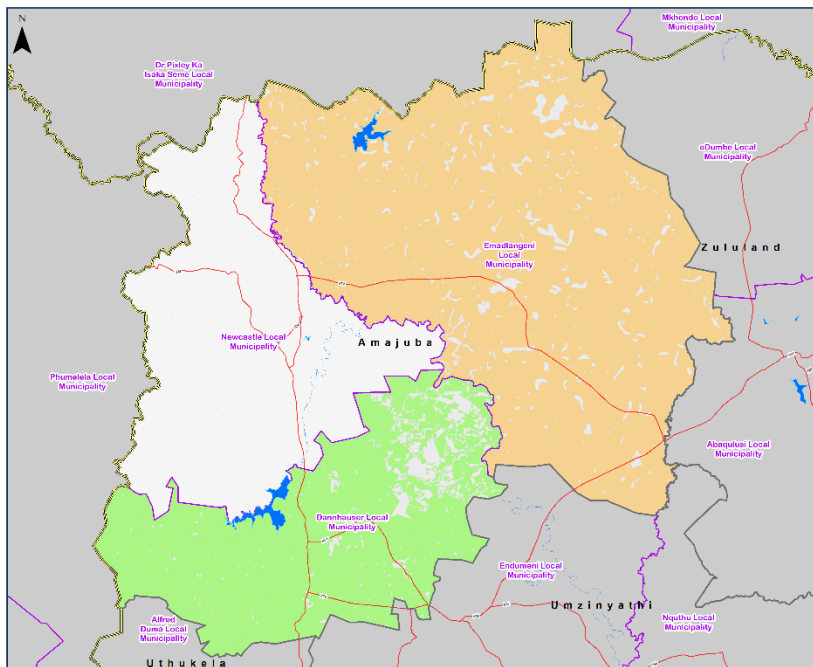


# UNIVERSAL ACCESS PLAN PHASE III – PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT SECONDARY BULK WATER MASTER PLAN FOR THE AMAJUBA DISTRICT MUNICIPALITY

(AS WATER SERVICES AUTHORITY TO DANNHAUSER AND  
EMADLANGENI LOCAL MUNICIPALITIES)

CONTRACT NO. 2018/164



## Reconnaissance Report

January 2021

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## EXECUTIVE SUMMARY

### A. Introduction

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

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

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

This document applies to the Amajuba District Municipality as Water Services Authority and its area of responsibility as WSA.

### B. Demographics

The Amajuba District Municipality (DC25), with an area of 7 101km<sup>2</sup>, is one of the ten (10) District Municipalities and one (1) Metropolitan Municipality that constitute the KwaZulu-Natal Province. The Amajuba DM has three district municipalities bordering it within the Province of KwaZulu-Natal, namely uThukela and uMzinyathi DMs to the south and Zululand DM in the east. In the north, the Amajuba DM shares its boundary with the Mpumalanga Province and in the west with the Free State Province.

Amajuba DM consists of three local municipalities namely:

- ✓ Dannhauser (KZN254);
- ✓ Emadlangeni (KZN253); and
- ✓ Newcastle (KZN252). The Newcastle LM is the WSA for its area of jurisdiction.

The total population in the ADM is estimated to be 531 327 people within 147 256 households (2016). The total population for the ADM's Water Services Authority area of jurisdiction is 142 210 (2016).

The population and household figures per Local Municipality are tabled in Table B-1 below.

**Table B-1: Population & Growth rates for ADM**

LM Name	Population 2011	Population 2016	Population Growth	Growth Rate pa
Dannhauser	102 937	105 341	2 404	0.47
Emadlangeni	34 442	36 869	2 427	1.41
<b>Total, Growth Rate Average</b>	137 379	142 210	4 831	0.70

Source: StatsSA, 2016 Community Survey

The growth in population as a number is very similar for both the Dannhauser and the Emadlangeni LMs, however as a percentage, it is higher for the Emadlangeni LM.

Population growth was determined until 2050 that resulted in the projected number of people residing within the WSA to be approximately 208 315 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	2040	2045	2050
Dannhauser	116 370	120 987	126 045	132 949	140 233	147 916	156 022
Emadlangeni	38 954	40 508	42 212	44 533	46 983	49 567	52 293
<b>Total</b>	155 324	161 495	168 257	177 482	187 216	197 483	208 315

Source: Water Demand Model, UAP Phase III, 2020

The average annual population growth rate for the municipalities between 2020 and 2025 is estimated to be 0.79% and from 2030 to 2050, it increases to 1.08%. The next national census is planned to 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.

## C. Service Levels

### C.1 Water

Approximately 24% of the households do not have access to formal water supply (2016).

**Table C-1 ADM Water Backlogs**

LM Name	Access to safe drinking water		No access to safe drinking water		Total households
	No. of Households	Percentage (%)	No. of Households	Percentage (%)	
Dannhauser	15 670	79.2	4 111	20.8	19 781
Emadlangeni	4 493	67.7	2 143	32.3	6 636
<b>Total</b>	<b>20 163</b>	<b>76.3</b>	<b>6 254</b>	<b>23.7</b>	<b>26 417</b>

Source: StatsSA, 2016 Community Survey

The municipality with the highest level of service, by number of households having access to safe drinking water of the WSA total number of households, is the Dannhauser LM, representing 84%.

