are vital for jumpstarting economic activity in the district.

Figure 3-3 Household Income



Source: Statistics SA Census 2011

3.3 Population Growth Scenarios

Umgeni Water, in collaboration with Statistics South Africa, developed a population growth scenario for the KwaZulu-Natal Province. The information was provided to Mariswe on a Census Small Areas Layer level, that can be used in the water requirements model and it links to the existing 2011 Census theme databases and GIS.

The UAP Phase II projected the population for the IDM from 2015 to 2045, based on a growth rate between 0.5% and 2.5% as illustrated in Table 3-2.

Table 3-2: IDM Demographic Projections – Population, UAP Phase II

Local Municipality	2015	2020	2025	2030	2035	2040	2045
KwaDukuza	248,284	278,181	311,677	349,207	391,257	438,369	491,154
Mandeni	146,625	154,104	160,361	170,227	178,910	188,036	197,628
Maphumulo	102,731	107,971	113,479	119,268	125,352	125,352	138,466
Ndwedwe	149,293	156,909	164,913	173,325	182,166	191,458	201,225
Total	646,933	697,165	750,430	812,027	877,685	943,215	1,028,473

Source: UAP Phase II, 2016

Most people resided in the KwaDukuza LM which during the 2011 Census, had an estimated 83% of the population living in urban areas. The overall majority of persons in the Maphumulo LM lived in rural areas.

The UAP Phase III projected population for the IDM, from 2016 to 2050 is illustrated in Table 3-3.

Table 3-3: IDM Demographic Projections – Population, UAP Phase III

Local Municipality	2020	2025	2030	2035	20405	2045	2050
KwaDukuza	259,395	269,553	278,849	292,949	307,762	323,324	339,673
Mandeni	154,897	160,963	166,514	174,934	183,779	193,072	202,835
Maphumulo	108,524	112,774	116,663	122,562	128,759	135,270	142,110
Ndwedwe	157,996	164,183	169,845	178,433	187,456	196,935	206,893
Total	680,811	707,472	731,871	768,878	807,756	848,601	891,510

Source: UAP Phase III, 2020

The average annual population growth rate for the municipalities between 2020 and 2025 is estimated to be 0.77% and from 2030 to 2050, it increases to 0.99%.

The next national census will take place in 2021 which is in less than one year from now. This census will provide greater certainty of at least current population figures and can also give a better understanding of migration patterns.

3.4 Main Development Nodes

From the IDM SDF (2015), that aligns to the KZN Provincial Growth and Development Strategy (2011) and in turn, the National Development Plan (2011) and Comprehensive Rural Development Programme (2009).

The SDF classified development nodes into: City Core Centres; Urban Town Centres; Urban Villages; Coastal Town Centres; Rural Town Centres; and Rural Village Centres. A listing of each class of development and the corresponding areas identified, is provided in Table 3-4.

Table 3-4 Proposed Development Nodes

Node	Description	Identified Areas
City Core	City Core Centre is the single biggest economic driver of the regional economy. It is the centre of the region's retailing, banking and financial services and the civic and cultural heart of the city.	Stanger, Ballito.
Urban Town Centre	An urban town centre refers to the commercial or geographical centre or core area of a town. They are traditionally associated with shopping or retail. They are also the centre of communications with major public transport hubs such as train or bus stations. Public buildings including town halls, museums and libraries are often found in town centres.	Maphumulo, Ndwedwe, Darnall, Groutville, Sundumbili.
Urban Village	An urban village is an urban development typically characterized by medium-density housing, mixed use zoning, good public transit and an emphasis on pedestrian and public space.	Umhlali, Tugela Mouth.
Coastal Town Centre	Coastal towns are small centres that vary in size and have a population ranging from 3,000 people. Coastal towns offer a range of services and facilities which may include a commercial, retail town centre, suburbs, parks, playing fields and caravan parks. A main street, churches and education institutions as well as medical facilities are also available. While each coastal town has a unique character based on its setting they are in general identified by their visual connections to the landscape and the coast, being located directly adjacent to the foreshore, centrally and conveniently located community facilities and public spaces.	Nonoti, Blythedale, Tinley Manor, Compensation, Ballito.
Rural Town Centre	The term "rural town center" can refer to historic Main Streets as well as newer developments in which a variety of jobs, housing, retail, and services are concentrated.	Ntunjambili, KwaMxhosa, KwaDeda, Otimati, Qinisani, Montebello, Umvoti, Bhamshela.
Rural Village Centre	Rural Village Centres are areas that have the most potential for evolving into mixed-use centres" with ability to attract and support local commercial development as well as community services and amenities (e.g. schools, community centres, libraries, etc.) and support regular transportation service.	Mcambini, Mdlebeni, Gugu.

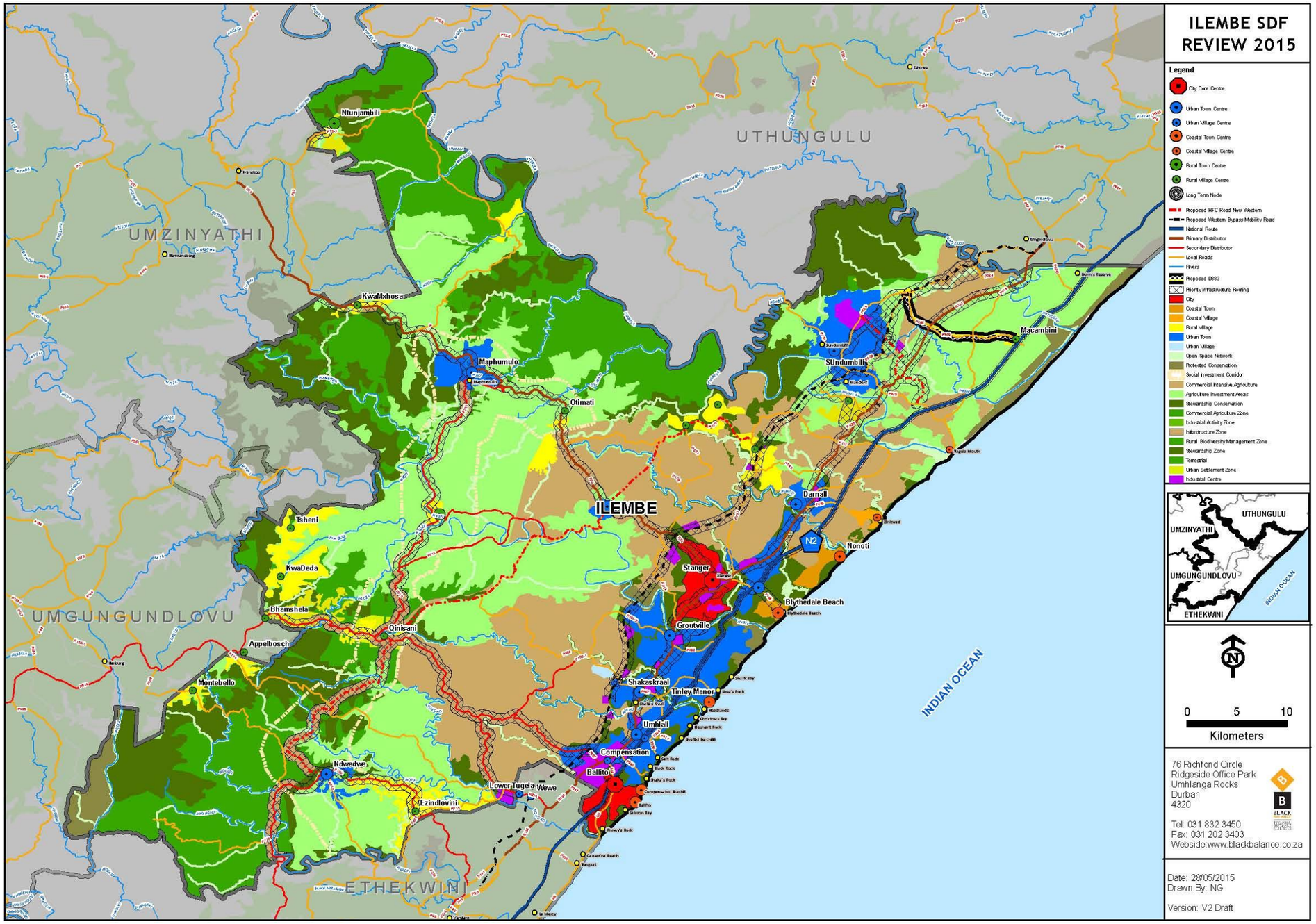
The development corridors classification is used as defined by the Provincial Spatial Economic Development Strategy (PSEDS) and are illustrated along with the development nodes, in. The primary corridor in the IDM includes the route along the N2 highway that serves as linkage to the eThekwini Metro and its facilities in the south and moving towards the City of uMhlathuze LM to the north and its development nodes.

The secondary corridor in the IDM is along the R102 (running inland of the N2 and is not a tolled road). It provides access to the whole of the IDM and a number of settlements that have emerged in the area over time. Other secondary corridors Identified include the P387 which links Ballito and Qinisani, the Proposed

western bypass for easing traffic flow, the P711 which links Maphumulo LM to Ndwedwe LM and the R74 which links KwaDukuza town to Maphumulo and beyond. Collectively, these routes are linked to the N2 which provides access to other economic opportunities.

The tertiary corridor in the IDM is along the R74 from Maphumulo to Umzinyathi LM via KwaMxhosa as it connects iLembe DM to Umzinyathi DM which is rich in agricultural activities. Then the P387 from Qinisani to Bhamshela is also identified as a tertiary corridor or an agricultural corridor linking Ndwedwe LM to uMgungundlovu DM which is also identified as an area with high agricultural activities.

Figure 3-4 IDM SDF Development Nodes and Corridors



4. WATER REQUIREMENTS

This section provides an overview of existing water service levels and projected water requirements as calculated using the demand model developed for the purpose of this study.

4.1 WATER SUPPLY SERVICE LEVEL

The water services levels, based on current available information is provided from various sources. Detailed verification of service levels will be performed during this study for UAP Phase III. The service level verification may also be used to update the DWS RF geodatabase. Refer to Figure 4-1 for the water reliability profile map

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

Reliability of services are affected by aging infrastructure, operation and maintenance, reliability of electricity supply, water resource availability, vandalism and theft, or extreme weather events. All these then affect water security to consumers and to the environment.

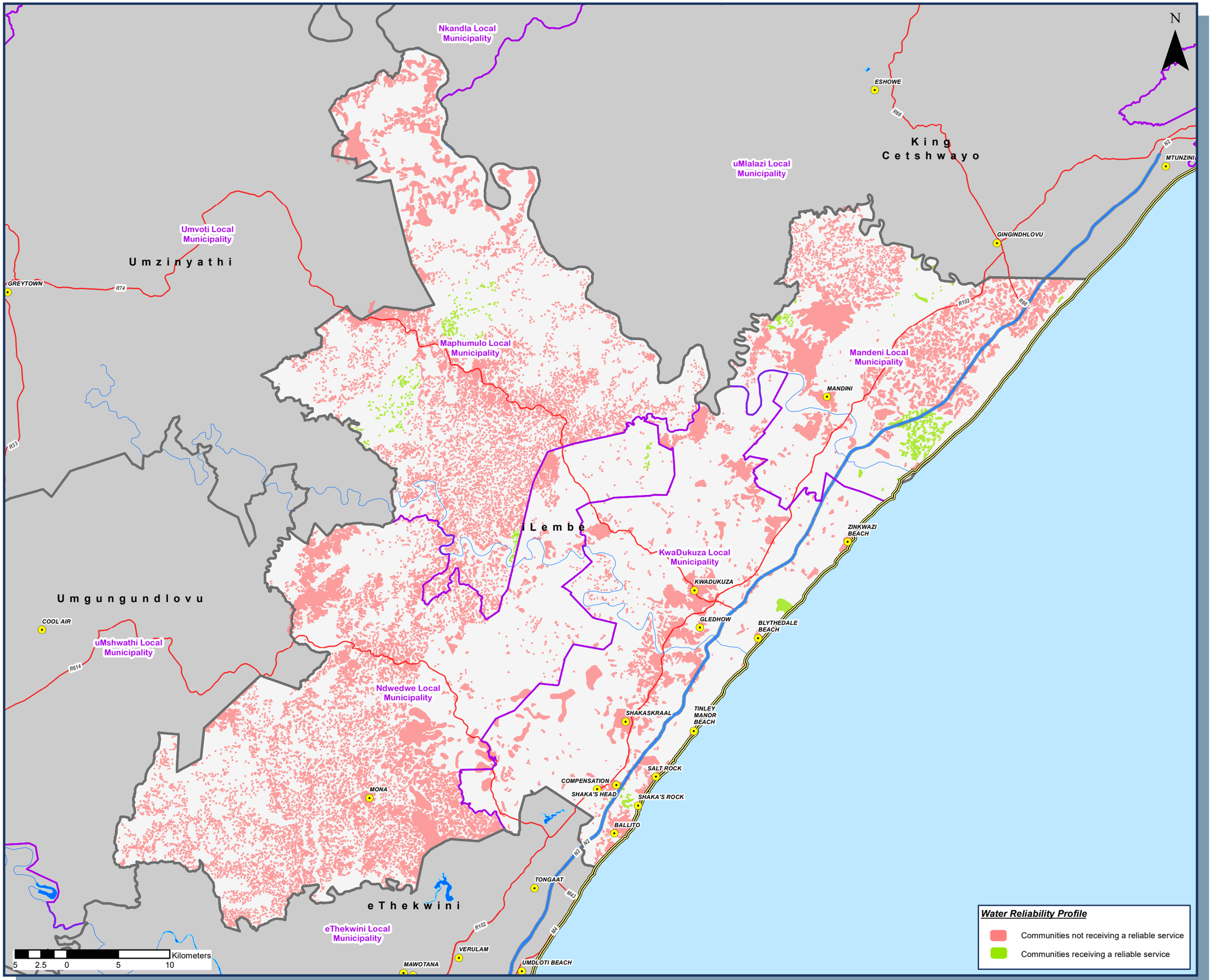
4.1.1.1 Community Survey 2016 Water Supply Levels

The following service levels are presented from the 2016 Community Survey for the WSA:

Table 4-1: Water Supply Levels, Community Survey 2016

	Access to safe drinking water		No access to safe drinking water		Total households
LM Name	**No. of Households**	**Percentage (%)**	**No. of Households**	**Percentage (%)**	
KwaDukuza	70 175	77.2	20 765	22.8	90 940
Mandeni	37 291	81.9	8 259	18.1	45 550
Maphumulo	10 283	50.2	10 198	49.8	20 481
Ndwedwe	17 278	52.1	15 890	47.9	33 168
Total	135 027	71.0	55 112	29.0	190 140

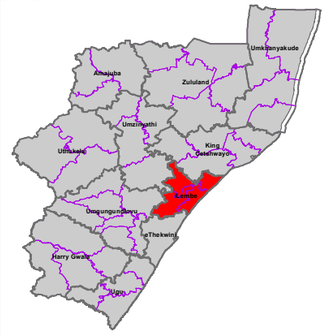
Source: StatsSA, 2016 Community Survey



Legend

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

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Water Reliability Profile

iLembe District Municipality

DATE COMPLETED: Friday, 12 June 2020

MAP NO.: **DC29: Figure 4.1**

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The municipalities with the highest level of service, by number of households having access to safe drinking water, are KwaDukuza and Mandeni LMs, representing 37% and 20% of the WSA total number of households respectively. However, KwaDukuza LM also has the highest number of households not having access to save drinking water, followed by the Ndwedwe LM.

4.1.1.2 DWS Reference Framework Water Supply Levels

The settlement's service levels presented were last updated during 2016.

Table 4-2: DWS RF Water Reliability, 2016

LM Name	No of Households	Households with reliable water supply	Percentage	Households with no reliable water supply	Percentage
KwaDukuza	107 565	65 488	61%	42 077	39%
Mandeni	37 863	27 660	73%	10 203	27%
Maphumulo	14 711	4 817	33%	9 894	67%
Ndwedwe	23 669	13 641	58%	10 028	42%
Total	**183 808**	**111 606**	**61%**	**72 202**	**39%**

Source: DWS RF geodatabase, 2016

The information is not corresponding to the 2016 Community Survey, with the DWS data reflecting a higher percentage of households not having reliable water supply.

4.1.1.3 Water and Sanitation Master Plan 2016

The WSA's Water and Sanitation Master Plan for 2016 did not include reporting on existing water service levels for the Local Municipalities.

4.1.1.4 WSA Municipal Infrastructure Forum Reporting

The WSA reports on the status of water and sanitation service levels at the Intergovernmental Relations (IGR) forum that is held every second month. The information is provided per infrastructure sector: water and sanitation, for the number of households (HH).

Table 4-3: WSA Water and Sanitation Backlogs (June 2019)

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Water	129 747	67.8	61 622	32.2	191 369
Sanitation	129 134	67.5	62 235	32.5	191 136

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

The WSA has set the following targets for service delivery by 2019/2020:

Table 4-4: WSA Water and Sanitation Targets for end 2019/2020

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Water	134 514	70.3	56 855	29.7	191 136
Sanitation	132 214	69.1	59 155	30.9	191 136

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

The total number of households and breakdown of figures, correlate to a fair extent to the 2011 Census, which reported a total number of households in this area of 157 689.

The total number of households reported from the 2016 Community Survey for this area was: 190 140.

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.

Part of such a WC/WDM Strategy is reporting on the water balance in the format developed by the International Water Association (IWA). The water balance provides an overview of water supplied, as System Input Volume (SIV) and the potential water accounted for and billed or water not billed, or water lost.

The WSAs in KZN each report monthly to the DWS Regional Office to provide information on its water balance components. The information is then submitted to the DWS Head Office in Pretoria.

The water balance information is an indicator of the water supply systems' efficiencies to supply water and conserve water resources. The main components reported on are system input volume (SIV), billed and unbilled consumption, metered and unmetered consumption, physical losses and unauthorised losses. The International Water Association (IWA) developed a standard methodology for reporting which then illustrates the resulting component of Revenue Water and Non-Revenue Water (NRW), see Figure 4-2.

Figure 4-2 IWA Best Practice Standard Water Balance

<table>
<tr><td rowspan="8">System Input Volume (corrected for known errors)</td><td rowspan="4">Authorised consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed Metered Consumption (including water exported)</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non-Revenue Water (NRW)</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="4">Water losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Customer Metering Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to point of Customer metering</td></tr>
</table>

Source: Lambert, A. 2003. Assessing non-revenue water and its components: a practical approach. Prepared by the IWA Water Losses Task Force.

4.2.1 *Water Balance, KZN Summary*

The following is a summary for the province, for the 2017/2018 financial year, as obtained from the DWS Head Office, Directorate: Water Use Efficiency. The Real Losses percentage of 30% or more, are highlighted in red, as are the WSAs having real losses (RL) of more than 10Mℓ/d. The equivalent Rand value per day as a reflection of the real losses per day, if assuming a bulk water price or R6/kl is reflected in the last column.

Table 4-5: Water Balance, KZN Provincial Summary, 2017/2018

WSA	Total System Input Volume (SIV) Kl/a	Real Losses Kl/a	Real Losses %	NRW Kl/a	Non-Revenue Water %	SIV Ml/d	Real Losses Ml/d	RL ZAR/d at R6/kl
eThekwini	321 333 002	87 650 063	27.3%	105 210 821	32.7%	880.36	240.14	R 1 440 823
Msunduzi	68 467 170	16 568 296	24.2%	32 383 145	47.3%	187.58	45.39	R 272 356
Newcastle	29 232 135	12 214 736	41.8%	14 149 362	48.4%	80.09	33.47	R 200 790
King Cetshwayo	24 266 572	11 063 392	45.6%	13 829 241	57.0%	66.48	30.31	R 181 864
Ilembe	20 610 221	11 063 392	53.7%	13 829 241	67.1%	56.47	30.31	R 181 864
Umgungundlovu	20 541 931	6 327 783	30.8%	10 825 905	52.7%	56.28	17.34	R 104 018
Uthukela	39 850 700	6 272 776	15.7%	24 265 606	60.9%	109.18	17.19	R 103 114
Ugu	45 595 559	6 195 703	13.6%	16 009 621	35.1%	124.92	16.97	R 101 847
Umzinyathi	12 480 726	4 597 998	36.8%	7 583 491	60.8%	34.19	12.60	R 75 584
City of uMhlathuze	27 407 660	3 920 426	14.3%	7 015 424	25.6%	75.09	10.74	R 64 445
uMkhanyakude	14 493 279	2 896 322	20.0%	6 813 861	47.0%	39.71	7.94	R 47 611
Amajuba	5 039 952	1 338 623	26.6%	2 537 314	50.3%	13.81	3.67	R 22 005
Harry Gwala	3 841 338	1 188 582	30.9%	1 460 174	38.0%	10.52	3.26	R 19 538
Zululand	19 846 359	- 246 948	-1.2%	13 181 260	66.4%	54.37	- 0.68	-R 4 059

Source: Department of Water and Sanitation, 2019

The global average for NRW is 36.6%, and that for South Africa is 37%. Each water supply scheme and area should be viewed in context such as its operational, ecological, economic and social aspects.

The water balance component's units are usually reported as percentages, but should be read in conjunction with the actual volumes.

The paper prepared for WISA: Supporting the implementation, monitoring and evaluation of water conservation and water demand management in KwaZulu-Natal (Singh et al., 2018), provided the overall characteristics of water systems per WSA in the KZN Province, as illustrated in the table below. The base year of information was 2016/2017.

Table 4-6: KZN WSA WSS Characteristics

WSA	Number of Water Supply Systems	System Characteristics					
		Length of mains (km)	Estimated Total Number of Connections	Average Supply Pressure (m)	Estimated Population	Estimated Households	% Time Pressurised
uMkhanyakude	25	2 239	75 932	50	689 130	151 245	81.4%
uThukela	15	2 062	86 966	45	318 858	79 410	73.5%
uMgungundlovu	15	2 381	28 436	50	412 092	111 376	86.0%
Amajuba	5	887	14 660	65	80 666	16 629	85.0%
King Cetshwayo	15	3 760	35 003	67	684 499	113 606	64.0%
City of uMhlathuze	4	2 021	77 363	58	278 507	77 363	99.0%
Harry Gwala	17	863	25 397	65	502 265	122 437	80.0%
Newcastle	2	1 094	84 220	45	363 236	84 269	78.7%
eThekwini	4	12 364	562 417	54	3 729 043	1 062 873	77.0%
Ugu	18	3 930	44 606	51	707 817	117 970	80.8%
Msunduzi	1	2 037	183 472	65	660 499	183 472	97.4%
uMzinyathi	15	1 350	38 990	40	551 177	125 736	67.0%
Zululand	40	870	115 071	50	892 310	178 516	86.2%
iLembe	45	2 362	36 948	62	657 612	191 346	64.0%
KZN Total	**221**	**38 220**	**1 409 481**	**55**	**10 527 711**	**2 616 248**	**78.3%**

The system characteristics per WSA provides valuable insight into the context per WSA and the potential extent of networks, consumers and challenges.

4.2.2 WSA WC/WDM Strategy

The WSA prepared a Non-Revenue Water Master Plan and Strategy for 2018/19 – 2022/23 during the 2018/2019 municipal financial year. The detailed strategy provides the current situation in terms of WC/WDM, activities performed to address WC/WDM, the challenges, and an NRW reduction programme including financial strategy.

The NRW Master Plan and Strategy provides for several interventions with costs attached over five years, under the topics:

- ✓ Programme Management and Support;
- ✓ Real Loss Reduction; and
- ✓ Billing Improvement.

The total budget required per annum to implement the Strategy recommendations vary from R53.3 million in year one (2018/2019), to R61.2 million in year five (2022/2023).

The municipal budget allocation however is R15 million per annum. The WSA issued a tender (contract TS199/2019) in March 2019 for a three-year intervention programme to assist the WSA in addressing NRW. The consultant has been appointed and commenced activities during late 2019.

Notwithstanding the WSA budget, there is an international-funded support programme in this area: Vuthela iLembe LED Support Programme, that started in 2017. It was launched by the iLembe District Municipality, KwaDukuza and Mandeni LMs, together with the Switzerland State Secretariat for Economic Affairs (SECO) and the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN DETEA).

The primary purpose of the Programme is improvement of the economic future of the iLembe District residents through sustainable economic growth of the local economy and the creation of higher, better and more inclusive employment and income generating opportunities.

The Programme comprises five components, namely:

- Public Financial Management Component.
- Municipal Infrastructure Component.
- Private Sector Development Component.
- Building Inclusive Growth Component.
- Partnership and Coordination Component.

The Municipal Infrastructure Component will also provide technical and advisory support to the WSA to assist in addressing NRW, under contract VILP/O/031, due to commence in the latter quarter of 2020.

4.2.3 WSA Water Balance

The WSA prepares monthly water balances, in the IWA format, on a district and local municipality level, for submission to the DWS.

Due to a lack of bulk and consumer metering (meters installed and read monthly), the water balances cannot be prepared on a water supply scheme or District Meter Area (DMA) level.

The latest annual water balance for the WSA is presented in the Figure 4-3, for the financial year ending 2019/2020, in million kilolitres per annum (same as million cubic metres (m^3) per annum).

Figure 4-3 WSA Water Balance 2019/2020

<table>
<tr><td rowspan="3">System Input Volume (SIV)

35.022Mkl/a</td><td>Authorised Consumption

12.695Mkl/a</td><td>Billed Authorised

8.818Mkl/a</td></tr>
<tr><td rowspan="2">Water Losses

22.327Mkl/a</td><td>Apparent Losses

3.721Mkl/a</td></tr>
<tr><td>Real Losses

18.606Mkl/a</td></tr>
</table>

Source: IDM Annual Water Balance Review, July 2020

Note that the water balance is based on bulk water meter readings, consumer meter readings and estimates where bulk or consumer meters are not functional or not present. The System Input Volume (SIV) was 35.022 million kilolitres for 2019/2020 or about 95.95Mℓ/d.

The SIV reported in the water balance excludes the water concession area that supplies Ballito and Shakaskraal areas. The NRW for the WSA by the end of the 2019/2020 financial year amounted to 73%, or expressed in volume, 61.17Mℓ/d, consisting of real losses of 50.98Mℓ/d.

If using a rate of R8.00/kl, the real losses amount to an estimated amount of R407 840 lost per day! Only 23.16Mℓ/d of the SIV can be billed and accounted for.

The 2019/2020 IDP stated the revenue collection rate as at 31 December 2018, as 66% (2016: 77%).

The Population, Meters, Distribution Input, Consumption and Losses as reported by the concessionaire in its Five-Year review report (2019), is provided in Table 4-7. The concessionaire indicated that it can economically maintain water losses at 9-10% which is very good for South African conditions. Reducing water losses further is not economically feasible.

Table 4-7 Population, Meters, Distribution Input, Consumption and Losses (concession area)

Item	Units	2014	2015	2016	2017	2018
Population (estimate)	nr	68 574	71 544	72 551	73 276	74 009
Metered Residential Units	nr	12 292	12 658	13 038	13 168	13 300
Metered Non Residential Units	nr	1 980	1 966	2 161	2 183	2 204
Standpipe Delivery	nr	36 000	38 000	38 000	38 000	38 000
Total water input into system (Umgeni, Recycled & Boreholes)	kl	4 864 055	3 763 502	3 839 454	4 006 575	4 451 900
Customer water consumption	kl	4 386 847	3 413 467	3 286 743	3 787 141	4 016 919
Water Loss	kl	477 208	350 035	552 711	219 434	434 981
Water Loss history (2014 to 2018) and target (2019 to 2013)	%	10%	9%	14%	5%	10%

Source: Five-year Review of the Water & Sanitation Concession Agreement Between the iLembe District Municipality and Siza Water (RF) (Pty) Ltd, 2020

4.3 Water Demand Model

The Water Demand Model as described within Section 1.5 was applied to the iLembe 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

This sub-section presents the projected population and water demands from 2020 to 2050 for the IDM, per local municipality in megalitres per day (Mℓ/d).

Table 4-8: Water Demand Projections per LM, Mℓ/d

	Population				Water Demands (Mℓ/d)			
LM Name	**2020**	**2030**	**2040**	**2050**	**2020**	**2030**	**2040**	**2050**
KwaDukuza	279,867	307,956	343,372	382,859	69.56	78.50	88.91	100.78
Mandeni	167,203	183,985	205,144	228,735	33.80	38.66	43.65	49.38
Maphumulo	117,146	128,904	143,728	160,256	21.34	23.79	26.92	30.52
Ndwedwe	170,548	187,666	209,248	233,311	24.89	32.36	36.65	41.61
Total	**734,764**	**808,512**	**901,491**	**1,005,162**	**149.58**	**173.31**	**196.13**	**222.29**

Source: Water Demand Model, UAP Phase III, 2020

The demographics and water demand projections include the whole of the IDM inclusive of the concession area.

The KwaDukuza LM, being the most urbanised and developed, has the highest water requirements, representing 47% of the total water demands of 2020 and 45% of the total water demands of 2050. The KwaDukuza LM also has the highest growth in water demands, representing an increase of 31.22Mℓ/d from 2020 to 2050. The Ndwedwe LM has the second-highest growth in requirements of 16.72Mℓ/d from 2020 to 2050, followed by the Mandeni LM with an increase in requirements of 15.59Mℓ/d. The Maphumulo LM has an increase of 9.18Mℓ/d from 2020 to 2050.

4.3.2 Demand per Regional Water Scheme

This sub-section presents the projected population and water demands from 2020 to 2050 for the IDM, per bulk water supply scheme in megalitres per day (Mℓ/d).

Some schemes however have water requirements of less than 2Mℓ/d, but are listed as they may serve as urbanisation and development or special nodes. Furthermore, some of the schemes will be amalgamated and become regional schemes. Therefore, all WSS in the IDM are listed.

Table 4-9: Water Demand Projections per WSS, Mℓ/d

		Population				Water Demands (Mℓ/d)			
WSS Number	**WSS Name**	**2020**	**2030**	**2040**	**2050**	**2020**	**2030**	**2040**	**2050**
ILE002	Dwedwe	53,617	58,998	65,783	73,348	7.81	10.52	11.98	13.66
ILE003	Emalangeni	25,110	27,630	30,807	34,350	3.47	4.63	5.25	5.97
ILE004	Glendale	9,499	10,453	11,655	12,995	1.71	1.95	2.21	2.50
ILE005	KwaDukuza-Stanger	58,531	64,405	71,812	80,070	19.74	21.91	24.66	27.76
ILE001	Lower Tugela Bulk WSS (extended Darnall)	45,016	49,535	55,231	61,583	10.19	11.49	13.02	14.76
ILE016	Macambini	44,881	49,385	55,065	61,397	8.20	9.15	10.35	11.73
ILE006	Mandeni	7,548	8,306	9,261	10,326	2.61	2.88	3.23	3.62
ILE007	Maphumulo WSS	104,866	115,391	128,661	143,457	18.72	21.02	23.77	26.94
ILE017	Ndulinde WSS	50,499	55,568	61,958	69,083	9.17	10.23	11.58	13.13
ILE009	Ngcebo WSS	16,721	18,400	20,516	22,875	3.04	3.39	3.84	4.36
ILE010	Nkwambase	19,018	20,926	23,333	26,016	3.24	3.66	4.19	4.81
ILE011	Ntunjambili	8,708	9,582	10,684	11,913	1.66	1.85	2.09	2.37
ILE012	Ozwathini	47,595	52,372	58,395	65,110	6.48	8.72	9.78	11.03
ILE013	Sundumbili	48,234	53,076	59,179	65,985	11.05	12.43	14.04	15.88
ILE014	Tugela South	11,880	13,073	14,576	16,252	1.93	2.99	3.36	3.78
ILE015	Umgeni Northern Feeder	168,990	185,951	207,335	231,179	38.02	43.38	49.29	56.05
Total		**720,714**	**793,051**	**884,252**	**985,941**	**147.03**	**170.20**	**192.65**	**218.37**

Source: Water Demand Model, UAP Phase III, 2020

The Umgeni Northern Feeder (Hazelmere-WTP-supplied area in the IDM) has the highest water demands for 2020 and till 2050, being 38.02Mℓ/d in 2020 and 56.05Mℓ/d in 2050, representing 26% of the demands for 2020 and for 2050.

The KwaDukuza-Stanger and Maphumulo WSS have the second-highest water demands for 2020 and till 2050, totalling 38.46Mℓ/d in 2020 and 54.70Mℓ/d in 2050, representing 26% of the demands for 2020 and 25% of the demands for 2050.

The Umgeni Northern Feeder has the highest growth in water demands from 2020 to 2050, totalling 18.03Mℓ/d, followed by the Maphumulo WSS, with a growth of 8.22Mℓ/d from 2020 to 2050, and then the KwaDukuza-Stanger area with a growth of 8.03Mℓ/d from 2020 to 2050.

The Umgeni Northern Feeder encompasses the Ballito area, Compensation industrial area and sea resort towns, which are also strategically located close to the King Shaka International Airport and Dube Tradeport.

5. EXISTING WATER SUPPLY INFRASTRUCTURE

5.1 WATER RESOURCES AVAILABILITY

The WSA falls in the Pongola Mtamvuna Water Management Area (WMA), one of nine WMAs that divides the large catchment areas of South Africa. The Pongola Mtamvuna WMA covers the whole of the KZN province, except a small part in the south, that falls within the Mzimvubu Tsitsikamma WMA. Prior to 2014, the WSA would have included the coastal and lower portions of the Usutu to Mhlatuze, Thukela and Usutu to Mhlatuze WMAs.

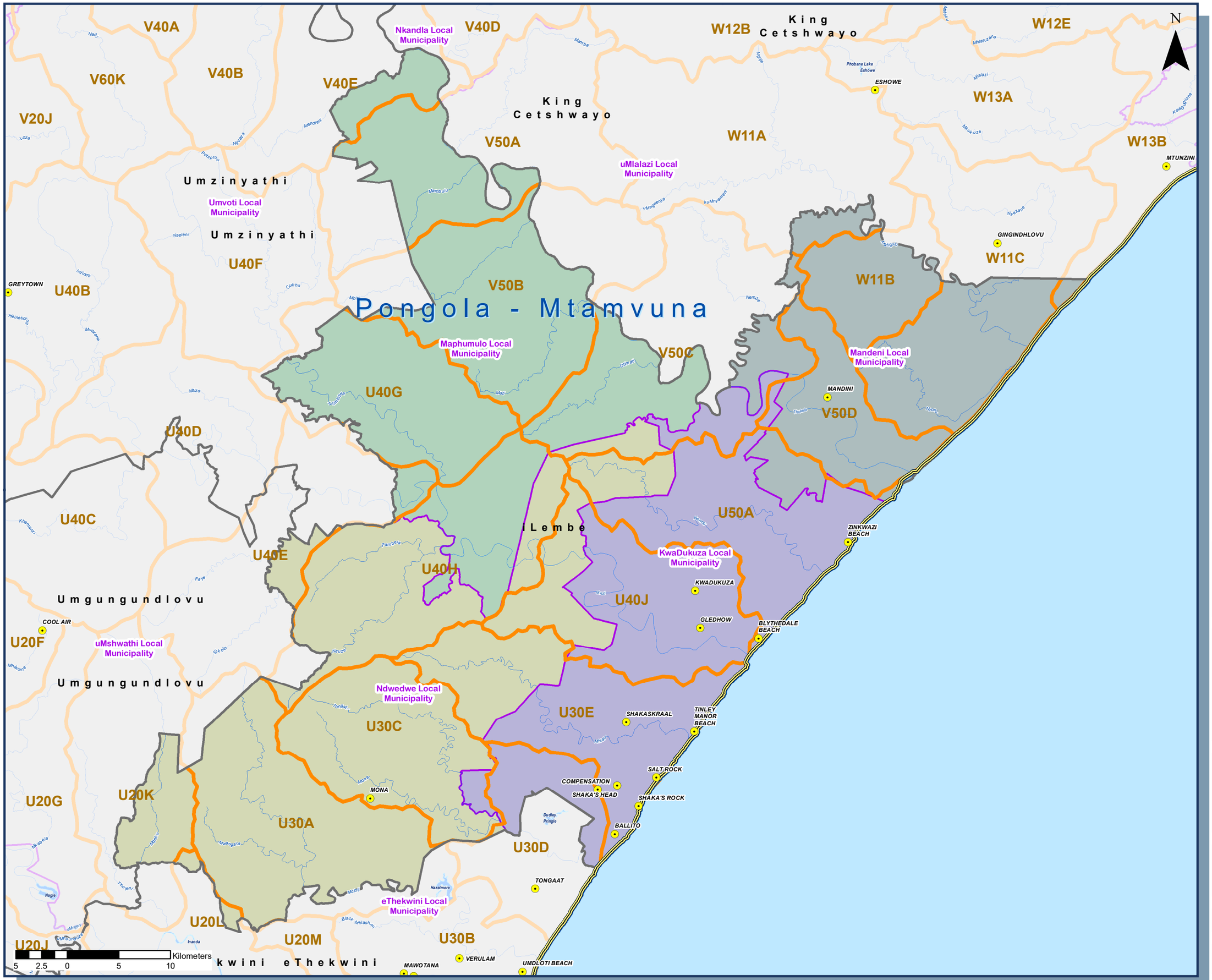
The most prominent rivers in the WSA are the Tugela (Thukela) and Mvoti Rivers. The only dam used for municipal water supply is the iMvutshane Dam. Other dams are for small scale private domestic, or agricultural use. There are no major dams in the WSA.

See Figure 5-1 for an overview of water resources.

5.2 WATER USE LICENSING

This section provides a summary of water use licensing as recorded at the DWS and received in September 2019, titled DW 760 report. The purpose of reflecting this information, from the Water use Authorization & Registration Management System (WARMS), is to evaluate the water use licensed at the DWS, versus the water currently in use especially for domestic water supply, by the WSA.

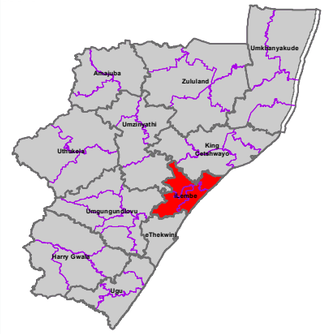
There are records in the source data with no District Municipality allocation. These records are not included in the summary.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Water Management Area
- Quaternary Boundaries & Numbers (W22F)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Water Resources

iLembe District Municipality

DATE COMPLETED:

22 October 2020

MAP NO.:

DC29: Figure 5.1

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The water user sectors have been grouped to distinguish only two categories: for domestic use and for other user sectors.

Table 5-1: Water Use Licensing, 2019. iLembe District Municipality.

Water User Sector	Resource Type	Registered Volume (m^3)	Time Interval	Registered Volume in Mℓ/d
Domestic	BOREHOLE	122 000.00	PER YEAR	0.33
Domestic	DAM	7 680.00	PER YEAR	0.02
Domestic	RIVER/STREAM	2 580 000.00	PER YEAR	7.07
Domestic	SCHEME	40 000 000.00	PER YEAR	109.59
Other user sector	BOREHOLE			
Other user sector	BOREHOLE	614 875.00	PER YEAR	1.68
Other user sector	DAM	2 987 445.00	PER YEAR	8.18
Other user sector	ESTUARY	709 560.00	PER YEAR	1.94
Other user sector	LAKE	600 000.00	PER YEAR	1.64
Other user sector	RIVER/STREAM	5 400.00	PER DAY	5.40
Other user sector	RIVER/STREAM	57 818 649.00	PER YEAR	158.41
Other user sector	SCHEME	309 700.00	PER YEAR	0.85
Other user sector	SPRING/EYE	2 000.00	PER YEAR	0.01
Other user sector	WETLAND	182.00	PER YEAR	0.00

Source: DWS KZN Regional Office, 2019

The information provided includes all allocations for the District Municipality. Only very small water volumes are registered for domestic use, from boreholes and dams, which are likely less than actual use. Only a volume of 7.07Mℓ/d is registered for use from a river and 109.59Mℓ/d for use from a scheme. The water use from schemes are likely the abstractions for use by Umgeni Water from the local water resources (Maphumulo WTP, Lower Tugela WTP).

The water use license information on the WARMS, from local surface water sources as abstracted by the WSA's Sundumbili WTP, Mvoti WTP, Ngcebo WTP, Ntuze WTP and Esidumeni WTP, need to be confirmed if recorded by the DWS.

Information on Full Supply Capacity (FSC) and Historic Firm Yield (HFY) is provided in Table 5-2 for the primary sources of the IDM's water supply. See the Umgeni Water Infrastructure Master Plan (2020) for detailed information the various Umgeni Water Systems' water resources.

Table 5-2: Water Resources: FSC, HFY

Water Resource	FSC	HFY
	Mm³	Mm³/a
Hazelmere Dam	37.1*	22.00
iMvutshane Dam	3.2	stochastic yield of the dam is 2.4million m³/a based on a 1:50 year return interval, however it excludes the Ecological Reserve
Tugela River**	Not available	Not available

Source: Umgeni Water (2020)

* Although the dam has been raised, there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.

** During the last Strategy Steering Committee meeting of the Integrated Vaal Reconciliation Study, held in October 2019, it was identified that the hydrology for the Tugela-Vaal System needs to be updated and recalibrated. This may influence the yield available from the Tugela River catchment.

5.3 Surface Water Resources

The next sections provide an overview of the most prominent surface water resources.

5.3.1 Tugela River

The Internal Strategic Perspective (ISP) report for the Thukela Water Management Area (2004), describes the Tugela River water source's geographic location as follows:

"*The Thukela River originates in the Drakensberg Mountain Range along the border between Lesotho and the KwaZulu-Natal Province of South Africa. The river meanders through central KwaZulu-Natal and discharges into the Indian Ocean. The Little Thukela, Klip, Bloukrans, Bushmans, Sundays, Mooi and Buffalo rivers are the major tributaries of the Thukela, which together make up the 'V' Hydrological Drainage with its 88 quaternary catchments. The total area of the Thukela River catchment is approximately 30 000km² in extent*."

The total MAR of the Tugela River catchment is high ~ 3 799 million m³/abut can be highly variable. The ISP listed the following Key Areas for the WMA:

- Upper Thukela (tertiary catchments V11, V12, V14 and quaternaries, V60G, H and J);
- Little Thukela (tertiary catchment V13);
- Bushmans (tertiary catchment V70);
- Sundays (quaternary catchments V60A, B, C, D, E and F);
- Mooi (tertiary catchment V20);
- Buffalo (tertiary catchments V31, V32 and quaternaries, V33A and B);

- Lower Thukela (tertiary catchments V40, V50 and quaternaries, V33C, D and V60K);

The IDM comprises all or part of the following tertiary catchments: U30, U40, U50, V50 and W11. The W11 catchment forms part of the previously-demarcated Usutu to uMhlatuze WMA.

The newly commissioned Umgeni Water Lower Tugela Bulk Water Supply Scheme (LTBWSS) abstracts its water from the lower part of the Tugela River, near the town of Mandeni. The lower Tugela includes the tertiary catchments V40, V50 and quaternary catchments of V33C, V33D and V60K. The highest water use in 2004 was from the SAPPI paper mill (24 million m^3/a).

The Sundumbili WTP also abstracts water from the Tugela River for supply to the Sundumbili Water Supply Scheme.

The ISP reported that water is sourced from the lower Tugela catchment to augment supply in Richard's Bay as well as allocations for future mining developments. This creates a deficit in the catchment but can be managed through releases from the upper Tugela.

The Tugela River is an important strategic water source, where the upper Tugela River forms part of the existing Tugela-Vaal Transfer scheme and the lower Tugela River forms part of the planned Tugela-Mhlatuze Transfer Scheme (All Towns Reconciliation Strategy for the uThungulu District Municipality, 2013).

The LTBWSS is bidirectional may support the Mvoti System (supplied from the Hazelmere Dam) as is the Mvoti System (North Coast System), that supplies currently to the KwaDukuza and Ndwedwe Local Municipalities in addition to the eThekwini Metro area.

Information that is more recent than the 2004 ISP on the Tugela River yield, especially in the lower reaches could not yet be sourced.

5.3.2 Mvoti River

The Internal Strategic Perspective report for the Mvoti to Mzimkulu Water Management Area (2004), lists the following key areas in the WMA:

- Mvoti (Tertiary catchments U40 and U50);
- Mdloti (Tertiary catchment U30);
- Mgeni (Tertiary catchment U20);
- Mlazi and Lovu (Tertiary catchments U60 and U70);
- Mkomazi (Tertiary catchment U30);
- South Coast (Tertiary catchment U80);
- Mtamvuna (Tertiary catchment T40); and
- Mzimkulu (Tertiary catchments T51 and T52).

The IDM comprises all or part of the following tertiary catchments: U30, U40, U50, V50 and W11. The W11 catchment forms part of the previously demarcated Usutu to uMhlatuze WMA.

According to the Mvoti to Mzimkulu ISP, the Mvoti River is poorly developed and have not kept up with increases in surrounding developments and corresponding water requirements. However, feasibility studies have been conducted and potentially three dams identified for future development: the Mvotipoort Dam, Isithundu Dam and the Welverdient Dam (UW Infrastructure Master Plan, 2018). The DWS to provide inputs on the potential future development options of these water resource.

Currently the Mvoti River supplies water to the town of KwaDukuza via the Mvoti WTP, but the area can also be supplied from the LTBWSS. SAPPI Mill Gledhow is also one of the larger abstractors from the Mvoti River. Illegal sand dune mining interferes with the availability of water and flow of the river (Lower Mvoti Catchment Forum Meeting minutes, May 2018).

The MAR of the Mvoti Key area is relatively high at 435 million m³/a, but due to the high sediment load and unfavourable conditions, storage development is likely to be costly.

5.3.3 iMvutshane Dam

The iMvutshane Dam, constructed in 2015, is on the iMvutshane River, a tributary of the Hlimbitwa River. The dam has a design capacity of 3.2million m³ but due to the drought conditions during 2015 till 2017, the dam was not fully impounded. However, since then, the dam levels have increased and the current level reported on the Umgeni Water website (May 2019) for the dam is 89%. The dead storage is given as 0.32million m³ in the latest Umgeni Water IMP (2019).

The stochastic yield of the dam is 2.4million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2018), however it excludes the Ecological Reserve.

The iMvutshane Dam, together with the Hlimbitwa River are supplying the Maphumulo Bulk Water Supply Scheme. If necessary, a transfer scheme can be constructed from the Hlimbitwa River to augment the volume of the iMvutshane Dam.

5.3.4 Hazelmere Dam

The Hazelmere Dam is located on the uMdloti River and lies in the neighbouring eThekwini Metropolitan Municipality. The dam however is the source of the Mdloti Water Supply System of Umgeni Water to the North Coast area, which includes part of the iLembe DM.

The net Full Supply Capacity of the dam is 35.28 million m³. The DWS is implementing a project to raise the dam wall and as such the impoundment of the dam is currently 21 million m³. The stochastic yield of the dam is 20 million m³/annum based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

5.3.5 *Other Surface Water Sources*

The other surface water sources are smaller, secondary rivers or privately-owned or smaller dams. The Hlimbitwa River flows through Maphumulo LM and joins the Mvoti River just south of the iMvutshane Dam which is a tributary of the Hlimbitwa River.

The Nonoti River in the KwaDukuza LM was used as water supply to the Darnall WSS, but this area is now supplied from the LTBWSS.

5.4 Proposed Potential Surface Water Sources

The following are proposed potential dams within the WSA:

- Welverdient Dam on the Mvoti River, less than 5km from the town of KwaDukuza;
- Isithundu Dam on the Mvoti River, some 30km north-west of the town of KwaDukuza, in the neighbouring Umvoti LM; and
- Mvotipoort Dam on the Mvoti River, 10km south-east of Greytown, in the neighbouring Umvoti LM.

The development of new surface water resources will depend detailed evaluations on the water requirements, economic and environmental costs and social benefits amongst other considerations (UAP Phase II, 2016).

Umgeni Water will commission a full feasibility study and preliminary design on the development of the Mvotipoort Dam and bulk infrastructure (Umgeni Water, 2020). Costs are estimated to be in the order of R10 million and should be accounted for in the UAP Phase III report of the uMzinyathi DM as the dam is near Greytown, in the District of uMzinyathi.

5.5 Groundwater Sources

The existing groundwater resources in the WSA are classified as minor. However, some of the rural areas are supplied from groundwater sources, such as in the Macambini WSS and other areas in the Macambini Tribal Authority areas, but plans are to connect this scheme to the Sundumbili WSS.

According to the 2004 Thukela WMA ISP (DWAF), the median depth of the water table in this WMA is 20m. Groundwater quality is generally good, specifically in the higher rainfall areas. The area consists of hard-rock aquifer formations and generally results in low-yielding groundwater supplies (0.1 – 0.6l/s), but higher yields can be obtained in suitable areas. The groundwater exploitation in the WMA is still low (2.75million m^3/a, which is only 0.4% of the mean annual recharge over the area) and significant opportunity exist for further development.

Groundwater availability in the Lower Thukela River Key Area (year 2005), at 1:50 assurance level:

- Supported by upstream releases: 1million m^3/a.

- Not supported by upstream releases: 1million m³/a.

Groundwater availability in the Mvoti River Key Area (year 2005), at 1:50 assurance level: 1million m³/a.

Groundwater availability in the Mdloti River Key Area (year 2005), at 1:50 assurance level: 0million m³/a.

The IDM Water and Sanitation Master Plan (2016) indicated that the groundwater sources in the Macambini area are however unreliable. Officials from the IDM mentioned that there are areas experiencing saltwater intrusion due to over-abstraction from the groundwater sources.

The coastal areas of Tugela Mouth, Zinkwazi Beach, Blythedale and Tinley Manor were also supplied from groundwater, but have since been connected to the LTBWSS. The area of Driefontein is now also supplied from groundwater after vandalism damaged the surface water infrastructure.

Several drought interventions, making use of additional boreholes have been proposed in the IDM Water and Sanitation Master Plan (2016). The status of borehole development from the drought interventions should be established, including the potential yield analysis of the boreholes.

The Department of Education and Department of Public Works initiated a groundwater feasibility study – Schools Drought Relief Project, investigating the existing and potential groundwater use at education facilities, for the KZN Province in 2017. This information may be useful for guiding groundwater options in especially rural areas not served from existing schemes.

5.6 External Water Sources

The southern portions of the WSA – KDM and NLM, are supplied from the Umgeni Water North Coast system, which is obtaining water from the neighbouring tertiary catchment U20, which includes the Hazelmere Dam, located on the Mdloti River as main source of water.

The full supply capacity of the Hazelmere Dam is 17.86million m³ and the stochastic yield of the dam is 20million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2018), however it excludes the Ecological Reserve. The updated Umgeni Water Infrastructure Master Plan (2020) reports the Hazelmere Dam full supply capacity as 37.1million m³, once the raising of the dam wall is complete. The Hazelmere Dam can currently impound 21million m³.

Since the LTBWSS as well as the North Coast System are both bi-directional, water can be supplied into the WSA as well as out of the WSA.

Since the completion of the UAP Phase II studies, the WSA has commenced and completed projects for water supply and sanitation development. Furthermore, Umgeni Water has implemented Phase 1 of the Lower Tugela Bulk Water Supply System (LTBWSS). A number of the smaller water supply schemes in the iLembe DM now receive water from this scheme.

This section provides a brief overview of the existing bulk and local water supply schemes. Brief discussions were held with the IDM technical and PMU officials during May and June 2019 with intermediate follow-ups thereafter. The IDM does not have up-to-date information systems or planning documents that are readily available and accessible to all officials, which make uptake of information and sharing of knowledge more difficult.

5.7 URBAN AND BULK WATER SUPPLY SCHEMES

The following sections give a brief overview of the urban and bulk water supply schemes (WSS). Bulk water supply schemes (see Figure 5-2) can be identified as schemes with a large geographic footprint, or with a water treatment plants (WTP) of a design capacity of 2Mℓ/d or more.

A summary of the Water Treatment Plants is provided in Table 5-3.

Table 5-3: Summary of WTPs

LM Name	Plant Name	Owner	Design Capacity (Mℓ/d)	Annual Average Production (Operational) (Mℓ/d)	Class of Plant
KwaDukuza	Mvoti	IDM	16	11	B
	Lower Tugela	Umgeni Water	55	25-30	A
	Mandeni (decommissioned, using pumps only)	IDM	6.6	0	
	SAPPI (on the Tugela River)	SAPPI	unknown	unknown	unknown
	SAPPI (at SAPPI)	SAPPI	unknown	unknown	unknown
Mandeni	Sundumbili	IDM	40	18	A
	Maphumulo package plant*	Umgeni Water	3	3	
	Maphumulo	Umgeni Water	6	6	B
Maphumulo	Ngcebo	IDM	4	1.6	C
	Esidumeni	IDM	1.5	1	C
	Montebello Hospital	Montebello Hospital	0.15	0.15	C
Ndwedwe	Ntuze	IDM	2	0.25-0.30	C
Total Capacity			134.25	40.75	
eThekwini Metro	Hazelmere (Mdloti System)	Umgeni Water	75	50	B

Source: iLembe DM correspondence received and from interviews (June, 2019); Umgeni Water (2020)

** The Maphumulo package plant is operated as an additional module to the Maphumulo WTP*

The operations at the Maphumulo WTP and package plant are hampered during times of drought and electricity outages and are then not able to meet the demands of consumers. The package plant is operated as an additional module of the Maphumulo WTP.

The remaining WTPs generally have spare operating capacity to meet future water demands.

N

Nkandla Local Municipality

Ntunjambili

Ngcebo WSS

uMlalazi Local Municipality

ESHOWE

R66

King Cetshwayo

N2

MTUNZINI

GINGINDHLOVU

Umvoti Local Municipality

Umzinyathi

GREYTOWN

R74

Ndulinde WSS

Mandeni Local Municipality

R102

R66

Sundumbili WSS

Macambini

MANDINI

Mandeni WSS

Tugela South

Maphumulo Local Municipality

Maphumulo WSS

R33

Lower Tugela Bulk WSS (extended Darnall)

ZINKWAZI BEACH

iLembe

Glendale

KwaDukuza Local Municipality

KWADUKUZA

Mvoti WSS (KwaDukuza-Stanger)

N2

GLEDHOW

BLYTHEDALE BEACH

Umgungundlovu

COOL AIR

uMshwathi Local Municipality

R614

Ozwathini

Ndwedwe Local Municipality

Umgeni Northern Feeder

SHAKASKRAAL

TINLEY MANOR BEACH

Emalangeni

SALT ROCK

COMPENSATION

SHAKA'S HEAD

SHAKA'S ROCK

Nkwambase

MONA

BALLITO

Dwedwe

N2

TONGAAT

M4

eThekwini

R102

eThekwini Local Municipality

VERULAM

MAWOTANA

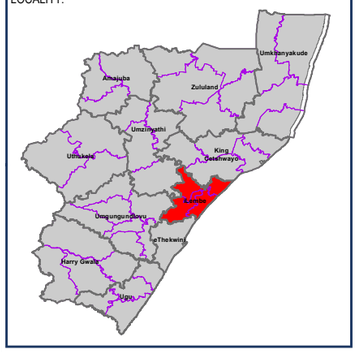
UMDLOTI BEACH

5 2.5 0 5 10 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names (Dried Dam)
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components
iLembe District Municipality

DATE COMPLETED: Wednesday, 17 June 2020

MAP NO.: **DC29: Figure 5.2**

Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

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5.7.1 Concession Area: Ballito to Tinley Manor and Shakaskraal

In January 1999, the Borough of Dolphin Coast ("BODC") and Sembcorp Siza Water (Siza Water) (with a controlling interest at that time by SAUR Services of France) entered into a Concession Contract whereby Siza Water would oversee, manage and implement the provision of water and sanitation services within the then BODC Municipal boundary, on a Concession basis, for a period of 30 years. The Concession Contract will consequently end in 2029.

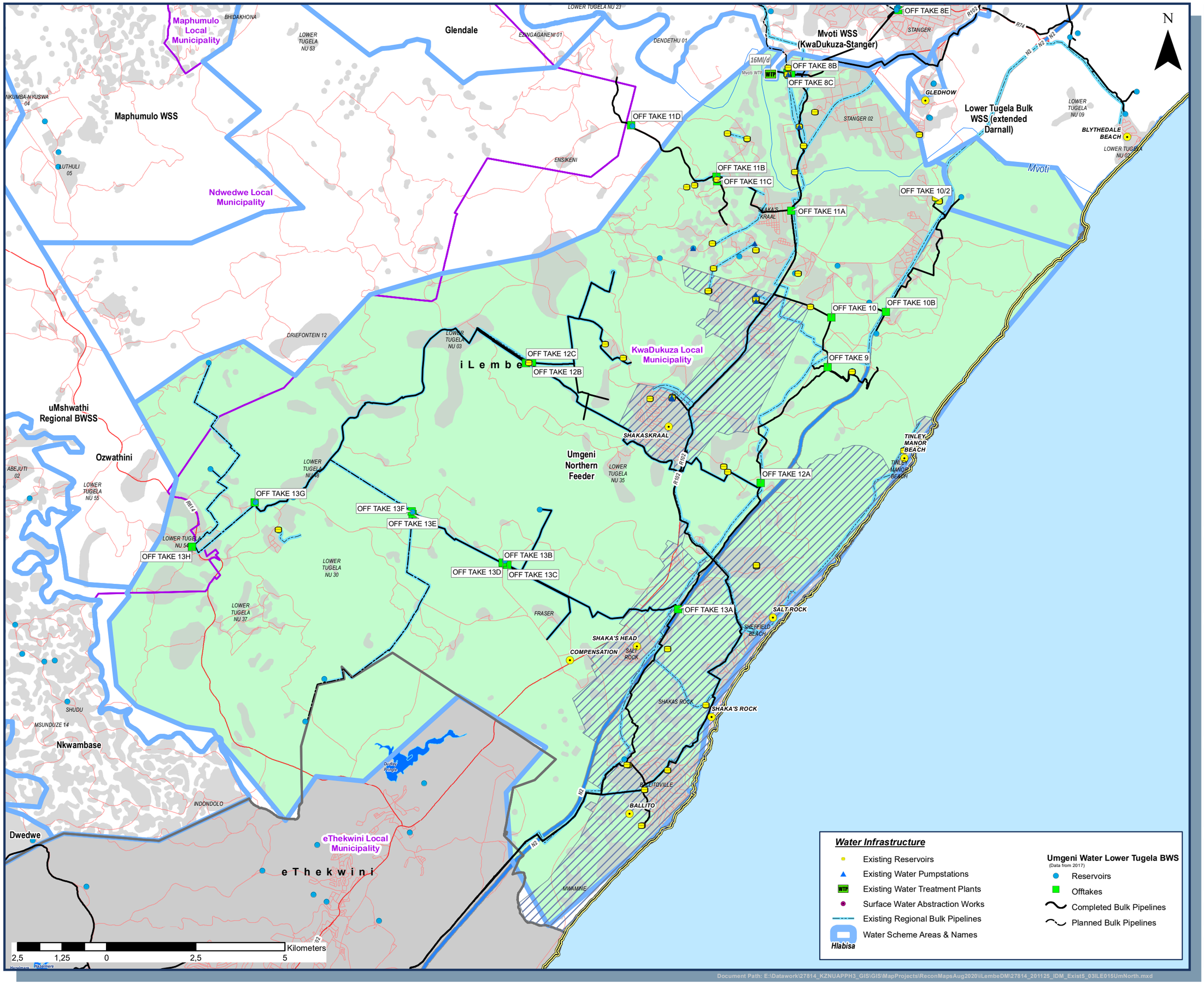
Siza Water (Pty) Ltd (SW) manages and operates the water and sewer services within the Ballito and surrounding areas, as well as inland areas of Nkobongo and Shayamoya (see Figure 5-3). Water is purchased from the Mdloti WSS operated by Umgeni Water, then distributed to consumers. The concession area's southernmost area of supply is Port Zimbali, then northwards up to Tinley Manor Beach and inland up to Etete. Most consumers receive high levels of service and waterborne sanitation or sanitation is provided via septic tanks.

The ownership of Siza Water has since changed to a consortium of local partners and the BODC became the KwaDukuza Local Municipality (KDM). The KDM is one of the family of local municipalities in the iLembe District Municipality, the latter now the Water Services Authority that includes this area of supply.

The volume supplied from the Mdloti WSS to Siza Water is between 9-10Mℓ/d. Most consumers have house or yard connections and some community stand pipes. Projects are under way to upgrade community stand pipes to yard connections. Sanitation is mostly waterborne connections, but there are also VIPs and septic tanks. There are a minimal number of illegal connections. In summary (correspondence received from Siza Water, March 2020):

- ✓ Total households = 22 266.
- ✓ Household connections = 14 666.
- ✓ Yard connections = 933.
- ✓ Standpipes = 6 667.

Siza Water has installed a Reverse Osmosis (RO) component at the Frasers WWTP (12Mℓ/d design capacity, can be upgraded) and can treat and reuse approximately 3Mℓ/d (upgradeable to 5Mℓ/d) from the current wastewater volume of 6-8Mℓ/d (Feb-Nov; else +-11Mℓ/d during peak summer tourism periods), which is blended into the potable water supply system. Groundwater was used only during drought periods to augment supply.



Legend

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- Main Roads
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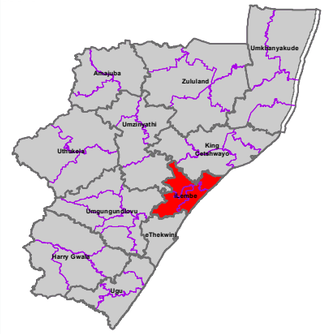
- Rivers
- Settlements
- Major Towns
- Siza Water Concession Area

LOCALITY:



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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Umgeni Northern Feeder
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.3**

Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

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The system managed by Siza Water has a bulk and distribution storage capacity of 27.3Ml. Umgeni Water provides and maintains the primary bulk water supply infrastructure which includes the Avondale and Ballito Terminal reservoirs and Siza Water maintains the IDM's existing secondary and reticulated infrastructure.

The Avondale-Honolulu Subsystem is divided into two reservoir zones: Shakaskraal / Nkobongo / Shayamoya reservoir zone and the Honolulu / Etete reservoir zone. Furthermore, there are the Ballito Terminal and Ballito Lea reservoir zone, the Shakasrock and Sheffield reservoir zone, the Shakashead reservoir zone, Taffeni reservoir zone, Zimbali reservoir zone and Umhlali reservoir zone.

There are bulk meters at the abstraction, WTP and bulk reservoirs as well as certain district meter areas. Siza Water is busy implementing an Automated Meter Reading (AMR) system. Most of the large water consumers consist of developed estates, industries, hotels and business complexes.

Siza Water implements and maintains a WC/WDM programme and the water loss in the system is about 9%, which is economically feasible to maintain.

SW recently completed their updated Infrastructure Master Plan (IMP) for 2019-2023, an update from their 2014 Infrastructure Master Plan. SW operates in a very economically dynamic area, with many existing developments and proposals for development. However, the developments are affected by the economic climate and the IMP makes provision for phased implementation and upgrade of the water and sanitation infrastructure.

5.7.2 Sundumbili WSS, Mandini WSS, Ndulinde WSS and Macambini WSS

The central and northern areas of Mandeni LM receive its raw water supplies from the Tugela River. The water is treated at the Sundumbili Waterworks and distributed to Sundumbili and surrounds as well as Ndulinde and surrounds. The Sundumbili Waterworks was upgraded to 40 Mℓ/day in 2011. The town of Mandeni is currently supplied directly from the Mandeni WTP; however, the intention is to decommission the Mandeni WTP in 2017/2018 and to supply Mandeni Town directly from the Sundumbili WTP (IDM Water and Sanitation Master Plan, 2016).

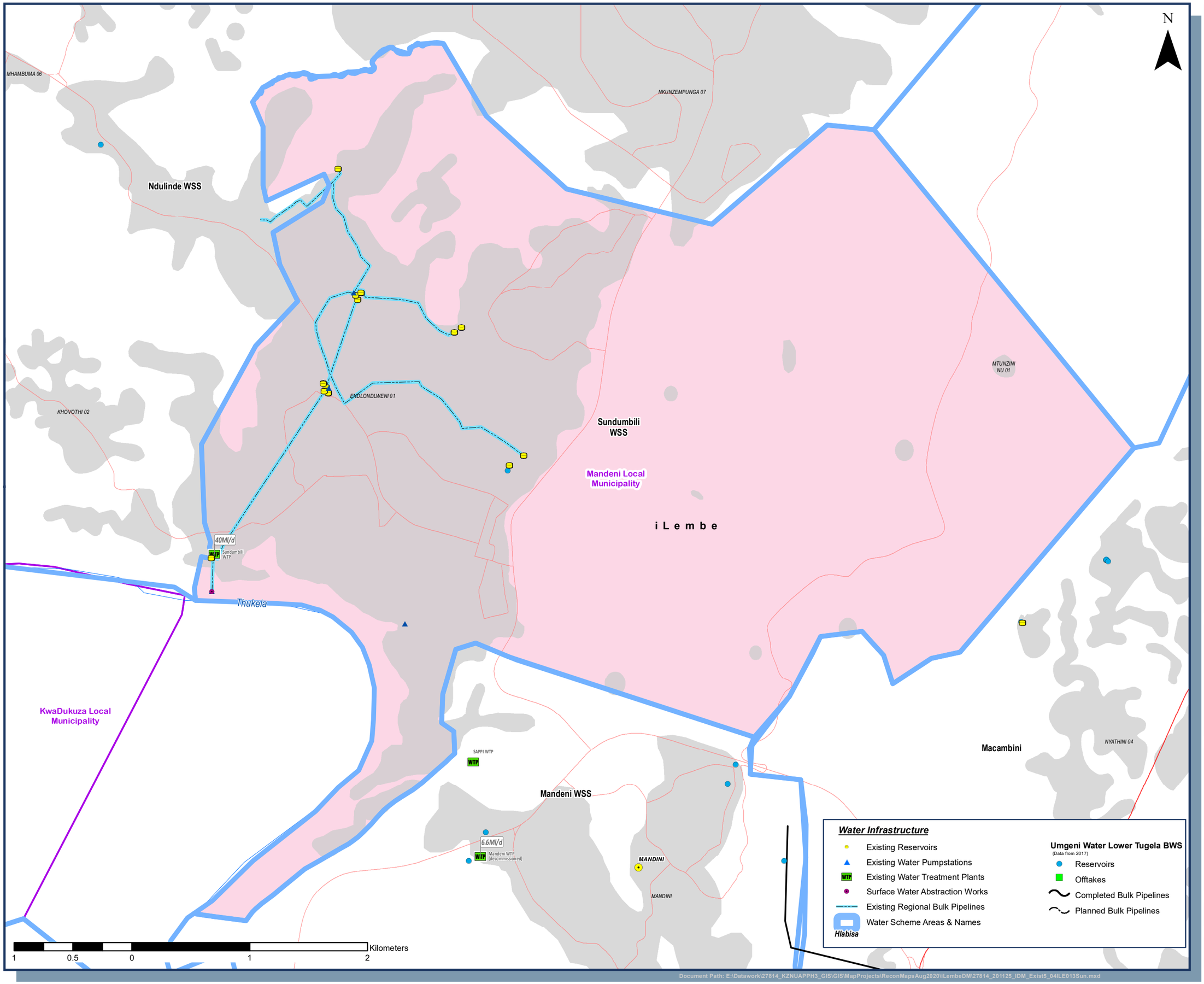
The area in the north-east of the Mandeni LM, is supplied from the Macambini WSS, obtaining its water from local boreholes. The IDM Master Plan indicates that the intention is to supply this area in future also from the Sundumbili WTP. Areas not included in the above-mentioned supply areas obtain water from local surface or groundwater sources.

The Mandeni WTP has been decommissioned during 2019, but the pump stations are still in use to support the Sundumbili WSS that is being developed into a regional scheme to cover most of the Mandeni LM. The WSS supplies mostly domestic consumers, but also the Isithebe Industrial Park outside the town of Mandini. The Sundumbili WTP currently operates at ~18Mℓ/d. Most of the bulk and reticulated infrastructure have been developed in the northern areas of the Mandeni LM. The IDM is busy with the extension of the scheme to the

Macambini area to the east of the Sundumbili WTP. Refer to Figure 5-4, Figure 5-5, Figure 5-6 and Figure 5-7 for the scheme layouts (IDM, 2019/2020).

The water supply to wards 3, 7 and 13-15 are reliable and have mostly waterborne sanitation, but not to wards 16-18. Ward 6 is not included in a formal scheme and obtain water from local groundwater sources and via water tanker from the IDM. Wards 6, 11, 12, 16, 17 and 18 will form part of the future Sundumbili WSS regional supply to the Ndulinde area. Ward 2 that includes Tugela Mouth, has septic tanks whereas the remainder of areas are served via VIPs. There are no immediate plans to upgrade the VIP services to higher levels of service such as waterborne sanitation. Water connections will be either house or yard connections, however there are many illegal connections that need to be formalised as they often are of poor workmanship causing leaks and are not billed (IDM, 2019/2020).

There are about 19 bulk reservoirs with a total capacity of 80Ml in the Sundumbili WSS. The bulk pipeline infrastructure is generally in good condition as this scheme is newly built. There are bulk meters installed at the abstraction works, the WTP and bulk reservoirs, which are read manually. There is currently no monitoring system or telemetry installed to expedite and simplify bulk meter readings (IDM, 2019/2020).



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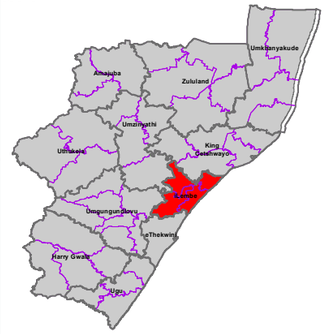

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PROJECT TITLE

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MAP TITLE:

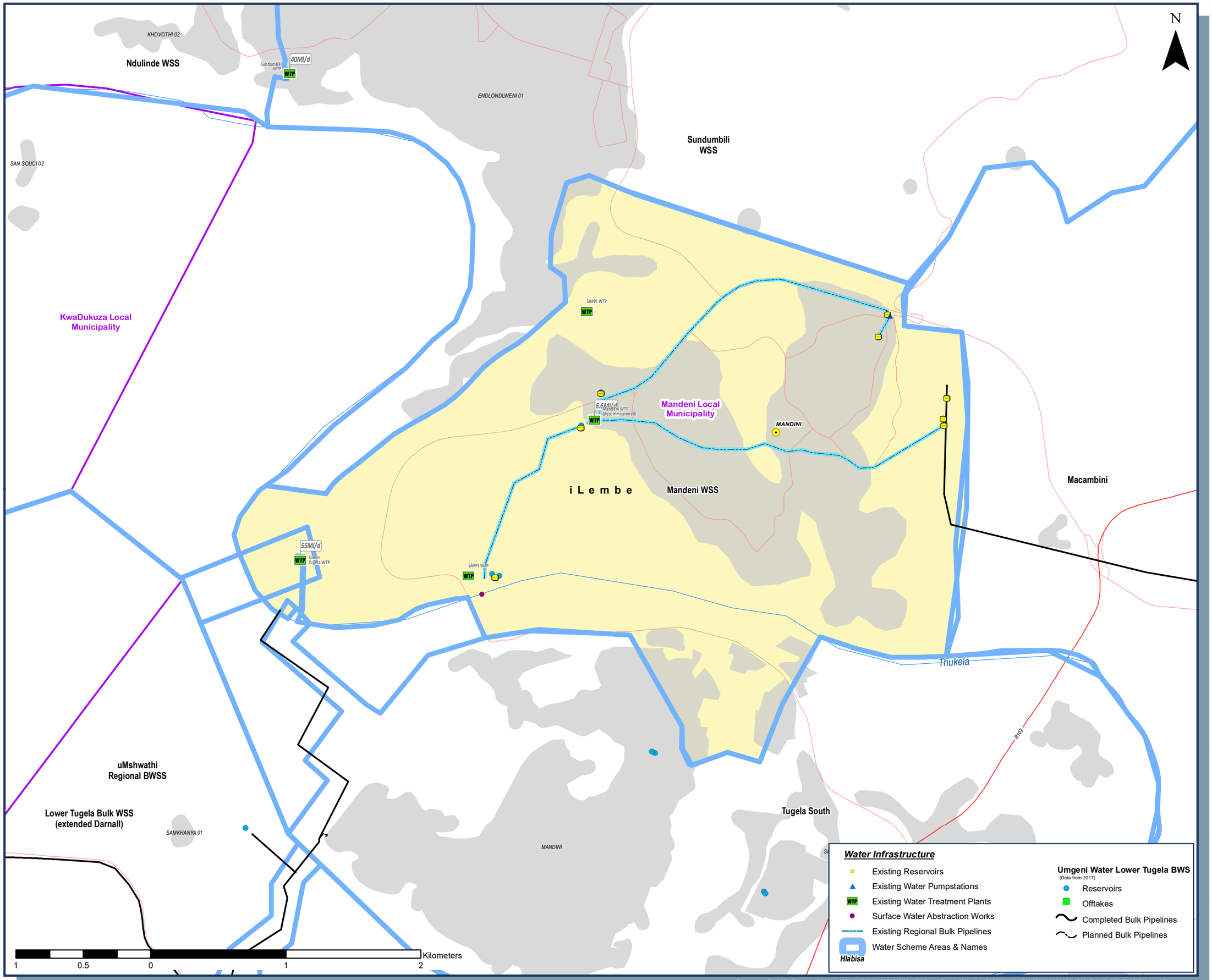
Existing Scheme Areas & Infrastructure Components - Sundumbili WSS
iLembe District Municipality

DATE COMPLETED:

2020/11/26

MAP NO.:

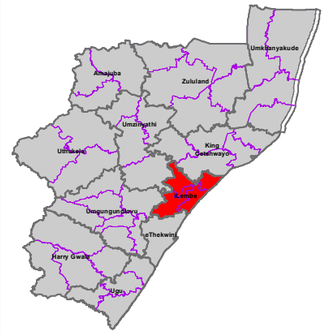
DC29: Figure 5.4



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

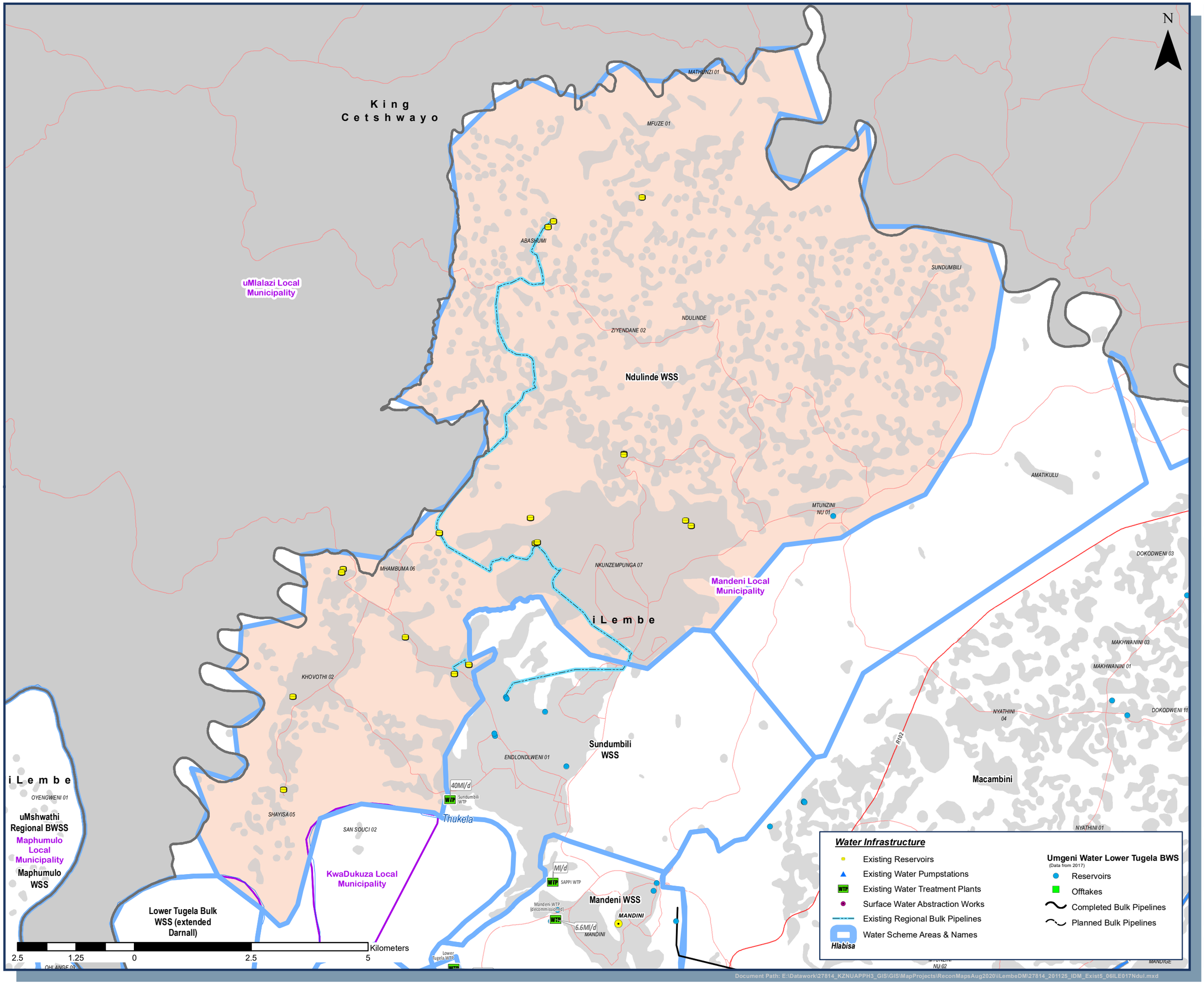
Ilembe DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mandeni WSS
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.5**



Legend

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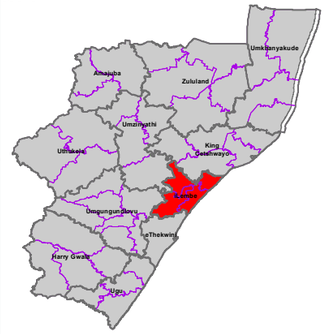
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

LOCALITY:



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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Ndulinde WSS
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.6**

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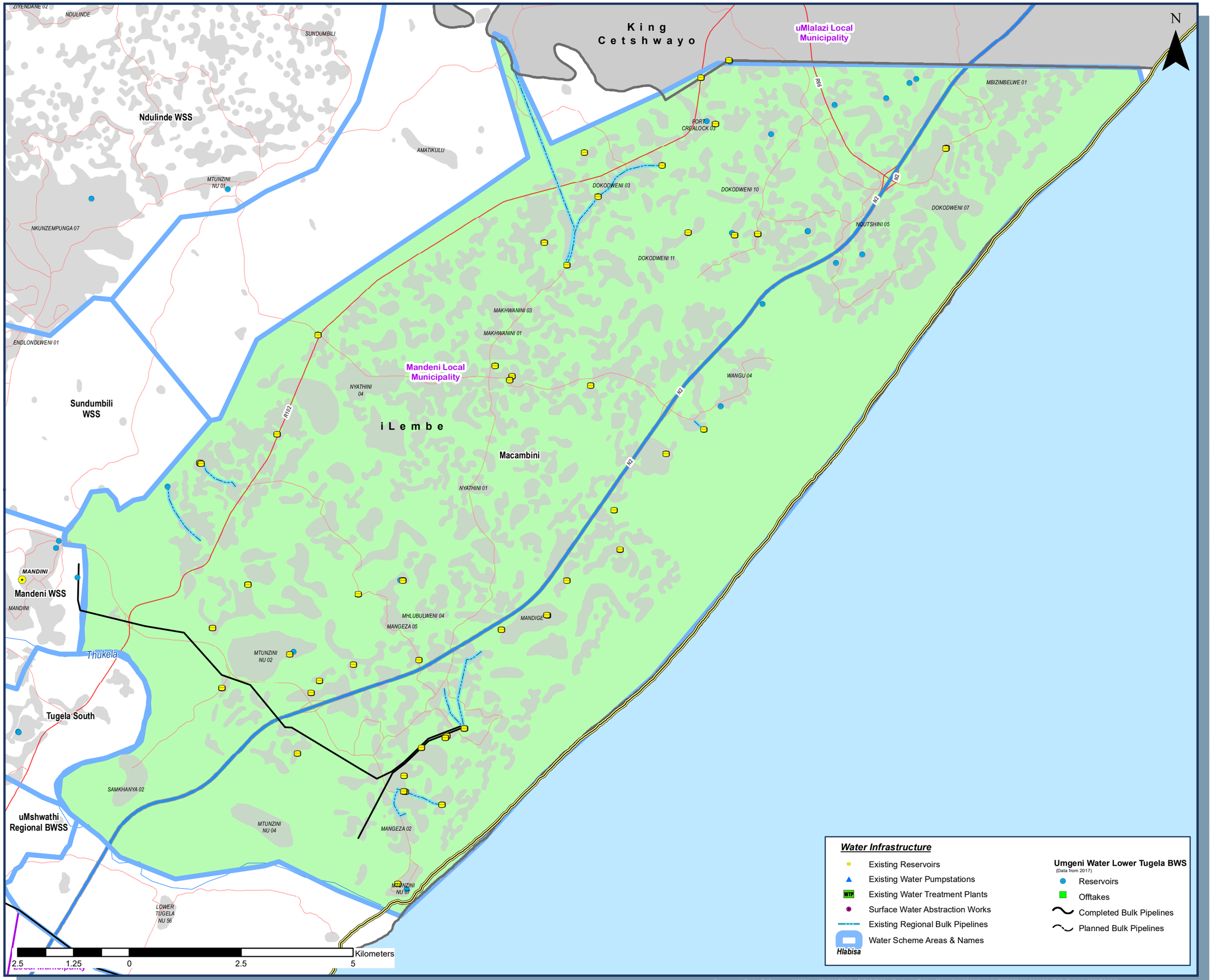

Legend

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- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

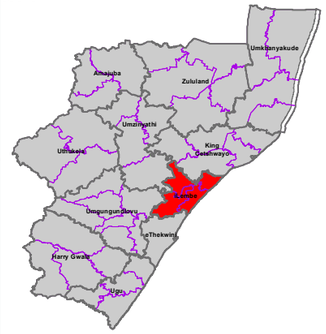
Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Macambini
iLembe District Municipality

DATE COMPLETED:

2020/11/26

MAP NO.:

DC29: Figure 5.7

5.7.3 Mvoti WSS (uMvoti WSS)

The Mvoti WSS, depicted in Figure 5-8, is one of three sub-systems that represent the North Coast System. The North Coast System being operated by Umgeni Water. The secondary bulk of the Mvoti WSS is owned and operated by the IDM. The other two sub-systems are the Mdloti WSS (Hazelmere Dam on the Mdloti River) and the Lower Tugela Bulk WSS (Tugela River).

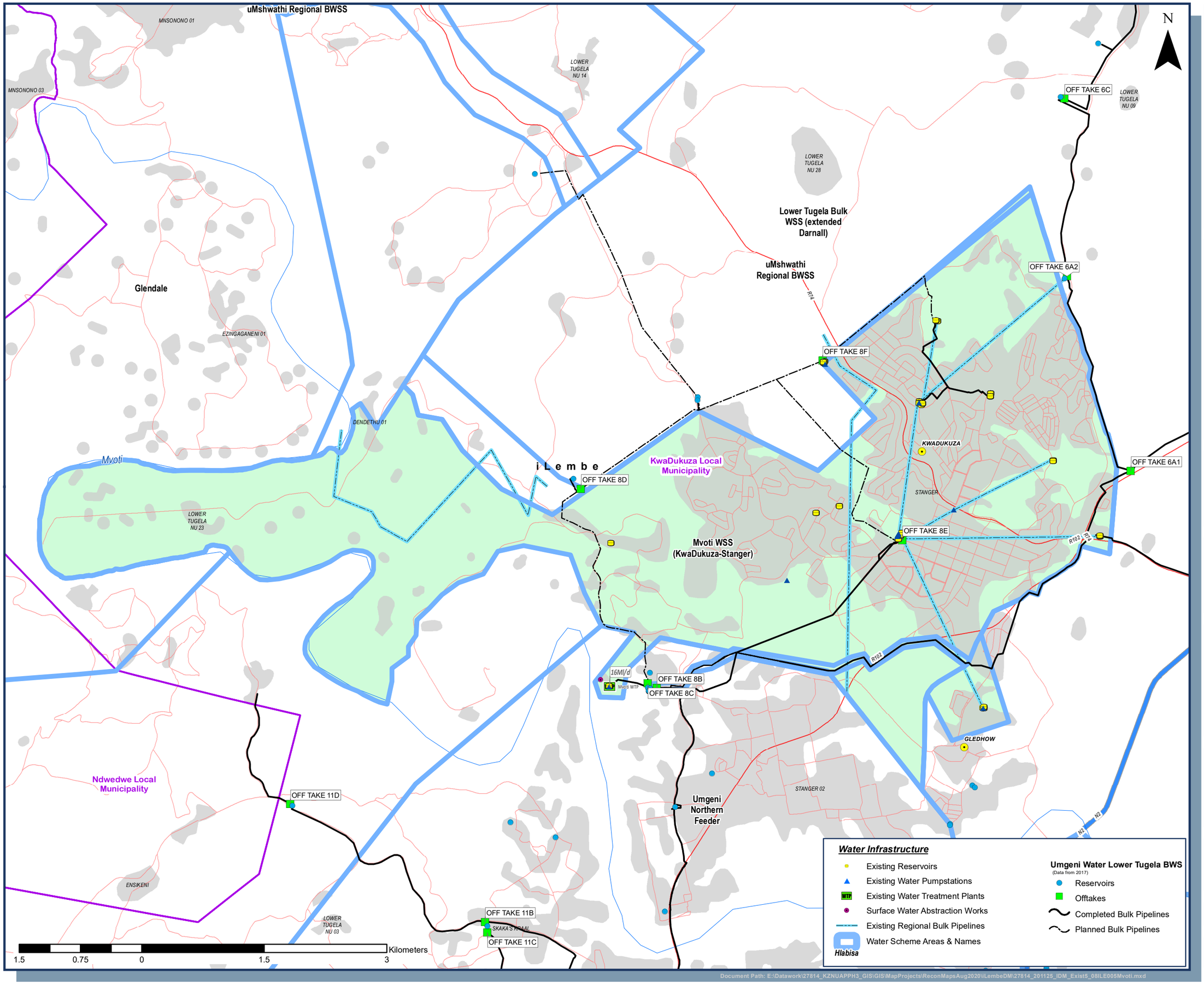
The KwaDukuza LM is supplied with a combination of the Mdloti River system (includes the Hazelmere Dam) and the local Mvoti River. A small portion of the town of KwaDukuza relies on run- of-river abstractions from the Mvoti River, the remainder supported by water transfers from the Mdloti catchment where the Mdloti System is supplied from the Hazelmere Dam. The Mvoti Balancing Reservoir mainly obtains water from the Mvoti WTP and supplies water to the town of KwaDukuza (previously known as Stanger) (IDM Water and Sanitation Master Plan, 2016).

According to the Mvoti to Mzimkhulu ISP (DWA, 2004) the water balance of the Mvoti region is in deficit of 56 million m³/annum. Umgeni Water applied for an abstraction licence of 6.57 million m³/annum (18Mℓ/day) from the Mvoti River for the Mvoti WTP; this should be reviewed as demands increase (Umgeni Water, 2016).

The Mvoti WTP feeds into the Big Balance reservoirs that also receive water from the Mdloti WSS and the LTBWS. The design capacity of the Mvoti WTP is 16Mℓ/d and is currently operating at ~11Mℓ/d. The wards supplied from this scheme include ward 13 and wards 16-19. All consumers have waterborne sanitation, except in wards 14, 15 and parts of ward 17 which have VIPs, but they are in process of being upgraded to house connections (IDM, 2019/2020).

There are at least five bulk reservoirs in the Mvoti WSS, with a total capacity of 8Ml. The IDM decommissioned the one 300mm ø Asbestos Cement (AC) pipeline from the 3Ml balancing reservoir and is using only the 350mm ø Polyvinyl Chloride (PVC) pipeline to feed the reservoirs that are also supplied from the LTBWS. Bulk meters are installed at the WTP and bulk reservoirs and are read manually. The Mdloti WSS also feeds into the 3Ml balancing reservoir (IDM, 2019/2020).

A mixture of domestic, industrial, business & commercial, and institutional (public institutions) consumers are served from this WSS (IDM, 2019/2020).



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Legend

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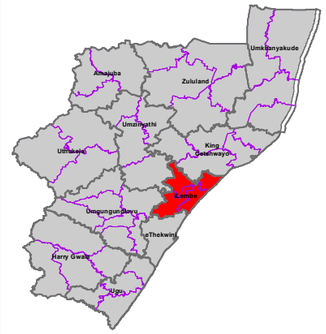
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

LOCALITY:



CLIENT: UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY: ILEMBE DISTRICT MUNICIPALITY

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mvoti WSS (KwaDukuza-Stanger) iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.8**

5.7.4 Lower Tugela Bulk WSS

The Lower Tugela Bulk WSS, depicted in Figure 5-9 and Figure 5-10, is one of three sub-systems that represent the North Coast System, operated by Umgeni Water. The other two sub-systems are the Mvoti WSS (Mvoti River) and the Mdloti WSS (Hazelmere Dam on the Mdloti River).

The Mvoti WTP, which supplies the town of KwaDukuza, is limited by its size and the availability of raw water from the Mvoti River to deliver approximately 16 Mℓ/day. The raising of Hazelmere Dam, will not be able to supply the estimated demand on the north coast of 115Mℓ/day in ten years' time. Further augmentation of the bulk water supply to the KwaDukuza area and the KZN North Coast is therefore required in the medium to long-term (IDM Water and Sanitation Master Plan, 2016).

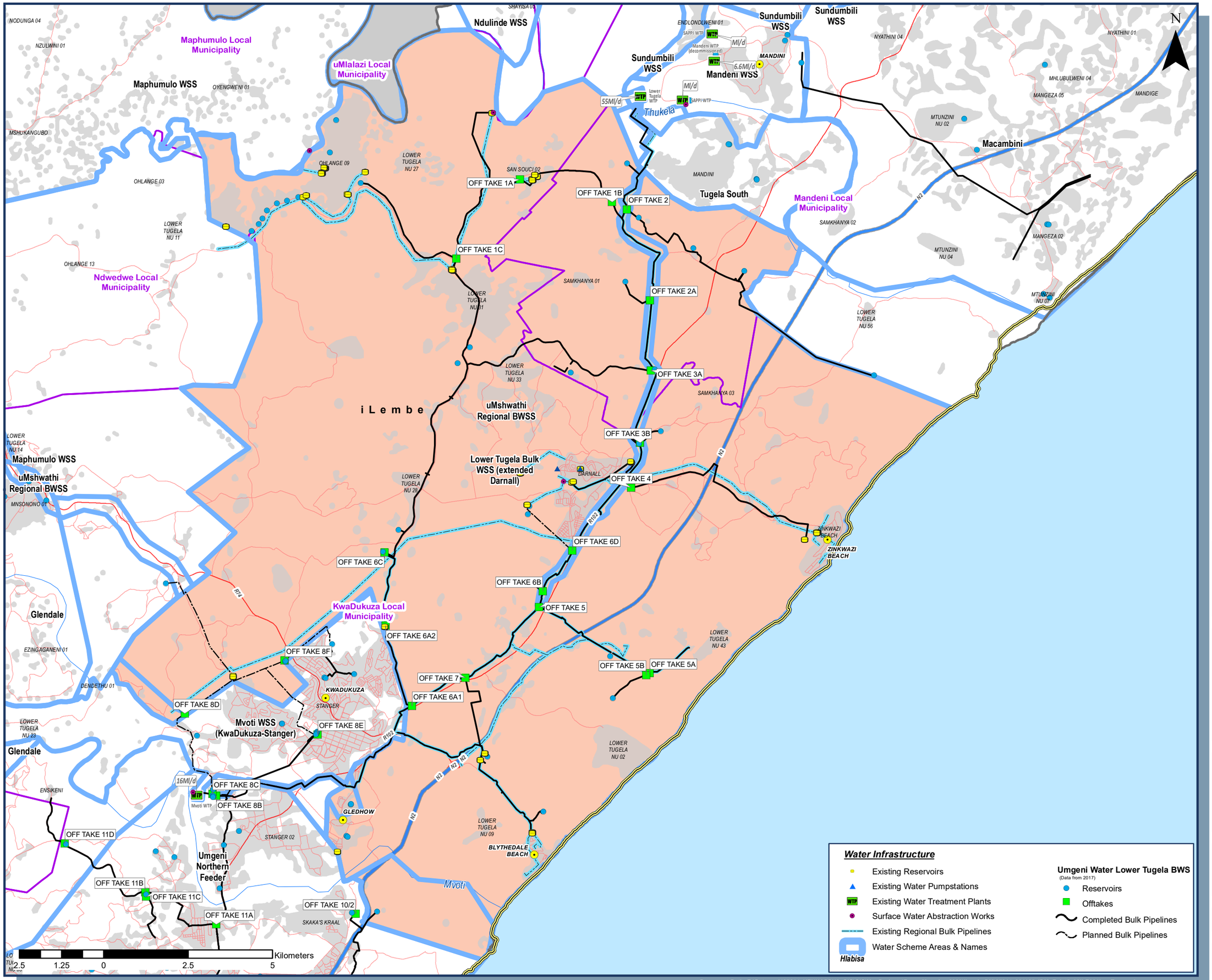
A Reserve Determination on the Tugela River revealed that there is a maximum of 110 Mℓ/day of raw water available from the Tugela River for supply to the North Coast areas. The Lower Tugela Bulk Water Supply Scheme (LTBWSS) was therefore constructed to abstract water directly from the Lower Tugela River with treatment at a WTP situated on the northern bank of the Tugela River (IDM Water and Sanitation Master Plan, 2016).

Bulk potable water will then be supplied from the Lower Tugela WTP southwards to the KwaDukuza area and into the existing North Coast Supply System. This scheme will be developed in a phased manner to match the growth in demands in these areas, and will be able to supply the rural areas of Bulwer, San Soucci and St Christopher in addition to supplying the towns of Darnall, Zinkwazi and Blythedale within the KwaDukuza Municipality (IDM Water and Sanitation Master Plan, 2016).

The Lower Tugela Bulk Water Supply Scheme (LTBWSS) involved the construction of a 110 Mℓ/d abstraction works on the lower Tugela River, a water treatment plant and a 3km rising bulk main (900mm ø) to supply a 30 Mℓ Command Reservoir located on the south-eastern bank of the Tugela River. A 29km long, 900mm ø gravity pipeline was then constructed to supply the existing Mvoti Balancing Reservoir situated south of the Mvoti River within the KwaDukuza Local Municipality (IDM Water and Sanitation Master Plan, 2016).

The Water Treatment Plant (WTP) was designed to be constructed in two phases. Phase One entailed the construction of a water treatment facility to process and treat 55 Mℓ/d of water, whereas Phase Two will involve the upgrade of the works by an additional 55 Mℓ/d, to ultimately process and treat 110 Mℓ/d. Currently the WTP has a capacity of 55 Mℓ/d, and will be upgraded to 110 Mℓ/d when demand dictates (IDM Water and Sanitation Master Plan, 2016).

Phase One of the LTBWSS (55 Mℓ/d) will supply the upper KwaDukuza Local Municipality (LM) region between the Tugela Village and Groutville, while Phase Two is intended to supply the lower regions of the KwaDukuza LM via the existing North Coast Pipeline, and the greater Mandeni area at a later stage (IDM Water and Sanitation Master Plan, 2016).



Legend

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- National Roads
- Main Roads
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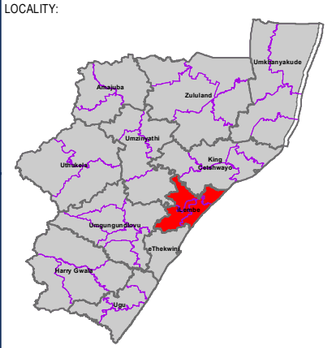
- Rivers
- Settlements
- Major Towns
- Siza Water Concession Area

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Lower Tugela Bulk WSS
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.9**

Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

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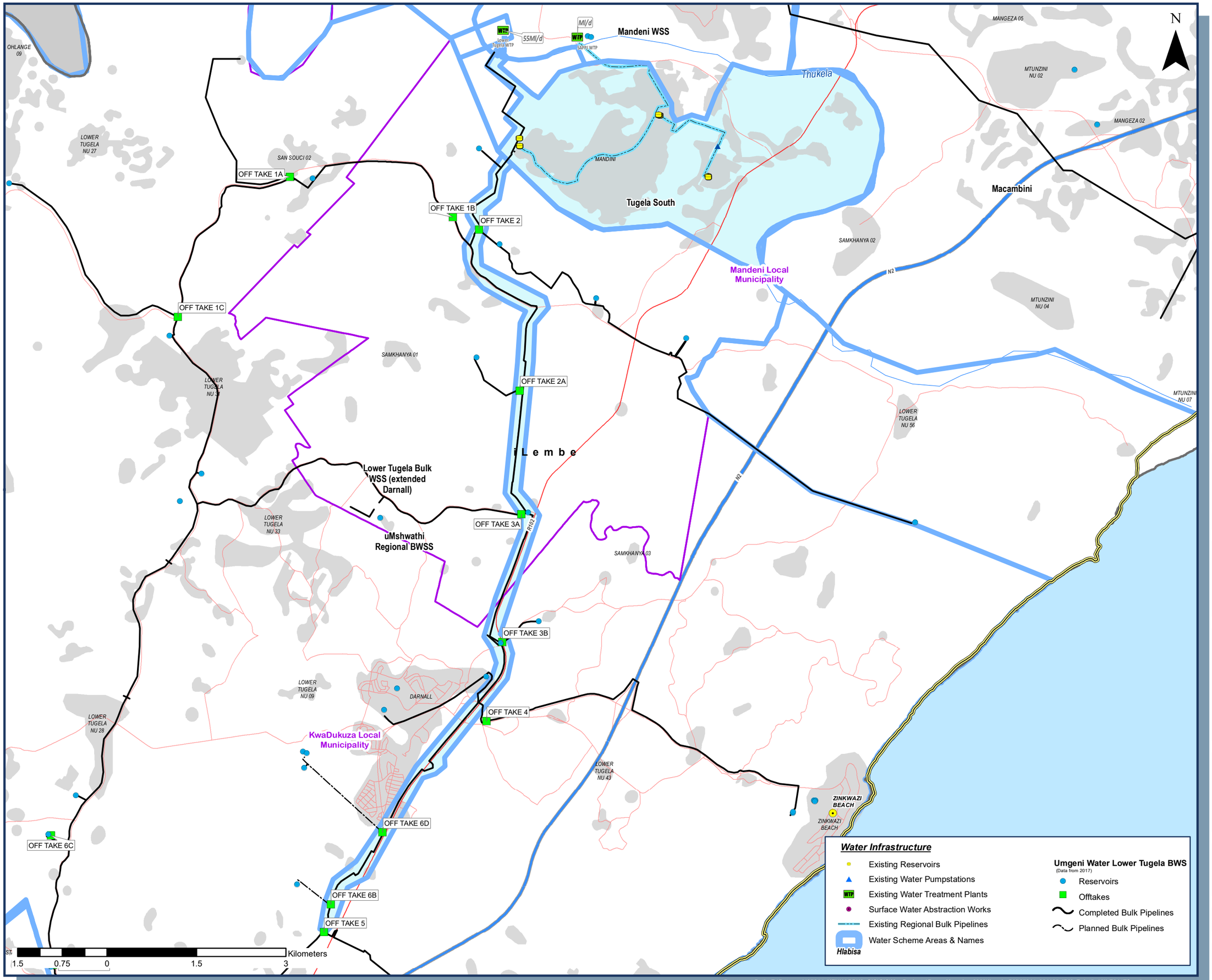

Legend

- Provincial Boundaries
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- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

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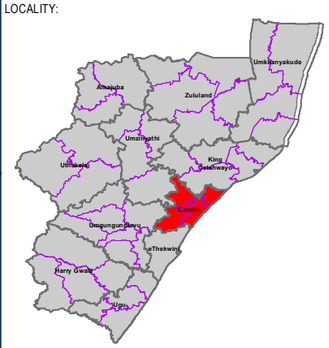

CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Tugela South
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.10**

The North Coast Pipeline was designed as a 'bi-directional pipeline' i.e. water can flow either from the north (via the LTBWSS) or from the south (from the Hazelmere WTP, via Avondale Reservoir). In the event that the supply from the LTBWSS is reduced due to operational challenges or other supply constraints, water supply to the North Coast area can be supplemented from the south (from Hazelmere Dam) as a 'back-up' supply (IDM Water and Sanitation Master Plan, 2016).

The intention previously was to also supply the greater Mandeni area from the LTBWSS, but the recently upgraded Sundumbili WTP (40 Mℓ/d) has sufficient capacity to supply the greater Mandeni area for approximately ten years (IDM Water and Sanitation Master Plan, 2016).

The LTBWSS is expected to be officially commissioned by the end of April 2016, but it is likely to take another two months to fully commission the system. The current demand on the LTBWSS is 20-25 Mℓ/d which will be released once final commissioning of the system is complete. Umgeni Water then intends to hand back the Mvoti WTP to the iLembe District Municipality once the LTBWSS has been fully commissioned (IDM Water and Sanitation Master Plan, 2016).

Umgeni Water commissioned Phase 1 (design capacity of 55Mℓ/d) of the Lower Tugela Bulk Water Supply Scheme (LTBWSS) in 2018, that abstracts water from the Tugela River, near the town of Mandeni. The Tugela WTP as it is known, is operated by Umgeni Water and is currently producing 25-30Mℓ/d. The areas to the west of the Tugela River in the Mandeni LM are now supplied from the LTBWSS as well as areas in the KDM (Umgeni Water, 2019/2020; IDM, 2019/2020).

Most of the offtakes in the Mandeni LM and KDM have been completed from the LTBWSS and towns such as Darnall, Zinkwazi Beach, Nonoti, Blythedale Beach and areas in and around the town of KwaDukuza are also supplied from the LTBWSS. Offtake 1 to 8, except offtake 2 are operational. It is anticipated that offtake 2 will only be commissioned in 5-10 years' time to serve new developments and growing water demands. Offtake AV69 has been specifically constructed to serve the Saunders Street Reservoir in the town of KwaDukuza (Umgeni Water, 2019/2020; IDM, 2019/2020).

The supply areas are represented by wards 1-3, 5 and 25 that are only supplied from the LTWBSS. Wards 11, 13, 16-19 are partially supplied from the LTBWSS and augmented by the Mvoti WSS. Most consumers in these wards have household connections and waterborne sanitation. Consumers in wards 1, 3, 4, 7-12, 14, 22 and 23 that currently have VIPs will eventually be upgraded to waterborne sanitation (IDM, 2019/2020).

There are about 15 bulk reservoirs in this part of the LTBWSS, with a total capacity of 75Ml. The system is newly constructed therefore the bulk pipelines are in good condition. The IDM has bulk meters installed at the bulk reservoirs and offtakes, that are also read manually. Currently this scheme serves mostly domestic consumers (Umgeni Water, 2019/2020; IDM, 2019/2020).

5.7.5 *Mdloti WSS (Hazelmere Dam system, part of the North Coast System / Northern Feeder)*

The Mdloti WSS, depicted in Figure 5-11, is one of three sub-systems that represent the North Coast System, operated by Umgeni Water. The other two sub-systems are the Mvoti WSS (Mvoti River) and the Lower Tugela Bulk WSS (Tugela River).