### C.2 Sanitation

Approximately 11% of the households do not have access to basic sanitation.

**Table C-2 ADM Sanitation Backlogs**

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
Dannhauser	2 111	240	4 322	11 920	1 391	-	14	245
Emadlangeni	2 182	183	819	2 249	827	16	43	348
<b>Total</b>	<b>4 293</b>	<b>423</b>	<b>5 141</b>	<b>14 169</b>	<b>2 218</b>	<b>16</b>	<b>57</b>	<b>593</b>

Source: StatsSA, 2016 Community Survey

The municipality with the highest level of service, by number of households having access to flush or VIP sanitation services, is the Dannhauser LM (18 593HH), representing 69% of the WSA total number of households. There is a total of 2 884 households (11%) not having a sanitation services level of VIP or better.

## **D. Water Resources, Existing Water Supply Schemes and Water Requirements**

The WSA falls in the Buffalo River catchment and in the larger 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.

The most prominent rivers in the WSA are the Buffalo and Ngagane Rivers. Others include the Slang, Ngogo, Harte and Ncandu Rivers. The most prominent dams are the Zaaihoek and Ntshingwayo Dams. The Zaaihoek Dam is a DWS dam built in 1988 to supply the Majuba power station near Volksrust. Currently there are no domestic abstractions from this dam. In the south, there are the smaller dams that supply water to the Biggarsberg WSS.

### **D-1 Buffalo River**

The Buffalo River is the main northern tributary of the Thukela River and flows in a south-easterly direction from the eastern escarpment (Newcastle area) to its confluence with the Thukela River near Nkandla. Irrigation forms the larger part of water requirements (55million m<sup>3</sup>/a), but combined, the domestic water requirements and water transfers account for an estimated 50million m<sup>3</sup>/a.

The Buffalo River is used as one of the water sources for the Biggarsberg WSS to Dundee, Glencoe and Hattingspruit, where water is abstracted at the Tayside Weir located in the neighbouring Endumeni LM. The water released (annually) from the Ntshingwayo Dam ensures continued supply at the Tayside weir. The Biggarsberg WSS is reliant on the operating rules of the Ntshingwayo Dam and return flows into the Buffalo River. The Buffalo River is also used as one of the water sources to the Newcastle, Madadeni and Osizweni WSS. However, the supply is unreliable during the winter months or if there are drought conditions.

### **D-2 Ngagane and Ncandu Rivers**

The Ngagane River rises at 1 993m MSL near Die Ark on the Normandien Pass (quaternary V31E) on the opposite side of the watershed of the Ncandu River (quaternary V31H and V31J). The Ntshingwayo Dam captures the flow of the river south of Newcastle. The Ncandu River, a tributary of the Ngagane River, joins the Ngagane River north-west of Madadeni from where the Ngagane River flows in an easterly direction towards the confluence with the Buffalo River just north of Madadeni.

### **D-3 Slang River**

The Slang River (quaternaries V31A and V31B) is the first major tributary of the Buffalo River, joining the Buffalo River 4km south-east of Volksrust. Rising at 2 275msl south of Wakkerstroom on the high Balelesberg-Skurweberg Plateau, the Slang River flows westerly – a unique feature in Natal – to the

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Zaaihoek Dam, from where water is pumped to the Majuba coal-fired power station at a rate of 55 Mm<sup>3</sup>/annum.

#### **D-4 Zaaihoek Dam**

The Zaaihoek Dam, a strategic water source for energy generation and part of the Tugela-Vaal Transfer Scheme, is located on the Slang River. The yield of the Zaaihoek Dam according to White Paper WPE 86 is 47Mm<sup>3</sup>/annum. The excess water is allocated to the Vaal system. Only water for ecological purposes and for irrigators at an agreed pattern is generally released from this Dam on a continuous basis.

The report – Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System (2013) – listed the water requirements transfer from the Zaaihoek Dam for the Majuba Power Station as 26Mm<sup>3</sup>/a during 2015/2016. The Full Supply Capacity (FSC) of the Zaaihoek Dam is 184.87Mm<sup>3</sup>/a. The reported HFY was 59Mm<sup>3</sup>/a without the environmental reserve.

#### **D-5 Ntshingwayo Dam**

The Ntshingwayo Dam (previously the Chelmsford Dam) is located (quaternary V31D) on the Ngagane River about 18km south-west of Newcastle. Most of the dam area is in the Dannhauser LM and the remainder in the Newcastle LM. The capacity of the dam is 194million m<sup>3</sup> with an available reserve yield of 21million m<sup>3</sup>/annum. The reserve yield should be preserved for the expected domestic and industrial growth of the supply area of between 11million m<sup>3</sup> and 39million m<sup>3</sup> over the next 20 years (2034) if other dams are not constructed in the demand area not taking account of the associated increase in return flows.