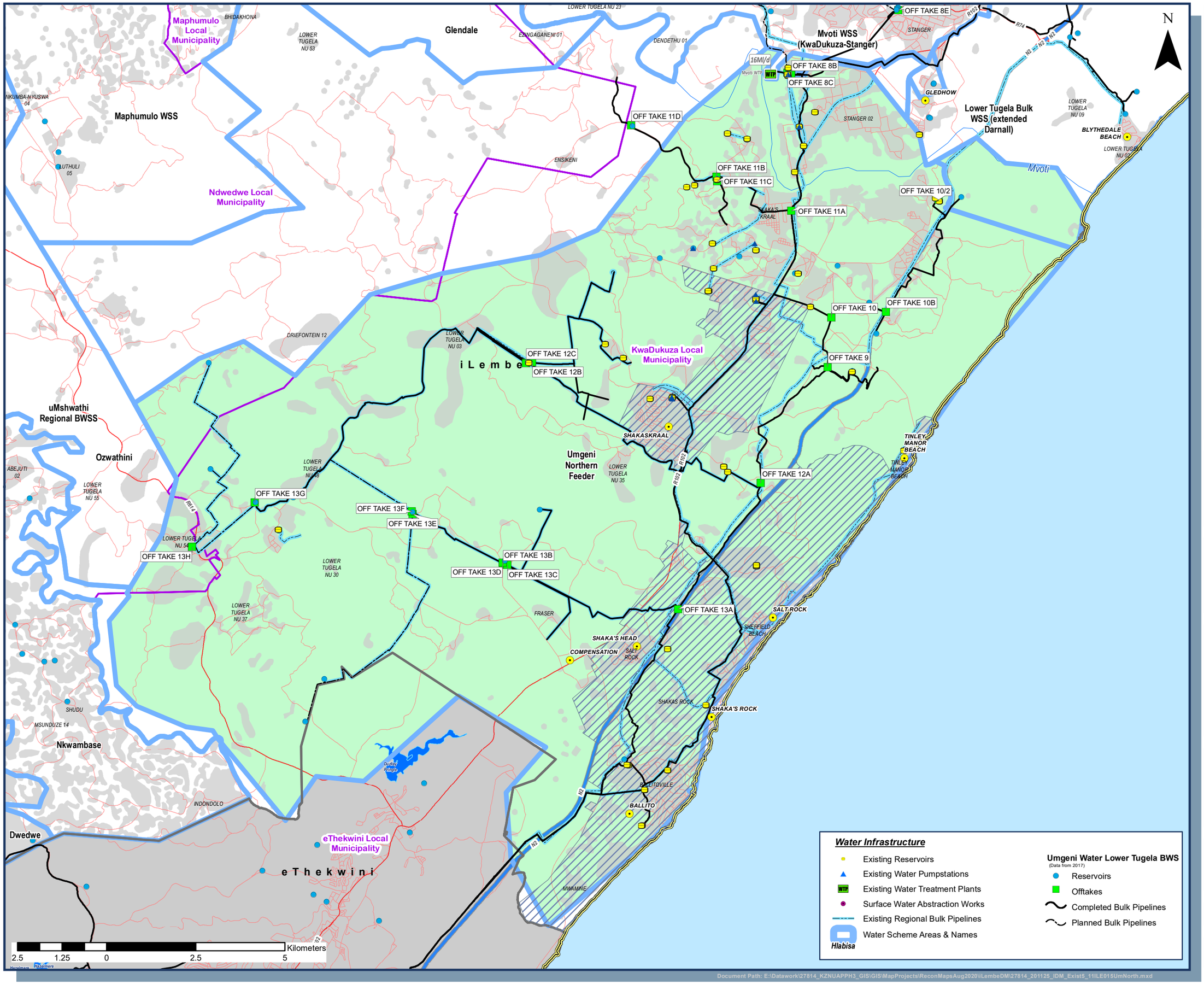
The Hazelmere WTP currently supplies water into the North Coast Pipelines (I and II), Nyaninga, King Shaka International Airport, the area of La Mercy into the Avondale reservoirs, then into the concession area, and into the areas west of the KDM at the Ndwedwe Bulk Reservoirs 1 to 5 in the Ndwedwe LM. The North Coast Supply System (NCSS) consists of the old North Coast Pipeline (PL I) which supplies water from the Avondale Reservoir to the areas of Ballito and Zimbali, Ballito Lea, Shakas Rock, Tiffany and Shakas Head (Hugh Dent Drive) (IDM Water and Sanitation Master Plan, 2016).

The new Umgeni Water North Coast Pipeline (PL II) carries water from the Avondale Reservoir to the Honolulu Reservoir, with bulk off-takes to the old North Coast Pipeline (PL I) and to various existing and proposed reservoirs en-route. The new pipeline (PL II) continues up to the Mvoti Balancing Reservoir and has the facility to supply the Mvoti Balancing through the Groutville Booster Pump station. The latter bulk pipeline is approximately 23km long, starting as a 1000mm ø at the Avondale Reservoir outlet, and reduces to 800mm ø from the Umhlali Off-take up to the Mvoti Balancing Reservoir Off-take. The Mvoti Balancing Reservoir mainly obtains water from the Mvoti WTP located on the Mvoti River, and supplies water to the town of KwaDukuza (previously known as Stanger) (IDM Water and Sanitation Master Plan, 2016).

The KDM wards currently being supplied from the Mdloti WSS include: 6-12, 14, 15, 20. 22 and 23. The wards supplied in the Ndwedwe LM are 11-15, part of 18, and ward 19, which constitute the Dwedwe WSS (see Figure 5-12) and Nkwambase WSS (see Figure 5-13). The volume supplied into NLM is about 11Mℓ/d. The Hazelmere WTP has a design capacity of 75Mℓ/d and is operating at about 50Mℓ/d (supplying into eThekwini and the iLembe DM) (IDM, 2019/2020).

There are about ten (10) bulk reservoirs in the KDM with a combined capacity of 43.5Ml, which excludes the Umgeni Water reservoirs. In the NLM, the Umgeni Water reservoir capacity is about 12Ml (the IDM does not check metering at these reservoirs and receive meter readings from Umgeni Water). Meters are installed at the secondary bulk reservoirs (IDM-owned) and read manually once per month (IDM, 2019/2020).

Most of the bulk pipeline infrastructure (steel) is in good condition, however ageing in the NLM. Umgeni Water is in the process of upgrading the bulk infrastructure, including at the Hazelmere WTP. Ndwedwe Reservoir 1 is fed directly from Hazelmere WTP through a 500 mm diameter steel rising main (IDM, 2019/2020).



Legend

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- Settlements
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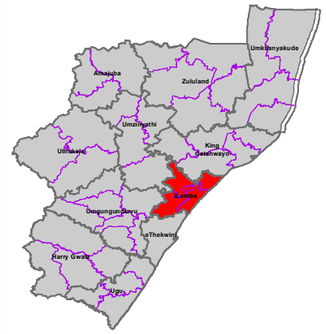
LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Umgeni Northern Feeder
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: DC29: Figure 5.11

Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

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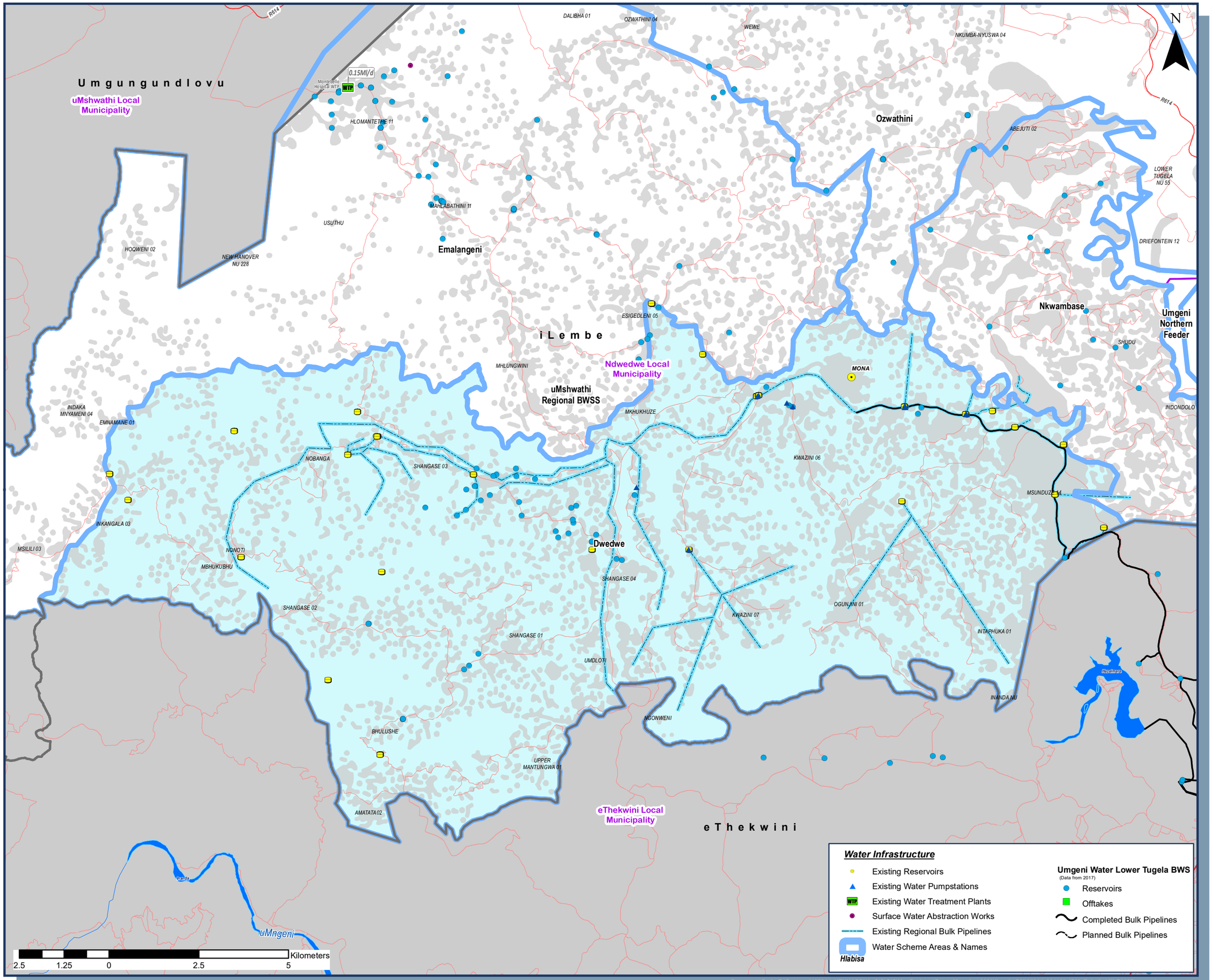

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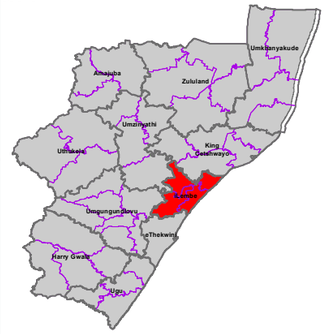

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DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Dwedwe
iLembe District Municipality

DATE COMPLETED:

2020/11/26

MAP NO.:

DC29: Figure 5.12

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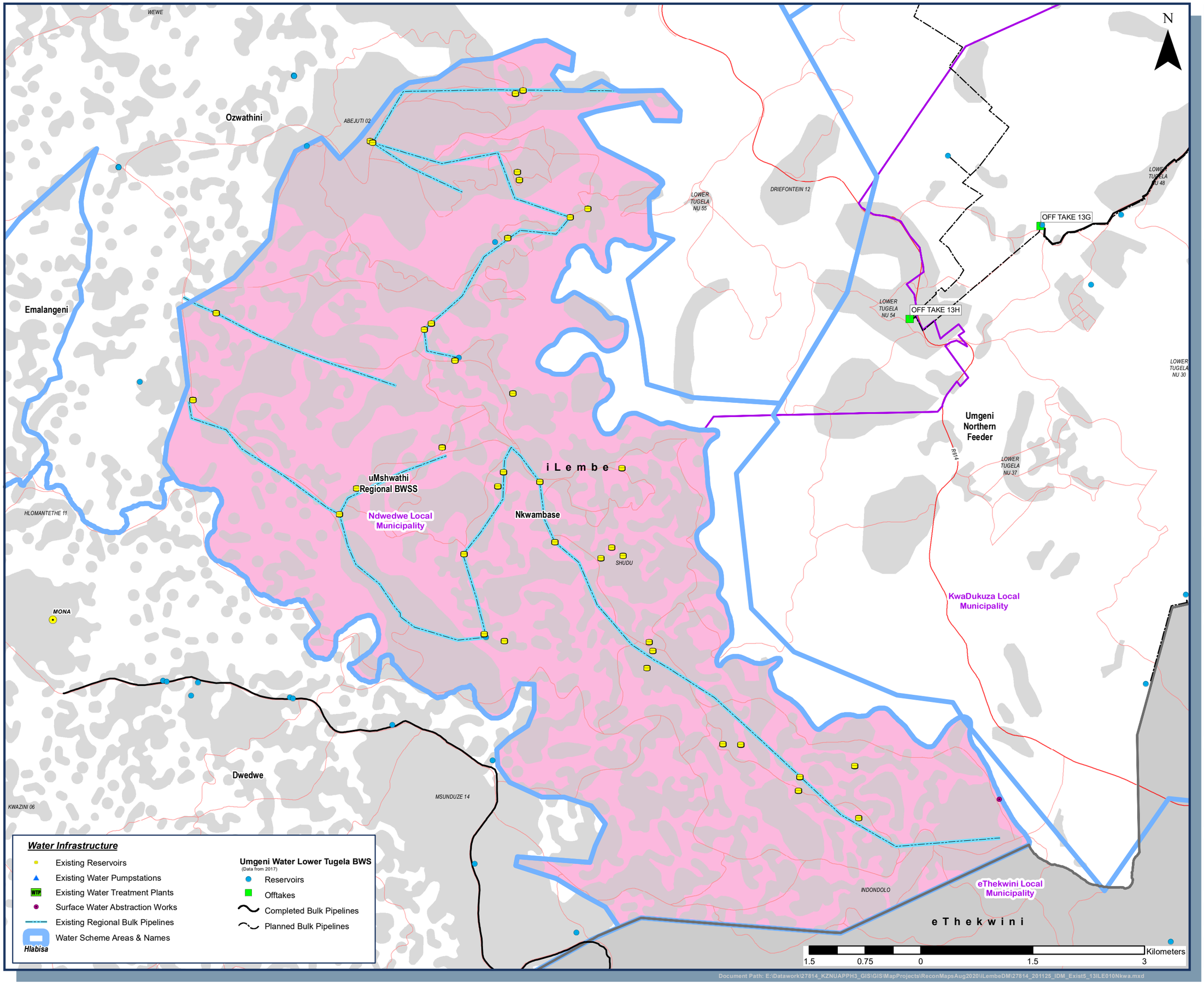

Legend

- Provinical Boundaries
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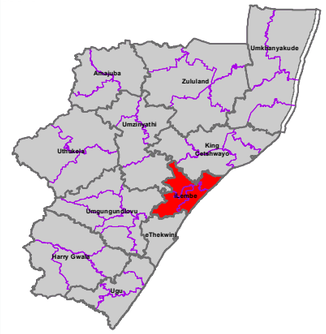
- Local Municipality Boundaries
- National Roads (N1)
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Nkwambase
iLembe District Municipality

DATE COMPLETED:

2020/11/26

MAP NO.:

DC29: Figure 5.13

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Most consumers are domestic, but there are a number of larger businesses, industries and health facilities supplied from this WSS (IDM, 2019/2020).

In the NLM, the water supply is not reliable largely due to the constraints in the capacity of the existing bulk infrastructure, but also due to increased consumer demands and leaks in the reticulation system (network and on properties). Another challenge in the NLM is the topography, being very hilly and this affects water supply to the furthest consumers if there is low pressure or a leak in the system closer to the source of supply in the network (IDM, 2019/2020).

5.7.6 Maphumulo Bulk WSS

This bulk water supply scheme is to serve the majority of the Maphumulo LM's central and southern extents, see Figure 5-14. In the north, consumers are served via the Ngcebo WSS.

The increase in demand for treated, potable water to supply rural backlog areas within the Maphumulo Local Municipality prompted Umgeni Water to implement a new potable bulk water supply scheme, known as the Maphumulo Bulk Water Supply Scheme (BWSS). The Maphumulo BWSS was executed in three phases:

Phase 1: entailed the temporary Abstraction from the iMvutshane River and construction of a Water Treatment Plant with a capacity of 6 Mℓ/d. Phase 1 was commissioned in August 2013.

Phase 2: consisted of the construction of the iMvutshane Dam. This was completed in 2015, however, the dam has been unable to impound water due to the El Nino drought phenomenon.

Phase 3: includes a new weir, abstraction works and pump station on the Hlimbitwe River to augment the abstraction from the iMvutshane Dam, in addition to a new rising main to the iMvutshane Dam abstraction works. An upgrade of the Maphumulo WTP capacity to 12 Mℓ/d is also scheduled to take place under Phase 3. This phase is intended to be commissioned by the end of 2017 (IDM Water and Sanitation Master Plan, 2016).

Raw water is treated at the Maphumulo WTP and then pumped to a booster reservoir then pumped further to the Maphumulo and Nyamazane reservoirs. The Maphumulo reservoir serves as a distribution reservoir for the town of Maphumulo and the Balcome/KwaSizabantu Scheme, whereas the Nyamazane reservoir serves as a distribution reservoir for the towns of Nyamazane and Maqumbi (from reservoir F). The Maqumbi reservoir F then, in turn, supplies both the Maqumbi reservoir T and the Ashville reservoirs (IDM Water and Sanitation Master Plan, 2016).

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Legend

- Provinical Boundaries
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- Main Roads
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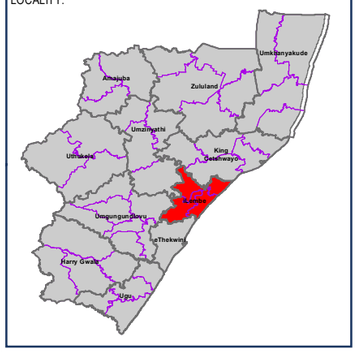
- Rivers
- Settlements
- Major Towns (Eshowe)
- Siza Water Concession Area

LOCALITY:



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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Maphumulo WSS
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: DC29: Figure 5.14

Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

Emalangeni
Kilometers
1 0.5 0 1 2

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Umgeni Water owns and operates the Maphumulo WTP, which design capacity of 6Mℓ/d (Umgeni Water Infrastructure Master Plan, 2019) and with an additional package plant of 3Mℓ/d is now operating at 9Mℓ/d (IDM, 2019). Designs have been conducted to upgrade it to add another 6Mℓ/d, for commissioning by 2022. There are however various problems at the works, mostly related to the interruptions of electricity supply. The water supply in this area needs to be increased and is currently unreliable. There are also many illegal connections, contributing to the problem. The IDM has to provide water via tanker services to augment supply where areas cannot be served from the WTP, or where there are no alternative water sources such as boreholes and springs.

Wards 3-11, and portions of wards 6 (also served by the Hlambithwa scheme) and 11 (also served by the Hlambithwa scheme) are served from this scheme. Most consumers have yard connections and VIP services for sanitation, else some consumers have septic tanks (IDM, 2019/2020).

The iMvutshane Dam now has sufficient yield, after the effects of the drought in 2015/2016, to provide water to the WTP. There is however currently a crack in the dam wall that is being repaired (IDM, 2019/2020).

The bulk reservoir capacity for this scheme is unknown. The bulk (mostly PVC and HDPE) and reticulated infrastructure are generally in good condition as it is newly constructed. Water is metered at the bulk reservoirs (inflow and outflow) and are read manually. Large consumers in this scheme comprise of public facilities such as the Maphumulo Hospital and schools as well as the Maphumulo central business district where the infrastructure is ageing, causing many leaks (2019/2020).

5.7.7 Ngcebo WSS

The Ngcebo Bulk Water Supply Scheme, depicted in Figure 5-15, is located in the far northern reaches of the Maphumulo Local Municipality, and borders on the uMzinyathi and uThungulu District Municipalities.

This bulk water supply scheme obtains its water supply via the Madungela Abstraction Works abstracting from the Tugela River. Raw water is then pumped to the Ngcebo WTP via a bulk water pipeline where the water is treated, then distributed to areas north and south of the WTP (IDM Water and Sanitation Master Plan, 2016).

The Ngcebo WSS was implemented in five phases by Umgeni Water, with the first phase (Phase 1) completed in June 2008 supplying an estimated population of 6 104. Phase 1 also included the upgrade of the Ngcebo WTP to 0.25 Mℓ/d, as well as the implementation of a reticulation system.

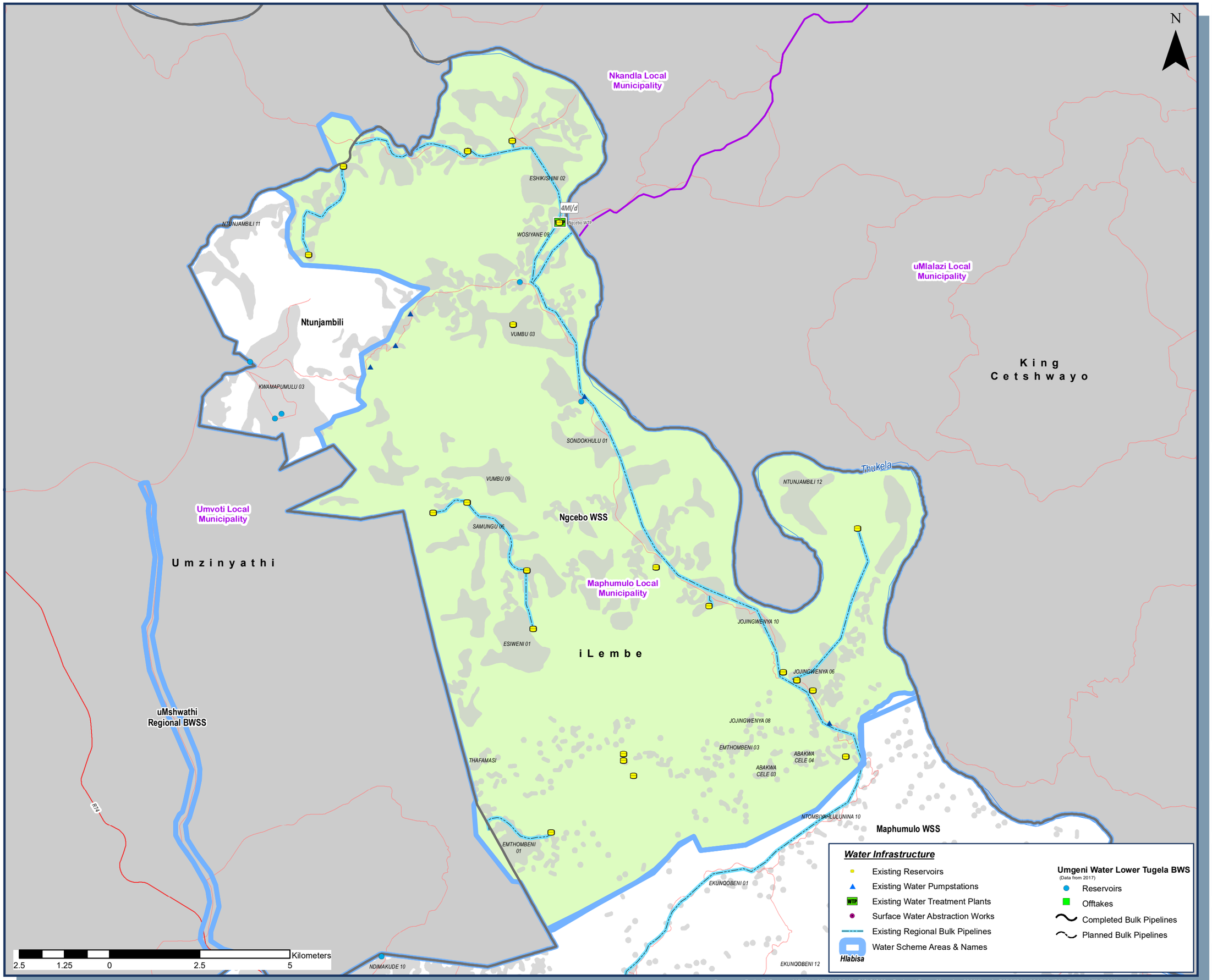
Phase 2 and Phase 3 entailed the construction of reticulation to supply an additional estimated population of 7 128 and was completed in December 2008 and June 2009 respectively. Umgeni Water then implemented an upgrade of existing bulk pipelines and an upgrade of the WTP to 0.43 Mℓ/d before implementation of Phase 4 could take place.

Phase 4 consisted of newly laid reticulation pipelines to supply approximately 2 168 people and was completed in April 2010. By January 2012, Umgeni Water had then completed the upgrade of the raw water bulk pipeline from the Madungela Abstraction Works to increase the supply of raw water to the Ngcebo WTP.

In October 2013, Phase 5 of the Ngcebo Bulk Water Supply Scheme was completed, ultimately providing water to an additional population of approximately 1 656. The Ngcebo WTP is currently undergoing a capacity upgrade to 4 Mℓ/d to provide a consistent supply of water to all households within the area (IDM Water and Sanitation Master Plan, 2016).

Umgeni Water previously operated and maintained the Ngcebo Bulk Water Supply Scheme on behalf of the iLembe District Municipality but handed back the Scheme to IDM in October 2015 and is therefore no longer involved with the running of the scheme (IDM Water and Sanitation Master Plan, 2016).

The Ngcebo WSS supplies consumers in wards 1, 2 and 5 and the northern part of ward 3, whereas the remainder are supplied from the Maphumulo-KwaDukuza WSS. The infrastructure provides for community stand pipes, but there are many illegal connections to yard and house connection level. All consumers have VIP sanitation services (IDM, 2019/2020).



Legend

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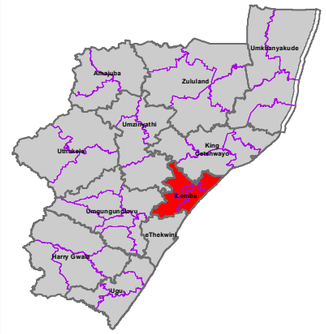

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Ngcebo WSS
iLembe District Municipality

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2020/11/26

MAP NO.:

DC29: Figure 5.15

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The IDM provides water via tanker services to augment supply where consumers do not get water from the scheme or from other local sources such as boreholes and springs (IDM, 2019/2020).

The Ngcebo WTP has a design capacity of 4Mℓ/d and is currently operating at 1.6Mℓ/d. It appears that the pipeline infrastructure needs to be upgraded to provide for the full capacity of supply of 4Mℓ/d, which may be required for this area, considering the higher-than-expected (albeit illegally connected) water consumption (IDM, 2019/2002).

The bulk reservoir capacity for this scheme is unknown. The bulk (mostly PVC and HDPE) and reticulated infrastructure are generally in good condition as it is newly constructed. Water is metered at the bulk reservoirs (inflow and outflow) and are read manually. Large consumers in this scheme comprise of public facilities such as the Ntunjambili Hospital and schools. The many illegal connections are also causing many leaks and contributing to the higher water demand (IDM, 2019/2020).

5.8 Other Water Supply Schemes

There are very few areas that are not included in local or regional schemes, most of which are in the rural Maphumulo and Ndwedwe Local Municipalities.

Areas that are extensively rural, with dispersed households and that are not close to existing formal or regional schemes, should be assisted by the WSA to ensure universal access to basic water and sanitation, by 2030, to meet the Sustainable Development Goal (SDG[2]) of “Leaving no one behind”.

This can be achieved in the form of individual household supply and on-site treatment, local community-managed schemes, or other water service models that take into account local conditions and community preferences for sustainable water and sanitation services. There are many organisations such as the International Water Management Institute (IWMI), Global Water Partnership (GWP), IRC and donor organisations (USAID, UNICEF, SIDA, WaterAid, etc.) that can assist a WSA to implement WASH (Water, Sanitation and Hygiene) systems.

5.8.1 Maphumulo Local Municipality

Various small water supply schemes currently exist within the Maphumulo Local Municipality, but most small water schemes will become redundant once the bulk regional supply schemes are implemented; namely the Balcome/ KwaSizabantu Bulk Water Supply Scheme, the Maphumulo/KwaDukuza Bulk Water Supply Scheme and the Maphumulo North/Umvoti South (Ntunjambili) Bulk Water Supply Scheme (IDM Water and Sanitation Master Plan, 2016).

[2] SDG 6: Ensure availability and sustainable management of water and sanitation for all

Amongst these small schemes are Hlambithwa 1 (serving part of ward 11) and 2 (serving part of ward 6) that obtain water from local sources and have package plants to treat water to potable standard. There are two package plants to treat water, one having a design capacity of 0.5Mℓ/d and operating at full capacity, the second having a design capacity of 0.5Mℓ/d and operating at 0.45Mℓ/d (IDM, 2019/2020).

Consumers are serviced through community standpipes and water supply is further augmented through water tankers by the IDM. There are many illegal connections that need to be formalised. Most of the pipelines are either PVC or HDPE and an estimated 45% in good condition. The remainder of pipeline infrastructure is in a poorer condition and ageing. Consumers in the smaller schemes in Maphumulo LM, such as the Ntunjambili WSS (see Figure 5-16), will in future be supplied from the Maphumulo-KwaDukuza Bulk WSS (IDM, 2019/2020).

5.8.2 Ndwedwe Local Municipality

Most of the Ndwedwe LM (NLM) that is not served through the Mdloti WSS (Hazelmere WTP) is served through local surface or groundwater schemes. A brief summary (from inputs by the IDM, 2019) is provided as follows:

- Ward 1 is supplied from groundwater, at about 115kl/d. The Glendale mill (have some waterborne sanitation installations) has a WWTP which is being upgraded and will be transferred to the IDM.
- Ntuze WTP (2Mℓ/d design, operating at 0.3Mℓ/d) in the Ozwathini WSS (see Figure 5-16 and Figure 5-17) supplies ward 2, a portion of ward 4 (ward 4 is further supplied from the Maphumulo WTP) and a portion of ward 5. Supply is hampered due to constraints in the existing infrastructure, but the IDM is in the process of upgrading the infrastructure in order to supply the full 2Mℓ/d;
- Ward 3 is provided water from the Maphumulo WTP as well as the Waterfall small package plant (~200kl/d) near Kranskloof. The remainder of areas use boreholes for supply;
- Esidumeni WTP (being upgraded to 1.5Mℓ/d, operating at 1Mℓ/d) supplies part of ward 7 and then also ward 8. Ward 7 is further augmented from the Maphumulo WTP. The IDM is in the process of upgrading the infrastructure in order to supply the full 1.5Mℓ/d;
- The Montobello Hospital WTP (design of 0.15Mℓ/d, operating at full capacity) supplies the hospital and other consumers in the area in ward 9 (see the Emalangeni WSS, Figure 5-18);
- Wards 16-18 are supplied from boreholes, protected springs and water tankers and are the areas under most water stress in terms of water quantity. and
- Ward 10 is supplied via a small slow sand filter WTP (~150kl/d operating at full capacity).

Wards 1 and 15 in the NLM have waterborne sanitation, whereas the rest have VIP sanitation installations. The IDM is not planning to upgrade the VIP installations to waterborne sanitation any time soon.

5.8.3 uMshwathi Regional Bulk WSS

The IDM is working with Umgeni Water on the planning and future implementation of the uMshwathi Regional Bulk WSS (Midmar WTP), which is being executed in six phases (Umgeni Water Infrastructure Master Plan, 2018) within the uMgungundlovu DM and IDM.

The Umgeni Water 2020 Infrastructure Master Plan provides the following description of the scheme:

"The uMshwathi Regional Bulk Water Supply Scheme (RBWSS) supplies the rural hinterland east of Pietermaritzburg in KwaZulu-Natal. The Scheme will provide bulk water supply to large areas within the uMgungundlovu and iLembe WSA boundaries and will include the rural areas of Swayimane, Ozwathini, Efaye and the major part of Ndwedwe Local Municipality. The scheme will also supply economic activities in the areas of Appeldoorns and Marburg and will reinforce the supply to the towns of Wartburg, Dalton, Cool Air and Schroeders. Umgeni Water implemented the uMshwathi RBWSS, which is an expansion of the earlier Wartburg Bulk Water Supply (Section 7.3.1 (h) in Volume 2). The extension will enable economic growth and provision of social services in existing centres, whilst greatly extending the supply area into the traditional settlement areas thereby improving the quality and reliability of water supply and supporting backlog eradication.

The uMshwathi RBWSS initially consisted of three phases with the fourth and fifth phases added during the implementation stage. Following is a brief detail of each phase:

- Phase 1 – Pipeline from Claridge Reservoir to Wartburg (Section 7.5.2 (f) in Volume 2)
- Phase 2 – Pipeline from Wartburg to Dalton (Section 7.5.2 (f) in Volume 2)
- Phase 3 – Pipeline from Dalton to Efaye including Ozwathini Reservoir (Section 7.5.2 (f) in Volume 2)
- Phase 4 – Supply from Ozwathini Reservoir into Central Ndwedwe linking with the Hazelmere System
- Phase 5 – Supply from Ozwathini Reservoir in a northerly direction within Central Ndwedwe, linking with the Maphumulo Supply System. Phase 5 will be implemented and operated by iLembe District Municipality.
- Phase 6 – This is a new phase added onto the uMshwathi BWSS. It is a supply from Bruyns Hill Reservoir into the southern portion of Ndwedwe.

Umgeni Water completed a detailed feasibility study (DFS) for Phase 4 of the uMshwathi RBWSS (previously known as the Southern Ndwedwe BWSS) at the end of November 2015, which included a preliminary design phase (Figure 12.42).

The supply area of Phase 4 comprises the central and southern parts of the Ndwedwe Local Municipality and occupies roughly 50% of the total area of Ndwedwe Municipality. Within the study area the proximity of neighbouring eThekwini and the Dube Trade Port are the major economic drivers leading to densification in

the southern parts of the study area. The area immediately around Montebello Hospital is another minor growth node. The remainder of the study area is predominantly rural in nature with dispersed settlement patterns.

The DFS determined that the proposed source of water for the southern Ndwedwe area is the uMshwathi RBWSS. The uMshwathi RBWSS is supplied with water from the D.V. Harris WTP in Pietermaritzburg. One of the terminal points, the Dalton Reservoir, will be the supply node to the Nondabula and Montebello reservoirs, whereas the Bruyns Hill Reservoir, another terminal point of the uMshwathi RBWSS, will be the supply node to the Swayimane area and the western parts of the southern Ndwedwe area.

The uMshwathi RBWSS design has allowed for 25 Ml/day of potable water to be available at the Nondabula Reservoir for distribution to consumers in both northern and southern Ndwedwe areas."

The areas to be served in the NLM, would rely on the implementation of Phase 1, Phase 3 and Phase 6. An overview of the uMshwathi Regional Bulk WSS is provided in Figure 5-19.

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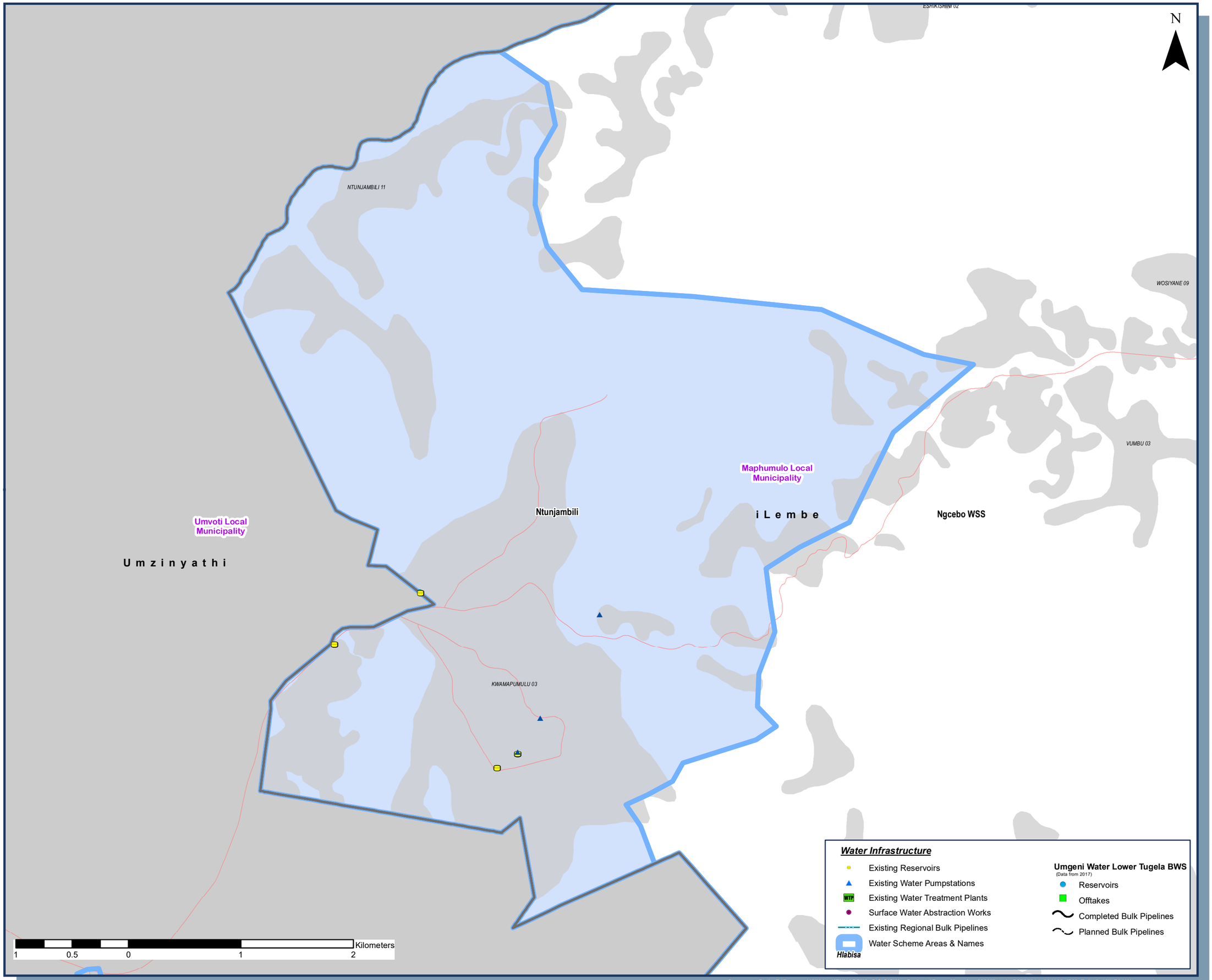

Legend

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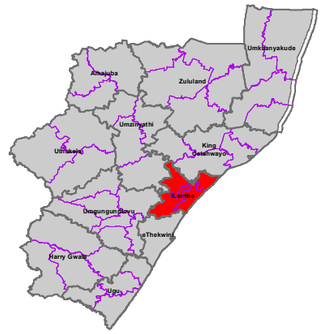

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PROJECT TITLE

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

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Ntunjambili
iLembe District Municipality

DATE COMPLETED: 2020/11/26

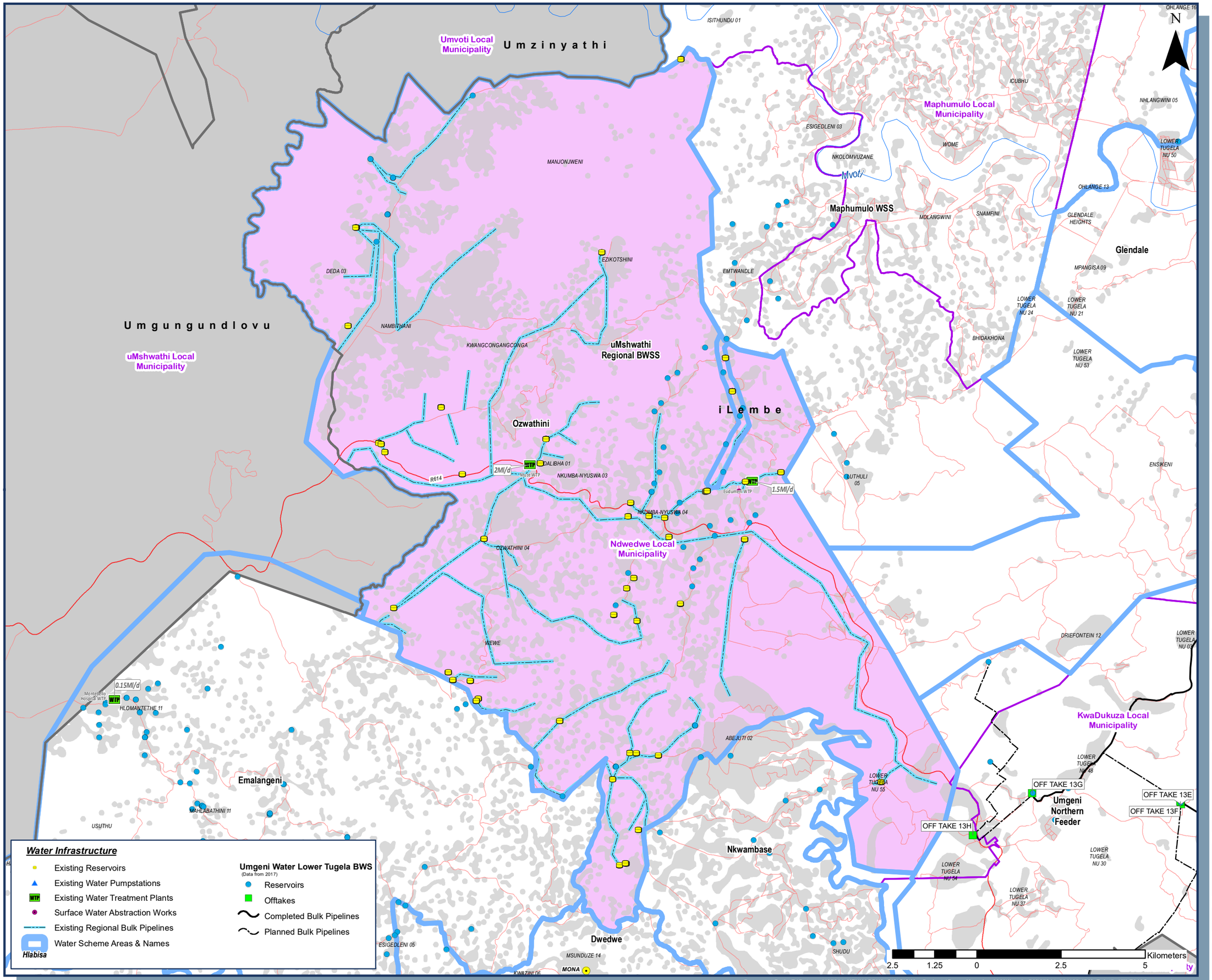
MAP NO.: **DC29: Figure 5.16**

Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines



Water Infrastructure

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

Umgeni Water Lower Tugela BWS
(Data from 2017)

- Reservoirs
- Offtakes
- Completed Bulk Pipelines
- Planned Bulk Pipelines

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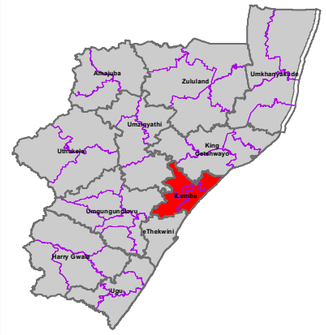

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PROJECT TITLE

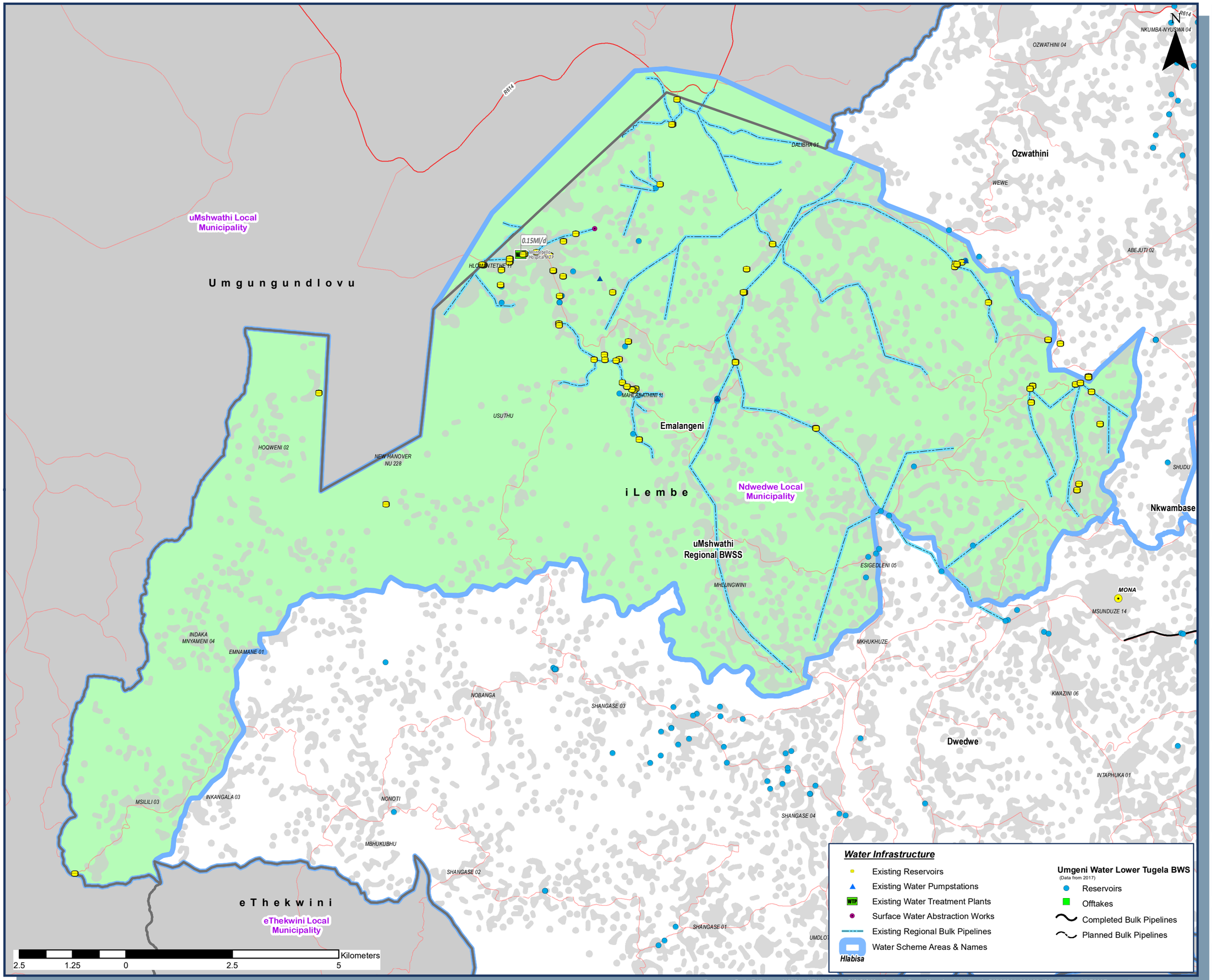
Ilembe DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Ozwathini
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.17**



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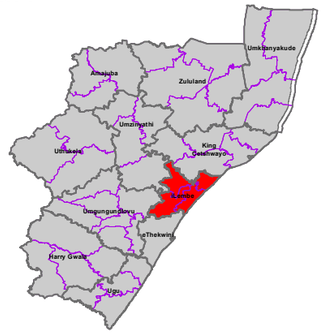

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PROJECT TITLE

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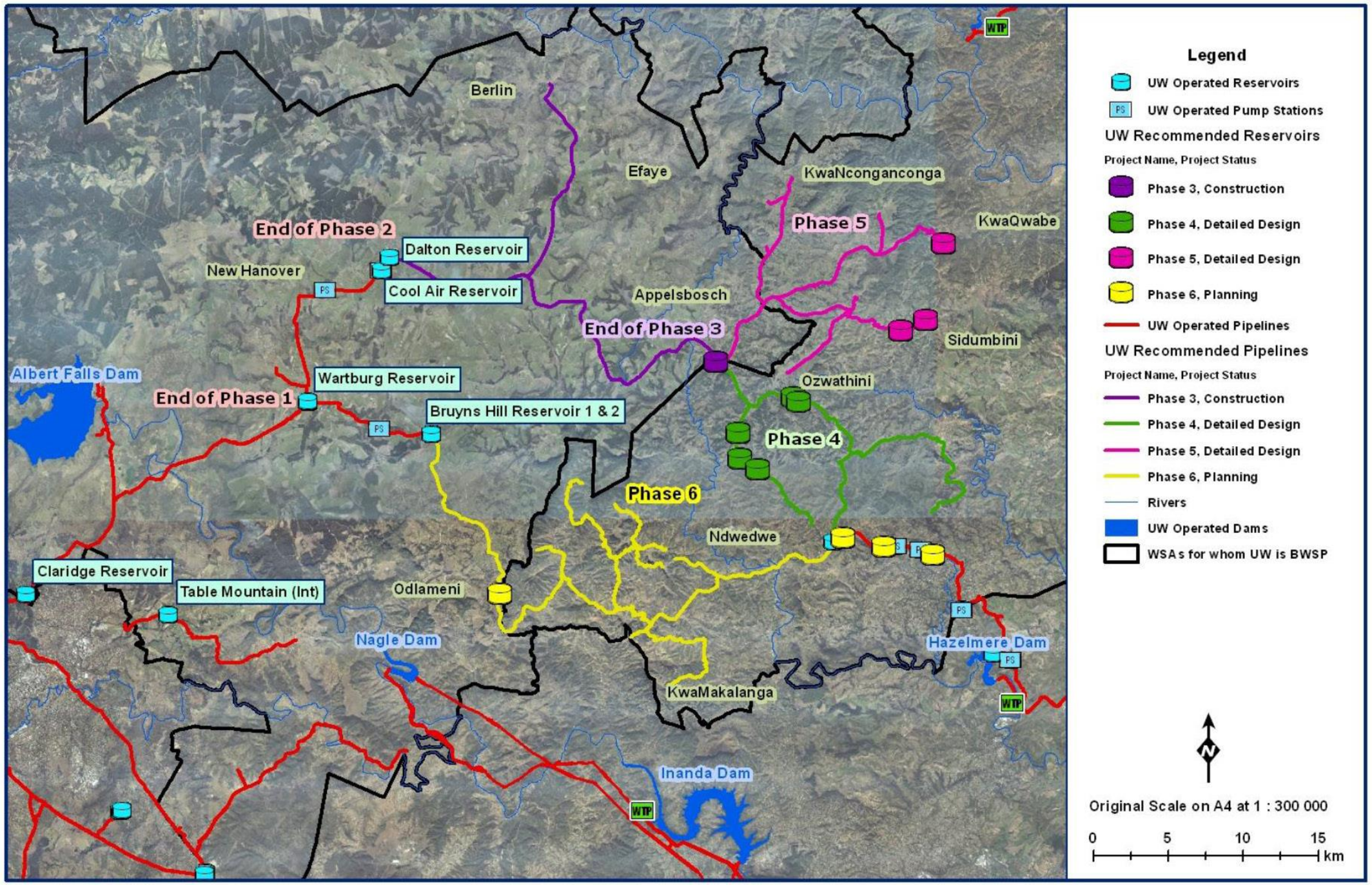
MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Emalangeni
iLembe District Municipality

DATE COMPLETED: 2020/11/26

MAP NO.: **DC29: Figure 5.18**

Figure 5-19 uMshwathi Bulk WSS



6. EXISTING SANITATION BULK INFRASTRUCTURE

The following sections give a brief overview of the sanitation service levels and urban and bulk sanitation schemes (SS).

The UAP Phase II report for the IDM did not include or address sanitation aspects such as bulk infrastructure, existing or projected sanitation service levels and corresponding water requirements or environmental impacts. Information for this section was sourced mostly from the IDM Water and Sanitation Master Plan (2016) and updated with inputs from IDM officials and Siza Water (2019 and 2020).

6.1 SANITATION SERVICE LEVELS

6.1.1 Community Survey 2016 Sanitation Supply Levels

The following service levels are presented from the 2016 Community Survey for the WSA:

Table 6-1: Sanitation Supply Levels, Community Survey 2016

LM Name	Flush toilet connected to a public sewage system	Flush toilet connected to a septic tank or conservancy tank	Chemical toilet	Pit latrine/toilet with ventilation pipe	Pit latrine/toilet without ventilation pipe	Ecological toilet (e.g. urine diversion; enviroloo, etc.)	Bucket toilet (collected by municipality or emptied by HH)	Other or None
KwaDukuza	27 755	6 088	14 843	8 828	28 523	260	88	4 901
Mandeni	9 999	878	12 704	13 912	5 719	23	16	2 427
Maphumulo	165	104	8 588	3 030	7 233		829	575
Ndwedwe	1 144	359	9 662	14 097	4 584	608	1 722	1 705
Total	39 064	7 429	45 798	39 868	46 059	891	2 654	9 607

Source: StatsSA, 2016 Community Survey

The municipalities with the highest level of service, by number of households having access to flush or VIP sanitation services, are KwaDukuza (57 514HH) and Mandeni (37 493HH) LMs, representing 30% and 20% of the WSA's total number of households respectively.

However, KwaDukuza LM also has the highest number of households (33 772HH) not having access to flush or VIP sanitation services, followed by the other three (3) LMs, all with backlogs of between 8 185 and 8 637 households. From the Community Survey, there are an estimated 59 211 households (31% of the WSA total) not having access to flush or VIP services.

6.1.2 DWS Reference Framework Water Supply Levels

The settlement's service levels presented in Table 6-2 and Figure 6-1 were last updated during 2016.

Table 6-2: DWS RF Sanitation Level of Service (LoS), 2016

LM Name	No of Households	Households with RDP or above LoS	Percentage	Households not within RDP or above LoS	Percentage
KwaDukuza	107 565	103 663	96%	3902	4%
Mandeni	37 863	36 952	98%	911	2%
Maphumulo	14 711	13 601	92%	1 110	8%
Ndwedwe	23 669	22 087	93%	1 582	7%
Total	**183 808**	**176 303**	**96%**	**7 505**	**20%**

Source: DWS RF geodatabase, 2016

The information is not corresponding to the 2016 Community Survey, with the DWS data reflecting a higher percentage of households having access to sanitation services at or above RDP standards (96%) and only 4% not having access to at or above RDP standards.

6.1.3 Water and Sanitation Master Plan 2016

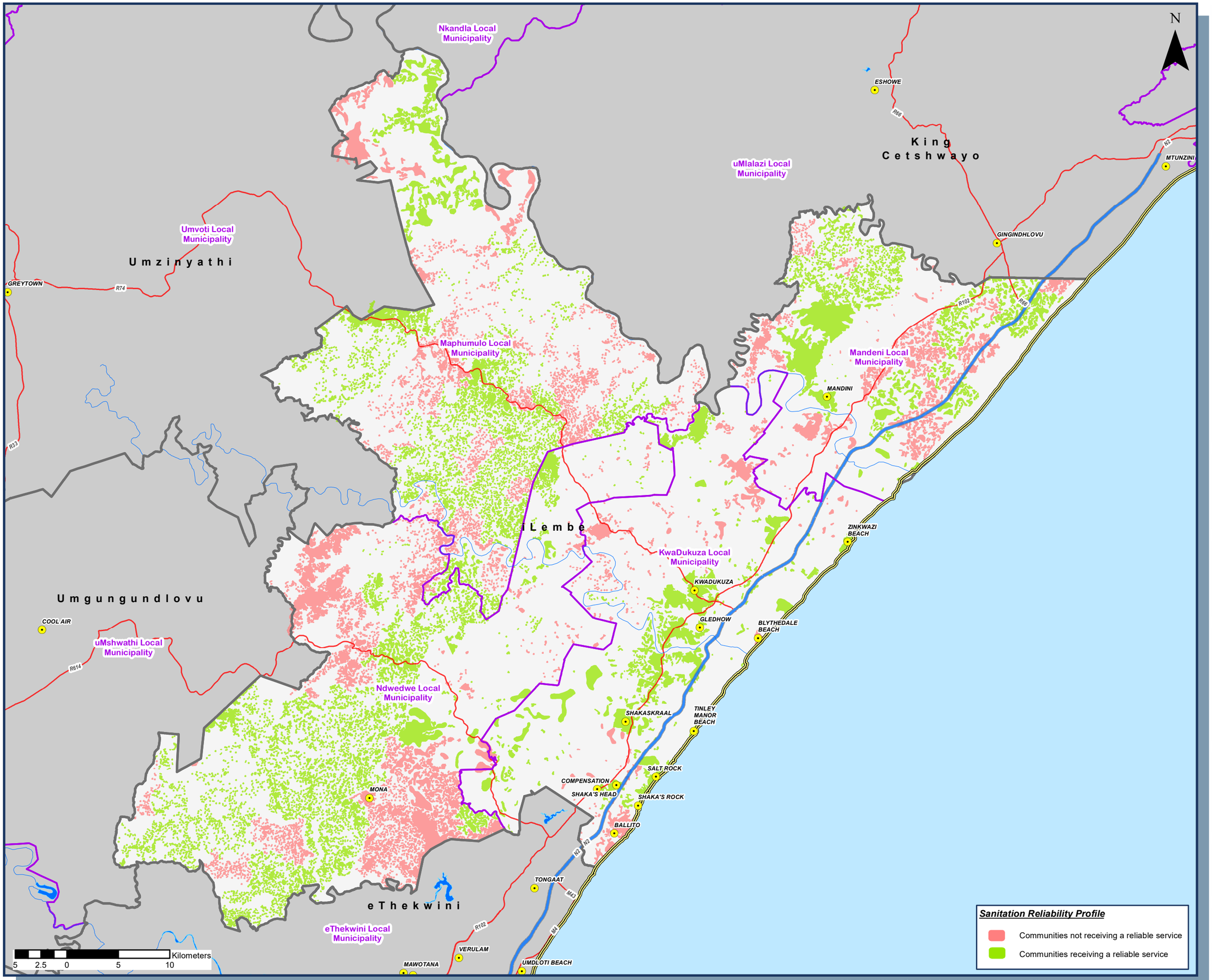
The WSA's Water and Sanitation Master Plan for 2016 referred to the 2015 Water Services Development Plan's (WSDP) reporting on sanitation services. The areas not receiving waterborne services according to the WSDP, would continue to be serviced up to VIP.

The sanitation backlogs (not yet serviced by a VIP) reported in the Master Plan are as follows.

Table 6-3: WSA Sanitation backlogs, 2015

LM Name	Wards	Household count
KwaDukuza	-	0
Mandeni	3, 9	800
Maphumulo	2, 3, 8	5 139
Ndwedwe	15	1 457
Total		**7 396**

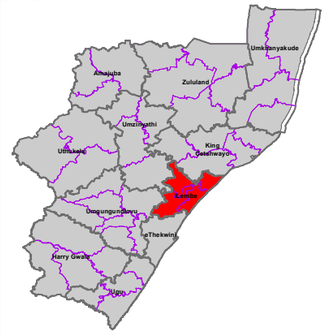
Source: iLembe District Municipality, Water and Sanitation Master Plan, 2016



Legend

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

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS:

Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Sanitation Reliability Profile

iLembe District Municipality

DATE COMPLETED:

Friday, 12 June 2020

MAP NO.:

DC29: Figure 6.1

Document Path: D:\27814_UAPPhaseIII\Spatial\MapProjects\iLembe\27814_200612_IDM_SReliable.mxd

6.1.4 *WSA Municipal Infrastructure Forum Reporting*

The WSA reports on the status of water and sanitation service levels at the Intergovernmental Relations (IGR) forum that is held every second month. The information is provided per infrastructure sector: water and sanitation, for the number of households (HH).

Table 6-4: WSA Water and Sanitation Backlogs (June 2019)

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Water	129 747	67.8	61 622	32.2	191 369
Sanitation	129 134	67.5	62 235	32.5	191 136

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

The WSA has set the following targets for service delivery by 2019/2020:

Table 6-5: WSA Water and Sanitation Targets for end 2019/2020

Sector	Households with access	Percentage of HH with access	Households with no access	Percentage of HH with no access	Total HH
Water	134 514	70.3	56 855	29.7	191 136
Sanitation	132 214	69.1	59 155	30.9	191 136

Source: WSA IGR Municipal Infrastructure Forum Report, February 2020

The total number of households and breakdown of figures, correlate to a fair extent to the 2011 Census, which reported a total number of households in this area of 157 689.

The total number of households reported from the 2016 Community Survey for this area was: 190 140.

6.2 URBAN AND BULK SANITATION SUPPLY SCHEMES

Bulk sanitation supply schemes, depicted in Figure 6-2, can be identified as schemes with a large geographic footprint, or with a wastewater treatment plant (WWTP) of a design capacity of 2Mℓ/d or more.

N

Nkandla Local Municipality

Ntunjambili WWTW

uMlalazi Local Municipality

ESHOWE

R66

King Cetshwayo

N2

MTUNZINI

GINGINDHLOVU

Umvoti Local Municipality

Umzinyathi

GREYTOWN

R74

R102

R66

SUNDUMBILI

AMATIKULU

Mandeni Local Municipality

MAPHUMULO HOSPITAL

Vukile High School

Maphumulo Local Municipality

MANDINI

MANDENI

R33

iLembe

DARNALL

ZINKWAZI BEACH

GLENDALE SUGAR Mill

KwaDukuza Local Municipality

KWADUKUZA

STANGER

N2

GLEDHOW

SAPPI STP

GLEDHOW

MELVILLE

BLYTHEDALE BEACH

Umgungundlovu

COOL AIR

uMshwathi Local Municipality

R614

Ndwedwe Local Municipality

Montabello Hospital STP

Palm Lakes

SHAKASKRAAL

SHAKASKRAAL

SHEFFIELD

TINLEY MANOR BEACH

SALT ROCK

COMPENSATION

SHAKA'S HEAD

SHAKA'S ROCK

MONA

FRASERS

BALLITO

N2

N2

TONGAAT

M43

eThekwini

eThekwini Local Municipality

R102

M4

VERULAM

MAWOTANA

UMDLOTI BEACH

Kilometers

5 2.5 0 5 10

Sanitation Infrastructure

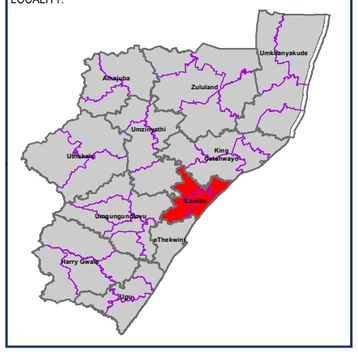
- Existing Wastewater Treatment Plant
- Sanitation Scheme Areas

Document Path: D:\27814_UAPPhaseIII\Spatial\MapProjects\iLembe\27814_200617_IDM_SanExistSupply.mxd

Legend

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

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS:

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PROJECT TITLE

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

MAP TITLE:

Existing Sanitation Infrastructure

iLembe District Municipality

DATE COMPLETED: Wednesday, 17 June 2020

MAP NO.: **DC29: Figure 6.2**

A summary of the Wastewater treatment plants is provided in Table 6-6.

Table 6-6: Summary of WWTPs

LM Name	Plant Name	Owner	Design Capacity (Mℓ/d)	Annual Average Volume Treated (Operational) (Mℓ/d)	Class of Plant*
	Darnall	IDM	0.5	0.3	D
	Frasers	IDM (operated by Siza Water)	12	6.8	C
	Gledhow	IDM	0.3	0.2	D
	Melville	IDM	0.4	0.3	
	Palm Lakes	IDM	1		
	SAPPI		unknown	unknown	unknown
	Shakaskraal	IDM (operated by Siza Water)	1.6	1.2	D
	Sheffield	IDM (operated by Siza Water)	6	0.2	
KwaDukuza	Stanger	IDM	10	7	C
	Amatikulu	IDM	0.25		D
	Mandeni	IDM	1.2	1	D
Mandeni	Sundumbili	IDM	12	12	D
	Maphumulo Hospital	IDM	0.2	0.165	D
	Ntunjambili	IDM	0.2	0.15	D
Maphumulo	Vukile High School		1		E
Ndwedwe	Glendale Sugar Mill				
	Montabello Hospital	Montabello Hospital	0.15	0.145	D
Total Capacity based on known information			46.8	29.46	

Source: iLembe DM correspondence received and from interviews (June, 2019; February 2020)

* Note: All the classifications for the WWTPs need to be confirmed by the DWS (correspondence from the IDM, 20 February 2020).

The IDM does collect and capture water and wastewater quality results that are submitted to the DWS on the IRIS system. Not all the wastewater treatment plants have flow meters and operational volumes in these cases have to be estimated.

The USAID South Africa Low Emissions Development Program (SA-LED) did perform energy audits on some of the WWTPs (Darnall, Gledhow, Stanger and Sundumbili) in the IDM and made recommendations to improve energy efficiencies and identify opportunities for co-generation and beneficiation. The Sundumbili WWTP may be investigated further for options of waste to energy and co-generation.

The following sections provide a brief overview of the main WWTPs.

6.2.1 Concession Area: Ballito to Tinley Manor and Shakaskraal

Siza Water operates three WWTPs, namely Frasers, Sheffield and Shakaskraal and they also handle the plans for upgrades and refurbishment.

The Frasers WWTP has been designed to treat 12 Mℓ/d. The majority of the influent is pumped from coastal and inland pump stations. This has an impact during peak times when all the pump stations pump during this period. The works has catered for this through a balancing reservoir at the inlet works (IDM Water and Sanitation Master Plan, 2016).

The existing Hugh Dent PS pumps southwards towards Frasers, however, this will change in the near future. To redirect effluent northwards to the Sheffield WWTP. The Sheffield WWTP is sized to treat 6 Mℓ/d but will be able to expand to an 18 to 20Mℓ/d treatment facility. Effluent is received from Sheffield Gardens and Tiffany's Spar pump stations (IDM Water and Sanitation Master Plan, 2016).

Information presented further in this sub-section was sourced from IDM and SW officials and supplemented by the recently-completed Siza Water Infrastructure Master Plan (IMP) for 2019-2023.

Sanitation is mostly waterborne connections, but there are also VIPs and septic tanks.

Siza Water installed a Reverse Osmosis (RO) component at the Frasers WWTP (12Mℓ/d design capacity, can be upgraded to 18Mℓ/d) and can treat and reuse approximately 3Mℓ/d (upgradeable to 5Mℓ/d) from the current wastewater volume of 6-8Mℓ/d (Feb-Nov; else +-11Mℓ/d during peak summer periods), which is blended into the water supply system. The Frasers WWTP serves the areas of Sheffield Beach, Salt Rock, Shakas Rock, Simbithi Estate, Ballito, Compensation and Zimbali Estate. The Frasers WWTP operates at peak during the high tourism season. Treated effluent is discharged to a tributary of the Tongaat River.

There is also the Shakaskraal WWTP with a design capacity of 1.6Mℓ/d and operating at 1.2Mℓ/d. The Shakaskraal WWTP serves the areas of Shakashead, Umhlali and Woodmead. It cannot be upgraded due to site restrictions and additional sewer volumes can be diverted to Sheffield WWTP. Planning is under way for the design of the pipework and pump stations to implement the decommissioning of the Shakaskraal WWTP and divert sewer flows to the Sheffield WWTP.

The Sheffield WWTP has a design capacity of 6Mℓ/d (upgradable to 18Mℓ/d) and is operating at 0.2Mℓ/d. The IDM will also utilise this WWTP for receiving and treatment of sewage from the IDM's areas of operation. The Sheffield WWTP discharges to a tributary of the Mhlali River.

6.2.2 Darnall SS

The 2011 Census stipulates the population for the town area Darnall as 8 435 and consisting of 2 374 households. The majority of consumers have waterborne sanitation or are served though septic tanks. The Darnall WWTP discharges into the Nonoti River, south of the town of Darnall.

The IDM Water and Sanitation Master Plan (2016) provides the ultimate design capacity of the Darnall WWTP as 3Mℓ/d, with 1.5Mℓ/d installed capacity at the time. The Darnall WWTP is an activated sludge system and runs as a semi-automated process. The electricity for this plant is provided directly by Eskom (USAID SA-LED, 2016).

6.2.3 Gledhow SS

The 2011 Census stipulates the population for the Sub-Place of Gledhow as 1 253 and consisting of 362 households. Most consumers have waterborne sanitation or are served though septic tanks. The Gledhow WWTP discharges into a canal that flows to the Mvoti River.

The IDM Water and Sanitation Master Plan (2016) provides the ultimate design capacity of the Gledhow WWTP as 0.3Mℓ/d. It is planned that the works will be decommissioned and the sewer pumped to the Stanger WWTP.

The Gledhow WWTP is an activated sludge system. The sludge activation is done manually as is the sludge pumping and drying process. The plant is not in a good condition and only operates at 50% of its capacity. The electricity for this plant is provided by the KwaDukuza Local Municipality (USAID SA-LED, 2016).

6.2.4 Melville SS

The 2011 Census stipulates the population for the Sub-Place of Eradamishini SP, that includes Melville as 6 384 and consisting of 1 728 households. The 2011 Census indicate that 12% of consumers in Eradamishini have waterborne sewer, 7% septic tanks, 27% VIPs and the remainder pit, bucket or chemical systems. The Melville WWTP discharges to the Mvoti River.

The IDM Water and Sanitation Master Plan (2016) does not provide any information on this facility and only indicates that this area will be served in future by the Stanger WWTP.

6.2.5 Palm Lakes SS

The 2011 Census stipulates the population for the Sub-Place of Royal Palm Estate SP as 367 and consisting of 129 households, all with waterborne sanitation. The Palm Lakes Estate is one of several estate developments in the KwaDukuza LM. The Palm Lakes package plant discharges to a small stream entering the Mhlali River.

The Palm Lakes package has been designed to treat 2 Mℓ/d. The works is currently operated by Palm Lakes, but will in the near future be handed over to IDM. The treatment works is adequately sized to cater for the fully developed residential area only and should the commercial and business parks start to develop, the Palm Lakes package plant would require upgrading (IDM Water and Sanitation Master Plan, 2016).

At present, (2020), the Palm Lakes package plant is still being operated by the estate. In 2016, the IDM performed a due diligence on taking over the operations of the plant and provided a list of conditions to be met before it can take over the operations and maintenance.

6.2.6 Stanger SS

The 2011 Census stipulates the population for the town area KwaDukuza (excluding Gledhow) as 42 054 and consisting of 12 012 households. The majority of consumers have waterborne sanitation. The Stanger WWTP, located in the east of KwaDukuza town, upon entering from the N2 KwaDukuza/Blythedale offramp, discharges into the Mbozamo River, a tributary of the Mvoti River.

The IDM Water and Sanitation Master Plan (2016) provides the design capacity of the Stanger WWTP as 10Mℓ/d. The Master Plan indicated that sewer infrastructure was being constructed, that include linkage to Gledhow, Groutville, Melville, Njebane (five to 20 years) and Njebane Township (within five years). This will lead to a wastewater demand of up to 14Mℓ/d. A proposal was made for a new regional KwaDukuza WWTP.

The Stanger WWTP has a dual-geared aerated and anaerobic digester. The electricity for this plant is provided KwaDukuza Local Municipality (USAID SA-LED, 2016).

The IDM commenced with the feasibility and detailed design study for the regional KwaDukuza WWTP during 2019. Furthermore, the Vuthela iLembe LED Support Programme added to the scope (funded by the Vuthela programme) the investigation of options for water reclamation and re-use, enhanced energy efficiencies, water efficiencies and energy from sludge. The study is still in the initial stages. There has however been concerns surrounding proposed site and sensitivity of the already-polluted receiving waters. The DWS indicated during 2020 that it will not allow any effluent released until the sources of pollution upstream are addressed. The IDM commissioned a study to finding the source/s of pollution. Due to the COVID19 lockdown regulations, the study was put on hold under Level 5 lockdown, but could commence under Level 3 lockdown (Level 3 lockdown commenced on 28 May 2020). The results of the study are expected by the end of October 2020. This may influence the design options of the proposed regional KwaDukuza WWTP.

6.2.7 Mandeni SS

The town areas served by the Mandeni WWTP are Mandeni SP and Mfusanvu. The 2011 Census stipulates the population for these areas as 3 853 and consisting of 1 133 households. All consumers have waterborne sanitation. The Mandeni WWTP discharges into the Tugela River, south of Mfusanvu.

The IDM Water and Sanitation Master Plan (2016) provided costing for future upgrades Mandeni WWTP. However, it also indicates that it will be decommissioned by 2036 and the sewer to be treated at the Sundumbili WWTP. There is a project currently (2020) under way to upgrade the Sundumbili WWTP, but challenges are encountered to manage the large stockpile of existing sludge which is also contaminated with heavy metals, likely emanating from effluent from the Isithebe Industrial Estate.

6.2.8 Sundumbili SS

The town areas served by the Sundumbili WWTP are Sundumbili A SP and the Isithebe Industrial Estate. The Isithebe Industrial Estate is one of the biggest industrial parks in South Afrika with facilities and warehousing covering textiles, manufacturing and industrial activities. The 2011 Census stipulates the population for these areas as 27 472 and consisting of 9 151 households. About 87% of consumers have waterborne sanitation with the remainder having access to septic tanks, VIPs or other, but below basic sanitation levels of service. The Sundumbili WWTP, located east of Sundumbili town discharges into a small stream leading to the Tugela River.

The IDM Water and Sanitation Master Plan (2016) indicates the design capacity of the Sundumbili WWTP as 12Mℓ/d, operating at 11Mℓ/d. The volume of influent received at the plant is correlated to the activities and utilisation at the Isithebe Industrial Estate and can represent up to 90% of the inflow at the WWTP. Should the Industrial Estate develop further, it is recommended that the Sundumbili WWTP be upgraded to 18Mℓ/d.

The Sundumbili WWTP is an activated sludge system with an anaerobic plant and biodigesters and maturation ponds. The plant has a low energy requirement and is less affected by electricity outages than for example the Stanger WWTP. The Sundumbili WWTP does however require a larger land area. The electricity for this plant is provided directly by Eskom. It was suggested to conduct a detailed feasibility to assess the potential for waste to energy and co-generation from this WWTP (USAID SA-LED, 2016).

As of 2019/2020, the plant is operating at full capacity. There has not yet been a detailed feasibility study to determine the potential for waste to energy and co-generation from this WWTP. However, it may be earmarked by the Vuthela iLembe LED Support programme to conduct such a study especially if it will encourage a circular economy and energy savings that can illustrate mitigation of direct and indirect greenhouse gas emissions. It was considered for a funding application during 2020 to ICLEI – Local Governments for Sustainability, however a proposal could not be prepared due to insufficient information and time constraints.

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 Water Services infrastructure Grant (WSIG) and the Regional Bulk Infrastructure Grant (RBIG). The main objective of WSIG 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[3] or sub regional [4]scale (over vast distances[5]), 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 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

This section provides a brief overview of planned bulk water supply infrastructure.

The funding allocations from the Division of Revenue Bill (B5-2019) under the Regional Bulk Infrastructure Grant (RBIG), Municipal Infrastructure Grant (MIG) and Water Services Infrastructure Grant (WSIG) are provided in Table 7-1 and Table 7-2.

Table 7-1: RBIG Funding in terms of DORA

Project Code	Local Municipality	Project Name	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)
RBIG 5b	Maphumulo Local Municipality	Ngcebo Regional Water Bulk (Lower Tugela)	R35 000	R30 000	R70 000

Source: Division of Revenue Bill (B5-2019)

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

[4] "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

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

Table 7-2: MIG and WSIG Funding in terms of DORA

Municipality	MIG 2019/2020 (R '000)	MIG 2020/2021 (R '000)	MIG 2021/2022 (R '000)	WSIG 2019/2020 (R '000)	WSIG 2020/2021 (R '000)	WSIG 2021/2022 (R '000)
iLembe DM Allocation	R192 596	R203 918	R220 207	R90 000	R75 000	R80 000

Source: Division of Revenue Bill (B5-2019)

Since the IDM is the WSA, the following information is presented from the latest IDP (2019/2020). The capital projects are presented in Table 7-3.

Table 7-3: Capital Projects, IDM, 2019/2020

Project Name	Area	Funder	2019/2020 Budget	2020/2021 Budget
EPWP	District Wide	EPWP	R0	R0
Schools Sanitation	District Wide	MIG	R0	R0
VIP Sanitation Program	District Wide	MIG	R21 000 000	R25 000 000
RRAMS	District Wide	RRMS	R2 405 000	R2 544 000
Old Infrastructure Replacement/Upgrade	District Wide	WSIG	R49 500 000	R65 000 000
Water Conservation/Water Demand Management	District Wide	WSIG	R15 000 000	R15 000 000
Darnal WWTP Upgrade and Reticulation	KwaDukuza	MIG	R8 000 000	R10 000 000
Driefontein Housing Bulk Sewer	KwaDukuza	MIG	R6 000 000	R13 000 000
Groutville D: Chris Hani, Lloyds, Ntshaweni, Etsheni & Njekane Sanitation Phase 2	KwaDukuza	MIG	R45 000 000	R41 500 000
KwaDukuza Regional Wastewater Works	KwaDukuza	MIG	R8 000 000	R5 000 000
Lindelani sewer upgrade	KwaDukuza	MIG	R9 445 000	R0
Lindelani Water	KwaDukuza	MIG	R3 500 000	R10 500 000
Southern Regional Bulk Water and Sanitation Scheme	KwaDukuza	MIG	R36 000 000	R33 000 000
Lower Thukela Bulk Water Supply Scheme	KwaDukuza	RBIG	R35 000 000	R30 000 000
Inyoni Bulk Sewer	Mandeni	MIG	R0	R0
Inyoni Bulk Water	Mandeni	MIG	R0	R0
Macambini Water Supply Scheme	Mandeni	MIG	R40 200 000	R40 000 000
Mandafarm Waterborne Sewer	Mandeni	MIG	R0	R0
Ndulinde Water Supply Scheme	Mandeni	MIG	R3 200 000	R3 200 000
Sundumbili WWTP Upgrade	Mandeni	MIG	R8 000 000	R8 000 000
Maphumulo Waterborne Sewer	Maphumulo		R2 000 000	R4 000 000
Ngcebo/KwaDukuza Water Supply Scheme	Maphumulo	MIG	R9 400 000	R34 400 000
Ntunjambili Bulk Water Supply Scheme	Maphumulo	MIG	R6 000 000	R16 000 000
Ozwathini / Phambela Water Supply (Nondabula Emergency Water Project)	Maphumulo	MIG	R700 000	R700 000
Masibambisane Water Supply Refurbishment	Maphumulo	WSIG	R6 000 000	R6 000 000

Project Name	Area	Funder	2019/2020 Budget	2020/2021 Budget
Swayimane, Msilili, Ndaka and Hoqweni Community Water Supply Scheme (Wosiyane)	Ndwedwe	MIG	R0	R0
PMU Top Slice	PMU	MIG	R0	R0

Source: IDM IDP 2019/2020

The IDP also reports on the alignment with sector departments and relevant institutions. The following tables present the projects from Umgeni Water and the concessionaire.

Table 7-4: Capital Projects, Umgeni Water, 2019/2020

Municipality	Ward No.	Programme and Description	Project Stage	MTEF 2018/2019 R (000)	MTEF 2019/2020 R (000)	MTEF 2020/2021 R (000)
Mandeni	3; 7; and 10	Lower Thukela Bulk Water Supply Scheme Phase 2. See Section 11.5.2 (b) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R3 200 000	R8 800 000	R0
KwaDukuza and Maphumulo	8 and 11 in Maphumulo Municipality. KwaDukuza Municipality is a beneficiary.	Maphumulo Bulk Water Supply Scheme (BWSS) Phase 4. See Section 11.5.2 (c) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R0	R200 000	R0
Ndwedwe	2; 4; 5; 6; 7; 8; 9; 10; 11; 13; 15; 16; 17; 18; and 19	uMshwathi Regional Bulk Water Supply Scheme (RBWSS) Phase 4. See Section 11.5.2 (a) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R23 000 000	R115 152 000	R115 152 000
Maphumulo and Ndwedwe	8 in Maphumulo Municipality. Ndwedwe Municipality is a beneficiary.	Maphumulo Bulk Water Supply Scheme (BWSS) Phase 3. See Section 11.5.2 (c) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R50 710 430	R43 081 176	R20 554 099
Maphumulo and Ndwedwe	8 and 11 in Maphumulo Municipality. Ndwedwe Municipality is a beneficiary.	Maphumulo Bulk Water Supply Scheme (BWSS) Phase 4. See Section 11.5.2 (c) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R0	R200 000	R0
Maphumulo	8	Maphumulo Bulk Water Supply Scheme (BWSS) Phase 3. See Section 11.5.2 (c) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R50 710 430	R43 081 176	R20 554 099

Municipality	Ward No.	Programme and Description	Project Stage	MTEF 2018/2019 R (000)	MTEF 2019/2020 R (000)	MTEF 2020/2021 R (000)
Maphumulo	8 and 11	Maphumulo Bulk Water Supply Scheme (BWSS) Phase 4. See Section 11.5.2 (c) in the Umgeni Water Infrastructure Master Plan 2018/2019.	Design	R0	R200 000	R0

Table 7-5: Capital Projects, Concessionaire, 2019/2020 – 2021/2022 (KDM IDP, 2019/2020)

There are no budget allocations for years 2020/2021 and 2021/2022 yet. To be updated with the Siza Water Five-Year Review, Capex project funding from developers and from grants for 2019-2023.

Project Name	Project Stage	2019/2020 Budget
New booster pump station for Barbets Crest	Completed	2 000 000
Refurbishment of Frasers lab office, Standby house	Implementation	200 000
Construction of 2.5Meg Cell Taffeni Reservoir	Implementation	14 354 459
Zululami bulk sanitation scheme sewer rising main	Implementation	14 369 421
Ballito Hills sanitation scheme	Implementation	14 837 645
Installation of AMR for district meters	Implementation	230 000
Various Raise & Replace meters - 2018	Implementation	
Construction of new Bogmore Reservoir	Implementation	14 837 645
Installation of new sewer line Sanctuary	Implementation	320 000
New, relocation & drainage of standpipes - 2018	Implementation	175 000
Installation of 2 x immersible pumps - Simbithi SPS	Implementation	737 334
Raise & Replace sewer manholes - 2018	Implementation	480 000
1 Meg link - Frasers to Ballito	Implementation	2 500 000
Replacement of AC Pipe - Tinley Manor	Implementation	393 537
Extension of Frasers workshops 2018	Implementation	250 000
Borehole & Recycling plant licensing	Implementation	150 000
Replace motors & gearboxes - Sheffield WWTP Clarifier	Implementation	72 450
Resolve outstanding issue, Brooklyn Reservoir	Implementation	80 000
Hydraulic Analysis & Water Main Extension - Lazuli	Pre-Planning	38 203
Replace Blowers for aerators - Frasers WWTP	Implementation	1 100 000
Replace Lifting Beams @ various SPS & Frasers	Implementation	175 646
Installation of Telemetry - SSW Sites	Implementation	1 000 000
Transferring Shakaskraal WPS to Shayamoya	Implementation	50 000
Installation of Transformer at Compensation SPS	Implementation	200 000
Replace Burglar Guards at Shayamoya Reservoir, Shakashead SPS, Shakaskraal SPS and Lali Park SPS	Implementation	100 000
Raise & Replace Meters - various areas	Implementation	500 000
New Installation, Relocation Removal of Standpipes - Various Areas	Implementation	600 000
Raise and Replace sewer manholes - Various Areas	Implementation	350 000
Foxhill water pipeline removal and relocation - Foxhill	Pre-Planning	140 000

Project Name	Project Stage	2019/2020 Budget
Installation of gravity Sewer - Salt Rock	Pre-Planning	1 260 000
Upgrade of 350m of 110mm Upvc Water main (AC Replacing) - Susan Ave	Pre-Planning	260 000
150m of 160mm Sewer Replacement - Shakashead	Pre-Planning	230 000
Elizabeth road crossing to Madelein 160mm x 450m (AC Replacement) - Ballito	Pre-Planning	600 000
Replace Wooden doors x 4 Pump stations	Pre-Planning	200 000
Sand traps - Lali Park	Pre-Planning	150 000
Installation of Odour Control Units x 2 - SPS 10	Pre-Planning	180 000
Workshop layout - SPS - Frasers	Pre-Planning	50 000
Smart PRV x 1 - Simbithi	Pre-Planning	100 000
Power Factor program Avondale, Salmon + 2 Others	Pre-Planning	100 000
Access Roads for SPS - Village SPS	Pre-Planning	80 000
Fencing and road - EXT 3 SPS	Pre-Planning	230 000
Zimbali 1 SPS 30Kw VSD'S X 2 - Zimbali	Pre-Planning	100 000
Hawkins SPS replace outdated 30Kw pumps with Flygt 22Kw x 2 off.	Pre-Planning	400 000
Simbithi SPS Gate Vales replacement x 2 off.	Pre-Planning	40 000
Tinley Manor WPS Non-Return & Gate Valves replacement.	Pre-Planning	20 000
Sump pumps for Ext 3, Santorini, SPS 10 & Bogmore WPS.	Pre-Planning	30 000
Shakaskraal SPS replace old T3 Gorman Rupp pumps. X 1	Pre-Planning	140 000
Santorini mild steel pump bases replacement.	Pre-Planning	25 000
Lali Park mild steel manifold replacement.	Pre-Planning	18 000
Whirly Birds at various sites.	Pre-Planning	5 000
Shakashead SPS access road.	Pre-Planning	70 000
Modifications to Sludge Ponds - Shakaskraal WWTP	Pre-Planning	40 000
Replace 2 RAS PUMPS - Shakaskraal WWTP	Pre-Planning	50 000
Access Control Recycle Water Plant - Recycle Plant	Pre-Planning	280 000
Remove Sludge from Sludge Pond 1 - Frasers - WWTP	Pre-Planning	360 000
Replace Grit Pump - Frasers - WWTP	Pre-Planning	50 000
Replacing of 6 sluice plates - Frasers - WWTP	Pre-Planning	45 000
Replace DO SENSORS - Frasers - WWTP	Pre-Planning	100 000
NEW area lights - Frasers - WWTP	Pre-Planning	56 000
Chemical Storage Container - Frasers - WWTP	Pre-Planning	35 000
Upgrade of Road -PART 2 - Sheffield - WWTP	Pre-Planning	150 000
Replace Grit Pump - Sheffield - WWTP	Pre-Planning	40 000
Install standby Emergency overflow pump - Sheffield - WWTP	Pre-Planning	60 000
Construction of new SPS & Rising Mains - Zululami	Pre-Planning	55 000 000
Taffeni 2.5Mg Res (Design, Monitoring & Construction) - Taffeni	Pre-Planning	12 500 000
Construction of new 2.5MG cell - Bogmore	Pre-Planning	
Lifting Beam installation at Woodmead 1 & 2 SPS. R140 K to Developers	Pre-Planning	140 000
Construction of new 2.5MG cell - Bogmore	Pre-Planning	

Project Name	Project Stage	2019/2020 Budget
Construction of new 2.5MG cell - Zimbali Lakes	Pre-Planning	
Upgrade of Sewer Pump Station - Shakashead	Pre-Planning	
Construction of new 1.5MG cell - Tinley Manor	Pre-Planning	
Redesign & Convert Shakaskraal Wastewater Treatment Works into Sewer Pump Station	Pre-Planning	
Ballito Hills - Ballito	Pre-Planning	26 000 000
Woodmead rising main	Pre-Planning	
Install 800m of 315mm sewer gravity in Lagoon drive & Odour control - Salt Rock	Tender	1 570 000

8. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

A gap analysis has been undertaken for the water schemes in the IDM. The gap analysis considered current planning interventions by the WSA.

Note however, that due to COVID19, municipal funds for domestic water and sanitation infrastructure, for 2019/2020 and 2020/2021 may be redirected to meet emergency water supply to all types of consumers, including health and education facilities.

In the IDM, there are current and planned linkages between schemes which would result in the enlargement of the existing regional schemes, creation of new regional schemes and the options for bi-directional flows between supply water treatment nodes. The existing and planned developments create complex water supply options and configurations.

8.1.1 Concession Area: Ballito to Tinley Manor and Shakaskraal

The concession area includes the areas from the southern, coastal boundary of the KDM, to just north along the coast up to Tinley Manor Beach. Inland it extends about one kilometre west of the N2 national highway, north of Ballito, then including the area of Shakaskraal.

The concessionaire has a programme of projects to maintain existing infrastructure and improve water supply and sanitation in its concession area. The Five-Year Review has recently been completed on the past five years' activities of the concessionaire, and the planned next five years of the concessionaire under the Vuthela iLembe LED Support Programme. However, the report has not yet been approved by the IDM to be made available.

The concession period comes to an end by 2029, by which the concession has to meet certain requirements on the condition of infrastructure, considering the option for transferring the infrastructure back to the IDM. A detailed study on the hand-over arrangements and options still need to be carried out in due time.

The Siza Water Five-Year report, provided water demand projections based on a low, medium and high demand scenario for its future planning, 2019 – 2023. The water demand, for 2023, based on a low scenario was stated as 4 915 257kl/a (13.47 Mℓ/d), for the medium scenario as 5 957 646kl/a (16.32 Mℓ/d) and for the high scenario as 6 541 302kl/a (17.92 Mℓ/d).

Under the UAP Phase III, concession area, falls in the Umgeni Northern Feeder WSS. The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for this area, which includes the concession area, are 56.05Mℓ/d.

The Umgeni Northern Feeder WSS is further discussed under the section for the Mdloti WSS.

8.1.2 *Sundumbili WSS, Mandini WSS, Ndulinde WSS and Macambini WSS*

The Sundumbili WSS supplies the areas of Sundumbili, Mandini, Ndulinde and Tugela Mouth. The IDM plans to further extend supply to the Macambini area (also mentioned in the UAP Phase II study, 2016) on the coast, east of Mandini. The Sundumbili WTP was upgraded to a capacity of 40Mℓ/d. The Sundumbili WWTP can be upgraded to 18Mℓ/d – MIG funding already allocated (R8 million for 2019/2020'; R8 million for 2020/2021). Potential for water reclamation and re-use may be investigated through the Vuthela iLembe LED Support Programme.

There is also a MIG project for the Macambini Water Supply with funding allocations of R40.2 million and R40 million for 2019/2020 and 2020/2021 respectively.

The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for the initially demarcated Sundumbili WSS are 15.88Mℓ/d, for the Mandini WSS, 3.62Mℓ/d, for the Ndulinde WSS, 13.13Mℓ/d and 11.73Mℓ/day for the Macambini area totalling 44.36Mℓ/d.

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

Table 8-1: Sundumbili WSS, Mandini WSS, Ndulinde WSS and Macambini WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d) – Sundumbili WTP	40		40	44.36	4.36
Water Treatment (Mℓ/d) – Lower Tugela WTP	55	55	110	110	
Storage (Mℓ)					29.7 (Sundumbili) 9.43 (Mandini) 22.82 (Ndulinde) 23.23 (Macambini)
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	105.25 (Sundumbili) 105.68 (Mandini) 151.25 (Ndulinde) 12.40 (Macambini)			126.78 (Sundumbili) 165.20 (Mandini) 181.70 (Ndulinde) 16.30 (Macambini)	21.53 (Sundumbili) 59.52 (Mandini) 30.45 (Ndulinde) 3.90 (Macambini)

The Sundumbili WTP will be fully utilised for all three (3) scheme areas, whereas a portion of supply to the Mandini, Tugela South and Macambini scheme areas will be augmented from the Lower Tugela WTP.

8.1.3 Mvoti WSS (uMvoti WSS)

The Mvoti WSS is one of three (3) sub-systems that represent the North Coast System, operated by Umgeni Water. The secondary bulk of the Mvoti WSS is owned and operated by the IDM. The other two sub-systems are the Mdloti WSS (Hazelmere Dam on the Mdloti River) and the Lower Tugela Bulk WSS (Tugela River).

The Mvoti supplies the urban areas in and around the town of KwaDukuza. There are MIG projects for improving water supply to Lindelani, east of the KwaDukuza CBD and a project referred to as the Southern Regional Bulk Water and Sanitation Scheme. Funding allocations for Lindelani of R3.5 million and R10.5 million in 2019/2020 and 2020/2021, and for the Southern RBWS and Sanitation Scheme of R36 million and R33 million in 2019/2020 and 2020/2021 respectively.

The iLembe DM Water Master Plan (2016) lists the twenty year demand (2036) as 156.17Mℓ/d and then the ultimate demand (beyond 2036) for the whole of the KDM, which will include the concession area, as 292.17Mℓ/d.

Under UAP Phase II, the proposed option links to the development of the Mvotipoort Dam, with bulk supply infrastructure to supply the Maphumulo LM, at a cost of R4.4billion (including water resource development, contingencies and VAT), from where a bulk pipeline can be constructed to the proposed KwaDukuza Reservoir to serve the KDM. The capital cost for the bulk pipeline from the Maphumulo Reservoir to the KwaDukuza Reservoir, including the KwaDukuza Reservoir, was estimated at R2.1billion (including contingencies and VAT).

Another option listed in the UAP Phase II study was the proposed Welverdient Dam on the Mvoti River close to Stanger, from where to supply the proposed KwaDukuza Reservoir. This option's cost estimate, including water resource development, came to R7.8billion (including contingencies and VAT).

The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for the Mvoti WSS are 27.76Mℓ/d.

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

Table 8-2: Mvoti WSS (uMvoti WSS) Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d) – Mvoti WTP	16		16	27.76	11.76
Water Treatment (Mℓ/d) – Lower Tugela WTP	55	55	110	110	
Storage (Mℓ)	11		11	53.54	42.54

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	125.1		125.1	162.6	37.5

It is envisaged to supply this area from the Lower Tugela WTP to meet future water requirements.

8.1.4 Lower Tugela Bulk WSS (LTBWS)

The Lower Tugela Bulk WSS is one of three sub-systems that represent the North Coast System, operated by Umgeni Water. The other two sub-systems are the Mvoti WSS (Mvoti River) and the Mdloti WSS (Hazelmere Dam on the Mdloti River).

The LTBWS is planned and commissioned in phases. Phase one is completed and includes the construction of the Lower Tugela WTP of 55Mℓ/d and a number of Offtakes from which the IDM's secondary bulk infrastructure is developed.

There is one RBIG project listed in the IDM's IDP (2019/2020) termed Lower Thukela Bulk Water Supply Scheme, with funding allocations of R35million and R30 million respectively for 2019/2020 and 2020/2021. This is to develop the secondary infrastructure from the LTBWS Offtakes, to meet domestic and development demands. One of the development demands is around the Tinley Manor North Node (Offtake 9), however, since most of the developments are private, the RBIG funding (conditional grant for basic bulk water supply), cannot be used by the IDM. Alternative funding mechanisms need to be sourced. Similarly, Offtake 13 is an important economic growth node, but again, mostly as an industrial and business node and for which RBIG funding cannot be applied.

There are many factors influencing the economic developments in the IDM, especially along the N2 National Highway corridor and the coastal tourism areas. This in turn affect the demand for improved and additional water supplies in the area.

The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for the Lower Tugela BWS, as demarcated in the UAP Phase III study, are 14.76Mℓ/d.

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

Table 8-3: Lower Tugela BWS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	55	55	110	110	
Storage (Mℓ)	8.4		8.4	72.46	64.06
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	1 171.60		1 171.60	1 741.68	570.08

It is envisaged that the Lower Tugela WTP would augment water supply to other areas such as Macambini WSS, Umgeni Water North Coast System and the Maphumulo WSS.

As demands increased in eThekwini Metro and on the Dolphin Coast (KDM) it is expected that Hazelmere WTP will only supply north as far as Ballito and the Lower Tugela WTP will supply south as far as Ballito. These operating rules will be based on demands and resource availability (Umgeni Water, 2020).

8.1.5 Mdloti WSS (Hazelmere Dam system, part of the North Coast System)

The Mdloti WSS is one of three (3) sub-systems that represent the North Coast System, operated by Umgeni Water. The other two sub-systems are the Mvoti WSS (Mvoti River) and the Lower Tugela Bulk WSS (Tugela River). The Mdloti WSS is supplied from the Hazelmere WTP, which also supplies to areas in the eThekwini Metropolitan Municipality

The Mdloti WSS supplies into the IDM water scheme areas of Ndwedwe LM (Dwedwe WSS, Nkwambase WSS) and part of the KwaDukuza LM, including the concession area (Umgeni Northern Feeder WSS). The volume supplied into NLM is about 11Mℓ/d. Although there are constraints in supply to the NLM, there are no funded projects in the IDM IDP of 2019/2020 for this area.

The Umgeni Water 2020 Infrastructure Master Plan includes the uMshwathi Regional Bulk WSS, which is being conducted in phases, to serve areas in the uMgungundlovu DM and IDM. Phases 4, 5 and 6 in particular are planned to serve the western areas of the Ndwedwe LM, which will relieve the requirements from the Hazelmere system to serve these areas of the Ndwedwe LM.

The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for the Dwedwe BWS, as demarcated in the UAP Phase III study, are 13.66Mℓ/d. For the Nkwambase WSS, the water requirements are 4.81Mℓ/d and for the Umgeni Northern Feeder WSS, the water requirements are 56.05Mℓ/d. The total water requirements are 74.52Mℓ/d.

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

Table 8-4: Mdloti WSS (Hazelmere Dam system, part of the North Coast System)

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	75		75	74.52	Requirements to be met from the Hazelmere WTP, Mvoti WTP, Lower Tugela TWP and from the concession area's water reclamation & re-use
Storage (Mℓ)	43.50Ml (KDM) 12.00 (NLM)		55.5	111.60	56.10
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	212.05 (Mdloti) 150.85 (Dwedwe) 65.47 (Nkwambase)		212.05 (Mdloti) 150.85 (Dwedwe) 65.47 (Nkwambase)	254.46 (Mdloti) 231.50 (Dwedwe) 80.28 (Nkwambase)	42.41 (Mdloti) 80.65 (Dwedwe) 14.81 (Nkwambase)

There are complex supply configurations between water supply systems, as well as ownership of bulk infrastructure. The IDM does not have up-to-date and complete information on capacities of bulk infrastructure at a component level.

As demands increased in eThekwini Metro and on the Dolphin Coast (KDM) it is expected that Hazelmere WTP will only supply north as far as Ballito and the Lower Tugela WTP will supply south as far as Ballito. These operating rules will be based on demands and resource availability (Umgeni Water, 2020).

8.1.6 Maphumulo-KwaDukuza WSS

This bulk water supply scheme is to serve the majority of the Maphumulo LM's central and southern extents.

There are two (2) funded projects in the IDM IDP of 2019/2020 that apply to this area: Ozwathini / Phambela Water Supply (Nondabula Emergency Water Project) with MIG funding of R700 000 during 2019/2020 and 2020/2021, then the project of Masibambisane Water Supply Refurbishment, with WSIG funding of R6 million during 2019/2020 and 2020/2021.

Under UAP Phase II, the proposed option links to the development of the Mvotipoort Dam, with bulk supply infrastructure to supply the Maphumulo LM, at a cost of R4.4billion (including contingencies and VAT) which includes water resource development. Another option (costs not provided) proposed was to upgrade the Greytown WTP in the neighbouring Umvoti Local Municipality and develop bulk infrastructure to supply Maphumulo LM via the Mvotipoort Dam.

Another option investigated under UAP Phase II, was the development of the Mvotipoort Dam, an upgrade of the Greytown WTP, which will allow supply to be augmented to the Dalton Reservoir complex from the Umshwathi System. This option will allow for the current load on the Mgeni system upstream of Dalton

Reservoir to be shed to the Upper Mvoti System which includes the Maphumulo WTP and supply areas. The estimated cost for this option, excluding the Greytown WTP upgrade and resource development, was R8.3million (including contingencies and VAT).

The Umgeni Water 2020 Infrastructure Master Plan includes the uMshwathi Regional Bulk WSS, which is being conducted in phases, to serve areas in the uMgungundlovu DM and IDM. Phase 5 in particular is planned to augment supply in the Maphumulo LM.

The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for the Maphumulo WSS are 26.94Mℓ/d.

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

Table 8-5: Maphumulo-KwaDukuza WSS

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	9	3	12	26.94	14.94
Storage (Mℓ)				54.84	54.84
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	240.25		240.25	288.66	48.41

8.1.7 Ngcebo WSS and Ntunjambili WSS

The Ngcebo Bulk Water Supply Scheme is located in the far northern reaches of the Maphumulo Local Municipality, and borders on the uMzinyathi and uThungulu District Municipalities. It supplies the areas of Woyisane, Jojingwenya, Thafamasi, Esiweni/Amambulwa and Mathonsi and surrounds. It is bordered in the west, still in the Maphumulo LM, by the Ntunjambili WSS.

There are two (2) projects in the IDM IDP of 2019/2020 for these areas: Ngcebo/KwaDukuza Water Supply Scheme with MIG funding allocations of R9.4 million and R34.4 million during 2019/2020 and 2020/2021; and the MIG funded project Ntunjambili Bulk Water Supply Scheme with allocations of R6million and R16 million in 2019/2020 and 2020/2021.

The planning conducted under the UAP Phase III study made provision for meeting the water requirements up to 2050. The projected water requirements for the Ngcebo WSS are 4.36Mℓ/d and for Ntunjambili WSS the water requirements are 2.37Mℓ/d, therefore totalling 6.73Mℓ/d.

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

Table 8-6: Ngcebo WSS and Ntunjambili WSS

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	4		4	6.73	2.73
Storage (Mℓ)					
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	23.91 (Ngcebo) 12.40 (Ntunjambili)		23.91 (Ngcebo) 12.40 (Ntunjambili)	30.11 (Ngcebo) 14.88 (Ntunjambili)	6.2 (Ngcebo) 2.48 (Ntunjambili)

9. PROPOSED BULK WATER SUPPLY INTERVENTIONS

This section details the water supply reconciliation options for bulk water services within the iLembe 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.

9.1 UAP Phase III Water Supply Interventions

The demand model that was proposed to be used within UAP Phase III will be used to determine the proposed bulk infrastructure requirements and would be sized accordingly to meet the demand of 2050.

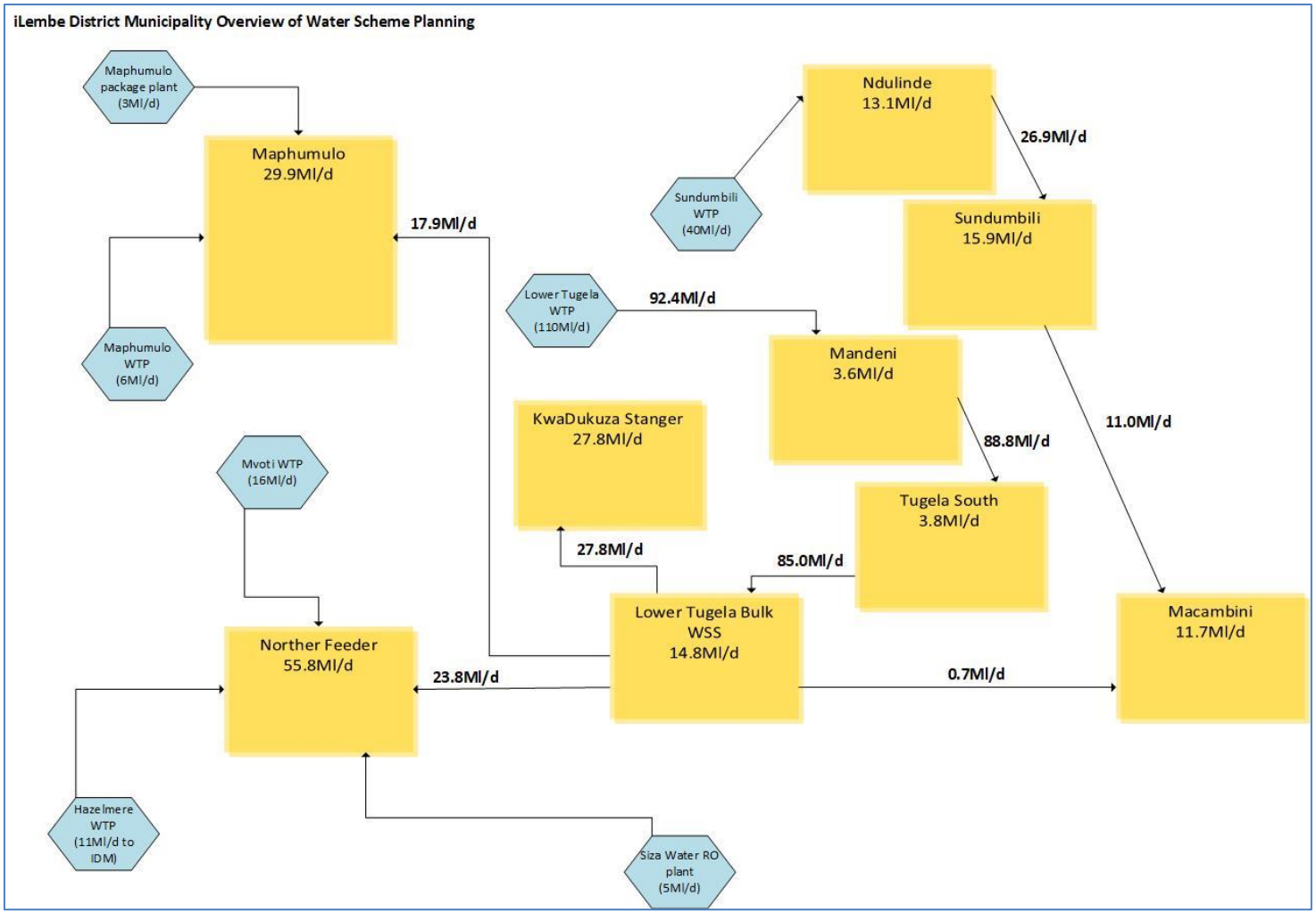
For the iLembe DM as WSA, the applicable larger and urban WSIAs for UAP Phase III coincide with the majority of IDM's WSSs. Some may turn into regional schemes depending on available water resources and infrastructure upgrades and extensions. However, the WSSs have a complex, interlinked relationship and should also be considered as a whole based on the linked physical infrastructure as well as shared water sources.

The grouping of schemes in the list below is indicative only. To illustrate the interlinkages, refer to the overview of the water scheme planning, Figure 9-1 and for an overview of the WSIAs, see Figure 9-2.

- ✓ ILE009 Ngcebo WSS;
- ✓ From the Sundumbili WTP: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS;
- ✓ From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder;
- ✓ From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South;
- ✓ ILE004 Glendale; and
- ✓ ILE011 Ntunjambili;

Each of the 2020 WSIAs' proposed interventions are briefly discussed in the following sub-sections.