#### **D-6 Proposed Potential Surface Water Sources**

The following are proposed potential dams within the WSA:

- ✓ Ncandu Dam on the Ncandu River, near the town of Newcastle;
- ✓ Horn River Dam on the Horn River flowing south-west from Newcastle.

Both dam sites have yet to be fully investigated and both rivers are tributaries of the Ngagane River. A proposal exists for Ncandu Dam to be constructed upstream of the confluence of the Ngagane River and Ncandu River. The yield of the proposed dam is indicated as 16.87Mm<sup>3</sup>/annum with a capacity to sustain another 46Ml/day of water supply. This proposal is still subject to evaluation against other potential resources such as the proposed Ngogo and Womeni Dams (uThukela Water Master plan) and further exploitation of Buffalo River.

Costing for the planning and construction of the Ncandu Dam is included under the Newcastle LM, but for reference, provision is made for R1.007billion.

## D-7 Groundwater Sources

There are several households in the non-urban areas that are supplied from groundwater sources. Groundwater is also utilised for agriculture, irrigation and industrial activities, but little information is registered on the WARMS database. Groundwater quality is often affected by the coal mining activities in the region. Groundwater quality is generally good, specifically in the higher rainfall areas.

There are 988 boreholes in the Buffalo Flats area of the Dannhauser LM which will remain as backup supply once this area is supplied from the Ngagane WTP (Amajuba District Municipality Master Plan for Water Supply, 2011). The functionality of the existing boreholes is unknown.

Groundwater is one of the main sources other than rivers or streams, for rural areas of the Emadlangeni LM. Groundwater in the northern portion of the Emadlangeni LM is of general good quality, but deteriorates towards the south. SRK Consulting (appointed by DWS) undertook an extensive borehole rehabilitation and drilling program within the Emadlangeni Local Municipality recently. This report is available upon request from SRK. Findings of this report was incorporated and applied in the report: First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality, (2014). From this report, it was found that a regional water supply scheme will not be economically feasible. A total of 36 individual schemes were proposed, in an order of priority, at a total cost of R 234 087 271 including VAT and professional fees. The planning horizon was for 2031, to serve an estimated 2 331 households.

## D-8 Water Supply Infrastructure

The urban water supply schemes in the Amajuba DM are the following:

- ✓ Skombaren WSS;
- ✓ Durnacol and Dannhauser WSS;
- ✓ Dannhauser 3 WSS Hilltop;
- ✓ Ngagane/Dannhauser 1 WSS Buffalo Flats; and
- ✓ Utrecht WSS.

The Biggarsberg WSS, located primarily in the neighbouring uMzinyathi DM, extends into the ADM to serve the areas of Hattingspruit. Refer to the uMzinyathi DM as WSA's UAP Phase III report for planning details on this scheme.

The urban water supply schemes in the Newcastle LM are dealt with in the Newcastle LM, as WSA UAP Phase III report, but for reference, are the following:

- ✓ Charlestown WSS; and
- ✓ Newcastle, Madadeni and Osizweni WSS.



The Newcastle, Madadeni and Osizweni WSS uses the same water source for its water supply as the majority of water supply schemes in the ADM, namely the Ntshingwayo Dam.

## D- 9 Urban and Bulk 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 below.

**Table D 1 Summary of WTPs**

Municipality	Plant Name	Design Capacity (Mℓ/d)	Annual Average Production (Operational) (Mℓ/d)
Dannhauser LM	Dannhauser	2.7	not in use at present**
	Durnacol	5.0	3.5
Emadlangeni LM	Utrecht	4.0	2.00
<b>Total for the ADM</b>		11.7	2.9 – 3.2
uMzinyathi DM	Biggarsberg*	17.0	13-14

Source: Amajuba DM correspondence received and from interviews with ADM and Uthukela Water (June, 2019); Umgeni Water (2020)

\* The Biggarsberg WTP supplies areas in the ADM and to the towns of Dundee and Glencoe in the uMzinyathi DM.

\*\* The Durnacol WTP now supplies the areas of Durnacol and Dannhauser. The information for the Dannhauser WTP is provided for completeness.

The projected population and water requirements for the ADM are presented per Local Municipality within Table D-2. By 2050, the ADM will require 46.91Mℓ/day.

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

LM Name	Population				Water Demands (Mℓ/d)			
	2020	2030	2040	2050	2020	2030	2040	2050
Dannhauser	122 108	134 795	151 162	169 517	23.22	26.55	30.52	35.09
Emadlangeni	41 168	45 446	50 964	57 152	5.79	9.20	10.41	11.82
<b>Total</b>	<b>163 276</b>	<b>180 241</b>	<b>202 126</b>	<b>226 669</b>	<b>29.01</b>	<b>35.75</b>	<b>40.93</b>	<b>46.91</b>

Source: Water Demand Model, UAP Phase III, 2020

The Dannhauser LM has an increase in requirements of 11.87Mℓ/d from 2020 to 2050, representing the highest growth in demands in the WSA area of jurisdiction.