Figure 9-1 Overview of Water Scheme Planning

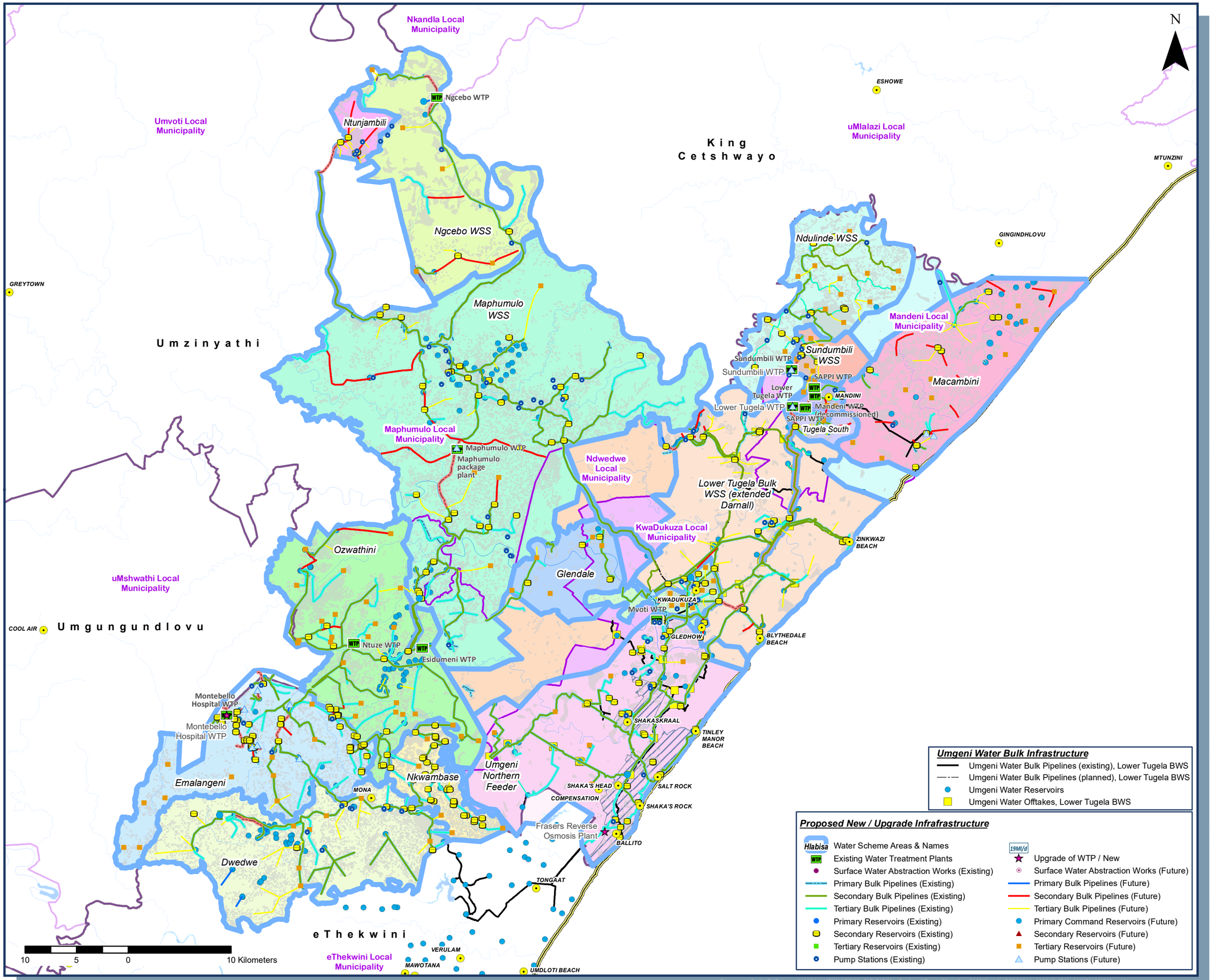


9.1.1 *Overview of Water Scheme Planning, considering the uMshwathi Regional Bulk WSS*

Should the uMshwathi Regional Bulk WSS be considered as an option, the following water requirement volume changes can be denoted:

- From the Lower Tugela WTP, a volume of 99.4Mℓ/d;
- From the Mandeni WSS, a volume of 95.8Mℓ/d;
- From the Tugela South WSS, a volume of 92Mℓ/d;
- From the Lower Tugela Bulk WSS, a volume of 8.9Mℓ/d to Maphumulo WSS;
- From the uMshwathi Regional Bulk WSS to Ozwathini WSS, to Maphumulo WSS, a volume of 6Mℓ/d; and
- From the Lower Tugela Bulk WSS, a volume of 39.8Mℓ/d to the Umgeni Northern Feeder WSS.

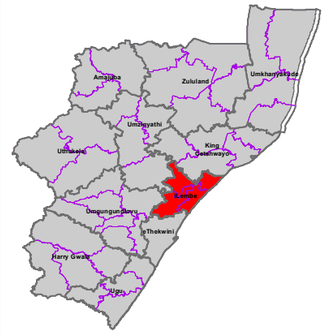
For further details, see the sub-section: ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Water Concession Area
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions

iLembe District Municipality

DATE COMPLETED: 21/11/2020

MAP NO.: **DC29: Figure 9.2**

Umgeni Water Bulk Infrastructure

- Umgeni Water Bulk Pipelines (existing), Lower Tugela BWS
- Umgeni Water Bulk Pipelines (planned), Lower Tugela BWS
- Umgeni Water Reservoirs
- Umgeni Water Offtakes, Lower Tugela BWS

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 WTP / New
- 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)

9.2 ILE009 NGCEBO WSS

The planning from the UAP III can be considered as an alternative to the planning presented by Umgeni Water in their 2020 Infrastructure Master Plan, with specific reference to the uMshwathi Regional Bulk WSS.

9.2.1 Water Demand

The water demand for the Ngcebo WSS was determined for 2020 and 2050 and included within Table 9-1.

Table 9-1: Population and Water demand (Mℓ/day) 2020 and 2050

Population	**Population 2020**	**Population 2050**
	16 721	22 875
Water Demand	**Demand 2020**	**Demand 2050**
	3.04	4.36

9.2.2 Water Resource Consideration

Water is abstracted from the Tugela River and treated at the Ngcebo WTP. There are areas which are supplied by water tanker and others that make use of groundwater in the form of boreholes and springs.

There is no information available on the yield and available yield from the Tugela River where it is used as source for the Ngcebo WSS.

The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority especially as it plays an important role in the Integrated Vaal River System by means of the Tugela-Vaal transfer scheme. It also influences the planning, prioritisation and sequencing of water resources development in the Tugela River catchment (upper) and the Lesotho Highlands Water Project.

9.2.3 Water Supply Infrastructure

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

- ✓ The existing capacity at the Ngcebo WTP is considered sufficient to meet the area's water requirements for 2050;
- ✓ The bulk distribution infrastructure would be extended to include three primary bulk pipes of diameter ranging between 63-315mm, totalling 6.04km in length, 17 secondary bulk pipes ranging in diameter of between 110-630mm, totalling 50.04km in length and 21 tertiary bulk pipes ranging in diameter of between 50-125mm, totalling 21.48km in length;
- ✓ The existing storage should be increased by two primary reservoirs, having a total storage capacity of 800kl and 25 tertiary reservoirs, having a total storage capacity of 8 220kl; and
- ✓ There is one pump station proposed to serve the primary command reservoir R2, requiring 15.51kW.

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

9.2.4 Financial Requirements

The bulk cost requirement for the Ngcebo WSS is provided within Table 9-2 below.

Table 9-2: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R20 448 000	R2 044 800	R22 492 800
Secondary	R143 653 000	R14 365 300	R158 018 300
Tertiary	R63 902 000	R6 390 200	R70 292 200
Total	**R228 003 000**	**R22 800 300**	**R250 803 300**

The total bulk cost requirement is R250.8 million (excl VAT). The scheme development cost per household is approximately R54 543.

N

Nkandla Local Municipality

uMlalazi Local Municipality

King Cetshwayo

Umvoti Local Municipality

Umzinyathi

Maphumulo Local Municipality

Ngcebo WSS

Ngcebo WTP 4Ml/d

0KI

ESHIKISHINI 02

WOSIYANE 09

400KI

NTUNJAMBILI 11

Ntunjambili

MAPUMULU 03

VUMBU 03

SONDOKHULU 01

600KI

VUMBU 09

SAMUNGU 06

ESIWENI 01

NTUNJAMBILI 12

JOJINGWENYA 10

JOJINGWENYA 06

JOJINGWENYA 08

EMTHOMBENI 03

ABAKWA CELE 04

ABAKWA CELE 03

200KI

THAFAMASI

EMTHOMBENI 01

EKUNQOBENI 01

Mandleni

Nsuze

Mambuli

Mpisi

Thukela

Ngcebo WTP
Maphumulo package plant
Maphumulo WTP
Ntuze WTP
Montebello Hospital WTP
Esidumeni WTP
Mvoti WTP
Lower Tugela WTP
Sundumbili WTP
SAPPI WTP
Mandeni WTP (decommissioned)
SAPPI WTP

5 2.5 0 5 Kilometers

Proposed New / Upgrade Infrafrastructure

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

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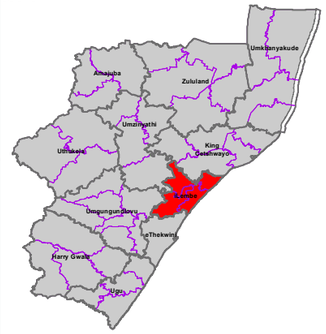
Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Water Concession Area
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Eshowe Major Towns

LOCALITY:



CLIENT:

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PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - Ngcebo WSS iLembe District Municipality

DATE COMPLETED: 21/11/2020

MAP NO.: **DC29: Figure 9.3**

Figure 9-4
WSIA: ILE009 Ngcebo WSS

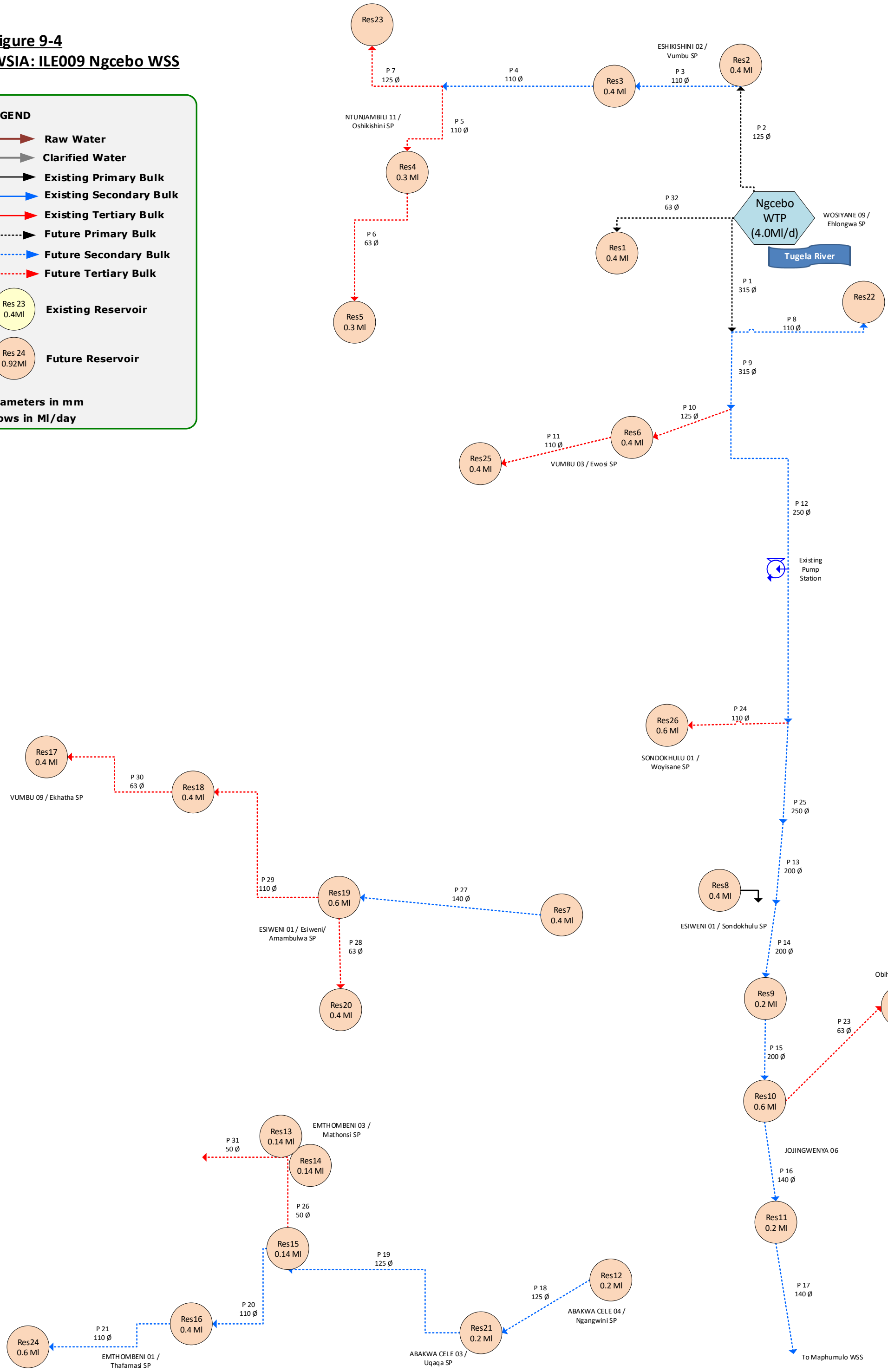
LEGEND

Treated Water
- Raw Water
- Clarified 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



9.3 FROM THE SUNDUMBILI WTP: ILE016 MACAMBINI, ILE017 NDULINDE WSS, ILE013 SUNDUMBILI WSS

The areas to be served in future from the Sundumbili WTP can be ringfenced to a large extent.

9.3.1 Water Demand

The water demand for the Macambini, Ndulinde WSS and Sundumbili WSS was determined for 2020 and 2050 and included within Table 9-3.

Table 9-3: Population and Water demand (Mℓ/day) 2020 and 2050

	Population 2020	Population 2050
Macambini	44 881	61 397
Ndulinde WSS	50 499	69 083
Sundumbili WSS	48 234	65 985
Total	**143 614**	**196 465**
	Demand 2020	**Demand 2050**
Macambini	8.20	11.73
Ndulinde WSS	9.17	13.13
Sundumbili WSS	11.05	15.88
Total	**28.42**	**40.74**

9.3.2 Water Resource Consideration

Water is abstracted from the Tugela River and treated at the Sundumbili WTP. Currently the Ndulinde WSS and Sundumbili WSS are supplied from the Sundumbili WTP. The area of Macambini make use of groundwater in the form of boreholes and springs.

There is no information available on the yield and available yield from the Tugela River where it is used as source for the Sundumbili WTP.

The Macambini are is located on the east cost of the IDM. Over-abstraction of groundwater has resulted in saltwater intrusion in some areas and making the water unfit for human consumption. The IDM assists in providing potable water in such cases by means of water tanker. It is foreseen that groundwater will still be used as source to augment the surface water supply in Macambini.

The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority especially as it plays an important role in the Integrated Vaal River System by means of the Tugela-Vaal transfer scheme. It also influences the planning, prioritisation and sequencing of water resources development in the Tugela River catchment (upper) and the Lesotho Highlands Water Project.

9.3.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Macambini, Ndulinde WSS and Sundumbili WSS and are illustrated within Figure 9-5 overleaf followed by the schematic layout of the WSIA within Figure 9-6.

It is proposed to allocate 13.1Mℓ/d from the Sundumbili WTP to Ndulinde WSS and a further 11Mℓ/d from the Sundumbili WTP to supply Macambini. Furthermore, an allocation of 0.7Mℓ/d is proposed from the Lower Tugela WTP to supply Macambini.

9.3.3.1 ILE016 Macambini

- ✓ The existing capacity at the Sundumbili WTP is proposed to be upgraded to 41Mℓ/d to meet the area's water requirements for 2050;
- ✓ The bulk distribution infrastructure would be extended to include 17 secondary bulk pipes ranging in diameter of between 63-140mm, totalling 25.41km in length and 13 tertiary bulk pipes ranging in diameter of between 50-250mm, totalling 25.40km in length;
- ✓ The existing storage should be increased by 31 tertiary reservoirs, having a total storage capacity of 23 230kl; and
- ✓ There is one pump station at borehole-supplied water proposed to serve tertiary Res5, requiring 3.72kW and another pump station at borehole-supplied water to serve tertiary reservoir Res7, requiring 7.25kW.

9.3.3.2 ILE017 Ndulinde WSS

- ✓ The existing capacity at the Sundumbili WTP is proposed to be upgraded to 41Mℓ/d to meet the area's water requirements for 2050;
- ✓ The bulk distribution infrastructure would be extended to include one primary bulk pipe of diameter 110mm, totalling 0.61km in length, 14 secondary bulk pipes ranging in diameter of between 110-630mm, totalling 36.22km in length and 26 tertiary bulk pipes ranging in diameter of between 50-315mm, totalling 41.10km in length;
- ✓ The existing storage should be increased by one primary reservoir, having a total storage capacity of 1 000kl and 29 tertiary reservoirs, having a total storage capacity of 21 820kl; and
- ✓ There is one pump station proposed at Sundumbili WTP to Command Reservoir R15 to the Ndulinde scheme area, requiring 526.64kW, another pump station at Sundumbili WTP to serve command reservoir R1 to the Ndulinde scheme area, requiring 9.56kW. Costing for these pump stations is allocated to the Ndulinde scheme.

9.3.3.3 ILE013 Sundumbili WSS

- ✓ The existing capacity at the Sundumbili WTP is proposed to be upgraded to 41Mℓ/d to meet the area's water requirements for 2050;

- ✓ The bulk distribution infrastructure would be extended to include one 813mm diameter primary bulk pipe totalling 2.61km in length, 5 secondary bulk pipes ranging in diameter of between 500-630mm, totalling 7.88km in length and 10 tertiary bulk pipes ranging in diameter of between 63-500mm, totalling 11.30km in length;
- ✓ The existing storage should be increased by 17 tertiary reservoirs, having a total storage capacity of 29 700kl; and
- ✓ The pumping capacities of the existing pump stations are sufficient.

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

9.3.4 Financial Requirements

The bulk cost requirement for the Macambini, Ndulinde WSS and Sundumbili WSS is provided within Table 9-4.

Table 9-4: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary			
Macambini	R 24 266 000	R2 426 600	R26 692 600
Ndulinde WSS	R42 892 000	R4 289 200	R47 181 200
Sundumbili WSS	R43 627 000	R4 362 700	R47 989 700
Sub-Total	**R110 785 000**	**R11 078 500**	**R121 863 500**
Secondary			
Macambini	R5 597 000	R559 700	R6 156 700
Ndulinde WSS	R66 189 000	R6 618 900	R72 807 900
Sundumbili WSS	R59 435 000	R5 943 500	R65 378 500
Sub-Total	**R131 221 000**	**R13 122 100**	**R144 343 100**
Tertiary			
Macambini	R143 855 000	R14 385 500	R158 240 500
Ndulinde WSS	R122 728 000	R12 272 800	R135 000 800
Sundumbili WSS	R151 665 000	R15 166 500	R166 831 500
Sub-Total	**R418 248 000**	**R41 824 800**	**R460 072 800**
Total	**R660 254 000**	**R66 025 400**	**R726 279 400**

The total bulk cost requirement is R726.28 million (excl VAT). The scheme development cost per household is approximately R18 322.

The total bulk cost requirement for the Macambini scheme is R191.1 million (excl VAT); for the Ndulinde scheme it is R368.4 million (excl VAT) and for the Sundumbili scheme it is R199.4 million (excl VAT

N

King Cetshwayo

King Cetshwayo

GINGINDHLOVU

uMlalazi Local Municipality

Nyezane

Matigulu

Nembe

AMATIKULU

Mandeni Local Municipality

Sundumbili WSS

Ndulinde WSS

Mandeni WTP (decommissioned)

SAPPI WTP

Lower Tugela WTP

Sundumbili WTP

Tugela South

Lower Tugela Bulk WSS (extended Darnall)

uMshwathi Regional BWSS

Macambini

MATHUNZI 01
MFUZE 01
ABASHUMI
ZIYENDANE 02
NDULINDE
SUNDUMBILI
MTUNZINI NU 01
NKUNZEMPUNGA 07
MHAMBUMA 06
KHOVOTHI 02
SHAYISA 05
ENDLONDLWENI 01
SAMKHANYA 02
SAMKHANYA 01
SAMKHANYA 03
ZINKWAZI BEACH
LOWER TUGELA NU 27
LOWER TUGELA NU 31
LOWER TUGELA NU 33
LOWER TUGELA NU 56
SAN SOUCI 02
MANDINI
MTUNZINI NU 02
MTUNZINI NU 04
MTUNZINI NU 07
MANGEZA 02
MANGEZA 05
MHLUBULWENI 04
NYATHINI 01
NYATHINI 04
WANGU 04
MAKHWANINI 01
MAKHWANINI 03
DOKODWENI 03
DOKODWENI 10
DOKODWENI 11
DOKODWENI 07
NQUTSHINI 05
FORT CREALOCK 03
MBIZIMBELWE 01
MANDINI

200KI
400KI
600KI
800KI
1000KI
1200KI
1600KI
1740KI
2800KI
6800KI
4400KI
900KI
1600KI
40Ml/d
41Ml/d
6.6Ml/d
55Ml/d
110Ml/d

5.5 2.75 0 5.5 Kilometers

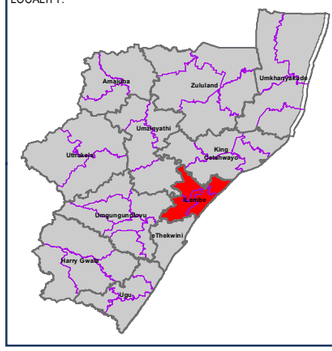
Municipality

Ngcebo WTP
Maphumulo package plant
Maphumulo WTP
Ntuze WTP
Montebello Hospital WTP
Esidumeni WTP
Mvoti WTP
Sundumbili WTP
SAPPI WTP
Lower Tugela WTP
Mandeni WTP (decommissioned)

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Water Concession Area
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Eshowe — Major Towns

LOCALITY:



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PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - Macambini, Ndulinde WSS, Sundumbili WSS
iLembe District Municipality

DATE COMPLETED:

21/11/2020

MAP NO.:

DC29: Figure 9.5

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 WTP / New
- 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)

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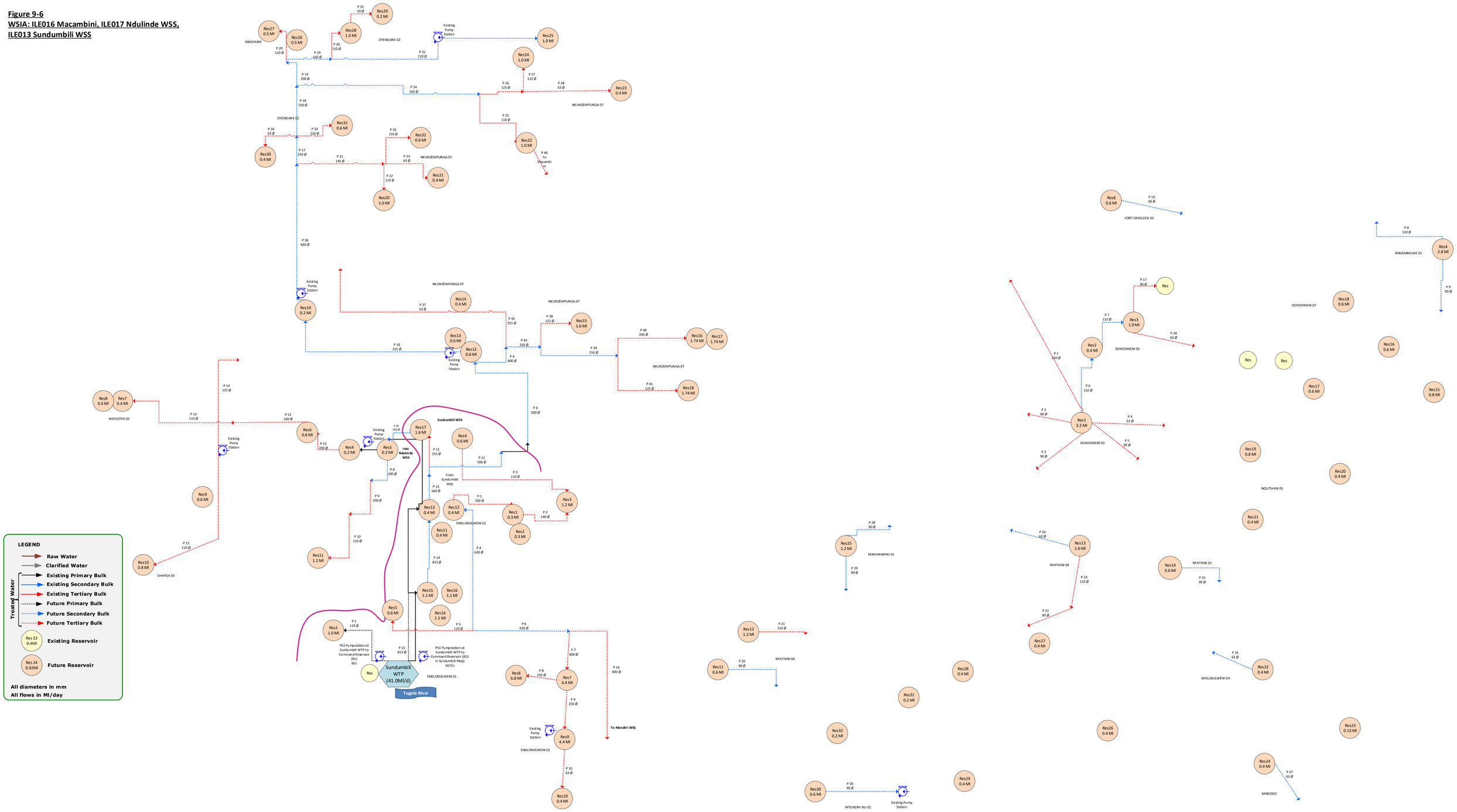
Figure 9-6
WSIA: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS



9.4 From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

The areas to be served in future from the Hazelmere WTP can be ring-fenced, to an extent, based on the existing scheme demarcation. In the UAP Phase III planning, the Umgeni Northern Feeder is augmented with 23.8Mℓ/d from the Lower Tugela WTP, with 16Mℓ/d from the Mvoti WTP, and with 5Mℓ/d from the reverse osmosis plant's water reclamation in the concession area.

The Lower Tugela WTP would augment water supply to the Mandeni area, Tugela South, Macambini and KwaDukuza-Stanger.

The planning from the UAP III can be considered as an alternative to the planning presented by Umgeni Water in their 2020 Infrastructure Master Plan, with specific reference to the uMshwathi Regional Bulk WSS.

9.4.1 Water Demand

The water demand for the Dwedwe, Emalangeni, Nkwambase, Ozwathini and Umgeni Northern Feeder was determined for 2020 and 2050 and included within Table 9-5.

Table 9-5: Population and Water demand (Mℓ/day) 2020 and 2050

	Population 2020	Population 2050
Dwedwe	53 617	73 348
Emalangeni	25 110	34 350
Nkwambase	19 018	26 016
Ozwathini	47 595	65 110
Umgeni Northern Feeder	168 990	231 179
Total	**314 330**	**430 003**
	Demand 2020	**Demand 2050**
Dwedwe	7.81	13.66
Emalangeni	3.47	5.97
Nkwambase	3.24	4.81
Ozwathini	6.48	11.03
Umgeni Northern Feeder	38.02	56.05
Total	**59.02**	**91.52**

9.4.2 Water Resource Consideration

The main source of water is the Hazelmere Dam, located on the uMdloti River and which lies in the neighbouring eThekwini Metropolitan Municipality. If necessary, the IDM assists in providing potable water by means of water tanker.

The net Full Supply Capacity of the dam is 35.28 million m³. The DWS is implementing a project to raise the dam wall and as such the impoundment of the dam is currently 21 million m³. The stochastic yield of the dam is 20 million m³/annum based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

9.4.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the scheme areas and are illustrated within Figure 9-7 overleaf followed by the schematic layout of the WSIA within Figure 9-8.

The scheme infrastructure upgrades and augmentation are discussed per scheme as to better illustrate the required infrastructure and upgrade requirements, ultimately served from the Hazelmere WTP, Lower Tugela WTP and Mvoti WTP.

9.4.3.1 ILE002 Dwedwe

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further;
- ✓ The bulk distribution infrastructure would be extended to include four primary bulk pipes of diameter ranging between 90-140mm, totalling 7.79km in length, 29 secondary bulk pipes ranging in diameter of between 50-762mm, totalling 65.27km in length and 31 tertiary bulk pipes ranging in diameter of between 50-160mm, totalling 52.84km in length;
- ✓ The existing storage should be increased by two primary reservoirs, having a total storage capacity of 720kl and 24 tertiary reservoirs, having a total storage capacity of 30 840kl; and
- ✓ There are eight pump stations proposed to supply reservoirs, requiring between 7.31kW and 183.75kW and totalling 577.40kW.

9.4.3.2 ILE003 Emalangeni

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further;
- ✓ The bulk distribution infrastructure would be extended to include 11 primary bulk pipes of diameter ranging between 75-160mm, totalling 13.95km in length, 27 secondary bulk pipes ranging in diameter of between 50-250mm, totalling 41.80km in length and 18 tertiary bulk pipes ranging in diameter of between 50-110mm, totalling 35.28km in length;
- ✓ The existing storage should be increased by five primary reservoirs, having a total storage capacity of 1 760kl and 23 tertiary reservoirs, having a total storage capacity of 10 300kl; and
- ✓ There are 10 pump stations proposed to supply reservoirs, requiring between 0.51kW and 78.31kW and totalling 203.56kW.

9.4.3.3 ILE010 Nkwambase

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further;
- ✓ The bulk distribution infrastructure would be extended to include 20 secondary bulk pipes ranging in diameter of between 50-500mm, totalling 21.78km in length and 28 tertiary bulk pipes ranging in diameter of between 50-450mm, totalling 26.55km in length;
- ✓ The existing storage should be increased by 44 tertiary reservoirs, having a total storage capacity of 10 000kl; and
- ✓ There are no pump station planning proposals for this area.

9.4.3.4 ILE012 Ozwathini

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further,
- ✓ The bulk distribution infrastructure would be extended to include 44 secondary bulk pipes ranging in diameter of between 50-400mm, totalling 105.36km in length and 36 tertiary bulk pipes ranging in diameter of between 50-400mm, totalling 58.59km in length,
- ✓ The existing storage should be increased by 65 tertiary reservoirs, having a total storage capacity of 22 960kl; and.
- ✓ There are no pump station planning proposals for this area.

9.4.3.5 ILE015 Umgeni Northern Feeder

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further.
- ✓ The bulk distribution infrastructure would be extended to include 32 secondary bulk pipes ranging in diameter of between 90-630mm, totalling 95.58km in length and 27 tertiary bulk pipes ranging in diameter of between 63-450mm, totalling 52.65km in length.
- ✓ The existing storage should be increased 44 tertiary reservoirs, having a total storage capacity of 111 600kl.
- ✓ There are no pump station planning proposals for this area.

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

9.4.4 *Financial Requirements*

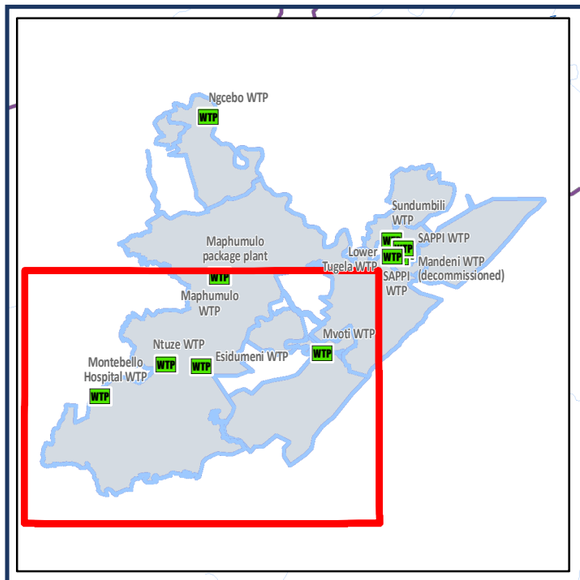
The bulk cost requirement for the Dwedwe, Emalangeni, Nkwambase, Ozwathini and Umgeni Northern Feeder is provided within Table 9-6 below.

Table 9-6: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary			
Dwedwe	R84 338 000	R8 433 800	R92 771 800
Emalangeni	R92 760 850	R9 276 085	R102 036 935
Nkwambase	R21 000 000	R2 100 000	R23 100 000
Ozwathini	R0	R0	R0
Umgeni Northern Feeder	R5 742 000	R574 200	R6 316 200
Sub-Total	**R203 840 850**	**R20 384 085**	**R224 224 935**
Secondary			
Dwedwe	R139 011 000	R13 901 100	R152 912 100
Emalangeni	R14 602 000	R1 460 200	R16 062 200
Nkwambase	R36 428 000	R3 642 800	R40 070 800
Ozwathini	R150 043 000	R15 004 300	R165 047 300
Umgeni Northern Feeder	R180 235 000	R18 023 500	R198 258 500
Sub-Total	**R520 319 000**	**R52 031 900**	**R572 350 900**
Tertiary			
Dwedwe	R160 787 000	R16 078 700	R176 865 700
Emalangeni	R77 478 000	R7 747 800	R85 225 800
Nkwambase	R96 294 000	R9 629 400	R105 923 400
Ozwathini	R180 587 000	R18 057 700	R198 645 700
Umgeni Northern Feeder	R503 298 000	R50 329 800	R553 627 800
Sub-Total	**R1 018 444 000**	**R101 844 400**	**R1 120 288 400**
Total	**R1 742 603 850**	**R174 260 385**	**R1 916 864 235**

The total bulk cost requirement is R1 917 million (excl VAT). The scheme development cost per household is approximately R26 958.

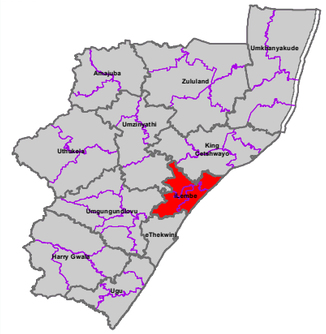
The total bulk cost requirement for the Dwedwe scheme is R422.5 million (excl VAT); for the Emalangeni scheme it is R203.3 million (excl VAT), for the Nkwambase scheme it is R169.1 million (excl VAT), for the Ozwathini scheme it is R364 million (excl VAT) and for the Umgeni Northern Feeder scheme it is R758.2 million (excl VAT).



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Water Concession Area
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Eshowe — Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

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

MAP TITLE: **Total Bulk Water Supply Interventions - Dwedwe, Emalangeni, Nkwambase, Ozwathini and Umgeni Northern Feeder iLembe District Municipality**

DATE COMPLETED: 21/11/2020

MAP NO.: **DC29: Figure 9.7**

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 WTP / New
- 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)

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Figure 9-8

WSIA: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

This schematic illustrates ILE002 Dwedwe

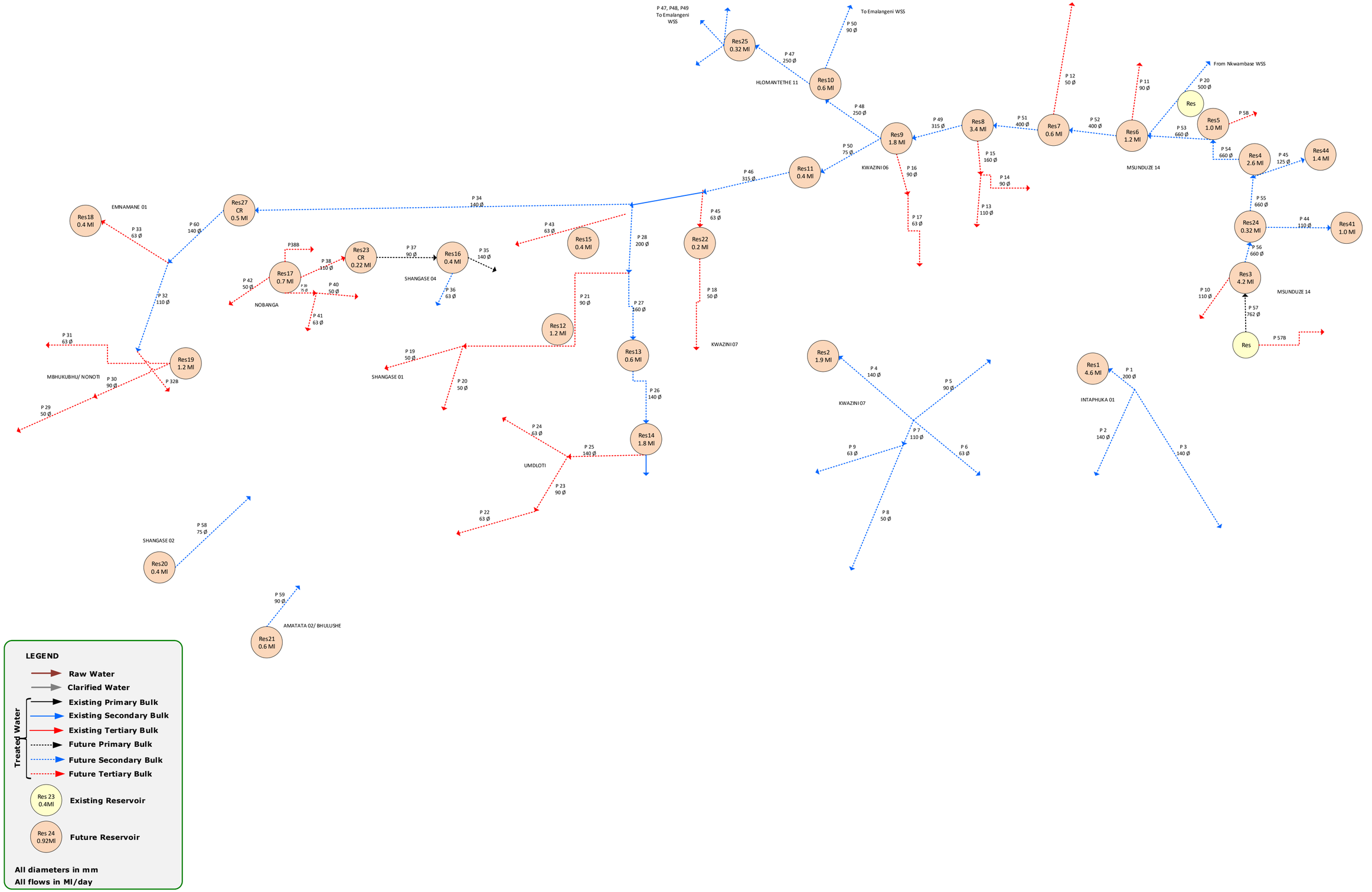


Figure 9-8

WSIA: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

This schematic illustrates ILE003 Emalangeni

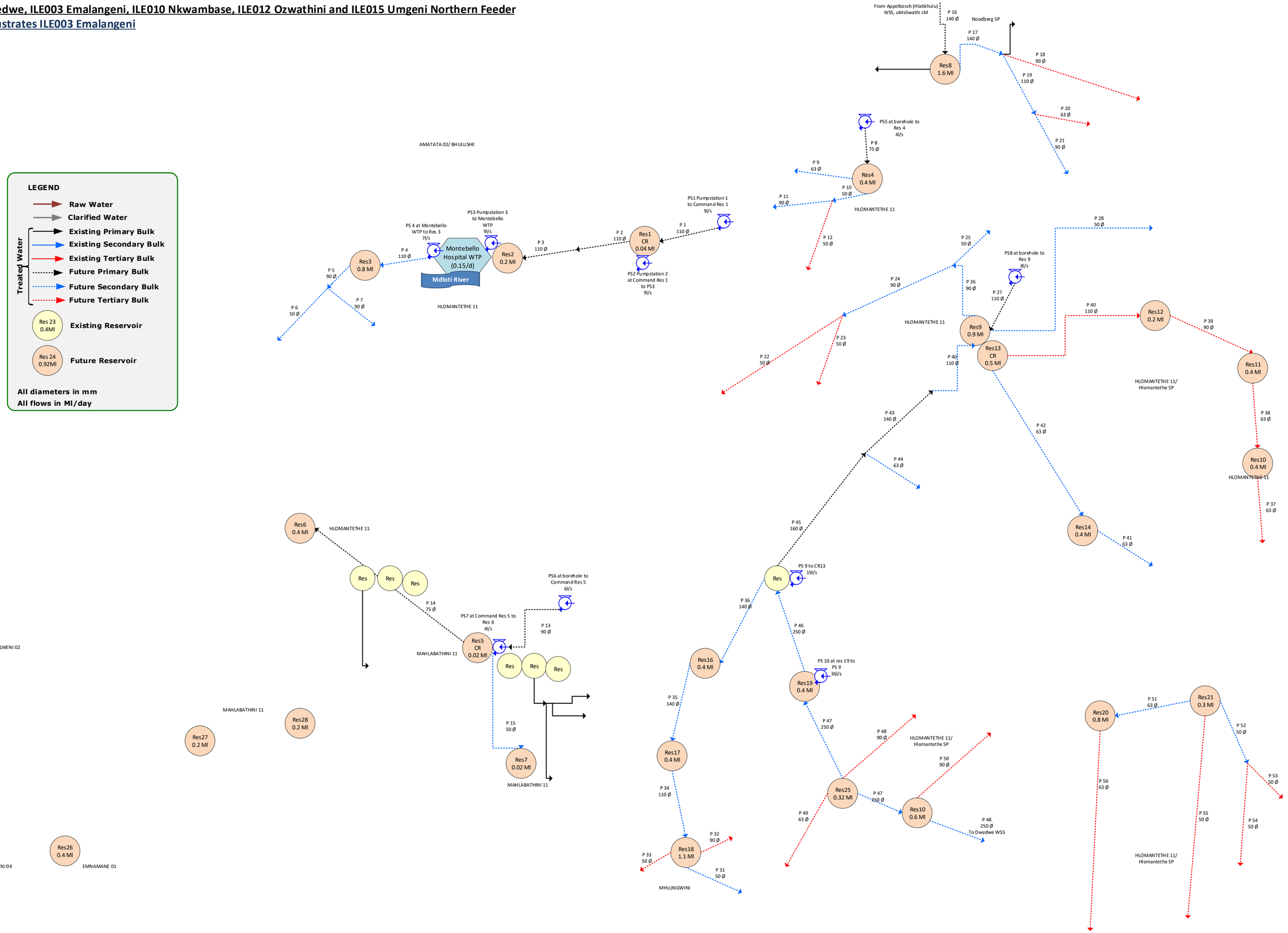


Figure 9-8 WSIA: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

This schematic illustrates ILE010 Nkwambase

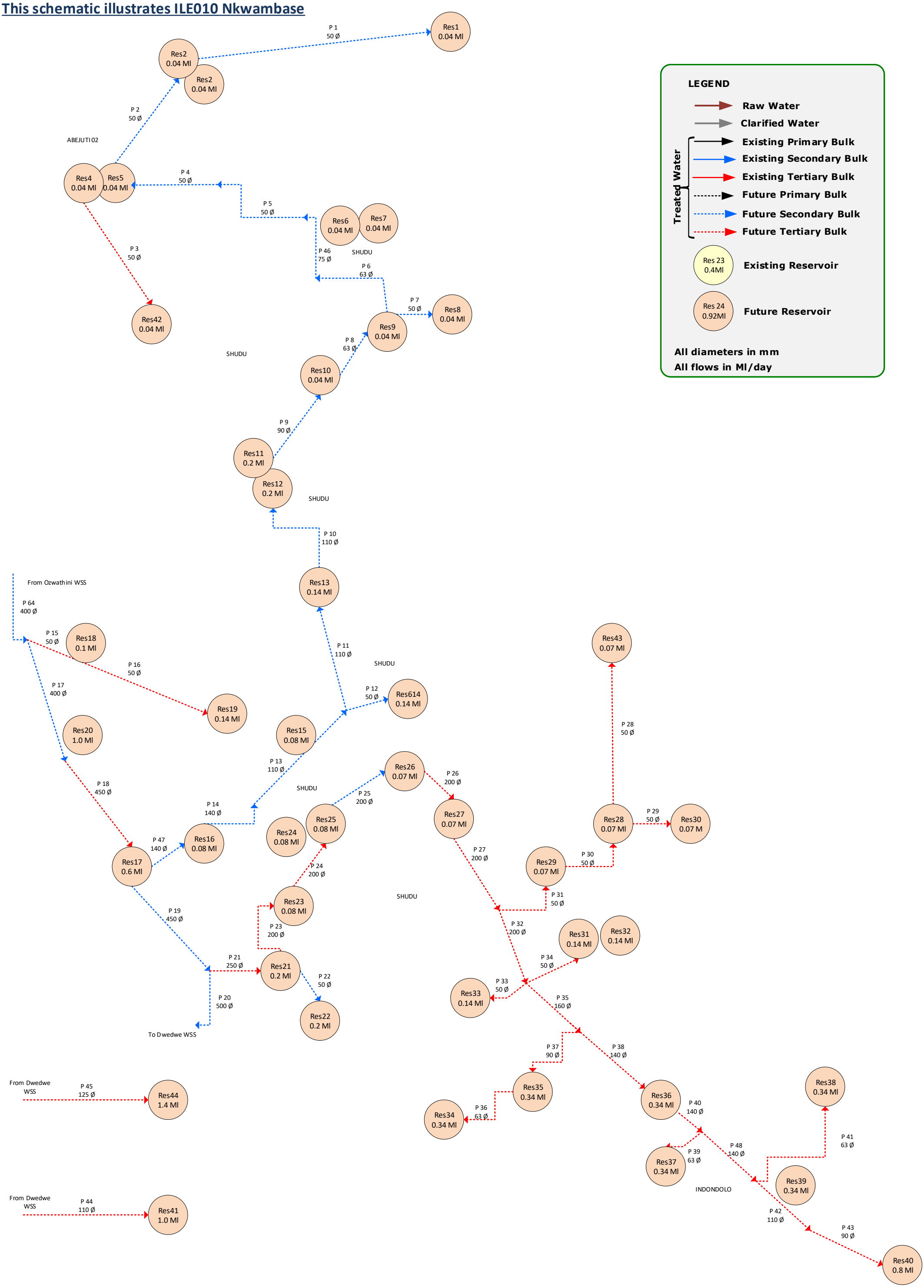


Figure 9-8 WSIA: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

This schematic illustrates ILE012 Ozwathini

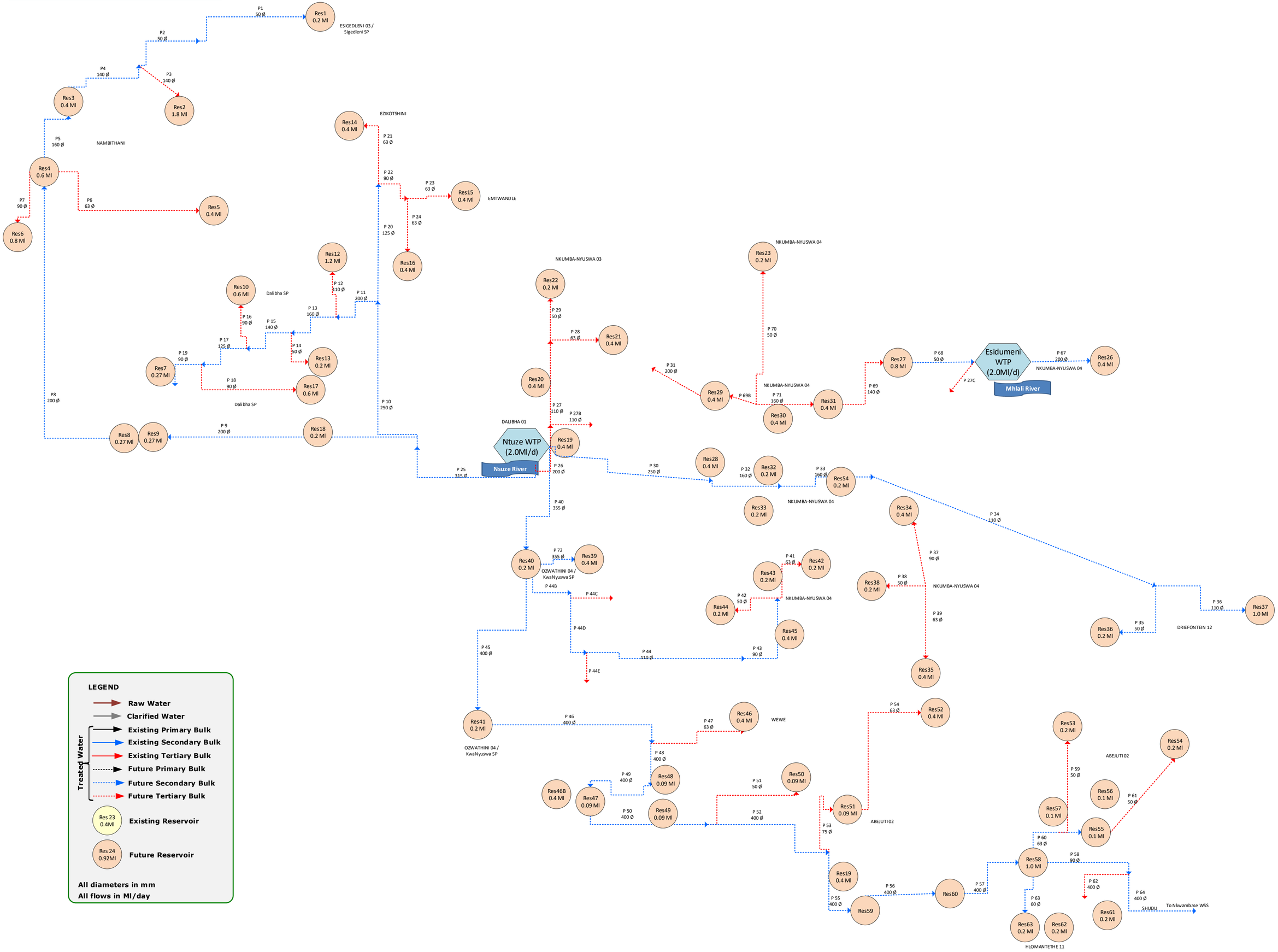
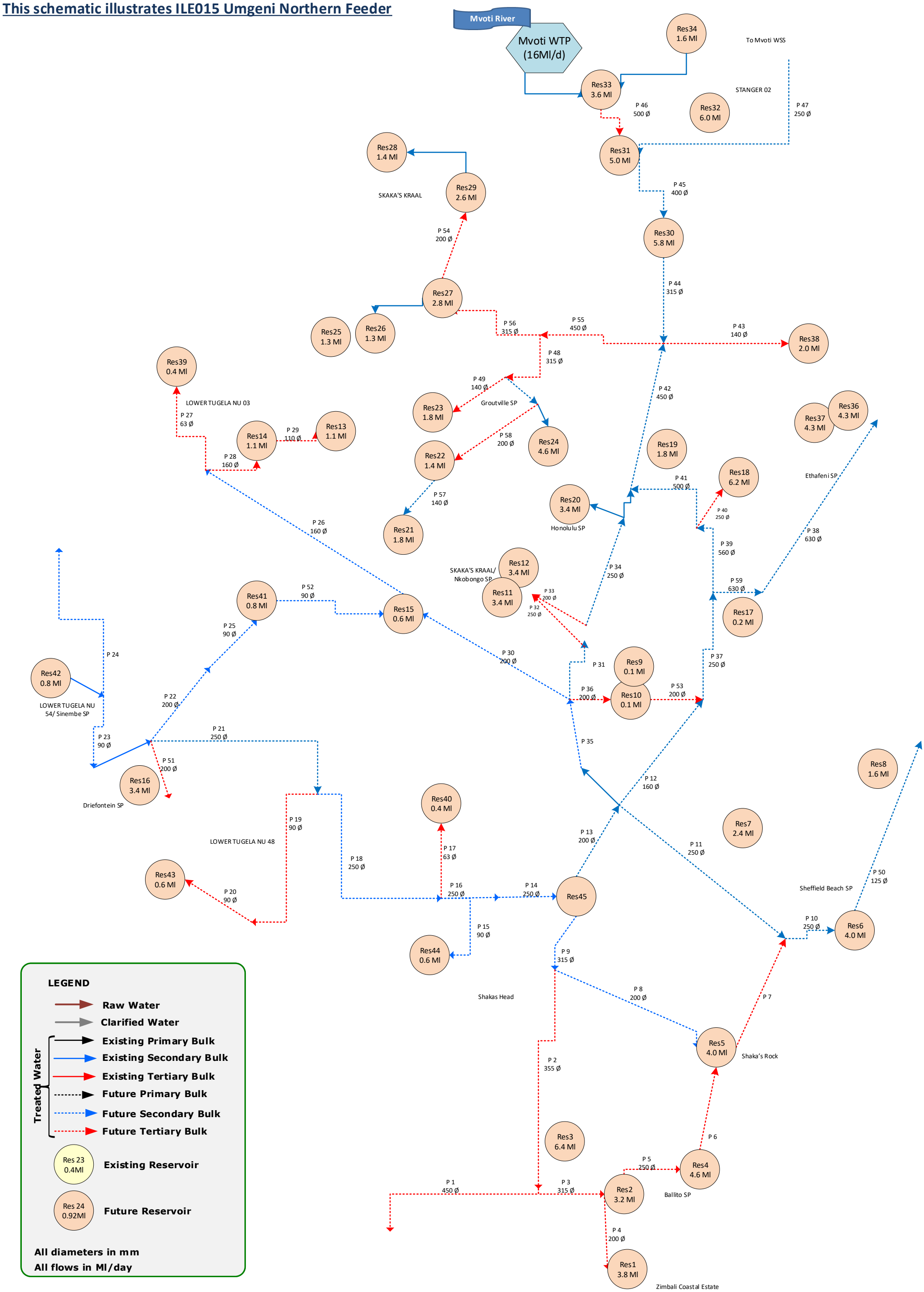


Figure 9-8 WSIA: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

This schematic illustrates ILE015 Umgeni Northern Feeder



9.5 From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

The areas to be served in future from the Lower Tugela WTP can be ring-fenced, to an extent, based on the existing scheme demarcation. In addition, the Lower Tugela WTP would also augment supply to the Umgeni Northern Feeder (by 23.8Mℓ/d) and Macambini (by 0.7Mℓ/d) scheme areas.

The planning from the UAP III can be considered as an alternative to the planning presented by Umgeni Water in their 2020 Infrastructure Master Plan, with specific reference to the uMshwathi Regional Bulk WSS.

9.5.1 Water Demand

The water demand for the Lower Tugela Bulk WSS (extended Darnall), Mvoti WSS (KwaDukuza-Stanger), Mandeni WSS, Maphumulo WSS, and Tugela South was determined for 2020 and 2050 and included within Table 9-7.

Table 9-7: Population and Water demand (Mℓ/day) 2020 and 2050

	Population 2020	**Population 2050**
Lower Tugela Bulk WSS (extended Darnall)	45 016	61 583
Mvoti WSS (KwaDukuza-Stanger)	58 531	80 070
Mandeni WSS	7 548	10 326
Maphumulo WSS	104 866	143 457
Tugela South	11 880	16 252
Total	**227 841**	**311 688**
	Demand 2020	**Demand 2050**
Lower Tugela Bulk WSS (extended Darnall)	10.19	14.76
Mvoti WSS (KwaDukuza-Stanger)	19.74	27.76
Mandeni WSS	2.61	3.62
Maphumulo WSS	18.72	26.94
Tugela South	1.93	3.78
Total	**53.19**	**76.86**

9.5.2 Water Resource Consideration

Water is abstracted from the Tugela River and treated at the Lower Tugela WTP. Currently the Mandeni WSS is supplied from the Sundumbili WTP which also abstracts from the Tugela River; a portion of the town KwaDukuza is supplied from the Mvoti WTP which abstracts from the Mvoti River; and the Maphumulo WSS is supplied from the Maphumulo WTP and the package plant, abstracting water from the iMvutshane Dam on the iMvutshane River.

There is no information available on the yield and available yield from the Tugela River where it is used as source for the Lower Tugela WTP.

The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority especially as it plays an important role in the Integrated Vaal River System by means of the Tugela-Vaal transfer scheme. It also influences the planning, prioritisation and sequencing of water resources development in the Tugela River catchment (upper) and the Lesotho Highlands Water Project.

The DWS has published the Reserve Determination of water resources for the Mvoti to Umzimkulu River catchments (Government Gazette No. 41970, 2018). At quaternary catchment U40H, which is the quaternary prior to U40J where the Mvoti WTP is located, the natural mean annual runoff is provided as 273.96 million m^3, and the total Ecological Water Requirement listed as 21.2% of mean annual runoff.

There are no major storage dams on the uMvoti and Nonoti Rivers and consequently there is limited available yield from this system. The full supply capacity of the iMvutshane Dam is 3.2 million m^3 and the stochastic yield is 2.4 million m^3/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

9.5.3 Water Supply Infrastructure

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

The scheme infrastructure upgrades and augmentation are discussed per scheme as to better illustrate the required infrastructure and upgrade requirements, ultimately served from the Lower Tugela WTP, Mvoti WTP and Maphumulo WTP and package plant.

ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

9.5.3.1 ILE001 Lower Tugela Bulk WSS (extended Darnall)

- ✓ The Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the WTP to 110Mℓ/d in due course. The costing component is allocated in the Mandeni WSS;
- ✓ The bulk distribution infrastructure would be extended to include three primary bulk pipes of diameter ranging between 110-160mm, totalling 2.21km in length, 65 secondary bulk pipes ranging in diameter of between 50-1060mm, totalling 112.69km in length and 37 tertiary bulk pipes ranging in diameter of between 50-965mm, totalling 54.67km in length;
- ✓ The existing storage should be increased by five primary reservoirs, having a total storage capacity of 54 251kl and 37 tertiary reservoirs, having a total storage capacity of 18 207.5kl; and
- ✓ There are no pump station planning proposals for this area.

9.5.3.2 ILE005 Mvoti WSS (KwaDukuza-Stanger)

- ✓ The Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the WTP to 110Mℓ/d in due course. The costing component is allocated in the Mandeni WSS;
- ✓ The bulk distribution infrastructure would be extended to include one primary bulk pipe of 200mm in diameter and 0.79km in length, 10 secondary bulk pipes ranging in diameter of between 63-660mm, totalling 9.97km in length and 14 tertiary bulk pipes ranging in diameter of between 90-315mm, totalling 12.11km in length;
- ✓ The existing storage should be increased by 20 tertiary reservoirs, having a total storage capacity of 53 540kl; and
- ✓ There are no pump station planning proposals for this area.

9.5.3.3 ILE006 Mandeni WSS

- ✓ The Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the WTP to 110Mℓ/d in due course;
- ✓ The bulk distribution infrastructure would be extended to include three primary bulk pipes ranging in diameter of between 88-315mm, totalling 2.49km in length, 9 secondary bulk pipes ranging in diameter of between 50-200mm, totalling 7.02km in length and 3 tertiary bulk pipes ranging in diameter of between 50-110mm, totalling 3.78km in length;
- ✓ The existing storage should be increased by one primary bulk reservoir having a total storage capacity of 2 220kl and 11 tertiary reservoirs, having a total storage capacity of 7 210kl; and
- ✓ There is one pump station proposed at the Lower Tugela WTP to serve the primary command reservoir Res1CR, requiring 65.78kW.

9.5.3.4 ILE007 Maphumulo WSS

- ✓ The Maphumulo WTP, Maphumulo Package Plant and Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the WTP to 110Mℓ/d in due course. The costing component is allocated in the Mandeni WSS. No further upgrades are proposed at the Maphumulo WTP,
- ✓ The bulk distribution infrastructure would be extended to include two primary bulk pipes ranging in diameter of between 110-400mm, totalling 7.52km in length, 83 secondary bulk pipes ranging in diameter of between 63-560mm, totalling 191.89km in length and 42 tertiary bulk pipes ranging in diameter of between 50-200mm, totalling 87.54km in length,
- ✓ The existing storage should be increased by two primary bulk reservoirs having a total storage capacity of 1 600kl and 98 tertiary reservoirs, having a total storage capacity of 53 540kl, and
- ✓ There are no pump station planning proposals for this area.

9.5.3.5 ILE014 Tugela South

- ✓ The Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the WTP to 110Mℓ/d in due course. The costing component is allocated in the Mandeni WSS;

- ✓ The bulk distribution infrastructure would be extended to include three primary bulk pipes ranging in diameter of between 90-1060mm, totalling 18.57km in length, 8 secondary bulk pipes ranging in diameter of between 50-250mm, totalling 7.51km in length and 12 tertiary bulk pipes ranging in diameter of between 75-110mm, totalling 5.60km in length;
- ✓ The existing storage should be increased by two primary bulk reservoirs having a total storage capacity of 55 510kl and three secondary reservoirs, having a total storage capacity of 7 800kl; and
- ✓ There is one pump station proposed requiring 57.96kW and one booster pump station at the water tower requiring 2.87kW.

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

9.5.4 Financial Requirements

The bulk cost requirement for the Lower Tugela Bulk WSS (extended Darnall), Mvoti WSS (KwaDukuza-Stanger), Mandeni WSS, Maphumulo WSS and Tugela South is provided within Table 9-8 below.

Table 9-8: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary			
Lower Tugela Bulk WSS (extended Darnall)	R271 049 500	R27 104 950	R298 154 450
Mvoti WSS (KwaDukuza-Stanger)	R4 753 000	R475 300	R5 228 300
Mandeni WSS	R27 381 000	R2 738 100	R30 119 100
Maphumulo WSS	R49 767 000	R4 976 700	R54 743 700
Tugela South	R516 920 000	R51 692 000	R568 612 000
Sub-Total	**R869 870 500**	**R86 987 050**	**R956 857 550**
Secondary			
Lower Tugela Bulk WSS (extended Darnall)	R995 423 000	R99 542 300	R1 094 965 300
Mvoti WSS (KwaDukuza-Stanger)	R38 083 000	R3 808 300	R41 891 300
Mandeni WSS	R3 801 000	R380 100	R4 181 100
Maphumulo WSS	R331 740 000	R33 174 000	R364 914 000
Tugela South	R39 086 000	R3 908 600	R42 994 600
Sub-Total	**R1 408 133 000**	**R140 813 300**	**R1 548 946 300**
Tertiary			
Lower Tugela Bulk WSS (extended Darnall)	R43 115 000	R4 311 500	R47 426 500
Mvoti WSS (KwaDukuza-Stanger)	R222 200 000	R22 220 000	R244 420 000
Mandeni WSS	R42 890 000	R4 289 000	R47 179 000
Maphumulo WSS	R273 180 000	R27 318 000	R300 498 000
Tugela South	R1 332 000	R133 200	R1 465 200
Sub-Total	**R582 717 000**	**R58 271 700**	**R640 988 700**
Total	**R2 860 720 500**	**R286 072 050**	**R3 146 792 550**

The total bulk cost requirement is R3 146.8 million (excl VAT). The scheme development cost per household is approximately R77 272.

The total bulk cost requirement for the Lower Tugela Bulk WSS (extended Darnall) scheme is R1 440 million (excl VAT); for the Mvoti WSS (KwaDukuza-Stanger) scheme it is R291.54 million (excl VAT), for the Mandeni scheme it is R81.48 million (excl VAT), for the Maphumulo scheme it is R720.16 million (excl VAT) and for the Tugela South scheme it is R613.07 million (excl VAT).

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 WTP / New
- 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)

N

Umzinyathi

Umvoti Local Municipality

Maphumulo Local Municipality

Ndwedwe Local Municipality

KwaDukuza Local Municipality

Mandeni Local Municipality

Ngcebo WSS

Maphumulo WSS

Ndulinde WSS

Sundumbili WSS

Maphumulo package plant

Maphumulo WTP

Esidumeni WTP

Sundumbili WTP

SAPPI WTP

Mandeni WTP (decommissioned)

Lower Tugela WTP

Mvoti WTP

Ntuze WTP

Montebello Hospital WTP

Ngcebo WTP

uMshwathi Regional BWSS

Lower Tugela Bulk WSS (extended Darnall)

Mvoti WSS (KwaDukuza-Stanger)

Umgeni Northern Feeder

ZINKWAZI BEACH

BLYTHEDALE BEACH

SHAKASKRAAL

TINLEY MANOR BEACH

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Legend

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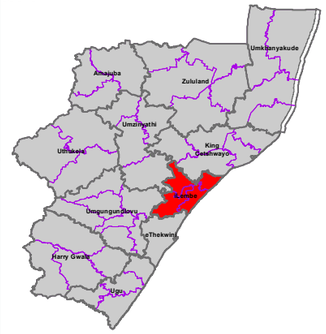

CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

MARISWE — IMPROVING LIVES ENGINEERING SOLUTIONS

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PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - Lower Tugela Bulk WSS, Mvoti WSS, Mandeni WSS, Maphumulo WSS, and Tugela South iLembe District Municipality

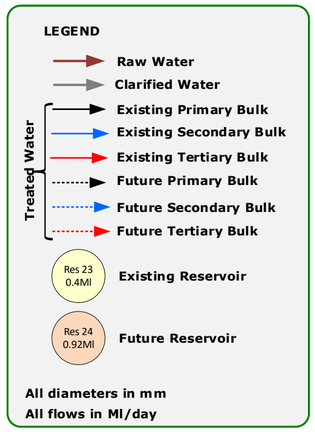
DATE COMPLETED: 21/11/2020

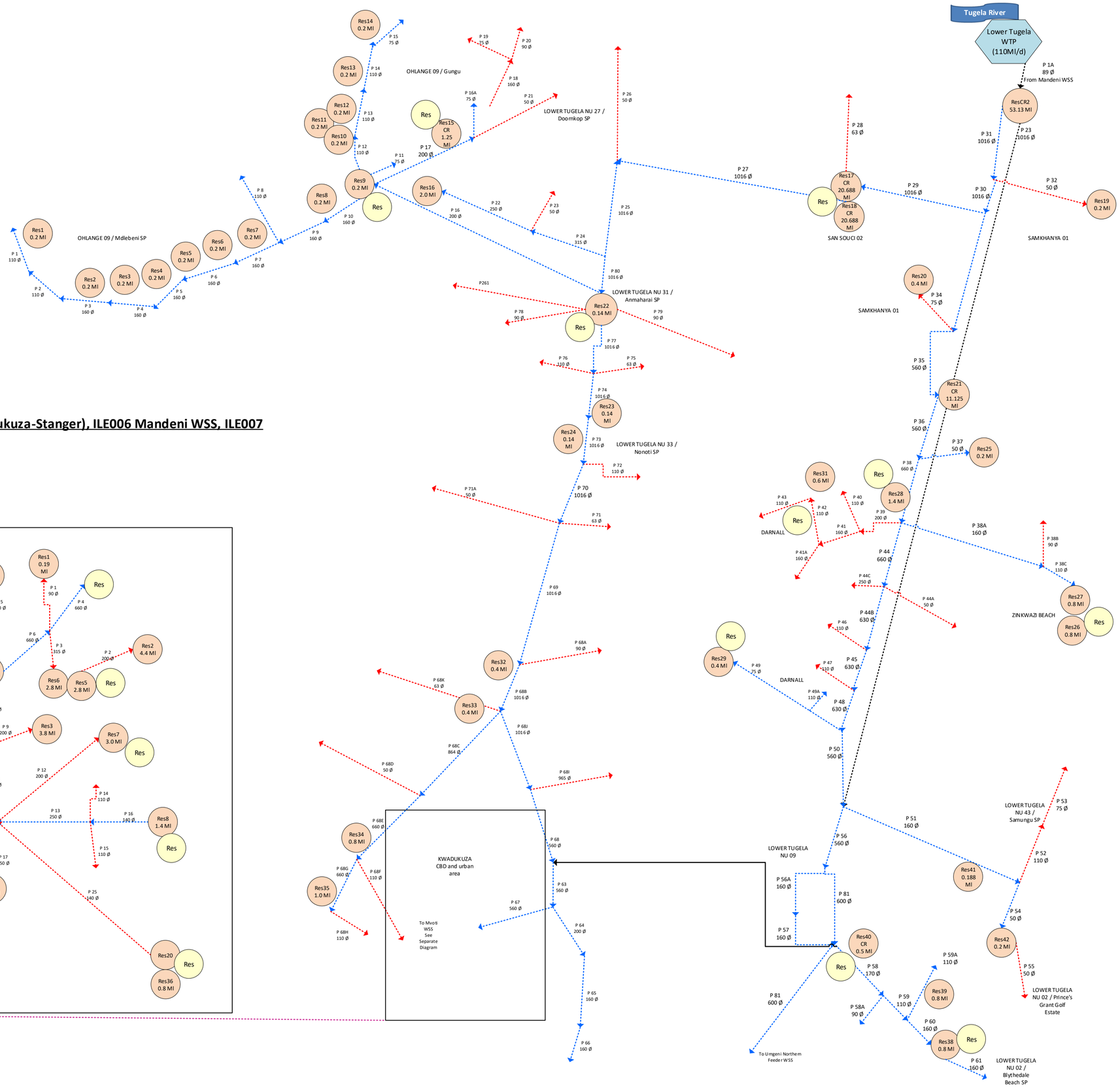
MAP NO.: **DC29: Figure 9.9**

Figure 9-10

WSIA: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

This schematic illustrates ILE001 Lower Tugela Bulk WSS (extended Darnall)





WSIA: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

This schematic illustrates ILE005 Mvoti WSS (KwaDukuza-Stanger)

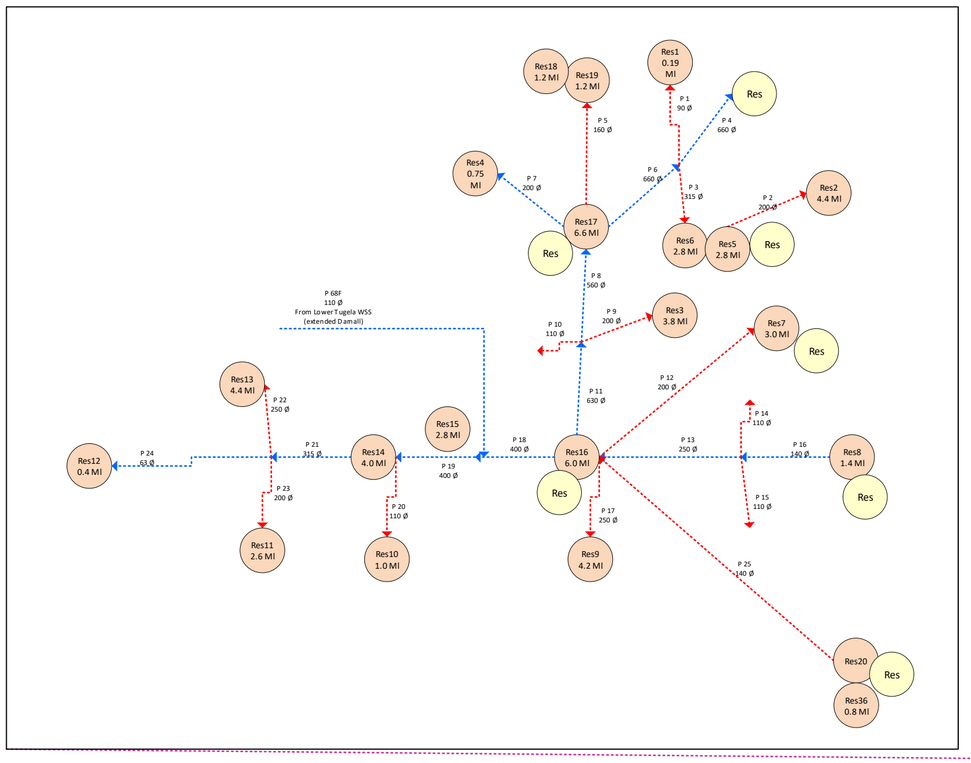


Figure 9-10

WSIA: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

This schematic illustrates ILE006 Mandeni WSS

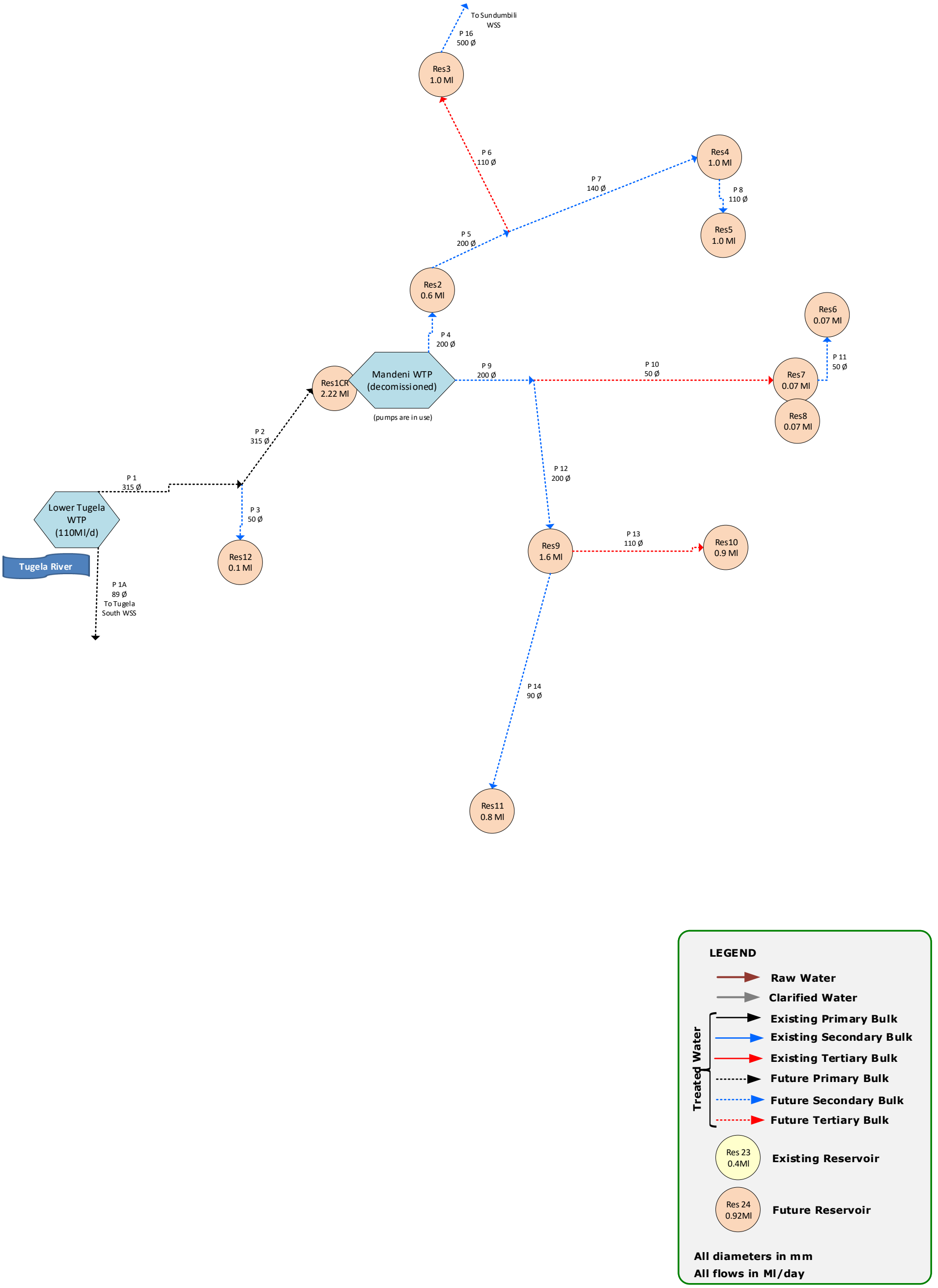


Figure 9-10

WSIA: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

This schematic illustrates ILE007 Maphumulo WSS

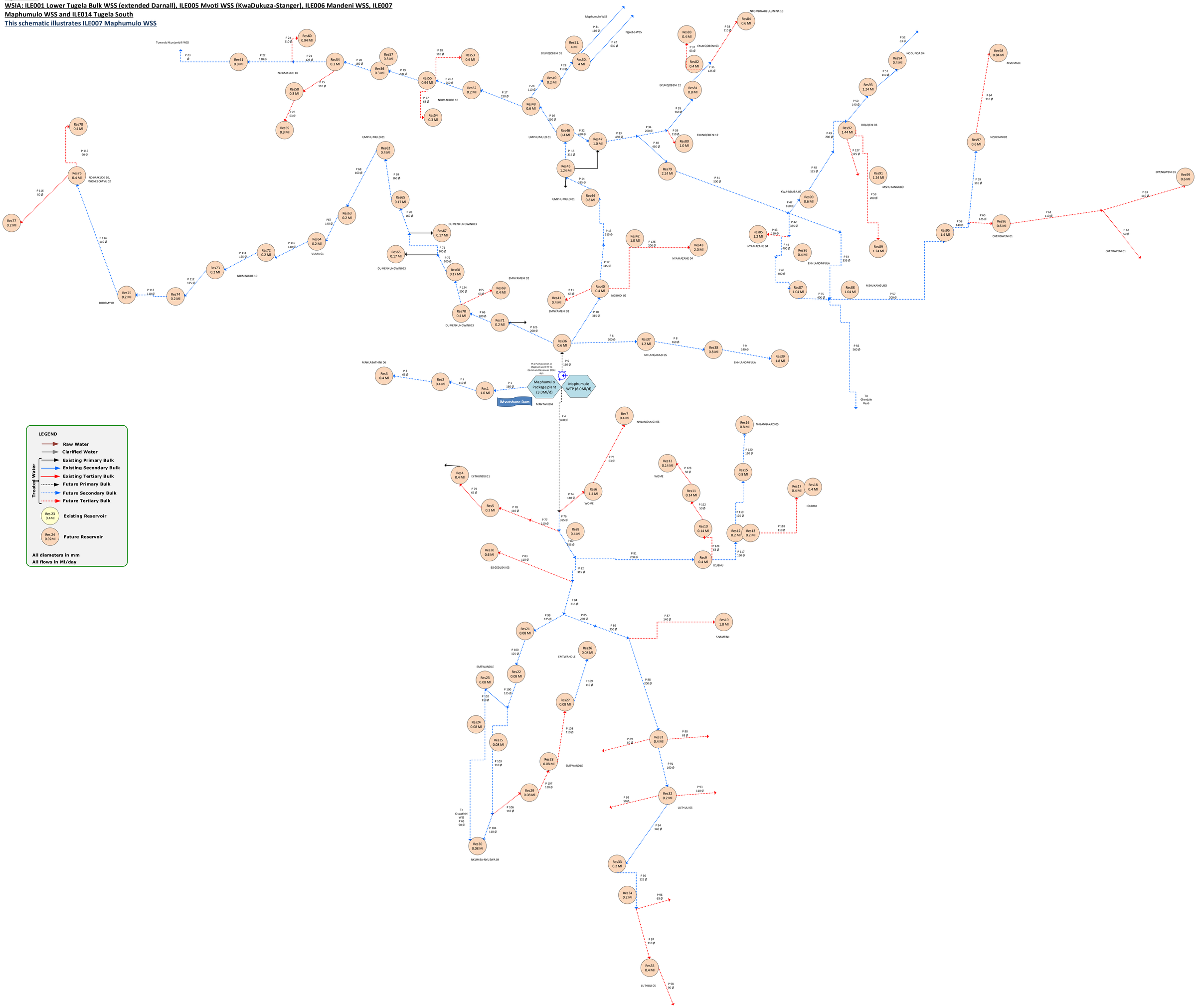
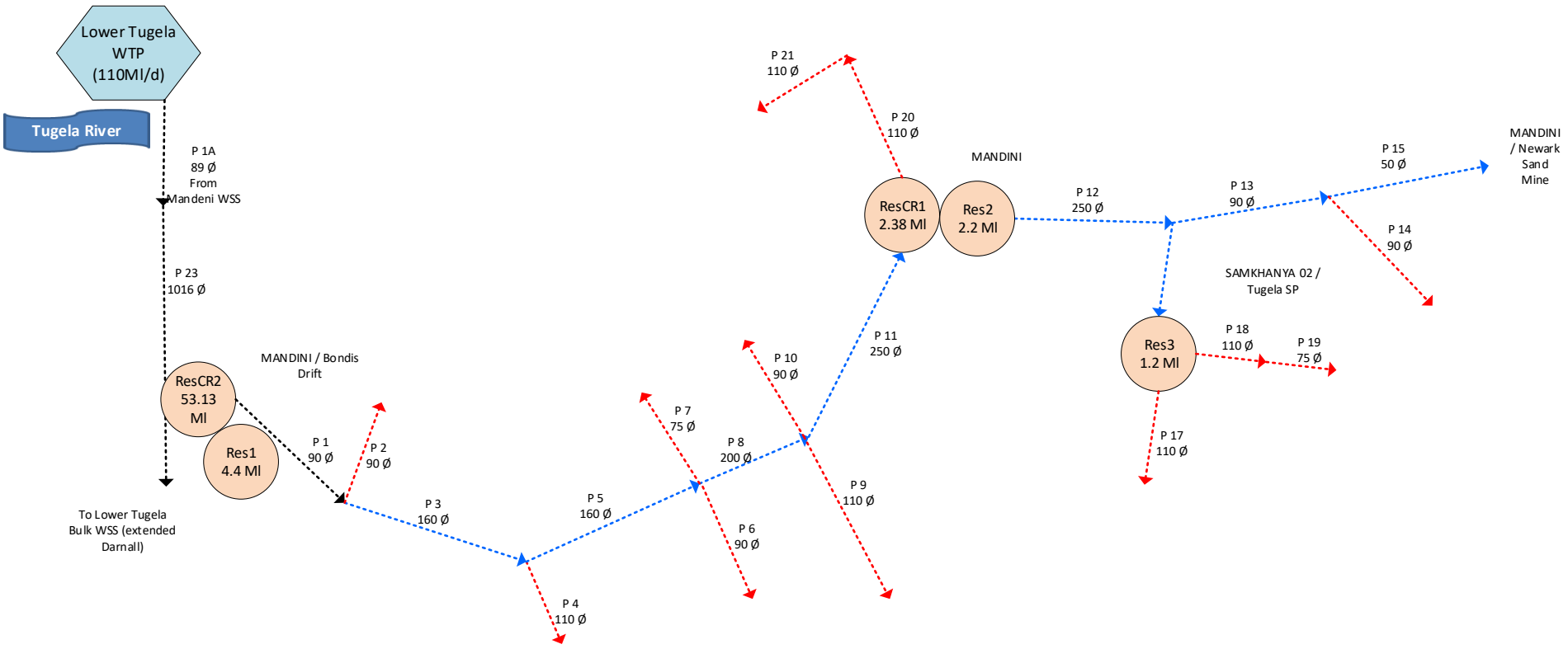
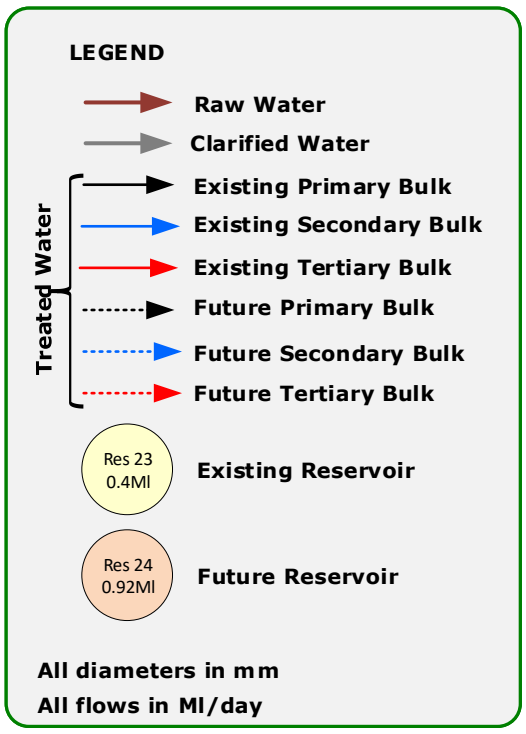


Figure 9-10

WSIA: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

This schematic illustrates ILE014 Tugela South





9.6 ILE004 GLENDALE

9.6.1 Water Demand

The water demand for the Glendale WSS was determined for 2020 and 2050 and included within Table 9-9.

Table 9-9: Population and Water demand (Mℓ/day) 2020 and 2050

Population	**Population 2020**	**Population 2050**
	9 499	12 995
Water Demand	**Demand 2020**	**Demand 2050**
	1.71	2.5

9.6.2 Water Resource Consideration

The Glendale area is supplied from the Maphumulo WTP and package plant, which abstracts from the iMvutshane Dam on the iMvutshane River. The full supply capacity of the iMvutshane Dam is 3.2 million m³ and the stochastic yield is 2.4 million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

9.6.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Glendale WSS and are illustrated within Figure 9-11 overleaf followed by the schematic layout of the WSIA within Figure 9-12.

- ✓ No further upgrades are proposed at the Maphumulo WTP. However, the Maphumulo scheme is proposed to be augmented (by 17.9Mℓ/d) from the Lower Tugela WTP that can be upgraded to 110Mℓ/d;
- ✓ The bulk distribution infrastructure would be extended to include 6 secondary bulk pipes ranging in diameter of between 63-110mm, totalling 15.31km in length and 6 tertiary bulk pipes ranging in diameter of between 50-90mm, totalling 6.04km in length;
- ✓ The existing storage should be increased by nine tertiary reservoirs, having a total storage capacity of 6 000kl; and
- ✓ There are no pump station planning proposals for this area.

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

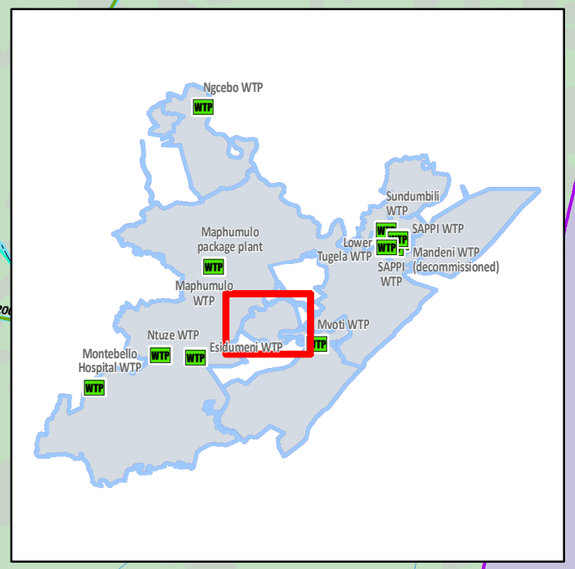
9.6.4 *Financial Requirements*

The bulk cost requirement for the Glendale WSS is provided within Table 9-10 below.

Table 9-10: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R0	R0	R0
Secondary	R2 438 000	R243 800	R2 681 800
Tertiary	R36 941 000	R3 694 100	R40 635 100
Total	**R39 379 000**	**R3 937 900**	**R43 316 900**

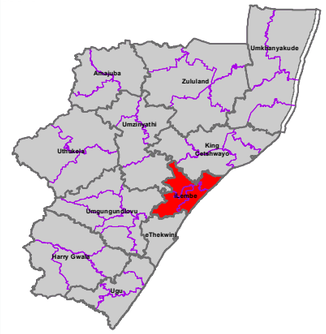
The total bulk cost requirement is R43.3 million (excl VAT). The scheme development cost per household is approximately R16 582.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Water Concession Area
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (Eshowe)

LOCALITY:



Proposed New / Upgrade Infrafrastructure

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

CLIENT: UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY: ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - Glendale WSS
iLembe District Municipality

DATE COMPLETED: 21/11/2020

MAP NO.: **DC29: Figure 9.11**

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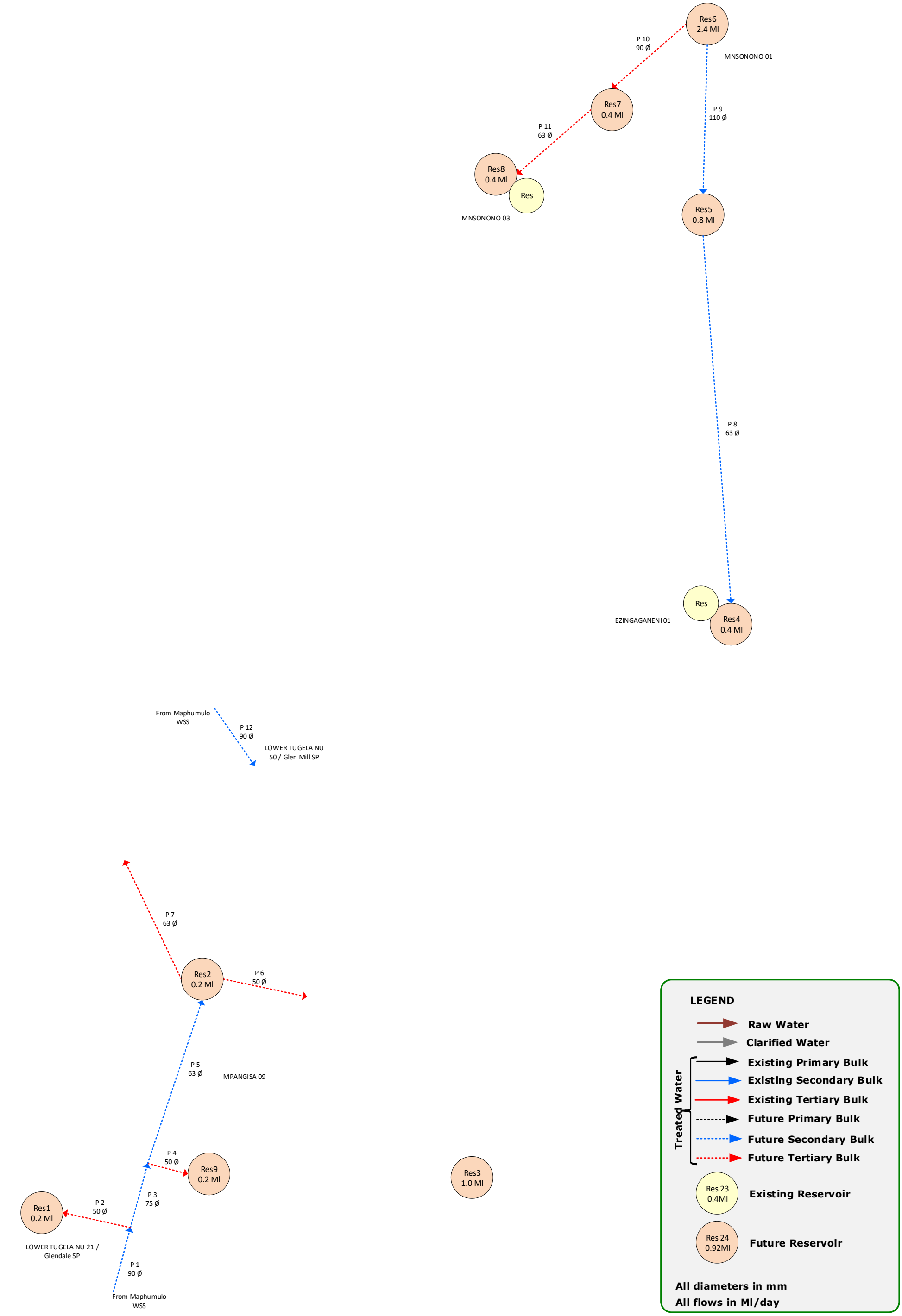
Figure 9-12
WSIA: ILE004 Glendale



9.7 ILE011 NTUNJAMBILI

9.7.1 Water Demand

The water demand for the Ntunjambili WSS was determined for 2020 and 2050 and included within Table 9-11Table 9-9.

Table 9-11: Population and Water demand (Mℓ/day) 2020 and 2050

Population	**Population 2020**	**Population 2050**
	8 708	11 913
Water Demand	**Demand 2020**	**Demand 2050**
	1.66	2.37

9.7.2 Water Resource Consideration

Some of the Ntunjambili areas are supplied from the Maphumulo WTP, else local surface and groundwater sources are used. It is planned to supply the area in future from the Maphumulo WTP and package plant, which abstracts from the iMvutshane Dam on the iMvutshane River. The full supply capacity of the iMvutshane Dam is 3.2 million m³ and the stochastic yield is 2.4 million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

9.7.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Glendale WSS and are illustrated within Figure 9-13 overleaf followed by the schematic layout of the WSIA within Figure 9-14.

- ✓ No further upgrades are proposed at the Maphumulo WTP. However, the Maphumulo scheme is proposed to be augmented (by 17.9Mℓ/d) from the Lower Tugela WTP that can be upgraded to 110Mℓ/d;
- ✓ The bulk distribution infrastructure would be extended to include one primary bulk pipe of 250mm in diameter and total length of 3.93km, 10 secondary bulk pipes ranging in diameter of between 90-200mm, totalling 10.79km in length and 10 tertiary bulk pipes ranging in diameter of between 50-160mm, totalling 7.90km in length;
- ✓ The existing storage should be increased by one primary bulk reservoir having a total storage capacity of 5 000kl and three secondary reservoirs, having a total storage capacity of 3 600kl;
- ✓ There are no pump station planning proposals for this area.

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

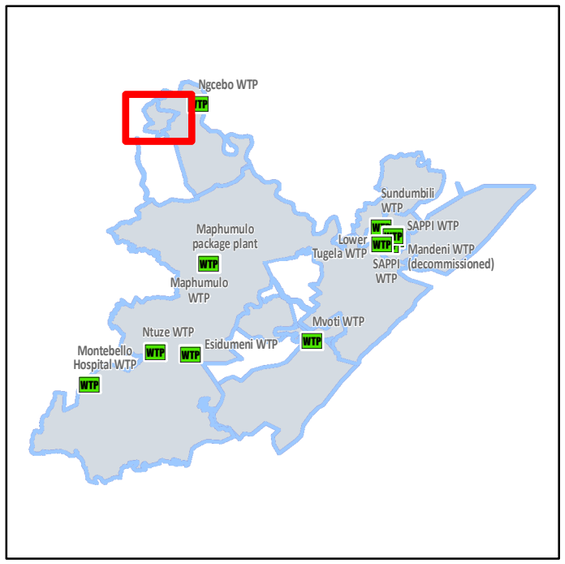
9.7.4 Financial Requirements

The bulk cost requirement for the Ntunjambili WSS is provided within Table 9-12 below.

Table 9-12: Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R23 770 000	R2 377 000	R26 147 000
Secondary	R22 897 000	R2 289 700	R25 186 700
Tertiary	R1 538 000	R153 800	R1 691 800
Total	**R48 205 000**	**R4 820 500**	**R53 025 500**

The total bulk cost requirement is R53.03 million (excl VAT). The scheme development cost per household is approximately R22 143.



U m z i n y a t h i

Umvoti Local Municipality

Maphumulo Local Municipality

Ntunjambili

Mandeni

ESHIKISHINI 02

NTUNJAMBILI 11

WOSIYANE 09

VUMBU 03

KWAMAPUMULU 03

Ngcebo WSS

Maphumulo WSS

Cubhu

110 110 110 125 63 90 90 110 200 125 63 63 160 63 90 125 125 110 63 90 63 50 250 400KI 400KI 400KI 400KI 110 125

N

1.5 0.75 0 1.5 Kilometers

Legend

- Provinical Boundaries
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- Water Concession Area
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- Dams & Dam Names
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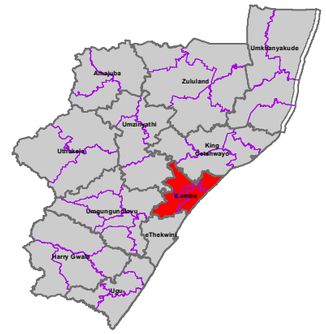
- Eshowe — Major Towns

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 WTP / New
- 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)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ILEMBE DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

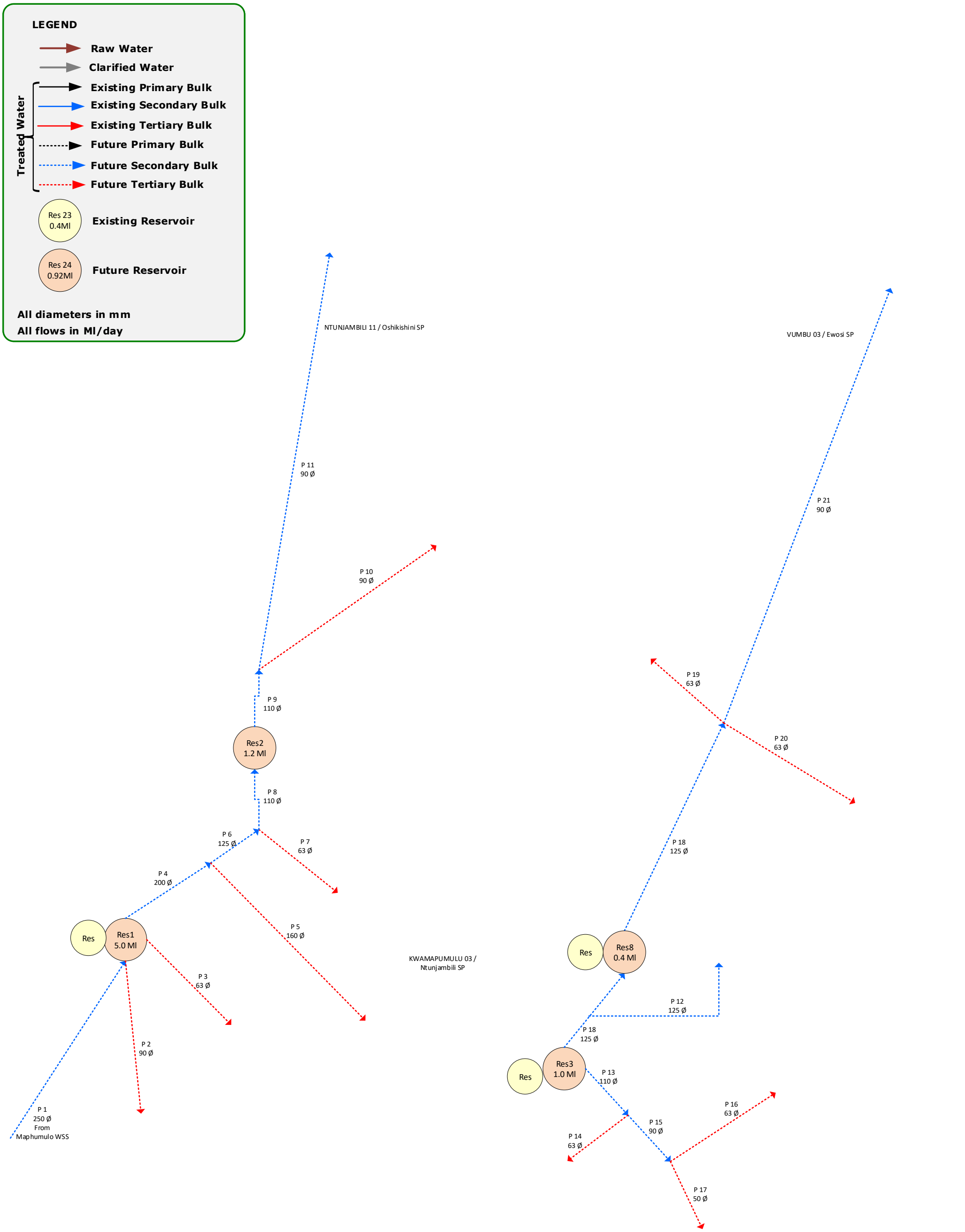
MAP TITLE:

Total Bulk Water Supply Interventions - Ntunjambili WSS iLembe District Municipality

DATE COMPLETED: 21/11/2020

MAP NO.: **DC29: Figure 9.13**

Figure 9-14
WSIA: ILE011 Ntunjambili



9.8 ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS

From discussions with Umgeni Water during October 2020, it was requested to develop a scenario to utilise the existing planning from Umgeni Water, to supply the areas in the west of the IDM. The scheme areas of the Ndwedwe and Maphumulo LMs are affected and are further elaborated on below.

The planning from the UAP III can be considered as an alternative to the planning presented by Umgeni Water in their 2020 Infrastructure Master Plan, with specific reference to the uMshwathi Regional Bulk WSS.

9.8.1 Water Demand

The water demand for the Dwedwe, Emalangeni, Lower Tugela Bulk WSS (extended Darnall), Maphumulo WSS, Nkwambase, Ozwathini, and was determined for 2020 and 2050 and included within Table 9-13.

Table 9-13: Population and Water demand (Mℓ/day) 2020 and 2050

	Population 2020	Population 2050
Dwedwe	53 617	73 348
Emalangeni	25 110	34 350
Lower Tugela Bulk WSS (extended Darnall)	45 016	61 583
Maphumulo WSS	104 866	143 457
Nkwambase	19 018	26 016
Ozwathini	47 595	65 110
Total	**295 222**	**403 864**
	Demand 2020	**Demand 2050**
Dwedwe	7.81	13.66
Emalangeni	3.47	5.97
Lower Tugela Bulk WSS (extended Darnall)	10.19	14.76
Maphumulo WSS	18.72	26.94
Nkwambase	3.24	4.81
Ozwathini	6.48	11.03
Total	**49.91**	**77.17**

9.8.2 Water Resource Consideration

Water is abstracted from the Tugela River and treated at the Lower Tugela WTP. Currently the Lower Tugela WTP provides water to the urban area of KwaDukuza but in this scenario water will also be provided to the Umgeni Northern Feeder scheme area and the Maphumulo WSS. The Maphumulo WSS is supplied from the Maphumulo WTP and the package plant, abstracting water from the iMvutshane Dam on the iMvutshane River. The Ntuze WTP abstracts water from the Nsuze River, a tributary of the Mvoti River.

The D.V. Harris WTP of the uMshwathi Regional Bulk WSS is supplied from the Midmar Dam, which as has a full supply capacity of 235.414million m³ and stochastic yield (1:100 year) of 183million m³/a. The Midmar Dam also supplies the Midmar WTP which is part of the Upper Mgeni System.

There is no information available on the yield and available yield from the Tugela River where it is used as source for the Lower Tugela WTP.

The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority especially as it plays an important role in the Integrated Vaal River System by means of the Tugela-Vaal transfer scheme. It also influences the planning, prioritisation and sequencing of water resources development in the Tugela River catchment (upper) and the Lesotho Highlands Water Project.

The DWS has published the Reserve Determination of water resources for the Mvoti to Umzimkulu River catchments (Government Gazette No. 41970, 2018). At quaternary catchment U40H, which is the quaternary prior to U40J where the Mvoti WTP is located, the natural mean annual runoff is provided as 273.96 million m³, and the total Ecological Water Requirement listed as 21.2% of mean annual runoff.

There are no major storage dams on the uMvoti and Nonoti Rivers and consequently there is limited available yield from this system. The full supply capacity of the iMvutshane Dam is 3.2 million m³ and the stochastic yield is 2.4 million m³/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

The net Full Supply Capacity of the Hazelmere dam is 35.28 million m³. The DWS is implementing a project to raise the dam wall and as such the impoundment of the dam is currently 21 million m³. The stochastic yield of the dam is 20 million m³/annum based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2020).

9.8.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the scheme areas and are illustrated within Figure 9-15 followed by the schematic layout of the WSIA within Figure 9-16, for the three schemes reviewed and amended under this scenario: Lower Tugela Bulk WSS (extended Darnall), Maphumulo WSS and Ozwathini. The schematic layout for Dwedwe, Emalangeni and Nkwambase stays the same as under the UAP Phase III planning presented in earlier sections.

The scheme infrastructure upgrades and augmentation are discussed per scheme as to better illustrate the required infrastructure and upgrade requirements.

9.8.3.1 ILE002 Dwedwe

The planning under UAP Phase III, remains applicable for this WSS.

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further;

- ✓ The bulk distribution infrastructure would be extended to include four primary bulk pipes of diameter ranging between 90-140mm, totalling 7.79km in length, 29 secondary bulk pipes ranging in diameter of between 50-762mm, totalling 65.27km in length and 31 tertiary bulk pipes ranging in diameter of between 50-160mm, totalling 52.84km in length;
- ✓ The existing storage should be increased by two primary reservoirs, having a total storage capacity of 720kl and 24 tertiary reservoirs, having a total storage capacity of 30 840kl; and
- ✓ There are eight pump stations proposed to supply reservoirs, requiring between 7.31kW and 183.75kW and totalling 577.40kW.

9.8.3.2 ILE003 Emalangeni

The planning under UAP Phase III, remains applicable for this WSS.

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further;
- ✓ The bulk distribution infrastructure would be extended to include 11 primary bulk pipes of diameter ranging between 75-160mm, totalling 13.95km in length, 27 secondary bulk pipes ranging in diameter of between 50-250mm, totalling 41.80km in length and 18 tertiary bulk pipes ranging in diameter of between 50-110mm, totalling 35.28km in length;
- ✓ The existing storage should be increased by five primary reservoirs, having a total storage capacity of 1 760kl and 23 tertiary reservoirs, having a total storage capacity of 10 300kl; and
- ✓ There are 10 pump stations proposed to supply reservoirs, requiring between 0.51kW and 78.31kW and totalling 203.56kW.

9.8.3.3 ILE001 Lower Tugela Bulk WSS (extended Darnall) (uMshwathi scenario)

The planning under UAP Phase III, was reviewed for this scenario, most notably the bulk water pipes' sizing, reservoir sizing and with the addition of a pump station. Furthermore, for the purpose of this option, the upgrade to the Lower Tugela WTP was costed in the Lower Tugela Bulk WSS (extended Darnall) WSS.