## E. Existing Sanitation Schemes

There are four Wastewater treatment plants (WWTP) within the ADM that serves the major urban areas but all of them need refurbishment and improved operations and maintenance. None of the WWTPs achieved Green Drop status in 2014 (the last available report from DWS).

A summary of the Wastewater treatment plants is provided in Table F-1 below.

**Table F-1: Summary of WWTPs**

LM Name	Plant Name	Design Capacity (Mℓ/d)	Annual Average Production (Operational) (Mℓ/d)	Class of Plant
Dannhauser	Dannhauser (Tweediedale sewer ponds)	2	1.8	D
	Durnacol	2	0.9	D
Emadlangeni	Utrecht (existing sewer ponds)	1	1	D
	Utrecht (to be completed by 2020)	2		TBC
<b>Total Capacity based on known information</b>		6	3.7	

Source: Amajuba DM correspondence and from interviews with consultants (June, 2019)

## 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 water infrastructure development over the next three years (till 2021/2022) within ADM amount to R161 million. ADM currently has no existing bulk interventions currently in planning under the Regional Bulk Infrastructure Grant.

## G. Bulk Water Supply Interventions Considered

This study aims to ensure that the ADM 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. 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.

For completeness, tables however include rural areas currently obtaining water from groundwater sources such as boreholes and springs or water tanker. The consumers are residing on rural farmsteads or small settlements.

**Table G-1 Conceptual Scheme Areas, Population and Water Requirements**

Water Supply Scheme / WSIA		Population 2020	Water Requirements (Mℓ/d)						
			2020	2025	2030	2035	2040	2045	2050
<b>AMA003</b>	Skombaren Ngagane WTP WSS	4 381	0.92	0.93	1.05	1.06	1.21	1.22	1.39
<b>AMA004 and AMA008</b>	Dannhauser WSS	6 489	2.12	2.10	2.36	2.36	2.67	2.68	3.03
	Durnacol WSS	3 866	1.38	1.37	1.54	1.54	1.74	1.74	1.96
<b>Total: AMA004 and AMA008</b>		<b>10 355</b>	<b>3.50</b>	<b>3.48</b>	<b>3.89</b>	<b>3.90</b>	<b>4.41</b>	<b>4.42</b>	<b>4.99</b>
<b>AMA005 and AMA014</b>	Dannhauser 3 WSS Hilltop	9 983	1.59	1.59	1.81	1.83	2.09	2.12	2.42
	Ngagane/Dannhauser 1 WSS Buffalo Flats	90 657	15.83	16.01	18.24	18.44	21.01	21.26	24.23
<b>Total: AMA005 and AMA014</b>		<b>100 640</b>	<b>17.41</b>	<b>17.61</b>	<b>20.04</b>	<b>20.27</b>	<b>23.10</b>	<b>23.38</b>	<b>26.65</b>
<b>AMA016</b>	Utrecht/Ngagane WSS	8 464	2.33	2.32	2.61	2.62	2.97	2.98	3.38
<b>AMA015</b>	Waterval prison	1 671	0.61	0.60	0.67	0.67	0.75	0.75	0.85
<b>AMA006</b>	Dannhauser Rural Supply Areas	4 975	0.97	1.04	1.10	1.18	1.26	1.35	1.45
<b>AMA009</b>	Emadlangeni Rural Supply Areas	31 033	2.86	4.32	5.92	6.29	6.69	7.13	7.60
<b>TOTAL</b>		<b>159 849</b>	<b>28.60</b>	<b>30.29</b>	<b>35.28</b>	<b>35.99</b>	<b>40.39</b>	<b>41.23</b>	<b>46.30</b>

Source: Water Demand Model, UAP Phase III, 2020

**Table G-2: Water Resources Required vs proposed WSI**

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm <sup>3</sup> /a)	[A] Existing Resources (Mm <sup>3</sup> /a)*	[B] Proposed Additional Demand under UAP Phase III (Mm <sup>3</sup> /a)	[A+B] Total Demand (Mm <sup>3</sup> /a)	Balance (Mm <sup>3</sup> /a)
AMA003	Skombaren Ngagane WTP WSS	6 082	1.39	0.51	170	0.17	170.17	
AMA004 and AMA008	Dannhauser WSS	9 009	3.03	1.10		0.33		
	Durnacol WSS	5 367	1.96	0.72		0.21		
<b>Total: AMA004 and AMA008</b>		14 376	4.99	1.82	170	0.54	170.54	
AMA005 and AMA014	Dannhauser 3 WSS Hilltop	13 860	2.42	0.88		0.31		
	Ngagane/Dannhauser 1 WSS Buffalo Flats	125 856	24.23	8.84		3.07		
<b>Total: AMA005 and AMA014</b>		139 715	26.65	9.73	170	3.37	173.37	
AMA016	Utrecht/Ngagane WSS	11 750	3.38	1.23	1.1**	0.38	1.48	
<b>TOTAL</b>		171 923	36.40	13.29		4.47		

\* The licensed allocation in the WARMS database of the DWS to the Ngagane WTP from its three water sources totals 170Mℓ/d (62.05Mm<sup>3</sup>/a).

\*\* The full supply capacity of the Dorps dam is 1.1Mm<sup>3</sup>, but the historic firm yield for both the Dorps and Nywerheids dams is not known (Umgeni Water, 2020).

The groundwater availability in the Buffalo Flats area is unknown.

### G-3: Total Cost requirement

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
<b>AMA003</b>	Skombaren Ngagane WTP WSS	R0	R9 405 000	R0	R940 500	R10 345 500
<b>AMA004</b>	Dannhauser WSS	R61 434 000	R8 344 000	R0	R6 977 800	R76 755 800
<b>AMA008</b>	Durnacol WSS	R103 383 000	R157 088 000	R1 866 000	R26 233 700	R288 570 700
<b>Total: AMA004 and AMA008</b>		<b>R164 817 000</b>	<b>R165 432 000</b>	<b>R1 866 000</b>	<b>R33 211 500</b>	<b>R365 326 500</b>
<b>AMA005</b>	Dannhauser 3 WSS Hilltop	R36 158 000	R60 233 000	R833 000	R9 722 400	R106 946 400
<b>AMA014</b>	Ngagane/ Dannhauser 1 WSS Buffalo Flats	R27 945 000	R264 472 000	R22 806 000	R31 522 300	R346 745 300
<b>Total: AMA005 and AMA014</b>		<b>R64 103 000</b>	<b>R324 705 000</b>	<b>R23 639 000</b>	<b>R41 244 700</b>	<b>R453 691 700</b>
<b>AMA016</b>	Utrecht/ Ngagane WSS	R0	R4 496 000	R22 244 000	R2 674 000	R29 414 000
<b>AMA015</b>	Waterval prison	R0	R996 000	R0	R99 600	R1 095 600
<b>AMA006</b>	Dannhauser Rural					R63 661 606
<b>AMA009</b>	Emadlangeni Rural Supply Area					R304 619 858
<b>Total</b>		<b>R228 920 000</b>	<b>R505 034 000</b>	<b>R47 749 000</b>	<b>R78 170 300</b>	<b>R1 228 154 764</b>

Source: Water Demand Model, UAP Phase III, 2020

A total estimate of approximately R1 228.15 million is required to address the total bulk water supply requirement by 2050.

## H. Conclusions and Recommendations

The WSA 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. 23.7% of the consumers within WSA does not have access to reliable water supply. Furthermore, there are areas where the existing water supply infrastructure as well as water source, are insufficient to meet current and projected future water requirements. New developments and urbanisation put further strain on existing supplies and resources.

The ADM 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 WSA over the MTEF period, it may take another sixteen years for the WSA 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 water supply area interventions would be an implementation priority for the WSA, 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 ADM as the WSA. The WSA 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 WSA to take this process further.

The proposed water supply intervention areas (WSIAs) for bulk water supply development within ADM are as follows:

- ✓ AMA003: Skombaren Ngagane WTP WSS;
- ✓ AMA004: Dannhauser WSS & AMA008: Durnacol WSS;
- ✓ AMA005: Dannhauser 3 WSS Hilltop and AMA014: Ngagane/Dannhauser 1 WSS Buffalo Flats;
- ✓ AMA016: Utrecht/Ngagane WSS;
- ✓ AMA006: Dannhauser Rural;
- ✓ AMA009: Emadlangeni Rural Supply Area; and
- ✓ AMA015: Waterval Ngagane WTW WSS.

Although all area interventions would be an implementation priority for the WSA, it is proposed to consider the following two (2) priorities detailed within Table I-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 I-1 Proposed Implementation Order**

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Estimated Project Value (Excl VAT)
1	AMA004 & AMA008	Dannhauser WSS and Durnacol WSS	Dannhauser and Durnacol WSS	R365 326 500
2	AMA005 & AMA014	Dannhauser 3 WSS Hilltop and Ngagane / Dannhauser 1 WSS Buffalo Flats	Dannhauser Hilltop and Buffalo Flats WSS.	R453 691 700

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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 <sup>3</sup>	Cubic meter
MIG	Municipal Infrastructure Grant
Mℓ/day	Mega liter per day
Mm <sup>3</sup>	Million Cubic meter
Mm <sup>3</sup>	Million Cubic Meters
Mm <sup>3</sup> /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

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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 Amajuba District Municipality (ADM) – as Water Services Authority (WSA), for two of the local municipalities in its jurisdiction namely Dannhauser and Emadlangeni.