- ✓ The Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the WTP to 110Mℓ/d in due course;
- ✓ The bulk distribution infrastructure would be extended to include three primary bulk pipes of diameter ranging between 110-160mm, totalling 1.31km in length, 65 secondary bulk pipes ranging in diameter of between 50-1060mm, totalling 125.86km in length and 37 tertiary bulk pipes ranging in diameter of between 50-965mm, totalling 54.57km in length;
- ✓ The existing storage should be increased by five primary reservoirs, having a total storage capacity of 54 251kl and 37 tertiary reservoirs, having a total storage capacity of 18 207.5kl; and
- ✓ There is one pump station proposed north of the existing Mvoti WTP to link the Lower Tugela Bulk WSS (extended Darnall) WSS to the Maphumulo WSS, requiring 790kW.

9.8.3.4 ILE007 Maphumulo WSS (uMshwathi scenario)

The planning under UAP Phase III, was reviewed for this scenario, most notably the bulk water pipes' sizing, reservoir sizing and with the upgrade of the Maphumulo WTP. This scheme will further be augmented from the uMshwathi Regional Bulk WSS and Lower Tugela Bulk WSS (extended Darnall) WSS via the Lower Tugela WTP.

- ✓ The Maphumulo WTP, Maphumulo Package Plant and Lower Tugela WTP provides water to this area. Umgeni Water has made provision for the upgrading of the Lower Tugela WTP to 110Mℓ/d in due course. The costing component for the Lower Tugela WTP upgrade is allocated in the Lower Tugela Bulk WSS (extended Darnall) WSS for this scenario. An upgrade to 12Mℓ/d of the Maphumulo WTP is proposed whereby the Maphumulo package plant will be put on standby;
- ✓ The bulk distribution infrastructure would be extended to include two primary bulk pipes ranging in diameter of between 110-400mm, totalling 7.52km in length, 83 secondary bulk pipes ranging in diameter of between 63-400mm, totalling 191.65km in length and 42 tertiary bulk pipes ranging in diameter of between 50-355mm, totalling 87.78km in length;
- ✓ The existing storage should be increased by three primary bulk reservoirs having a total storage capacity of 3 600kl and 97 tertiary reservoirs, having a total storage capacity of 53 240kl, and
- ✓ There is one pump station proposed at Maphumulo WTP to Command Reservoir (R36), requiring 60kW.

9.8.3.5 ILE010 Nkwambase

The planning under UAP Phase III, remains applicable for this WSS.

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further;
- ✓ The bulk distribution infrastructure would be extended to include 20 secondary bulk pipes ranging in diameter of between 50-500mm, totalling 21.78km in length and 28 tertiary bulk pipes ranging in diameter of between 50-450mm, totalling 26.55km in length;
- ✓ The existing storage should be increased by 44 tertiary reservoirs, having a total storage capacity of 10 000kl; and
- ✓ There are no pump station planning proposals for this area.

9.8.3.6 ILE012 Ozwathini (uMshwathi scenario)

The planning under UAP Phase III, was reviewed for this scenario, most notably the bulk water pipes' sizing and reservoir sizing. The Ozwathini WSS, under this scenario, will be augmented from the uMshwathi Regional Bulk WSS.

- ✓ The Hazelmere WTP provides water to this area. Umgeni Water indicated that the WTP will not be upgraded further,
- ✓ The bulk distribution infrastructure would be extended to include 44 secondary bulk pipes ranging in diameter of between 50-560mm, totalling 105.36km in length and 37 tertiary bulk pipes ranging in diameter of between 50-560mm, totalling 61.30km in length,

- ✓ The existing storage should be increased by three secondary reservoirs having a total storage capacity of 580kl and 62 tertiary reservoirs, having a total storage capacity of 22 260kl; and.
- ✓ There are no pump station planning proposals for this area.

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

9.8.4 Financial Requirements

The bulk cost requirement for the Dwedwe, Emalangeni, Lower Tugela Bulk WSS (extended Darnall), Maphumulo, Nkwambase, Ozwathini is provided within Table 9-14 below.

Table 9-14: Cost Requirement

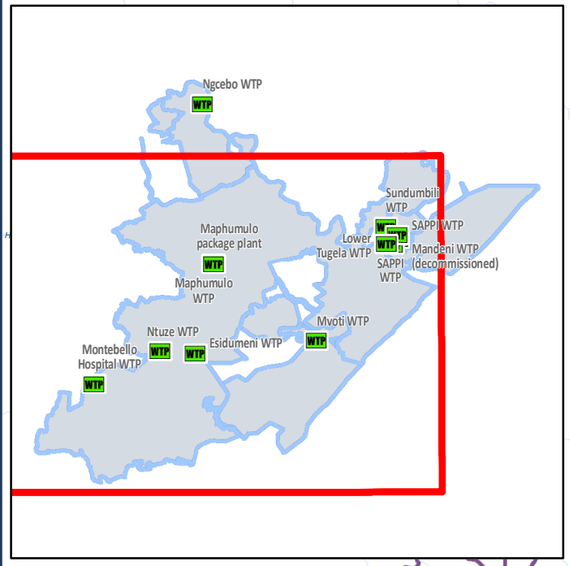
	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary			
Dwedwe	R84 338 000	R8 433 800	R92 771 800
Emalangeni	R92 760 850	R9 276 085	R102 036 935
uMshwathi-Lower Tugela Bulk WSS (extended Darnall)	R312 965 500	R31 296 550	R344 262 050
uMshwathi-Maphumulo WSS	R61 701 000	R6 170 100	R67 871 100
Nkwambase	R21 000 000	R2 100 000	R23 100 000
uMshwathi-Ozwathini	R0	R0	R0
Sub-Total	**R572 765 350**	**R57 276 535**	**R630 041 885**
Secondary			
Dwedwe	R139 011 000	R13 901 100	R152 912 100
Emalangeni	R14 602 000	R1 460 200	R16 062 200
uMshwathi-Lower Tugela Bulk WSS (extended Darnall)	R1 064 807 000	R106 480 700	R1 171 287 700
uMshwathi-Maphumulo WSS	R201 196 000	R20 119 600	R221 315 600
Nkwambase	R36 428 000	R3 642 800	R40 070 800
uMshwathi-Ozwathini	R209 952 000	R20 995 200	R230 947 200
Sub-Total	**R1 665 996 000**	**R166 599 600**	**R1 832 595 600**
Tertiary			
Dwedwe	R160 787 000	R16 078 700	R176 865 700
Emalangeni	R77 478 000	R7 747 800	R85 225 800
uMshwathi-Lower Tugela Bulk WSS (extended Darnall)	R33 248 000	R3 324 800	R36 572 800
uMshwathi-Maphumulo WSS	R275 618 000	R27 561 800	R303 179 800
Nkwambase	R96 294 000	R9 629 400	R105 923 400

uMshwathi-Ozwathini	R205 698 000	R20 569 800	R226 267 800
Sub-Total	**R849 123 000**	**R84 912 300**	**R934 035 300**
Total	**R3 087 884 350**	**R308 788 435**	**R3 396 672 785**

The total bulk cost requirement is R3 396.67 million (excl VAT). The scheme development cost per household is approximately R43 930.

The total bulk cost requirement for the Dwedwe scheme is R422.5 million (excl VAT); for the Emalangeni scheme it is R203.3 million (excl VAT) and for the Nkwambase scheme it is R169.1 million (excl VAT).

Then for the schemes reviewed for this scenario, the total bulk cost requirement for the Lower Tugela Bulk WSS (extended Darnall) scheme becomes R1 552 million (excl VAT), the Maphumulo WSS becomes R592.366 million (excl VAT) and the Ozwathini scheme becomes R457.2 million (excl VAT).



King Cetshwayo

uMlalazi Local Municipality

Maphumulo Local Municipality

Maphumulo WSS

Maphumulo package plant

Maphumulo WTP

Ngcebo WSS

Ndulinde WSS

Sundumbili WTP

Sundumbili WSS

SAPPI WTP

Mandeni WTP (decommissioned)

Macambini

Lower Tugela WTP

Mandeni WTP (decommissioned)

SAPPI WTP

Tugela South

Mandeni Local Municipality

Lower Tugela Bulk WSS (extended Darnall)

KwaDukuza Local Municipality

Mvoti WTP

Mvoti WSS (KwaDukuza-Stanger)

ZINKWAZI BEACH

GLEDHOW

BLYTHEDALE BEACH

Ndwedwe Local Municipality

Esidumeni WTP

Ntuze WTP

Montebello Hospital WTP

Emalangeni

Nkwambase

MONA

Dwedwe

uMshwathi Regional BWSS

Umgeni Northern Feeder

SHAKASKRAAL

TINLEY MANOR BEACH

SALT ROCK

SHAKA'S HEAD

SHAKA'S ROCK

COMPENSATION

TONGAAT

COOL AIR

uMshwathi Local Municipality

Umgungundlovu

Mkhambathini Local Municipality

eThekwini Local Municipality

eThekwini

Glendale

Ozwathini

10 5 0 10 Kilometers

Proposed New / Upgrade Infrafrastructure

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

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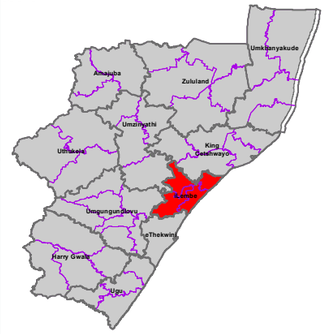

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CONSULTANTS: Project No.: 27814

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PROJECT TITLE

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

MAP TITLE:

Total Bulk Water Supply Interventions - Scenario Option: From the uMshwathi Regional Bulk WSS iLembe District Municipality

DATE COMPLETED: 21/11/2020

MAP NO.: **DC29: Figure 9.15**

Figure 9-16

WSIA: ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, including Dwedwe, Emalangeni, Lower Tugela Bulk WSS (extended Darnall), Maphumulo WSS, Nkwambase and Ozwathini

This schematic illustrates Lower Tugela Bulk WSS (extended Darnall)

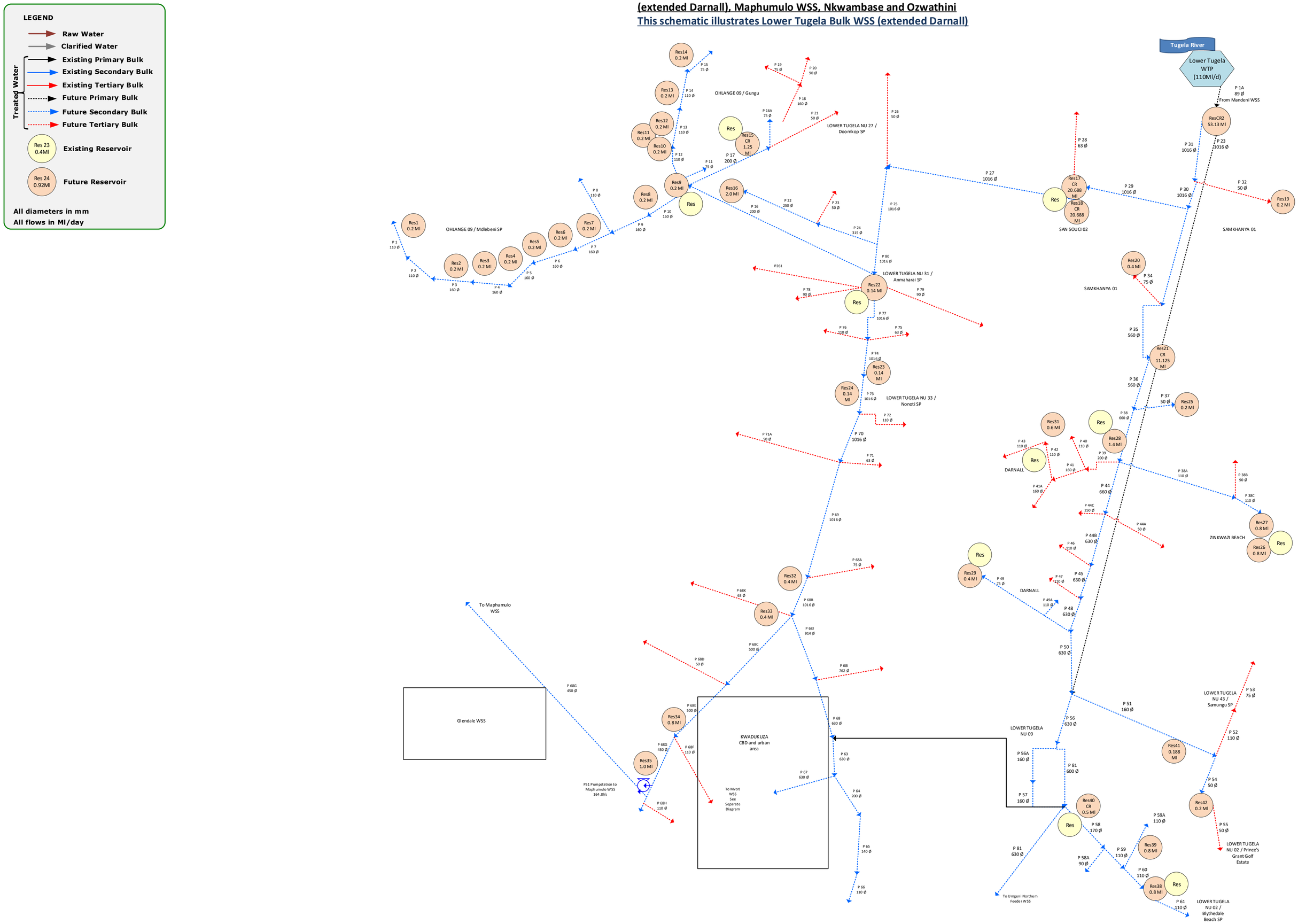


Figure 9-16

WSIA: ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, including Dwedwe, Emalangeni, Lower Tugela Bulk WSS (extended Darnall), Maphumulo WSS, Nkwambase and Ozwathini

This schematic illustrates Maphumulo WSS

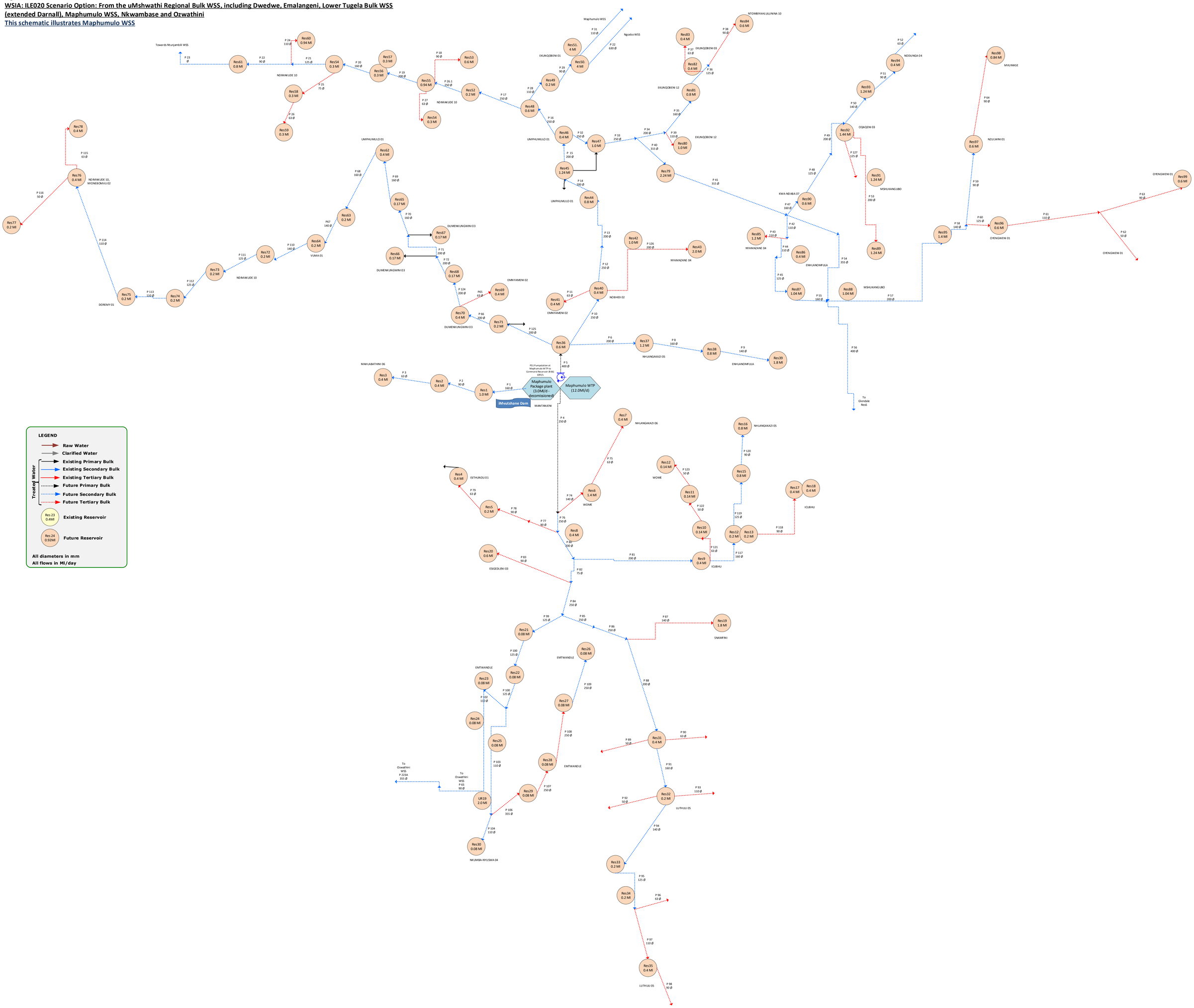
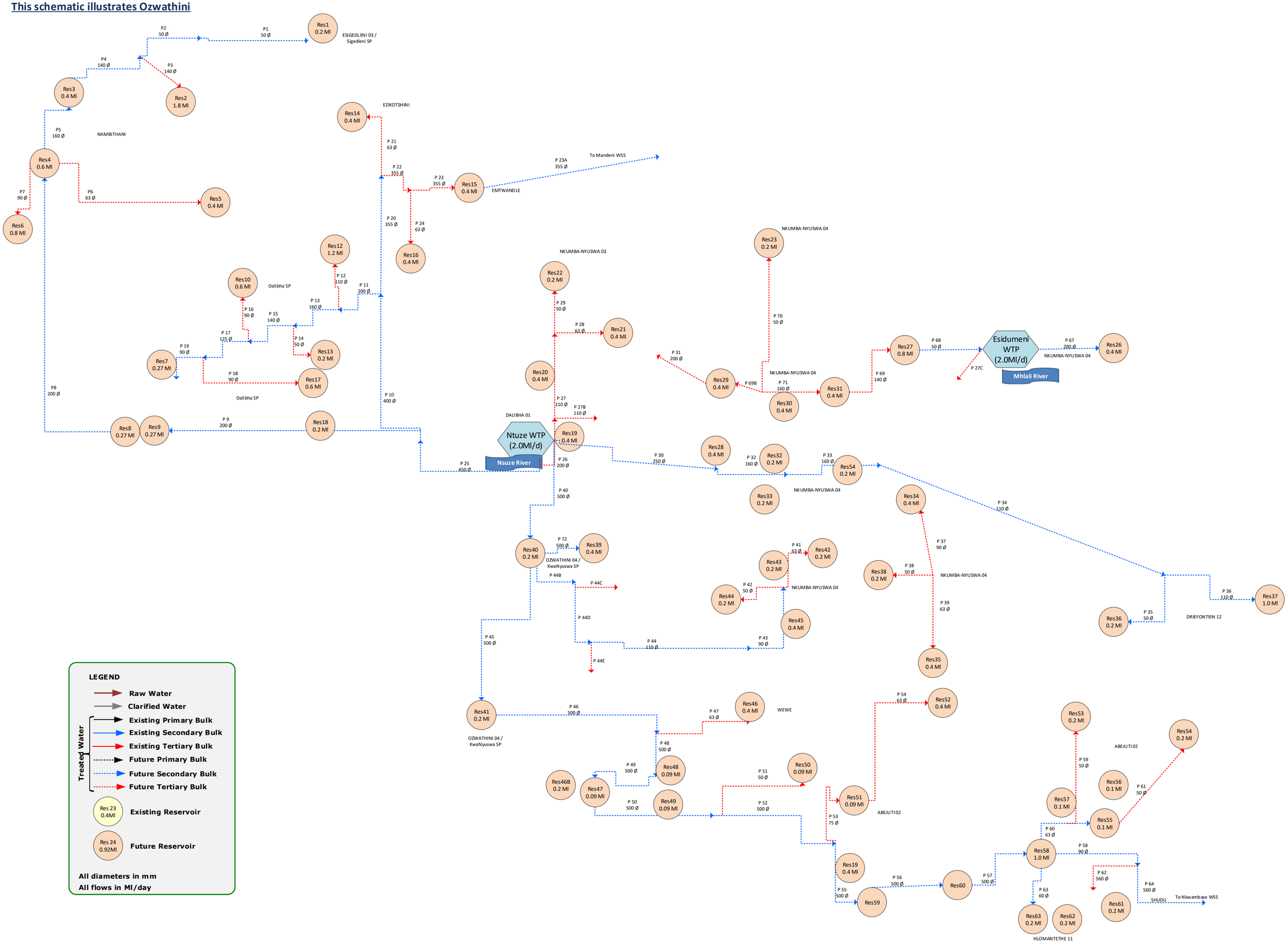


Figure 9-16

WSIA: ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, including Dwedwe, Emalangeni, Lower Tugela Bulk WSS (extended Darnall), Maphumulo WSS, Nkwambase and Ozwathini

This schematic illustrates Ozwathini



10. CONCLUSIONS

10.1 Total Water Demand per Supply Area

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

Table 10-1: Total Water Demand (Mℓ/d) 2050 per WSIA

Water Supply Scheme / WSIA		Population 2020	Water Requirements (Mℓ/d)						
			2020	2025	2030	2035	2040	2045	2050
ILE009	Ngcebo WSS	16 721	3.04	3.22	3.39	3.61	3.84	4.09	4.36
ILE016, ILE017 and ILE013	Macambini	44 881	8.20	8.69	9.15	9.73	10.35	11.01	11.73
	Ndulinde WSS	50 499	9.17	9.71	10.23	10.88	11.58	12.33	13.13
	Sundumbili WSS	48 234	11.05	11.75	12.43	13.21	14.04	14.93	15.88
Sub-Total:		**143 615**	**28.42**	**30.15**	**31.80**	**33.81**	**35.97**	**38.28**	**40.75**
ILE002, ILE003, ILE010, ILE012 and ILE015	Dwedwe	53 617	7.81	9.14	10.52	11.23	11.98	12.79	13.66
	Emalangeni	25 110	3.47	4.04	4.63	4.93	5.25	5.59	5.97
	Nkwambase	19 018	3.24	3.45	3.66	3.92	4.19	4.49	4.81
	Ozwathini	47 595	6.48	7.57	8.72	9.23	9.78	10.38	11.03
	Umgeni Northern Feeder	168 990	38.02	40.73	43.38	46.23	49.29	52.55	56.05
Sub-Total		**314 329**	**59.01**	**64.93**	**70.91**	**75.53**	**80.50**	**85.82**	**91.52**
ILE001, ILE006, ILE007, ILE005 and ILE014	Lower Tugela Bulk WSS (extended Darnall)	45 016	10.19	10.85	11.49	12.23	13.02	13.86	14.76
	Mandeni WSS	7 548	2.61	2.75	2.88	3.05	3.23	3.42	3.62
	Maphumulo WSS	104 866	18.72	19.89	21.02	22.35	23.77	25.30	26.94
	Mvoti WSS (KwaDukuza-Stanger)	58 531	19.74	20.86	21.91	23.24	24.66	26.16	27.76
	Tugela South	11 880	1.93	2.45	2.99	3.17	3.36	3.56	3.78
Sub-Total		**227 841**	**53.19**	**56.80**	**60.30**	**64.04**	**68.04**	**72.31**	**76.86**
ILE004	Glendale	9 499	1.71	1.83	1.95	2.07	2.21	2.35	2.50
ILE011	Ntunjambili	8 708	1.76	1.85	1.97	2.09	2.23	2.37	1.76
TOTAL		**720 714**	**147.03**	**158.69**	**170.20**	**181.04**	**192.65**	**205.07**	**218.37**

Source: Water Demand Model, UAP Phase III, 2020

The IDM is working with Umgeni Water on the planning and future implementation of the uMshwathi Regional Bulk WSS (Midmar WTP), which is being executed in six phases (Umgeni Water Infrastructure Master Plan, 2018) within the uMgungundlovu DM and IDM. Should this scenario option be considered, the total Water Demand (Mℓ/d) up to 2050 is presented in Table 10-2.

Table 10-2 Total Water Demand (Mℓ/d) 2050 – uMshwathi Regional Bulk WSS Scenario

Water Supply Scheme / WSIA		Population 2020	Water Requirements (Mℓ/d)						
			2020	2025	2030	2035	2040	2045	2050
ILE002, ILE003, ILE001, ILE007, ILE010 and ILE012	Dwedwe	53 617	7.81	9.14	10.52	11.23	11.98	12.79	13.66
	Emalangeni	25 110	3.47	4.04	4.63	4.93	5.25	5.59	5.97
	Lower Tugela Bulk WSS (extended Darnall)	45 016	10.19	10.85	11.49	12.23	13.02	13.86	14.76
	Maphumulo WSS	104 866	18.72	19.89	21.02	22.35	23.77	25.30	26.94
	Nkwambase	19 018	3.24	3.45	3.66	3.92	4.19	4.49	4.81
	Ozwathini	47 595	6.48	7.57	8.72	9.23	9.78	10.38	11.03
TOTAL		**295 222**	**49.91**	**54.94**	**60.04**	**63.89**	**67.99**	**72.41**	**77.17**

Source: Water Demand Model, UAP Phase III, 2020

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

The total volume of water required for the proposed water supply interventions is tabled within Table 10-3:

Table 10-3: Water Resources Required vs proposed WSI

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	[A] Existing Resources (Mm^3/a)*	[B] Proposed Additional Demand under UAP Phase III (Mm^3/a)	[A+B] Total Demand (Mm^3/a)	Balance (Mm^3/a)
ILE009	Ngcebo WSS	22 875	4.36	1.59		0.48	0.48	
ILE016, ILE017 and ILE013	Macambini	61 397	11.73	4.28	14.6	1.29	15.89	
	Ndulinde WSS	69 083	13.13	4.79	14.6	1.45	16.05	
	Sundumbili WSS	65 985	15.88	5.80	14.6	1.77	16.37	
Sub-Total:		196 466	40.75	14.87		4.50	19.10	
ILE002, ILE003, ILE010, ILE012 and ILE015	Dwedwe		13.66	4.99	22	2.14	24.14	
	Emalangeni	73 348	5.97	2.18	22	0.91	22.91	
	Nkwambase	34 350	4.81	1.76	22	0.58	22.58	
	Ozwathini	26 016	11.03	4.03	22	1.66	23.66	
	Umgeni Northern Feeder	65 110	56.05	20.46	22	6.58	28.58	
Sub-Total		231 179	91.52	33.41	22	11.87	33.87	
ILE001, ILE006, ILE007, ILE005 and ILE014	Lower Tugela Bulk WSS (extended Darnall)	430 004	14.76	5.39	40.15	1.67	41.82	
	Mandeni WSS		3.62	1.32	40.15	0.37	40.52	
	Maphumulo WSS	61 583	26.94	9.83	2.4 & 40.15	3.00	45.55	
	Mvoti WSS (KwaDukuza-Stanger)	10 326	27.76	10.13	6.57	2.93	9.50	
	Tugela South	143 457	3.78	1.38	40.15	0.67	40.82	
Sub-Total		80 070	76.86	28.06		8.64	8.64	

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	[A] Existing Resources (Mm^3/a)*	[B] Proposed Additional Demand under UAP Phase III (Mm^3/a)	[A+B] Total Demand (Mm^3/a)	Balance (Mm^3/a)
ILE004	Glendale	12 995	2.50	0.91	2.4	0.29	2.69	
ILE011	Ntunjambili	11 913	2.37	0.87	2.4	0.26	2.66	
TOTAL		985 941	218.37	79.70				

* The Historic Firm Yield from the Hazelmere Dam is 22Mm^3/a, however the total yield cannot be allocated to the areas supplied from the Hazelmere WTP. The stochastic yield of the iMvutshane dam is 2.4million m^3/a based on a 1:50 year return interval (Umgeni Water Infrastructure Master Plan, 2018), however it excludes the Ecological Reserve. The planned allocation to the Lower Tugela WTP from the Tugela River totals 110Mℓ/d (40.15Mm^3/a). The allocation to the Sundumbili WTP from the Tugela River totals 40Mℓ/d (14.6Mm^3/a). Umgeni Water applied for an abstraction licence of 6.57 million m^3/annum (18Mℓ/day) from the Mvoti River for the Mvoti WTP. The yield from groundwater used by the scheme areas is not known.

The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.

10.3 TOTAL WATER RESOURCES REQUIRED

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

10.3.1 ILE009 Ngcebo WSS

Table 10-4: WSIA Summary for ILE009 Ngcebo WSS

Ngcebo WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ngcebo WSS	**ILE009**	**16 721**	**22 875**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ngcebo WSS	**ILE009**	**3.04**	**4.36**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**				
		River	Tugela River			
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Ngcebo WTP	Primary Bulk		4
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	125 - 315 ømm	4.72
				Secondary Bulk	110 - 630 ømm	37.88
				Tertiary Bulk	63 - 110 ømm	14.14
		Reservoirs	Command Reservoir	Primary Bulk	1	400
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	19	6420
		Pump stations		Primary Bulk	1	15.505
4.2	**Future**	Bulk Pipelines		Primary Bulk	63 ømm	1.32
				Secondary Bulk	110 - 140 ømm	12.66
				Tertiary Bulk	50 - 125 ømm	7.34
		WTP	Ngcebo WTP	Primary Bulk		4
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk	1	400

			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	6	1800
		Pump stations		Primary Bulk	2	10.964
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R20 448 000**	**R2 044 800**	**R22 492 800**	
		Secondary	R143 653 000	R14 365 300	**R158 018 300**	
		Tertiary	R63 902 000	R6 390 200	**R70 292 200**	
		Total	**R228 003 000**	**R22 800 300**	**R250 803 300**	

10.3.2 *From the Sundumbili WTP: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS*

Table 10-5: WSIA Summary for ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS

Ndulinde WSS & Macambini & Sundumbili WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ndulinde WSS & Macambini & Sundumbili WSS	**ILE017 & ILE016 & ILE013**	**143 614**	**196 465**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ndulinde WSS & Macambini & Sundumbili WSS	**ILE017 & ILE016 & ILE013**	**28.42**	**40.74**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Sundumbili WTP	Primary Bulk		40
			Sundumbili WTP upgrade	Primary Bulk		41
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	813 ømm	2.61
				Secondary Bulk	90 - 630 ømm	49.85
				Tertiary Bulk	50 - 315 ømm	39.63
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	17	11680
		Pump stations		Primary Bulk	1	526.642

4.2	**Future**	Bulk Pipelines		Primary Bulk	110 ømm	0.61
				Secondary Bulk	63 - 140 ømm	19.66
				Tertiary Bulk	63 - 500 ømm	38.17
		WTP		Primary Bulk		
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk	1	1000
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	12	10140
		Pump stations		Primary Bulk	1	9.561
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R110 785 000**	**R11 078 500**	**R121 863 500**	
		Secondary	R131 221 000	R13 122 100	**R144 343 100**	
		Tertiary	R418 248 000	R41 824 800	**R460 072 800**	
		Total	**R660 254 000**	**R66 025 400**	**R726 279 400**	

10.3.3 From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

Table 10-6: WSIA Summary for ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

Umgeni Northern Feeder & Dwedwe & Emalangeni & Nkwambase & Ozwathini						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Umgeni Northern Feeder & Dwedwe & Emalangeni & Nkwambase & Ozwathini	**ILE015 & ILE002 & ILE003 & ILE010 & ILE012**	**314 330**	**430 003**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Umgeni Northern Feeder & Dwedwe & Emalangeni & Nkwambase & Ozwathini	**ILE015 & ILE002 & ILE003 & ILE010 & ILE012**	**59.02**	**91.52**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Mvoti WTP	Primary Bulk		16
			0	Primary Bulk		0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	75 - 160 ømm	90.61

				Secondary Bulk	50 - 762 ømm	313.75
				Tertiary Bulk	50 - 450 ømm	173.35
		Reservoirs	Command Reservoir	Primary Bulk	6	1980
			Command Reservoir	Secondary Bulk	0	0
			Supply Reservoirs	Tertiary Bulk	143	149750
		Pump stations		Primary Bulk	15	777.40
4.2	**Future**	Bulk Pipelines		Primary Bulk	75 - 140 ømm	1106.14
				Secondary Bulk	50 - 450 ømm	16.04
				Tertiary Bulk	50 - 200 ømm	52.56
		WTP	0	Primary Bulk		0
			0	Primary Bulk		0
		Reservoirs	Command Reservoir	Primary Bulk	1	500
			Command Reservoir	Secondary Bulk	0	0
			Supply Reservoirs	Tertiary Bulk	58	35950
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R203 840 850**	**R20 384 085**	**R224 224 935**	
		Secondary	R520 319 000	R52 031 900	R572 350 900	
		Tertiary	R1 018 444 000	R101 844 400	R1 120 288 400	
		Total	**R1 742 603 850**	**R174 260 385**	**R1 916 864 235**	

10.3.4 *From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South*

Table 10-7: WSIA Summary for ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

Lower Tugela Bulk WSS (extended Darnall) & Mvoti WSS (KwaDukuza-Stanger) & Mandeni WSS & Maphumulo WSS & Tugela South						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Lower Tugela Bulk WSS (extended Darnall) & Mvoti WSS (KwaDukuza-Stanger) & Mandeni WSS & Maphumulo WSS & Tugela South	**ILE001 & ILE005 & ILE006 & ILE007 & ILE014**	**227 841**	**311 688**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Lower Tugela Bulk WSS (extended Darnall) & Mvoti WSS (KwaDukuza-Stanger) & Mandeni WSS & Maphumulo WSS & Tugela South	**ILE001 & ILE005 & ILE006 & ILE007 & ILE014**	**53.19**	**76.86**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Lower Tugela WTP	Primary Bulk		55

			Lower Tugela WTP upgrade	Primary Bulk		110
			Maphumulo WTP	Primary Bulk		6
			Maphumulo Package Plant	Primary Bulk		3
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	90 - 1016 ømm	28.43
				Secondary Bulk	90 - 660 ømm	270.81
				Tertiary Bulk	50 - 200 ømm	80.2
		Reservoirs	Command Reservoir	Primary Bulk	10	113581
			Command Reservoir	Secondary Bulk	40	27607.5
			Supply Reservoirs	Tertiary Bulk	113	85050
		Pump stations		Primary Bulk	2	60.83
4.2	**Future**	Bulk Pipelines		Primary Bulk	88 - 315 ømm	3.15
				Secondary Bulk	75 - 864 ømm	58.27
				Tertiary Bulk	50 - 965 ømm	83.5
		WTP		Primary Bulk		
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk	1	750
			Command Reservoir	Secondary Bulk	0	0
			Supply Reservoirs	Tertiary Bulk	15	28490
		Pump stations		Primary Bulk	2	68.867
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	WTP Costed in the Mandeni WSS
		Primary	**R869 870 500**	**R86 987 050**	**R956 857 550**	
		Secondary	R1 408 133 000	R140 813 300	**R1 548 946 300**	
		Tertiary	R582 717 000	R58 271 700	**R640 988 700**	
		Total	**R2 860 720 500**	**R286 072 050**	**R3 146 792 550**	

10.3.5 ILE004 Glendale

Table 10-8: WSIA Summary for ILE004 Glendale

Glendale						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Glendale	**ILE004**	**9 499**	**12 995**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Glendale	**ILE004**	**1.71**	**2.5**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**	iMvutshane Dam (TBC)		FSC 3.2million m³; stochastic yield is 2.4 million m³/a based on a 1:50 year return interval	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	none	Primary Bulk		0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	0	0
				Secondary Bulk	50 - 110 ømm	15.31
				Tertiary Bulk	50 - 90 ømm	4.95
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	4	3400
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk	0	0
				Secondary Bulk	63 ømm	1.09
				Tertiary Bulk	0	0

		WTP		Primary Bulk		
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	5	2600
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R0**	**R0**	**R0**	
		Secondary	R2 438 000	R243 800	**R2 681 800**	
		Tertiary	R36 941 000	R3 694 100	**R40 635 100**	
		Total	**R39 379 000**	**R3 937 900**	**R43 316 900**	

10.3.6 ILE011 Ntunjambili

Table 10-9: WSIA Summary for ILE011 Ntunjambili

Ntunjambili						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ntunjambili	**ILE011**	**8 708**	**11 913**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ntunjambili	**ILE011**	**1.66**	**2.37**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**	iMvutshane Dam		FSC 3.2million m^3; stochastic yield is 2.4 million m^3/a based on a 1:50 year return interval	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	none	Primary Bulk		0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	250 ømm	3.93
				Secondary Bulk	0	0
				Tertiary Bulk	0	0
		Reservoirs	Command Reservoir	Primary Bulk	1	5000
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	3	3600
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk	0	0
				Secondary Bulk	90 - 200 ømm	10.79
				Tertiary Bulk	50 - 160 ømm	7.9
		WTP	Maphumulo WTP	Primary Bulk		6

				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk		
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R23 770 000**	**R2 377 000**	**R26 147 000**	
		Secondary	R22 897 000	R2 289 700	**R25 186 700**	
		Tertiary	R1 538 000	R153 800	**R1 691 800**	
		Total	**R48 205 000**	**R4 820 500**	**R53 025 500**	

10.3.7 ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS

Table 10-10: WSIA Summary for ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS

Dwedwe; Emalangeni; Nkwambase; uMshwathi-Lower Tugela Bulk WSS (extended Darnall); uMshwathi-Maphumulo WSS; uMshwathi-Ozwathini						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Dwedwe; Emalangeni; Nkwambase; uMshwathi-Lower Tugela Bulk WSS (extended Darnall); uMshwathi-Maphumulo WSS; uMshwathi-Ozwathini	**ILE002 ILE003 ILE010 ILE020**	**295 222**	**403 864**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Dwedwe; Emalangeni; Nkwambase; uMshwathi-Lower Tugela Bulk WSS (extended Darnall); uMshwathi-Maphumulo WSS; uMshwathi-Ozwathini	**ILE002 ILE003 ILE010 ILE020**	**49.91**	**77.17**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resource**	**Dam**	iMvutshane Dam		FSC 3.2million m^3; stochastic yield is 2.4 million m^3/a based on a 1:50 year return interval	

		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Lower Tugela WTP	Primary Bulk		55.00
			Lower Tugela WTP upgrade	Primary Bulk		110.00
			Maphumulo WTP	Primary Bulk		6.00
			Maphumulo WTP upgrade	Primary Bulk		12.00
			Maphumulo Package Plant	Primary Bulk		3, will be put on standby
			Esidumeni WTP	Primary Bulk		1.50
			Ntuze WTP	Primary Bulk		2.00
			Montebello Hospital WTP	Primary Bulk		0.15
			Hazelmere WTP	Primary Bulk		75.00
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	110 - 400 ømm	24.44
				Secondary Bulk	50 - 1016 ømm	114 414.58
				Tertiary Bulk	50 - 560 ømm	198.66
7		Reservoirs	Command Reservoir	Primary Bulk	13	57 831.00
			Command Reservoir	Secondary Bulk	40	18 787.50
			Supply Reservoirs	Tertiary Bulk	196	111 027.50
		Pump stations		Primary Bulk	15	777.40
4.2	**Future**	Bulk Pipelines		Primary Bulk	90 - 140 ømm	7.04
				Secondary Bulk	50 - 864 ømm	65.95
				Tertiary Bulk	50 - 965 ømm	119.66
		WTP		Primary Bulk		
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk	2	2 500.00
			Command Reservoir	Secondary Bulk	0	-

			Supply Reservoirs	Tertiary Bulk	55	33 950.00
		Pump stations		Primary Bulk	5	853.57
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R572 765 350**	**R57 276 535**	**R630 041 885**	
		Secondary	R1 665 996 000	R166 599 600	**R1 832 595 600**	
		Tertiary	R849 123 000	R84 912 300	**R934 035 300**	
		Total	**R3 087 884 350**	**R308 788 435**	**R3 396 672 785**	

10.4 Financial Requirements

The financial requirements for the provision of bulk infrastructure per WSIA based on the demand model intervention by 2050 is summarised in the table below.

Table 10-11: Financial Requirements based on Demand Model Interventions

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
ILE009	Ngcebo WSS	R20 448 000	R143 653 000	R63 902 000	R22 800 300	R250 803 300
ILE016, ILE017 and ILE013	Macambini	R24 266 000	R5 597 000	R143 855 000	R17 371 800	R191 089 800
	Ndulinde WSS	R42 892 000	R66 189 000	R122 728 000	R23 180 900	R254 989 900
	Sundumbili WSS	R43 627 000	R59 435 000	R151 665 000	R25 472 700	R280 199 700
Sub-Total:		**R110 785 000**	**R131 221 000**	**R418 248 000**	**R66 025 400**	**R726 279 400**
ILE002, ILE003, ILE010, ILE012 and ILE015	Dwedwe	R84 338 000	R139 011 000	R160 787 000	R38 413 600	R422 549 600
	Emalangeni	R92 760 850	R14 602 000	R77 478 000	R18 484 085	R203 324 935
	Nkwambase	R21 000 000	R36 428 000	R96 294 000	R15 372 200	R169 094 200
	Ozwathini	R0	R150 043 000	R180 587 000	R33 063 000	R363 693 000
	Umgeni Northern Feeder	R5 742 000	R180 235 000	R503 298 000	R68 927 500	R758 202 500
Sub-Total		**R203 840 850**	**R520 319 000**	**R1 018 444 000**	**R174 260 385**	**R1 916 864 235**
ILE001, ILE006, ILE007, ILE005 and ILE014	Lower Tugela Bulk WSS (extended Darnall)	R271 049 500	R995 423 000	R43 115 000	R130 958 750	R1 440 546 250
	Mandeni WSS	R27 381 000	R3 801 000	R42 890 000	R7 407 200	R81 479 200
	Maphumulo WSS	R49 767 000	R331 740 000	R273 180 000	R65 468 700	R720 155 700
	Mvoti WSS (KwaDukuza-Stanger)	R4 753 000	R38 083 000	R222 200 000	R26 503 600	R291 539 600
	Tugela South	R516 920 000	R39 086 000	R1 332 000	R55 733 800	R613 071 800
Sub-Total		**R869 870 500**	**R1 408 133 000**	**R582 717 000**	**R286 072 050**	**R3 146 792 550**
ILE004	Glendale	R0	R2 438 000	R36 941 000	R3 937 900	R43 316 900
ILE011	Ntunjambili	R23 770 000	R22 897 000	R1 538 000	R4 820 500	R53 025 500

Total	**R1 228 714 350**	**R2 228 661 000**	**R2 121 790 000**	**R557 916 535**	**R6 137 081 885**

A total estimate of approximately R 6.14 billion (excl. VAT) is required to address the total bulk water supply requirement by 2050.

For the Scenario Option: From the uMshwathi Regional Bulk WSS, the total bulk cost requirement is R3 396.67 million (excl VAT), which includes the UAP Phase III planning and costing for the Dwedwe, Emalangeni and Nkwambase schemes, as well as reviewed planning and costing under this scenario, for the Lower Tugela Bulk WSS (extended Darnall), Maphumulo and Ozwathini schemes.

Should all schemes under Scenario Option: From the uMshwathi Regional Bulk WSS be grouped under the UAP Phase III planning and costing, the total bulk cost requirement comes to R3 322.69 million (excl VAT).

10.5 Funding Options

The IDM relies mainly on grant funding programmes to fund their bulk water supply projects. These funding programmes are mainly RBIG, MIG and WSIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of 15 years for the WSA to address their water supply requirements. Another funding option that the IDM could consider is additional loan funding through the Development Bank of Southern Africa (DBSA). They have existing loans with the DBSA (expiring 2025) and ABSA bank (expiring 2020) (IDM IDP, 2019/2020).

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. The interventions for areas that do not yet have access to basic and safe water supply, such as the areas in Ndwedwe LM and Maphumulo LM, would be an implementation priority for the IDM.

The proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within IDM and are as follows, with an indicative grouping of schemes:

- ✓ ILE009 Ngcebo WSS;
- ✓ From the Sundumbili WTP: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS;
- ✓ From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder;
- ✓ From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South; and
- ✓ ILE004 Glendale.; and ILE011 Ntunjambili.

The order would most likely be determined by the availability of funds or intervention programmes. Furthermore, implementing appropriate WC/WDM programmes would assist to delay capital investment requirements in areas such as KwaDukuza town and surrounding urban areas and Mandini town and surrounding areas.

11. RECOMMENDATIONS

11.1 RESPONSIBILITIES

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

11.2 SELECTION OF SOLUTIONS

The proposed water supply intervention areas (WSIAs) as appropriate solutions for bulk water supply development within the UDM and Umgeni Water to assist are:

- From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini;
- From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE006 Mandeni WSS, ILE007 Maphumulo WSS, ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE014 Tugela South; and
- From the Sundumbili WTP: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS.

For the Scenario Option: From the uMshwathi Regional Bulk WSS, the total bulk cost requirement is R3 396.67 million (excl VAT), which includes the UAP Phase III planning and costing for the Dwedwe, Emalangeni and Nkwambase schemes, as well as reviewed planning and costing under this scenario, for the Lower Tugela Bulk WSS (extended Darnall), Maphumulo and Ozwathini schemes.

Should all schemes under Scenario Option: From the uMshwathi Regional Bulk WSS be grouped under the UAP Phase III planning and costing, the total bulk cost requirement comes to R3 322.69 million (excl VAT). This may prompt a detailed feasibility investigation into the options of water supply to compare this to the uMshwathi Regional Bulk WSS costing of R3 396.67 million (excl VAT). The feasibility should include full infrastructure life cycle costing and operational costs.

11.3 PERTINENT LEGISLATION

Various Acts of Parliament make provision for existing or planned institutional structures for management of water resources and water and sanitation services. These are:

- Current Acts of Parliament: National Water, Water Services, Municipal Structures, Municipal Systems, Division of Revenue Acts; and
- Existing and proposed policy documents such as The White Paper on Water Services, the Local Government White Paper and the White Paper on Municipal Service Partnerships.

These Acts deal with the management of water resources and the provision of water services. Provision for the bodies listed below is made in these acts:

- The Catchment Management Agencies (CMA's) which will be established throughout South Africa over the next three years;

- Water User Associations comprising co-operative associations of individual water users at a restricted local level;
- National Government;
- Water Service Authorities comprising District Municipalities or Local Municipalities;
- Water Boards;
- Water Service Providers;
- Provincial Government; and
- Advisory Committees.

11.3.1 Municipal Structures Act

The Municipal Structures Act (117 of 1997), which was subsequently amended by the Municipal Structure Amendment Act (33 of 2000), addresses the basis for establishing municipalities (Category A,B & C) and stipulates that Category A and C (Metropolitan and District) municipalities are WSA's and the Category B (local) municipalities can only be WSA's if authorised by the Minister of DPLG.

11.3.2 Municipal Systems Act

The Municipal Systems Act (32 of 2000) legislates internal systems and addresses the differences between the authority and the provider functions as well as alternative mechanisms for providing municipal services.

11.3.3 Water Services Act

The Water Services Act (Act 108 of 1997) states that each WSA must for its area of jurisdiction, prepare a Water Services Development Plan (WSDP). Whilst the WSDP is a legal requirement, the real value in preparing the WSDP lies in the need to plan for Water Services (Water Supply and Sanitation Provision) whereby key targets are set over the next five years. At least six WSDP key focus areas need to be addressed during the planning process. These are:

- Basic Service: Water supply, sanitation, free basic water supply and free basic sanitation;
- Higher Levels of Service: Water supply, sanitation, associated needs and economic development;
- Water Resources: Appropriate choice, demand and water conservation management, water resource protection and integrated water resource management;
- Environmental Issues: Health, natural and social environment;
- Effective Management: planning, organisational or institutional aspects, management, financial and regulatory aspects; and
- Transfers: Infrastructure related transfers.

Water services development planning must also be done as part of the IDP process (section 12 (1) (a)) and the WSDP must be incorporated into the IDP (section 15 (5)).

Water Services Authorities must report on the implementation of its WSDP every year i.e. annual performance reporting (section 18).

Water Services Authorities must also comply with applicable regulations including Regulation No. R. 509, Government Gazette No. 22355, 8 June 2001 which requires the inclusion of a Water Services Audit as part of the annual performance report.

The Department must monitor the performance of every water services authority to ensure its compliance with every applicable water services development plan… section 62 (1) (c).

The Minister may- issue guidelines to water services institutions on performing their functions in terms of this Act section 73 (1) (h).

The Minister must ensure that there is a national information system on water services….to monitor the performance of water services institutions. section 68 (b) (i).

The Minister may require any …water services institution…to furnish information to be included in the national information system. section 68 (a).

Based on the above, the preparation of a WSDP is a legal requirement.

ANNEXURE A – REFERENCES

Reference List

DWAF	Thukela WMA: Internal Strategic Perspective. DWAF Report No : P WMA 07/000/00/0304. 2004
DWS	Continuation of the Reconciliation Strategies for All Towns (CRSAT) in the Eastern Region. Water Reconciliation Strategy of the Schemes in the Buffalo River System for the Period 2015-2045. 2016.
DWS	Reference Framework Geo database, March 2018.
DWS	Reserve Determination of Water Resources for the Mvoti to Umzimkulu Catchments. Government Gazette No. 41970, 2018.
IDP	iLembe District Municipality IDP Review, 2019/2020.
Planning and Feasibility Studies	iLembe District Municipality Water and Sanitation Master Plan, 2016. Siza Water Five-Year Report, 2019-2023. Non-Revenue Water Master Plan. Strategy for 2018/19 – 2022/23 Financial Year. Annual Water Balance Review. iLembe District Municipality – Professional Service for the Provision of Specialised Consulting Services for the Non-Revenue Water Reduction Program, 2020.
Siza Water	Five-year Review of the Water & Sanitation Concession Agreement Between the iLembe District Municipality and Siza Water (RF) (Pty) Ltd, 2019.
Statistics SA	Census 2011; Community Survey 2016.
Umgeni Water	UAP Phase II: Towards the Development of a Regional Bulk Water Requirements for the iLembe District Municipality, June 2015. Umgeni Water Infrastructure Master Plan, 2019. Umgeni Water Infrastructure Master Plan, 2020.
Vuthela iLembe LED Support Programme (2017 – 2022)	Various projects and project documents such as from the Asset Management Plans & Scoping study for an Asset Management and Maintenance System; Pilot project to address Non-Revenue Water, apparent losses in Sundumbili; support to the IDM on the concession contract; Scoping study for green infrastructure.

ANNEXURE B – DETAILED PROPOSED WSI INFRASTRUCTURE COMPONENT COSTS

ILE009 Ngcebo WSS

The total bulk cost requirement is R250.8 million (excl VAT). The scheme development cost per household is approximately R54 543.

Ngcebo WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ngcebo WSS	ILE009	16 721	22 875	
		Total		**16 721**	**22 875**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ngcebo WSS	ILE009	3.04	4.36	
		Total		**3.04**	**4.36**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Tugela River			
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Ngcebo WTP	Primary Bulk		4
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	125 - 315 ømm	4.72
				Secondary Bulk	110 - 630 ømm	37.88
				Tertiary Bulk	63 - 110 ømm	14.14
		Reservoirs	R2	Primary Bulk		400
			R10	Tertiary Bulk		600
			R11	Tertiary Bulk		200
			R12	Tertiary Bulk		200
			R13	Tertiary Bulk		140
			R14	Tertiary Bulk		140
			R15	Tertiary Bulk		140
			R16	Tertiary Bulk		400
			R17	Tertiary Bulk		400

			R18	Tertiary Bulk		400
			R19	Tertiary Bulk		600
			R20	Tertiary Bulk		400
			R27	Tertiary Bulk		400
			R3	Tertiary Bulk		400
			R4	Tertiary Bulk		300
			R5	Tertiary Bulk		300
			R6	Tertiary Bulk		400
			R7	Tertiary Bulk		400
			R8	Tertiary Bulk		400
			R9	Tertiary Bulk		200
		Pump stations	PS1 Pumpstation at Ngcebo WTP to Command Res (R2)	Primary Bulk	0.010 m³/s	15.505
4.2	**Future**	Bulk Pipelines		Primary Bulk	63 ømm	1.32
				Secondary Bulk	110 - 140 ømm	12.66
				Tertiary Bulk	50 - 125 ømm	7.34
		WTP	Ngcebo WTP	Primary Bulk	-	4
					-	-
		Reservoirs	R1	Primary Bulk		400
			R21	Tertiary Bulk		200
			R22	Tertiary Bulk		0
			R23	Tertiary Bulk		0
			R24	Tertiary Bulk		600
			R25	Tertiary Bulk		400
			R26	Tertiary Bulk		600
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R20 448 000**	**R2 044 800**	**R22 492 800**	
		Secondary	R143 653 000	R14 365 300	R158 018 300	
		Tertiary	R63 902 000	R6 390 200	R70 292 200	
		Total	**R228 003 000**	**R22 800 300**	**R250 803 300**	

From the Sundumbili WTP: ILE016 Macambini, ILE017 Ndulinde WSS, ILE013 Sundumbili WSS

The total bulk cost requirement is R726.28 million (excl VAT). The scheme development cost per household is approximately R18 322.