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 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 uMhlatuze 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 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:

- ✓ Newcastle Local Municipality Water and Sanitation Master Plan – still in development (requires funding for its release),
- ✓ Development and Implementation of Water Conservation/Water Demand Management in Amajuba District Municipality: Bulk Water Meter Audit Report, 2016;
- ✓ StatsSA Community Survey, 2016;
- ✓ Submission of monthly water balance reports to the DWS;

- 
- ✓ KZN Water Conservation and Water Demand Management Handbook. Amajuba District Municipality, 2018;
  - ✓ KZN Water Conservation and Water Demand Management Handbook. Newcastle Local Municipality, 2018;
  - ✓ Amajuba District Municipality Spatial Development Framework, 2018/2019;
  - ✓ Amajuba District Municipality Integrated Development Plan, 2019/2020;
  - ✓ Dannhauser Local Municipality Integrated Development Plan, 2018/2019;
  - ✓ Emadlangeni Local Municipality Integrated Development Plan, 2019/2020;
  - ✓ Newcastle Local Municipality Integrated Development Plan, 2019/2020;
  - ✓ Umgeni Water Infrastructure Master Plans, 2017, 2018, 2019 and 2020;
  - ✓ Uthukela Water Infrastructure Master Plan 2015;
  - ✓ Eskom Satellite Building Count (SBC), 2015;
  - ✓ Newcastle Local Municipality Community Base Plans April 8, 2019 – still to be obtained;
  - ✓ 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

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During the UAP Phase III study, the stakeholders identified and engaged from the previous UAP Phase II study, were reviewed and the stakeholder list updated. In the ADM (2019), there were a few changes of officials with new appointments as well as persons appointed in acting positions.

Uthukela Water provides bulk water services in the Dannhauser LM 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

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

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### 1.5.1 Total Water Demand Calculations

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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

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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**

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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**

Classification	Type of Centre	Description	Typical CSIR / SACN Settlement Typology	Indirect demands as a ratio of direct demands			
				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
<b>House Connections: Very High Income</b>	Grows with Population growth
<b>House Connections: Upper middle income</b>	Grows with Population growth
<b>House Connections: Average Middle Income</b>	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
<b>House Connections: Low middle Income</b>	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
<b>House Connections: Low income</b>	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
<b>Yard Connections</b>	Grows with Population growth + minimum LOS by 2030
<b>Households with access to interim services</b>	Reduce to 0 by 2030
<b>Households with access to below interim services</b>	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

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Cubic Meters per annum (Mm<sup>3</sup>/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

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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

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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.

### 2.1 CONTEXT

The Amajuba District Municipality (DC25), is one of the ten (10) District Municipalities and one (1) Metropolitan Municipality that constitute the KwaZulu-Natal Province. The Amajuba DM has three district municipalities bordering it within the Province of KwaZulu-Natal, namely uThukela and uMzinyathi DMs to the south and Zululand DM in the east. In the north, the Amajuba DM shares its boundary with the Mpumalanga Province and in the west with the Free State Province.

Amajuba DM consists of three local municipalities namely:

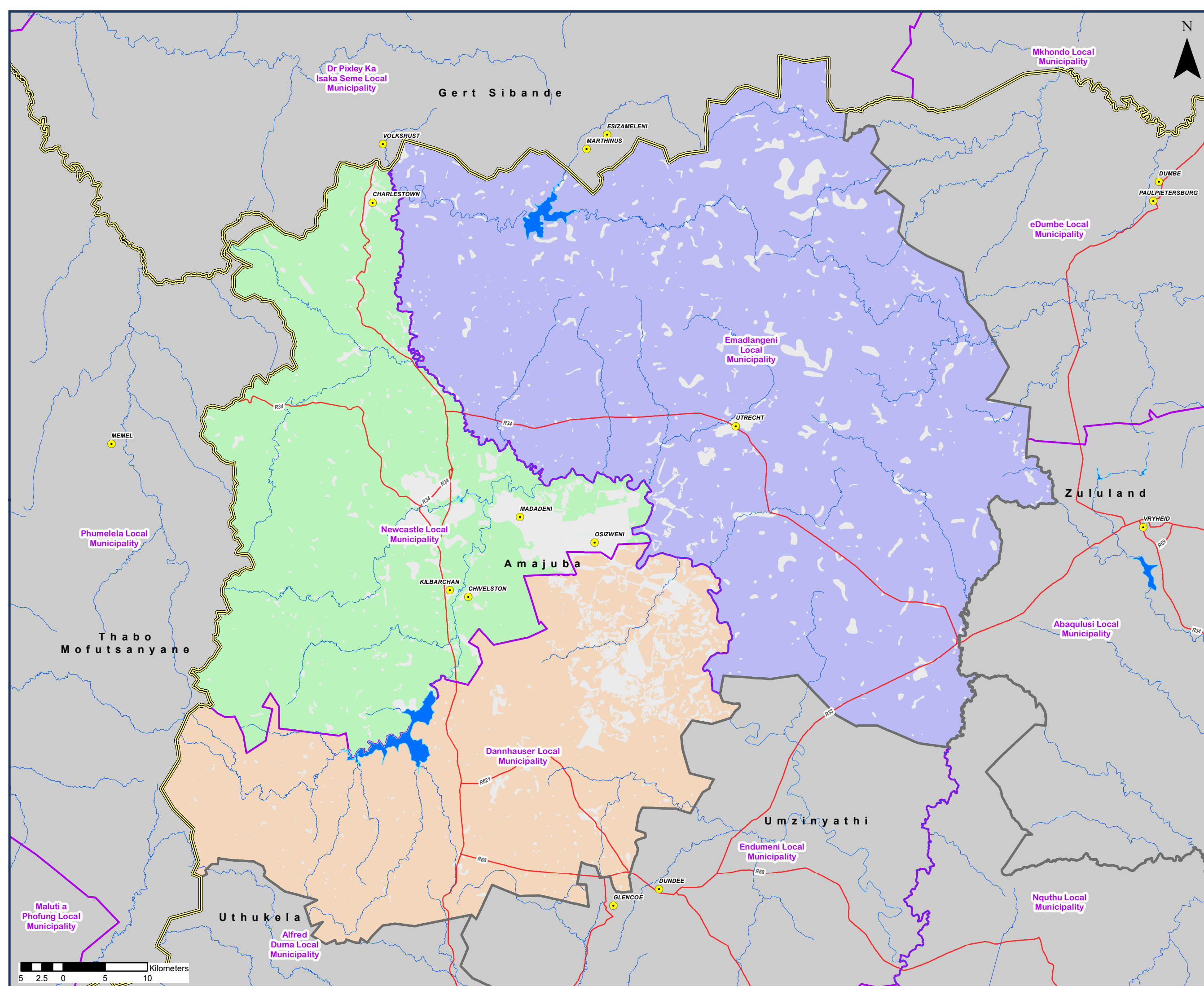
- ✓ Dannhauser (KZN254);
- ✓ Emadlangeni (KZN253); and
- ✓ Newcastle (KZN252). The Newcastle LM is the WSA for its area of jurisdiction.

The main transportation route linking the district to its surroundings, is the N11. This is also an alternative route to Johannesburg from Durban. The R34 bisects the district in an east-west direction and provides a linkage from the port city of Richards Bay to the interior. The district has a total surface area of 6 910km<sup>2</sup>, (ADM IDP, 2019/2020).

According to the Community Survey 2016, the total population in the ADM is estimated to be 531 327 people within 147 256 households. Newcastle LM has the highest population with 389 117 people residing in 90 347 households. It is projected that the population in the ADM will grow by 5.1% between 2019 and 2023 (ADM IDP, 2019/2020), which is the same as determined in the UAP Phase III water requirements model.

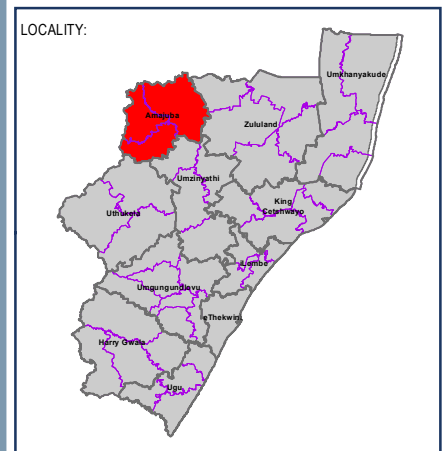
The ADM serves as a regional node of development and functional services in the north of KwaZulu-Natal and linking to the southern portion of the Mpumalanga Province, the eastern Free State and good access via road and rail to these provinces as well as Gauteng (ADM IDP, 2019/2020). Manufacturing is the main contributor to Gross Value Added in the ADM, followed by mining, finance and community services. The agricultural sector has shown a decline whereas it has shown growth in the province as a whole (ADM IDP, 2019/2020).





**Legend**

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- National Roads
- Main Roads
- Local Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns



CLIENT:

DISTRICT MUNICIPALITY:

CONSULTANTS:

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IMPROVING LIVES  
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PROJECT TITLE

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

MAP TITLE:

**Study Areas**

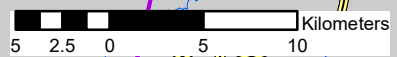
**Amajuba District Municipality &  
Newcastle Local Municipality**

DATE COMPLETED:

18 June 2020

MAP NO.:

DC25: Figure 2.1



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## 2.2 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

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

### 2.2.1 Dannhauser Local Municipality (DLM)

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The municipality is a category B municipality and is in the northern part of KwaZulu Natal with the most prominent towns being Dannhauser town, Durnacol and Hattingspruit. The DLM consists of 13 wards, including four Tribal Authorities and a total of 58 settlement areas (Census Main Places, 2011). The Dannhauser region has well-developed coal mining areas and is easily accessible by road – N11 national highway, and rail, which provide opportunities for product movement to and from Gauteng as well as the coastal ports of Durban and Richard's Bay (DLM IDP 2018/2019).

The DLM, covering 1 516km<sup>2</sup>, had a population of 102 161 in 2011, that increased to 105 341 in 2016 with the highest population and population density in the traditional council areas with the highest concentration in the north-east of the DLM. About 97 905 people reside in rural areas. The town of Dannhauser functions as the primary node as it has well-developed, although ageing infrastructure, provides access to community services, industries and agricultural industries. The main sectors contributing to the GDP of the economy are the community services, manufacturing and mining sectors. There has been a decrease in the agricultural sector's GDP contribution and employment (DLM IDP, 2018/2019).