The total bulk cost requirement for the Macambini scheme is R191.1 million (excl VAT); for the Ndulinde scheme it is R254.99 million (excl VAT) and for the Sundumbili scheme it is R280.2 million (excl VAT).

Ndulinde WSS & Macambini & Sundumbili WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ndulinde WSS & Macambini & Sundumbili WSS	ILE017 & ILE016 & ILE013	143 614	196 465	
		Total		**143 614**	**196 465**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ndulinde WSS & Macambini & Sundumbili WSS	ILE017 & ILE016 & ILE013	28.42	40.74	
		Total		**28.42**	**40.74**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Sundumbili WTP	Primary Bulk		40
			Sundumbili WTP upgrade	Primary Bulk		41
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	813 ømm	2.61

				Secondary Bulk	90 - 630 ømm	49.85
				Tertiary Bulk	50 - 315 ømm	39.63
		Reservoirs	Res10	Tertiary Bulk		800
			Res12	Tertiary Bulk		600
			Res13	Tertiary Bulk		600
			Res14	Tertiary Bulk		400
			Res16	Tertiary Bulk		1740
			Res17	Tertiary Bulk		1740
			Res19	Tertiary Bulk		200
			Res20	Tertiary Bulk		1000
			Res26	Tertiary Bulk		500
			Res27	Tertiary Bulk		500
			Res28	Tertiary Bulk		1000
			Res4	Tertiary Bulk		200
			Res5	Tertiary Bulk		200
			Res6	Tertiary Bulk		800
			Res7	Tertiary Bulk		400
			Res8	Tertiary Bulk		400
			Res9	Tertiary Bulk		600
			Res1	Tertiary Bulk		3200
			Res12	Tertiary Bulk		1200
			Res13	Tertiary Bulk		1600
			Res14	Tertiary Bulk		600
			Res2	Tertiary Bulk		400
			Res21	Tertiary Bulk		400
			Res22	Tertiary Bulk		400
			Res23	Primary Bulk		130
			Res24	Tertiary Bulk		400
			Res25	Tertiary Bulk		1200
			Res29	Tertiary Bulk		400
			Res3	Tertiary Bulk		1000
			Res30	Tertiary Bulk		600

			Res31	Tertiary Bulk		200
			Res32	Tertiary Bulk		200
			Res5	Tertiary Bulk		800
			Res6	Tertiary Bulk		600
			Res7	Tertiary Bulk		1100
			Res8	Primary Bulk		600
			R1	Tertiary Bulk		300
			R11	Tertiary Bulk		400
			R12	Tertiary Bulk		400
			R13	Tertiary Bulk		400
			R14	Tertiary Bulk		1100
			R15	Tertiary Bulk		1100
			R16	Tertiary Bulk		1100
			R17	Tertiary Bulk		1600
			R2	Tertiary Bulk		300
			R6	Tertiary Bulk		4600
		Pump stations	PS1 Pumpstation at Sundumbili WTP to Command Reservoir (R15 in Sundumbili Map)	Primary Bulk	0.567 m³/s	526.64
4.2	**Future**	Bulk Pipelines		Primary Bulk	110 ømm	0.61
				Secondary Bulk	63 - 140 ømm	19.66
				Tertiary Bulk	63 - 500 ømm	38.17
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res1	Primary Bulk		1000
			Res11	Tertiary Bulk		1200
			Res15	Tertiary Bulk		1600

			Res18	Tertiary Bulk		1740
			Res21	Tertiary Bulk		400
			Res22	Tertiary Bulk		1000
			Res23	Tertiary Bulk		400
			Res24	Tertiary Bulk		1000
			Res25	Tertiary Bulk		1000
			Res29	Tertiary Bulk		200
			Res30	Tertiary Bulk		400
			Res31	Tertiary Bulk		600
			Res32	Tertiary Bulk		600
			Res10	Tertiary Bulk		200
			Res15	Tertiary Bulk		800
			Res16	Tertiary Bulk		600
			Res17	Tertiary Bulk		600
			Res18	Tertiary Bulk		600
			Res19	Primary Bulk		800
			Res20	Tertiary Bulk		400
			Res26	Tertiary Bulk		400
			Res27	Tertiary Bulk		400
			Res28	Tertiary Bulk		400
			Res4	Tertiary Bulk		2800
			Res9	Tertiary Bulk		200
			R10	Tertiary Bulk		400
			R3	Tertiary Bulk		1200
			R4	Tertiary Bulk		600
			R5	Tertiary Bulk		600
			R7	Tertiary Bulk		4400
			R8	Tertiary Bulk		6800
			R9	Tertiary Bulk		4400
		Pump stations	PS2 Pumpstation at Sundumbili WTP to Command Reservoir (R1)	Primary Bulk	0.009 m^3/s	9.561

			Macambini PS1 Pumpstation 1 at BH to Res 5	Primary Bulk	0.013 m^3/s	3.718
			Macambini PS2 Pumpstation 2 at BH to Res 7	Primary Bulk	0.01 m^3/s	7.245
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R110 785 000**	**R11 078 500**	**R121 863 500**	
		Secondary	R131 221 000	R13 122 100	R144 343 100	
		Tertiary	R418 248 000	R41 824 800	R460 072 800	
		Total	**R660 254 000**	**R66 025 400**	**R726 279 400**	

From the Hazelmere WTP: ILE002 Dwedwe, ILE003 Emalangeni, ILE010 Nkwambase, ILE012 Ozwathini and ILE015 Umgeni Northern Feeder

The total bulk cost requirement is R1 917 million (excl VAT). The scheme development cost per household is approximately R26 958.

The total bulk cost requirement for the Dwedwe scheme is R422.5 million (excl VAT); for the Emalangeni scheme it is R203.3 million (excl VAT), for the Nkwambase scheme it is R169.1 million (excl VAT), for the Ozwathini scheme it is R364 million (excl VAT) and for the Umgeni Northern Feeder scheme it is R758.2 million (excl VAT).

WSIA Cost Details for ILE002 Dwedwe

Dwedwe						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Dwedwe	ILE002	53 617	73 348	
		Total		**53 617**	**73 348**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Dwedwe	ILE002	7.81	13.66	
		Total		**7.81**	**13.66**	
					Comments	
3	**Water Resources**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River				
		Groundwater				

4	Infrastructure			Class	Size / No	Capacity (Ml/d or kl or km or kW)
4.1	**Existing**	WTP	Hazelmere WTP	Primary Bulk		
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	90 ømm	2.99
				Secondary Bulk	50 - 762 ømm	65.27
				Tertiary Bulk	50 - 110 ømm	20.66
		Reservoirs	Res23 CR	Primary Bulk		220
			Res1	Tertiary Bulk		4600
			Res10	Tertiary Bulk		600
			Res12	Tertiary Bulk		1200
			Res16	Tertiary Bulk		400
			Res17	Tertiary Bulk		700
			Res18	Tertiary Bulk		400
			Res19	Tertiary Bulk		1200
			Res2	Tertiary Bulk		1900
			Res20	Tertiary Bulk		400
			Res21	Tertiary Bulk		600
			Res24	Tertiary Bulk		320
			Res25	Tertiary Bulk		320
			Res4	Tertiary Bulk		2600
			Res5	Tertiary Bulk		1000
			Res6	Tertiary Bulk		1200
			Res7	Tertiary Bulk		600
			Res9	Tertiary Bulk		1800
		Pump stations	PS1 Pumpstation 1 to Command Res 23	Primary Bulk	0.01m³/s	13.907
			PS2 Pumpstation 2 at Command Res 23 to Res 17	Primary Bulk	0.006m³/s	11.229
			PS3 PS 3 to res 20	Primary Bulk	0.004m³/s	12.281
			PS4 PS 4 to Res 21	Primary Bulk	0.006m³/s	41.242
			PS5 PS 5 to PS 6	Primary Bulk	0.348m³/s	183.749
			PS6 PS 6 to PS 7	Primary Bulk	0.112m³/s	143.973
			PS7 PS 7 to PS 8	Primary Bulk	0.106m³/s	163.712
			PS8 PS 8 to Command res 27	Primary Bulk	0.004m³/s	7.309

4.2	**Future**	Bulk Pipelines		Primary Bulk	75 - 140 ømm	4.80
				Secondary Bulk		
				Tertiary Bulk	50 - 160 ømm	32.18
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res27 CR	Primary Bulk		500
			Res11	Tertiary Bulk		400
			Res13	Tertiary Bulk		600
			Res14	Tertiary Bulk		1800
			Res15	Tertiary Bulk		400
			Res22	Tertiary Bulk		200
			Res3	Tertiary Bulk		4200
			Res8	Tertiary Bulk		3400
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R84 338 000**	**R8 433 800**	**R92 771 800**	
		Secondary	R139 011 000	R13 901 100	R152 912 100	
		Tertiary	R160 787 000	R16 078 700	R176 865 700	
		Total	**R384 136 000**	**R38 413 600**	**R422 549 600**	

WSIA Cost Details for ILE003 Emalangeni

Emalangeni						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Emalangeni	ILE003	25 110	34 350	
		Total		**25 110**	**34 350**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Emalangeni	ILE003	3.47	5.97	
		Total		**3.47**	**5.97**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River	Mdlotshana River			
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Hazelmere WTP	Primary Bulk		75
			Montebello Hospital WTP	Primary Bulk		0.15
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	75 - 160 ømm	12.62
				Secondary Bulk	50 - 250 ømm	38.96
				Tertiary Bulk	50 - 110 ømm	32.83

		Reservoirs	Res1 CR	Primary Bulk		40
			Res4	Primary Bulk		400
			Res5 CR	Primary Bulk		20
			Res6	Primary Bulk		400
			Res9	Primary Bulk		900
			Res10	Tertiary Bulk		400
			Res11	Tertiary Bulk		400
			Res13 CR	Tertiary Bulk		500
			Res15	Tertiary Bulk		400
			Res19	Tertiary Bulk		400
			Res2	Tertiary Bulk		200
			Res20	Tertiary Bulk		800
			Res21	Tertiary Bulk		300
			Res3	Tertiary Bulk		800
			Res7	Tertiary Bulk		200
			Res8	Tertiary Bulk		1600
		Pump stations	PS10 PS 10 at res 19 to PS 9	Primary Bulk	0.036m³/s	78.308
			PS1 Pumpstation 1 to Command Res 1	Primary Bulk	0.009m³/s	12.430
			PS2 Pumpstation 2 at Command Res 1 to PS3	Primary Bulk	0.009m³/s	8.074
			PS3 Pumpstation 3 to Montebello WTP	Primary Bulk	0.009m³/s	3.187
			PS4 PS 4 at Montebello WTP to Res 3	Primary Bulk	0.007m³/s	53.289
			PS7 at Command Res 5 to Res 6	Primary Bulk	0.004m³/s	3.697
			PS9 PS 9 to CR13	Primary Bulk	0.019m³/s	41.008
4.2	**Future**	Bulk Pipelines		Primary Bulk	90 - 110 ømm	1.34
				Secondary Bulk	50 - 63 ømm	2.84
				Tertiary Bulk	50 - 90 ømm	2.45
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res12	Tertiary Bulk		200
			Res14	Tertiary Bulk		400
			Res16	Tertiary Bulk		400
			Res17	Tertiary Bulk		400

			Res18	Tertiary Bulk		1100
			Res22	Tertiary Bulk		200
			Res23	Tertiary Bulk		400
			Res24	Tertiary Bulk		200
			Res25	Tertiary Bulk		200
			Res26	Tertiary Bulk		400
			Res27	Tertiary Bulk		200
			Res28	Tertiary Bulk		200
		Pump stations	PS5 at borehole to Res 4	Primary Bulk	0.004m³/s	0.510
			PS6 at borehole to Command Res 5	Primary Bulk	0.006m³/s	1.147
			PS8 at borehole to Res 9	Primary Bulk	0.008m³/s	1.912
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R92 760 850**	**R9 276 085**	**R102 036 935**	
		Secondary	R14 602 000	R1 460 200	R16 062 200	
		Tertiary	R77 478 000	R7 747 800	R85 225 800	
		Total	**R184 840 850**	**R18 484 085**	**R203 324 935**	

WSIA Cost Details for ILE010 Nkwambase

Nkwambase						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Nkwambase	ILE010	19 018	26 016	
		Total		**19 018**	**26 016**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Nkwambase	ILE010	3.24	4.81	
		Total		**3.24**	**4.81**	
					Comments	
3	**Water Resources**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Hazelmere WTP	Primary Bulk		75
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	50 - 500 ømm	21.04
				Tertiary Bulk	50 - 450 ømm	22.19
		Reservoirs	Res10	Tertiary Bulk		200
			Res11	Tertiary Bulk		200
			Res12	Tertiary Bulk		200
			Res13	Tertiary Bulk		140
			Res14	Tertiary Bulk		140
			Res15	Tertiary Bulk		80
			Res16	Tertiary Bulk		80

			Res17	Tertiary Bulk		600
			Res18	Tertiary Bulk		100
			Res2	Tertiary Bulk		40
			Res20	Tertiary Bulk		1000
			Res21	Tertiary Bulk		200
			Res22	Tertiary Bulk		200
			Res23	Tertiary Bulk		80
			Res24	Tertiary Bulk		80
			Res25	Tertiary Bulk		80
			Res26	Tertiary Bulk		70
			Res27	Tertiary Bulk		70
			Res28	Tertiary Bulk		70
			Res29	Tertiary Bulk		70
			Res3	Tertiary Bulk		40
			Res30	Tertiary Bulk		70
			Res31	Tertiary Bulk		140
			Res32	Tertiary Bulk		140
			Res33	Tertiary Bulk		140
			Res34	Tertiary Bulk		340
			Res35	Tertiary Bulk		340
			Res36	Tertiary Bulk		340
			Res37	Tertiary Bulk		340
			Res38	Tertiary Bulk		340
			Res39	Tertiary Bulk		340
			Res4	Tertiary Bulk		40
			Res43	Tertiary Bulk		70
			Res5	Tertiary Bulk		40
			Res6	Tertiary Bulk		40
			Res7	Tertiary Bulk		40
			Res8	Tertiary Bulk		40
			Res9	Tertiary Bulk		40
		Pump stations		Primary Bulk		

4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	50 ømm	0.74
				Tertiary Bulk	50 - 125 ømm	4.36
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res1	Tertiary Bulk		40
			Res19	Tertiary Bulk		140
			Res40	Tertiary Bulk		800
			Res41	Tertiary Bulk		1000
			Res42	Tertiary Bulk		40
			Res44	Tertiary Bulk		1400
		Pump stations		Primary Bulk		
				Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R21 000 000**	**R2 100 000**	**R23 100 000**	
		Secondary	R36 428 000	R3 642 800	R40 070 800	
		Tertiary	R96 294 000	R9 629 400	R105 923 400	
		Total	**R153 722 000**	**R15 372 200**	**R169 094 200**	

WSIA Cost Details for ILE012 Ozwathini

Ozwathini						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ozwathini	ILE012	47 595	65 110	
		Total		**47 595**	**65 110**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ozwathini	ILE012	6.48	11.03	
		Total		**6.48**	**11.03**	
					Comments	
3	**Water Resources**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River	Mhlali River, Ntuze River			
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Esidumeni WTP	Primary Bulk		1.5
			Ntuze WTP	Primary Bulk		2
			Hazelmere WTP	Primary Bulk		75
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	50 - 400 ømm	92.90
				Tertiary Bulk	50 - 400 ømm	50.82
		Reservoirs	Res11	Tertiary Bulk		400
			Res14	Tertiary Bulk		400
			Res18	Tertiary Bulk		200

			Res19	Tertiary Bulk		400
			Res20	Tertiary Bulk		400
			Res24	Tertiary Bulk		600
			Res25	Tertiary Bulk		400
			Res26	Tertiary Bulk		400
			Res27	Tertiary Bulk		800
			Res28	Tertiary Bulk		400
			Res29	Tertiary Bulk		400
			Res29	Tertiary Bulk		400
			Res30	Tertiary Bulk		400
			Res31	Tertiary Bulk		400
			Res32	Tertiary Bulk		200
			Res33	Tertiary Bulk		200
			Res34	Tertiary Bulk		400
			Res38	Tertiary Bulk		200
			Res4	Tertiary Bulk		600
			Res40	Tertiary Bulk		200
			Res41	Tertiary Bulk		200
			Res42	Tertiary Bulk		200
			Res43	Tertiary Bulk		200
			Res44	Tertiary Bulk		200
			Res45	Tertiary Bulk		400
			Res46B	Tertiary Bulk		400
			Res47	Tertiary Bulk		90
			Res48	Tertiary Bulk		90
			Res49	Tertiary Bulk		90
			Res51	Tertiary Bulk		90
			Res55	Tertiary Bulk		100
			Res56	Tertiary Bulk		100
			Res57	Tertiary Bulk		100
			Res57	Tertiary Bulk		100
			Res58	Tertiary Bulk		100

			Res61	Tertiary Bulk		200
			Res61	Tertiary Bulk		200
			Res62	Tertiary Bulk		200
			Res63	Tertiary Bulk		200
			Res7	Tertiary Bulk		270
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	50 - 400 ømm	12.46
				Tertiary Bulk	50 - 200 ømm	7.77
		WTP		Primary Bulk	-	
				Primary Bulk		
				Primary Bulk	-	
		Reservoirs	Res1	Tertiary Bulk		200
			Res10	Tertiary Bulk		600
			Res12	Tertiary Bulk		1200
			Res13	Tertiary Bulk		200
			Res15	Tertiary Bulk		400
			Res16	Tertiary Bulk		400
			Res17	Tertiary Bulk		600
			Res2	Tertiary Bulk		1800
			Res21	Tertiary Bulk		400
			Res22	Tertiary Bulk		200
			Res23	Tertiary Bulk		200
			Res3	Tertiary Bulk		400
			Res35	Tertiary Bulk		400
			Res36	Tertiary Bulk		200
			Res37	Tertiary Bulk		1000
			Res39	Tertiary Bulk		400
			Res46	Tertiary Bulk		400
			Res5	Tertiary Bulk		400
			Res50	Tertiary Bulk		90
			Res52	Tertiary Bulk		400
			Res53	Tertiary Bulk		200

			Res54	Tertiary Bulk		200
			Res6	Tertiary Bulk		800
			Res8	Tertiary Bulk		270
			Res9	Tertiary Bulk		270
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R0	R0	R0	
		Secondary	R150 043 000	R15 004 300	R165 047 300	
		Tertiary	R180 587 000	R18 058 700	R198 645 700	
		Total	**R330 630 000**	**R33 063 000**	**R363 693 000**	

WSIA Cost Details for ILE015 Umgeni Northern Feeder

Umgeni Northern Feeder						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Umgeni Northern Feeder	ILE015	168 990	231 179	
		Total		**168 990**	**231 179**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Umgeni Northern Feeder	ILE015	38.02	56.05	
		Total		**38.02**	**56.05**	
					Comments	
3	**Water Resources**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Mvoti WTP	Primary Bulk		16
			Hazelmere	Primary Bulk		75
			Siza Water RO Plant	Primary Bulk		3
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	90 - 630 ømm	95.58
				Tertiary Bulk	63 - 500 ømm	46.85
		Reservoirs	Res1	Tertiary Bulk		3800
			Res10	Tertiary Bulk		100
			Res11	Tertiary Bulk		3400
			Res12	Tertiary Bulk		3400

			Res13	Tertiary Bulk		1100
			Res14	Tertiary Bulk		1100
			Res15	Tertiary Bulk		600
			Res16	Tertiary Bulk		3400
			Res17	Tertiary Bulk		200
			Res18	Tertiary Bulk		6200
			Res19	Tertiary Bulk		1800
			Res2	Tertiary Bulk		3200
			Res20	Tertiary Bulk		3400
			Res21	Tertiary Bulk		1800
			Res22	Tertiary Bulk		1400
			Res23	Tertiary Bulk		1800
			Res24	Tertiary Bulk		4600
			Res25	Tertiary Bulk		1300
			Res26	Tertiary Bulk		1300
			Res27	Tertiary Bulk		2800
			Res28	Tertiary Bulk		1400
			Res29	Tertiary Bulk		2600
			Res3	Tertiary Bulk		6400
			Res30	Tertiary Bulk		5800
			Res31	Tertiary Bulk		5000
			Res32	Tertiary Bulk		6000
			Res33	Tertiary Bulk		3600
			Res34	Tertiary Bulk		1600
			Res35	Tertiary Bulk		1600
			Res36	Tertiary Bulk		4300
			Res37	Tertiary Bulk		4300
			Res4	Tertiary Bulk		4600
			Res5	Tertiary Bulk		4000
			Res6	Tertiary Bulk		4000
			Res7	Tertiary Bulk		2400
			Res8	Tertiary Bulk		1600

			Res9	Tertiary Bulk		100
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk		0
				Tertiary Bulk	140 - 450 ømm	5.80
		WTP		Primary Bulk	-	
				Primary Bulk	-	
		Reservoirs	Res45	Tertiary Bulk		
			Res38	Tertiary Bulk		2000
			Res39	Tertiary Bulk		400
			Res40	Tertiary Bulk		400
			Res41	Tertiary Bulk		800
			Res42	Tertiary Bulk		800
			Res43	Tertiary Bulk		600
			Res44	Tertiary Bulk		600
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R5 742 000**	**R574 200**	**R6 316 200**	
		Secondary	R180 235 000	R18 023 500	R198 258 500	
		Tertiary	R503 298 000	R50 329 800	R553 627 800	
		Total	**R689 275 000**	**R68 927 500**	**R758 202 500**	

From the Lower Tugela WTP: ILE001 Lower Tugela Bulk WSS (extended Darnall), ILE005 Mvoti WSS (KwaDukuza-Stanger), ILE006 Mandeni WSS, ILE007 Maphumulo WSS and ILE014 Tugela South

The total bulk cost requirement is R3 146.8 million (excl VAT). The scheme development cost per household is approximately R77 272.

The total bulk cost requirement for the Lower Tugela Bulk WSS (extended Darnall) scheme is R1 440 million (excl VAT); for the Mvoti WSS (KwaDukuza-Stanger) scheme it is R291.54 million (excl VAT), for the Mandeni scheme it is R81.48 million (excl VAT), for the Maphumulo scheme it is R720.16 million (excl VAT) and for the Tugela South scheme it is R613.07 million (excl VAT).

WSIA Cost Details for ILE001 Lower Tugela Bulk WSS (extended Darnall)

Lower Tugela Bulk WSS (extended Darnall)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Lower Tugela Bulk WSS (extended Darnall)	ILE001	45 016	61 583	
		Total		**45 016**	**61 583**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Lower Tugela Bulk WSS (extended Darnall)	ILE001	10.19	14.76	
		Total		**10.19**	**14.76**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Lower Tugela WTP	Primary Bulk		55
			Lower Tugela WTP upgrade	Primary Bulk		110

		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	110 - 160 ømm	1.31
				Secondary Bulk	50 - 1016 ømm	101.26
				Tertiary Bulk	50 - 200 ømm	13.15
		Reservoirs	R15 CR	Primary Bulk		1250
			R17 CR	Primary Bulk		20688
			R18 CR	Primary Bulk		20688
			R21 CR	Primary Bulk		11125
			R40 CR	Primary Bulk		500
			R1	Secondary Bulk		200
			R10	Secondary Bulk		200
			R11	Secondary Bulk		200
			R12	Secondary Bulk		200
			R13	Secondary Bulk		200
			R14	Secondary Bulk		200
			R16	Secondary Bulk		2000
			R19	Secondary Bulk		200
			R2	Secondary Bulk		200
			R20	Secondary Bulk		400
			R22	Secondary Bulk		140
			R23	Secondary Bulk		140
			R24	Secondary Bulk		140
			R25	Secondary Bulk		200
			R26	Secondary Bulk		800
			R27	Secondary Bulk		800
			R28	Secondary Bulk		1400
			R29	Secondary Bulk		400
			R3	Secondary Bulk		200
			R30	Secondary Bulk		1200
			R31	Secondary Bulk		600
			R32	Secondary Bulk		400
			R33	Secondary Bulk		400
			R34	Secondary Bulk		800

			R35	Secondary Bulk		1000
			R36	Secondary Bulk		800
			R37	Secondary Bulk		1600
			R38	Secondary Bulk		800
			R39	Secondary Bulk		800
			R4	Secondary Bulk		200
			R41	Secondary Bulk		187.5
			R42	Secondary Bulk		200
			R5	Secondary Bulk		200
			R6	Secondary Bulk		200
			R7	Secondary Bulk		200
			R8	Secondary Bulk		200
			R9	Secondary Bulk		200
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk	110 ømm	0.90
				Secondary Bulk	75 - 864 ømm	11.43
				Tertiary Bulk	50 - 965 ømm	41.52
		WTP		Primary Bulk	-	
					-	-
		Reservoirs		Tertiary Bulk		
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	WTP upgrade costed in the Mandeni WSS
		Primary	**R271 049 500**	**R27 104 950**	**R298 154 450**	
		Secondary	R995 423 000	R99 542 300	R1 094 965 300	
		Tertiary	R43 115 000	R4 311 500	R47 426 500	
		Total	**R1 309 587 500**	**R130 958 750**	**R1 440 546 250**	

WSIA Cost Details for ILE005 Mvoti WSS (KwaDukuza-Stanger)

Mvoti WSS (KwaDukuza-Stanger)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Mvoti WSS (KwaDukuza-Stanger)	ILE005	58 531	80 070	
		Total		**58 531**	**80 070**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Mvoti WSS (KwaDukuza-Stanger)	ILE005	19.74	27.76	
		Total		**19.74**	**27.76**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Mvoti River. Tugela River (future)		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater	Boreholes			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Mvoti WTP	Primary Bulk		16
			Lower Tugela WTP (future)	Primary Bulk		110
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	140 - 660 ømm	6.35
				Tertiary Bulk	140 - 200 ømm	5.44
		Reservoirs	R12	Tertiary Bulk		400
			R14	Tertiary Bulk		4000
			R15	Tertiary Bulk		2800
			R16	Tertiary Bulk		6000
			R17	Tertiary Bulk		6600
			R18	Tertiary Bulk		1200
			R19	Tertiary Bulk		1200
			R20	Tertiary Bulk		0

			R5	Tertiary Bulk		2800
			R6	Tertiary Bulk		2800
			R7	Tertiary Bulk		3000
			R8	Tertiary Bulk		1400
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk	200 ømm	0.79
				Secondary Bulk	63 - 400 ømm	3.62
				Tertiary Bulk	90 - 315 ømm	6.67
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	R4	Primary Bulk		750
			R1	Tertiary Bulk		190
			R10	Tertiary Bulk		1000
			R11	Tertiary Bulk		2600
			R13	Tertiary Bulk		4400
			R2	Tertiary Bulk		4400
			R3	Tertiary Bulk		3800
			R9	Tertiary Bulk		4200
		Pump stations		Primary Bulk		
				Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R4 753 000**	**R475 300**	**R5 228 300**	
		Secondary	R38 083 000	R3 808 300	R41 891 300	
		Tertiary	R222 200 000	R22 220 000	R244 420 000	
		Total	**R265 036 000**	**R26 503 600**	**R291 539 600**	

WSIA Cost Details for ILE006 Mandeni WSS

Mandeni WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Mandeni WSS	ILE006	7 548	10 326	
		Total		**7 548**	**10 326**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Mandeni WSS	ILE006	2.61	3.62	
		Total		**2.61**	**3.62**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Sundumbili WTP	Primary Bulk		40
			Lower Tugela WTP (future)	Primary Bulk		110
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	315 ømm	1.03
				Secondary Bulk	50 - 200 ømm	4.57
				Tertiary Bulk	50 - 200 ømm	1.80
		Reservoirs	Res1CR	Primary Bulk		2220
			Res12	Tertiary Bulk		100
			Res2	Tertiary Bulk		600
			Res4	Tertiary Bulk		1000
			Res5	Tertiary Bulk		1000
			Res6	Tertiary Bulk		70
			Res7	Tertiary Bulk		70

			Res8	Tertiary Bulk		70
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk	88-315 ømm	1.46
				Secondary Bulk	50 - 200 ømm	2.45
				Tertiary Bulk	110 ømm	1.98
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res10	Tertiary Bulk		900
			Res11	Tertiary Bulk		800
			Res3	Tertiary Bulk		1000
			Res9	Tertiary Bulk		1600
		Pump stations	PS1 Pumpstation at WTP to Res 1CR	Primary Bulk	0.067 m^3/s	65.782
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R27 381 000**	**R2 738 100**	**R30 119 100**	
		Secondary	R3 801 000	R380 100	R4 181 100	
		Tertiary	R42 890 000	R4 289 000	R47 179 000	
		Total	**R74 072 000**	**R7 407 200**	**R81 479 200**	

WSIA Cost Details for ILE007 Maphumulo WSS

Maphumulo WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Maphumulo WSS	ILE007	104 866	143 457	
		Total		**104 866**	**143 457**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Maphumulo WSS	ILE007	18.72	26.94	
		Total		**18.72**	**26.94**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**	iMvutshane Dam		FSC 3.2million m^3; stochastic yield is 2.4 million m^3/a based on a 1:50 year return interval	
		River	Tugela River (future)		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater	Boreholes			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Maphumulo WTP	Primary Bulk		6
			Maphumulo Package Plant	Primary Bulk		3
			Lower Tugela WTP (future)	Primary Bulk		110
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	110 - 400 ømm	7.52
				Secondary Bulk	63 - 560 ømm	153.41
				Tertiary Bulk	50 - 200 ømm	59.06
		Reservoirs	R1	Primary Bulk		1000
			R36	Primary Bulk		600
			R10	Tertiary Bulk		140
			R11	Tertiary Bulk		140

			R12	Tertiary Bulk		140
			R13	Tertiary Bulk		200
			R14	Tertiary Bulk		200
			R15	Tertiary Bulk		800
			R17	Tertiary Bulk		400
			R18	Tertiary Bulk		400
			R2	Tertiary Bulk		400
			R20	Tertiary Bulk		600
			R21	Tertiary Bulk		80
			R22	Tertiary Bulk		80
			R23	Tertiary Bulk		80
			R24	Tertiary Bulk		80
			R25	Tertiary Bulk		80
			R26	Tertiary Bulk		80
			R27	Tertiary Bulk		80
			R28	Tertiary Bulk		80
			R29	Tertiary Bulk		80
			R3	Tertiary Bulk		400
			R30	Tertiary Bulk		80
			R31	Tertiary Bulk		400
			R32	Tertiary Bulk		200
			R33	Tertiary Bulk		200
			R34	Tertiary Bulk		400
			R35	Tertiary Bulk		400
			R37	Tertiary Bulk		1200
			R38	Tertiary Bulk		800
			R39	Tertiary Bulk		1800
			R4	Tertiary Bulk		400
			R40	Tertiary Bulk		400
			R41	Tertiary Bulk		400
			R42	Tertiary Bulk		1000
			R43	Tertiary Bulk		2000

			R44	Tertiary Bulk		800
			R45	Tertiary Bulk		1240
			R46	Tertiary Bulk		400
			R47	Tertiary Bulk		1000
			R48	Tertiary Bulk		600
			R49	Tertiary Bulk		200
			R5	Tertiary Bulk		200
			R50	Tertiary Bulk		400
			R51	Tertiary Bulk		400
			R52	Tertiary Bulk		200
			R53	Tertiary Bulk		600
			R54	Tertiary Bulk		300
			R54	Tertiary Bulk		300
			R55	Tertiary Bulk		940
			R56	Tertiary Bulk		300
			R57	Tertiary Bulk		300
			R58	Tertiary Bulk		300
			R59	Tertiary Bulk		300
			R6	Tertiary Bulk		1400
			R60	Tertiary Bulk		940
			R61	Tertiary Bulk		800
			R62	Tertiary Bulk		400
			R63	Tertiary Bulk		200
			R64	Tertiary Bulk		200
			R65	Tertiary Bulk		170
			R66	Tertiary Bulk		170
			R67	Tertiary Bulk		170
			R68	Tertiary Bulk		170
			R69	Tertiary Bulk		400
			R70	Tertiary Bulk		400
			R71	Tertiary Bulk		200
			R72	Tertiary Bulk		200
			R73	Tertiary Bulk		200

			R74	Tertiary Bulk		200
			R75	Tertiary Bulk		200
			R76	Tertiary Bulk		400
			R77	Tertiary Bulk		200
			R78	Tertiary Bulk		400
			R79	Tertiary Bulk		2240
			R8	Tertiary Bulk		400
			R80	Tertiary Bulk		1000
			R81	Tertiary Bulk		800
			R82	Tertiary Bulk		400
			R83	Tertiary Bulk		400
			R85	Tertiary Bulk		1200
			R86	Tertiary Bulk		400
			R87	Tertiary Bulk		1040
			R88	Tertiary Bulk		1040
			R89	Tertiary Bulk		1240
			R9	Tertiary Bulk		400
			R90	Tertiary Bulk		600
			R91	Tertiary Bulk		1240
			R92	Tertiary Bulk		1440
			R93	Tertiary Bulk		1240
			R94	Tertiary Bulk		400
			R95	Tertiary Bulk		1400
			R96	Tertiary Bulk		600
			R97	Tertiary Bulk		600
			R98	Tertiary Bulk		840
			R99	Tertiary Bulk		600
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	63 - 200 ømm	38.48
				Tertiary Bulk	63 - 140 ømm	28.48
		WTP		Primary Bulk	-	

				Primary Bulk		
				Primary Bulk	-	
		Reservoirs	R16	Tertiary Bulk		800
			R19	Tertiary Bulk		1800
			R7	Tertiary Bulk		400
			R84	Tertiary Bulk		600
		Pump stations	PS1 Pumpstation at Maphumulo WTP to Command Reservoir (R36)	Primary Bulk	0.006 m^3/s	3.085
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R49 767 000**	**R4 976 700**	**R54 743 700**	
		Secondary	R331 740 000	R33 174 000	R364 914 000	
		Tertiary	R273 180 000	R27 318 000	R300 498 000	
		Total	**R654 687 000**	**R65 468 700**	**R720 155 700**	

WSIA Cost Details for ILE014 Tugela South

Tugela South						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Tugela South	ILE014	11 880	16 252	
		Total		**11 880**	**16 252**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Tugela South	ILE014	1.93	3.78	
		Total		**1.93**	**3.78**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Lower Tugela	Primary Bulk		55
			Lower Tugela WTP (future)	Primary Bulk		110
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	90 - 1016 ømm	18.57
				Secondary Bulk	160 - 250 ømm	5.22
				Tertiary Bulk	110 ømm	0.75
		Reservoirs	CR1	Primary Bulk		2380
			CR2	Primary Bulk		53130
			R1	Secondary Bulk		4400
			R2	Secondary Bulk		2200
			R3	Secondary Bulk		1200
		Pump stations	PS1 Pump	Primary Bulk	0.041 m^3/s	57.963
			PS2 Booster Pump water tower	Primary Bulk	0.013 m^3/s	2.868

4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	50 - 90 ømm	2.29
				Tertiary Bulk	75 - 110 ømm	4.85
		WTP		Primary Bulk	-	
					-	-
		Reservoirs		Tertiary Bulk		
		Pump stations		Primary Bulk		
				Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R516 920 000**	**R51 692 000**	**R568 612 000**	
		Secondary	R39 086 000	R3 908 600	R42 994 600	
		Tertiary	R1 332 000	R133 200	R1 465 200	
		Total	**R557 338 000**	**R55 733 800**	**R613 071 800**	

ILE004 Glendale

The total bulk cost requirement is R43.3 million (excl VAT). The scheme development cost per household is approximately R16 582.

Glendale						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Glendale	ILE004	9 499	12 995	
		Total		**9 499**	**12 995**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Glendale	ILE004	1.71	2.5	
		Total		**1.71**	**2.5**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**	iMvutshane Dam		FSC 3.2million m³; stochastic yield is 2.4 million m³/a based on a 1:50 year return interval	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	none	Primary Bulk		
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	50 - 110 ømm	15.31
				Tertiary Bulk	50 - 90 ømm	4.95
		Reservoirs	Res4	Tertiary Bulk		400
			Res6	Tertiary Bulk		2400
			Res8	Tertiary Bulk		400
			Res9	Tertiary Bulk		200
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	63 ømm	1.09
				Tertiary Bulk		

		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res1	Tertiary Bulk		200
			Res2	Tertiary Bulk		200
			Res3	Tertiary Bulk		1000
			Res5	Tertiary Bulk		800
			Res7	Tertiary Bulk		400
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R0**	**R0**	**R0**	
		Secondary	R2 438 000	R243 800	R2 681 800	
		Tertiary	R36 941 000	R3 694 100	R40 635 100	
		Total	**R39 379 000**	**R3 937 900**	**R43 316 900**	

ILE011 Ntunjambili

The total bulk cost requirement is R53.03 million (excl VAT). The scheme development cost per household is approximately R22 143.

Ntunjambili						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		Ntunjambili	ILE011	8 708	11 913	
		Total		**8 708**	**11 913**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		Ntunjambili	ILE011	1.66	2.37	
		Total		**1.66**	**2.37**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**	iMvutshane Dam		FSC 3.2million m^3; stochastic yield is 2.4 million m^3/a based on a 1:50 year return interval	
		River				
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	none	Primary Bulk		
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	250 ømm	3.93
				Secondary Bulk		
				Tertiary Bulk		
		Reservoirs	Res1	Primary Bulk		5000
			Res2	Tertiary Bulk		1200
			Res3	Tertiary Bulk		1000
			Res4	Tertiary Bulk		1400
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	90 - 200 ømm	10.79

				Tertiary Bulk	50 - 160 ømm	7.90
		WTP	Maphumulo WTP	Primary Bulk	-	6
					-	-
		Reservoirs		Tertiary Bulk		
		Pump stations		Primary Bulk		
				Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R23 770 000**	**R2 377 000**	**R26 147 000**	
		Secondary	R22 897 000	R2 289 700	R25 186 700	
		Tertiary	R1 538 000	R153 800	R1 691 800	
		Total	**R48 205 000**	**R4 820 500**	**R53 025 500**	

ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, which includes:

- UAP Phase III planning and costing for Dwedwe, see earlier cost details for Dwedwe;
- UAP Phase III planning and costing for Emalangeni, see earlier cost details for Emalangeni;
- UAP Phase III planning and costing for Nkwambase, see earlier cost details for Nkwambase;
- ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, reviewed planning and costing for Lower Tugela Bulk WSS (extended Darnall). Details provided in this sub-section;
- ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, reviewed planning and costing for Maphumulo WSS. Details provided in this sub-section; and
- ILE020 Scenario Option: From the uMshwathi Regional Bulk WSS, reviewed planning and costing Ozwathini WSS. Details provided in this sub-section.

The total bulk cost requirement is R3 396.67 million (excl VAT). The scheme development cost per household is approximately R43 930.

The total bulk cost requirement for the Dwedwe scheme is R422.5 million (excl VAT); for the Emalangeni scheme it is R203.3 million (excl VAT) and for the Nkwambase scheme it is R169.1 million (excl VAT).

Then for the schemes reviewed for this scenario, the total bulk cost requirement for the Lower Tugela Bulk WSS (extended Darnall) scheme becomes R1 552 million (excl VAT), the Maphumulo scheme becomes R592.366 million (excl VAT) and the Ozwathini scheme becomes R457.2 million (excl VAT).

uMshwathi-Lower Tugela Bulk WSS (extended Darnall)

uMshwathi-Lower Tugela Bulk WSS (extended Darnall)						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		uMshwathi-Lower Tugela Bulk WSS (extended Darnall)	ILE020	45 016	61 583	
		Total		**45 016**	**61 583**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		uMshwathi-Lower Tugela Bulk WSS (extended Darnall)	ILE020	10.19	14.76	
		Total		**10.19**	**14.76**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**				
		River	Tugela River		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Lower Tugela WTP	Primary Bulk		55
			Lower Tugela WTP upgrade	Primary Bulk		110
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	110 - 160 ømm	1.31
				Secondary Bulk	50 - 1016 ømm	114043
				Tertiary Bulk	50 - 200 ømm	13.05
		Reservoirs	R15 CR	Primary Bulk		1250
			R17 CR	Primary Bulk		20688

			R18 CR	Primary Bulk		20688
			R21 CR	Primary Bulk		11125
			R40 CR	Primary Bulk		500
			R1	Secondary Bulk		200
			R10	Secondary Bulk		200
			R11	Secondary Bulk		200
			R12	Secondary Bulk		200
			R13	Secondary Bulk		200
			R14	Secondary Bulk		200
			R16	Secondary Bulk		2000
			R19	Secondary Bulk		200
			R2	Secondary Bulk		200
			R20	Secondary Bulk		400
			R22	Secondary Bulk		140
			R23	Secondary Bulk		140
			R24	Secondary Bulk		140
			R25	Secondary Bulk		200
			R26	Secondary Bulk		800
			R27	Secondary Bulk		800
			R28	Secondary Bulk		1400
			R29	Secondary Bulk		400
			R3	Secondary Bulk		200
			R30	Secondary Bulk		1200
			R31	Secondary Bulk		600
			R32	Secondary Bulk		400
			R33	Secondary Bulk		400
			R34	Secondary Bulk		800
			R35	Secondary Bulk		1000
			R36	Secondary Bulk		800
			R37	Secondary Bulk		1600
			R38	Secondary Bulk		800
			R39	Secondary Bulk		800

			R4	Secondary Bulk		200
			R41	Secondary Bulk		187.5
			R42	Secondary Bulk		200
			R5	Secondary Bulk		200
			R6	Secondary Bulk		200
			R7	Secondary Bulk		200
			R8	Secondary Bulk		200
			R9	Secondary Bulk		200
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk	110 ømm	0.90
				Secondary Bulk	75 - 864 ømm	11.43
				Tertiary Bulk	50 - 965 ømm	41.52
		WTP		Primary Bulk	-	
					-	-
		Reservoirs		Tertiary Bulk		
		Pump stations	Pumpstation to Maphumulo	Primary Bulk	0.1648 m^3/s	790.000
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R312 965 500**	**R31 296 550**	**R344 262 050**	
		Secondary	R1 064 807 000	R106 480 700	R1 171 287 700	
		Tertiary	R33 248 000	R3 324 800	R36 572 800	
		Total	**R1 411 020 500**	**R141 102 050**	**R1 552 122 550**	

uMshwathi-Maphumulo WSS

uMshwathi-Maphumulo WSS						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		uMshwathi-Maphumulo WSS	ILE020	104 866	143 457	
		Total		**104 866**	**143 457**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		uMshwathi-Maphumulo WSS	ILE020	18.72	26.94	
		Total		**18.72**	**26.94**	
			HFY (Mm3/a)	**HFY (Ml/d)**	**Comments**	
3	**Water Resources**	**Dam**	iMvutshane Dam		FSC 3.2million m^3; stochastic yield is 2.4 million m^3/a based on a 1:50 year return interval	
		River	Tugela River (future)		The DWS indicated (2019) that the hydrology of the Tugela River catchment needs to be updated as a matter of priority.	
		Groundwater	Boreholes			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Maphumulo WTP	Primary Bulk		6
			Maphumulo WTP upgrade	Primary Bulk		12
			Maphumulo Package Plant	Primary Bulk		3, will be put on standby
			Lower Tugela WTP (future)	Primary Bulk		110
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	110 - 400 ømm	7.52
				Secondary Bulk	63 - 400 ømm	153.41
				Tertiary Bulk	50 - 355 ømm	59.30

		Reservoirs	R1	Primary Bulk		1000
			R36	Primary Bulk		600
			R10	Tertiary Bulk		140
			R11	Tertiary Bulk		140
			R12	Tertiary Bulk		140
			R13	Tertiary Bulk		200
			R14	Tertiary Bulk		200
			R15	Tertiary Bulk		800
			R17	Tertiary Bulk		400
			R18	Tertiary Bulk		400
			R2	Tertiary Bulk		400
			R20	Tertiary Bulk		600
			R21	Tertiary Bulk		80
			R22	Tertiary Bulk		80
			R23	Tertiary Bulk		80
			R24	Tertiary Bulk		80
			R25	Tertiary Bulk		80
			R26	Tertiary Bulk		80
			R27	Tertiary Bulk		80
			R28	Tertiary Bulk		80
			R29	Tertiary Bulk		80
			R3	Tertiary Bulk		400
			R30	Tertiary Bulk		80
			R31	Tertiary Bulk		400
			R32	Tertiary Bulk		200
			R33	Tertiary Bulk		200
			R34	Tertiary Bulk		400
			R35	Tertiary Bulk		400
			R37	Tertiary Bulk		1200
			R38	Tertiary Bulk		800
			R39	Tertiary Bulk		1800
			R4	Tertiary Bulk		400

			R40	Tertiary Bulk		400
			R41	Tertiary Bulk		400
			R42	Tertiary Bulk		1000
			R43	Tertiary Bulk		2000
			R44	Tertiary Bulk		800
			R45	Tertiary Bulk		1240
			R46	Tertiary Bulk		400
			R47	Tertiary Bulk		1000
			R48	Tertiary Bulk		600
			R49	Tertiary Bulk		200
			R5	Tertiary Bulk		200
			R50	Tertiary Bulk		400
			R51	Tertiary Bulk		400
			R52	Tertiary Bulk		200
			R53	Tertiary Bulk		600
			R54	Tertiary Bulk		300
			R55	Tertiary Bulk		940
			R56	Tertiary Bulk		300
			R57	Tertiary Bulk		300
			R58	Tertiary Bulk		300
			R59	Tertiary Bulk		300
			R6	Tertiary Bulk		1400
			R60	Tertiary Bulk		940
			R61	Tertiary Bulk		800
			R62	Tertiary Bulk		400
			R63	Tertiary Bulk		200
			R64	Tertiary Bulk		200
			R65	Tertiary Bulk		170
			R66	Tertiary Bulk		170
			R67	Tertiary Bulk		170
			R68	Tertiary Bulk		170
			R69	Tertiary Bulk		400
			R70	Tertiary Bulk		400

			R71	Tertiary Bulk		200
			R72	Tertiary Bulk		200
			R73	Tertiary Bulk		200
			R74	Tertiary Bulk		200
			R75	Tertiary Bulk		200
			R76	Tertiary Bulk		400
			R77	Tertiary Bulk		200
			R78	Tertiary Bulk		400
			R79	Tertiary Bulk		2240
			R8	Tertiary Bulk		400
			R80	Tertiary Bulk		1000
			R81	Tertiary Bulk		800
			R82	Tertiary Bulk		400
			R83	Tertiary Bulk		400
			R85	Tertiary Bulk		1200
			R86	Tertiary Bulk		400
			R87	Tertiary Bulk		1040
			R88	Tertiary Bulk		1040
			R89	Tertiary Bulk		1240
			R9	Tertiary Bulk		400
			R90	Tertiary Bulk		600
			R91	Tertiary Bulk		1240
			R92	Tertiary Bulk		1440
			R93	Tertiary Bulk		1240
			R94	Tertiary Bulk		400
			R95	Tertiary Bulk		1400
			R96	Tertiary Bulk		600
			R97	Tertiary Bulk		600
			R98	Tertiary Bulk		840
			R99	Tertiary Bulk		600
		Pump stations		Primary Bulk		

4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	63 - 200 ømm	38.48
				Tertiary Bulk	63 - 140 ømm	28.48
		WTP		Primary Bulk	-	
				Primary Bulk		
				Primary Bulk	-	
		Reservoirs	UR19	Primary Bulk		2000
			R16	Tertiary Bulk		800
			R19	Tertiary Bulk		1800
			R7	Tertiary Bulk		400
			R84	Tertiary Bulk		600
		Pump stations	PS1 Pumpstation at Maphumulo WTW to Command Reservoir	Primary Bulk	0.1087 m^3/s	60.000
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R61 701 000**	**R6 170 100**	**R67 871 100**	
		Secondary	R201 196 000	R20 119 600	R221 315 600	
		Tertiary	R275 618 000	R27 561 800	R303 179 800	
		Total	**R538 515 000**	**R53 851 500**	**R592 366 500**	

uMshwathi-Ozwathini

uMshwathi-Ozwathini						
Item	**Description**					
1	**Population**	**Scheme Name**	**Scheme No**	**Population 2020**	**Population 2050**	
		uMshwathi-Ozwathini	ILE020	47 595	65 110	
		Total		**47 595**	**65 110**	
2	**Demand**	**Scheme Name**	**Scheme No**	**Demand 2020**	**Demand 2050**	
		uMshwathi-Ozwathini	ILE020	6.48	11.03	
		Total		**6.48**	**11.03**	
					Comments	
3	**Water Resources**	**Dam**	Hazelmere Dam		FSC: 37.1Mm³; HFY: 22.00Mm³/a. Although the dam has been raised there is still work that is needed before full impoundment can occur (pretension of rock anchors). The yield shown in this table is consistent with an unraised dam and will remain so until the dam can impound to full capacity.	
		River	Mhlali River, Ntuze River			
		Groundwater				
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Ml/d or kl or km or kW)**
4.1	**Existing**	WTP	Esidumeni WTP	Primary Bulk		1.5
			Ntuze WTP	Primary Bulk		2
			Hazelmere WTP	Primary Bulk		75
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	50 - 560 ømm	92.90
				Tertiary Bulk	50 - 560 ømm	50.63
		Reservoirs	Res27B	Secondary Bulk		400
			Res59	Secondary Bulk		90
			Res60	Secondary Bulk		90
			Res11	Tertiary Bulk		400
			Res14	Tertiary Bulk		400

			Res18	Tertiary Bulk		400
			Res19	Tertiary Bulk		200
			Res20	Tertiary Bulk		400
			Res24	Tertiary Bulk		400
			Res25	Tertiary Bulk		600
			Res26	Tertiary Bulk		400
			Res27	Tertiary Bulk		400
			Res28	Tertiary Bulk		800
			Res29	Tertiary Bulk		400
			Res30	Tertiary Bulk		400
			Res31	Tertiary Bulk		400
			Res32	Tertiary Bulk		400
			Res33	Tertiary Bulk		200
			Res34	Tertiary Bulk		200
			Res38	Tertiary Bulk		400
			Res4	Tertiary Bulk		200
			Res40	Tertiary Bulk		600
			Res41	Tertiary Bulk		200
			Res42	Tertiary Bulk		200
			Res43	Tertiary Bulk		200
			Res44	Tertiary Bulk		200
			Res45	Tertiary Bulk		200
			Res46B	Tertiary Bulk		400
			Res47	Tertiary Bulk		400
			Res48	Tertiary Bulk		90
			Res49	Tertiary Bulk		90
			Res51	Tertiary Bulk		90
			Res55	Tertiary Bulk		90
			Res56	Tertiary Bulk		100
			Res57	Tertiary Bulk		100
			Res58	Tertiary Bulk		100
			Res61	Tertiary Bulk		100

			Res62	Tertiary Bulk		200
			Res63	Tertiary Bulk		200
			Res7	Tertiary Bulk		200
		Pump stations		Primary Bulk		
4.2	**Future**	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	50 - 500 ømm	12.46
				Tertiary Bulk	50 - 355 ømm	10.67
		WTP		Primary Bulk	-	
				Primary Bulk		
				Primary Bulk	-	
		Reservoirs	Res1	Tertiary Bulk		200
			Res10	Tertiary Bulk		600
			Res12	Tertiary Bulk		1200
			Res13	Tertiary Bulk		200
			Res15	Tertiary Bulk		400
			Res16	Tertiary Bulk		400
			Res17	Tertiary Bulk		600
			Res2	Tertiary Bulk		1800
			Res21	Tertiary Bulk		400
			Res22	Tertiary Bulk		200
			Res23	Tertiary Bulk		200
			Res3	Tertiary Bulk		400
			Res35	Tertiary Bulk		400
			Res36	Tertiary Bulk		200
			Res37	Tertiary Bulk		1000
			Res39	Tertiary Bulk		400
			Res46	Tertiary Bulk		400
			Res5	Tertiary Bulk		400
			Res50	Tertiary Bulk		90
			Res52	Tertiary Bulk		400
			Res53	Tertiary Bulk		200
			Res54	Tertiary Bulk		200
			Res6	Tertiary Bulk		800

			Res8	Tertiary Bulk		270
			Res9	Tertiary Bulk		270
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	**R0**	**R0**	**R0**	
		Secondary	R209 952 000	R20 995 200	R230 947 200	
		Tertiary	R205 698 000	R20 569 800	R226 267 800	
		Total	**R415 650 000**	**R41 565 000**	**R457 215 000**	