The majority of the Ntshingwayo Dam on the Ngagane River falls within the DLM with the remainder including the dam wall, within the Newcastle LM. Groundwater resources may be affected by the coal mining operations, resulting in acid mine drainage however this is monitored by the Department of Mineral Resources (DLM IDP, 2018/2019).

### 2.2.2 Emadlangeni Local Municipality (ELM)

---

The municipality is a category B municipality and is in the north of KwaZulu-Natal with the most prominent town being Utrecht which is 52km east of Newcastle. The town of Vryheid in the neighbouring Zululand DM, lies 68km west of Utrecht, along the R34 regional route (ELM IDP, 2019/2020).

The ELM is predominantly rural and characterised by vast tracts of commercial farmland and dispersed rural settlements over an area of 3 539km<sup>2</sup>. There are six electoral wards and five traditional councils. The population of the ELM grew from 34 442 (6 252 households) based on the 2011 census, to 36 869 (6 667 households) according to the 2016 Community Survey (ELM IDP, 2019/2020).

The ELM form part of the Battlefields tourism route, where the Blood River runs along the south-eastern section of the municipality, partially forming the boundary with the Zululand DM. The Balele mountains in the north-eastern region form part of the Drakensberg escarpment. There is further tourism development potential due to the diversity of natural resources in the municipality. Commercial agriculture, mining, trade, finance

and government services are the dominant economic sectors, but more is needed to diversify the economy of the area including agricultural sectors and afforestation. The urban areas are served, but there are still backlogs in the rural areas (ELM IDP, 2019/2020).

### 2.3 CLIMATE AND CLIMATE CHANGE

The ADM climatic conditions are varied between summer and winter months ranging between very cold temperatures during the winter, with temperatures that can go below zero degrees Celsius and high summer temperatures that can exceed 30°C. The average temperature for the ADM is about 17°C. The mean annual precipitation figures per LM are illustrated in Table 2-1 (ADM SDF, 2019/2020).

**Table 2-1 Mean Annual Precipitation**

	Dannhauser	Emadlangeni
<b>Annual minimum rainfall</b>	587	517
<b>Annual maximum</b>	1 015	1 127

It is anticipated that climate change will have an effect on ecosystems and ecosystem services. The changes in land use, especially loss of grassland and vegetation, will exacerbate the effects of climate change as these biomes serve as carbon sinks and assist to mitigate temperature increases (ADM SDF, 2019/2020).

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 WSAs. The CCRP used various models to provide information on predicted changes in precipitation and temperature. The report states the following: “It is therefore projected across most of the models that Amajuba District Municipality could experience an increase in rainfall in the months of January, February, March, May, July, August September, October, November and December, and a decrease in rainfall during April and June (Climate System Analysis Group 2017a).”

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

- ✓ Deterioration of water quality, especially impoundments, due to increased salt concentrations due to evaporation;
- ✓ Increased floods – also deteriorating water quality and increasing pollutants in water sources;
- ✓ Increased droughts – reducing the diluting ability of water resources; reducing water availability;
- ✓ Poorer water quality and less water availability (due to mining activities) impact on aquatic ecosystems;

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Responses to these threats include improved water resource management and management of water services infrastructure and other supporting infrastructure such as stormwater systems.

In addition to the information and recommendations from the CCRP, 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

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The information in this section was sourced from the ADM SDF, 2019/2020.

The topography of the ADM resembles a horse-shoe type formation of high-lying areas in the western, northern and eastern areas, with elevations ranging from 1 042m to 2 290m above mean sea level. The western region forms part of the Drakensberg escarpment, with the northern and eastern regions forming part of the Balelesberg and Skurweberg mountains respectively. In the south, a portion of the ADM forms part of the Biggarsberg mountains. The high-lying regions' runoff drains into the Buffalo River catchment.

The underlying geology of the central portion of the ADM is underlain by Karoo Sequence sediment with higher-lying areas underlain by a combination of geological foundations. Varying soil types occur in the area consisting of Dolerite, Mudstone, Sand and Shale (including coal) amongst others and form part of the Ecca Group, Karoo Sequence with intrusive dolerite. Dolerite is especially prominent in the central and eastern portion of the ADM.

The over texture of the soil appears to be predominantly clay. Due to the numerous wetlands in the area, it is usual for the soils to have an expansive property, meaning that they have the ability to shrink and swell based on their water content (typical of wetland type soils).

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## 2.5 ENVIRONMENT

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The information in this section was sourced from the ADM SDF, 2019/2020. Water resources are described separately in the Water Resources section of this document. The land cover was sourced from the Department of Environment (2018 dataset) and is illustrated in Figure 2-2.

There are four biome types within the ADM: Forest, Savanna, Grasslands and Wetlands, that contain 14 different vegetation types (Scott-Shaw and Escott 2011). The ADM is dominated by Grasslands and more specifically by Income Sandy Grassland, Wakkerstroom Montane Grassland, Northern KZN Moist Grassland and the KZN Highland Thornveld. In addition to the dominant Grasslands, the ADM also has Paulpietersburg Moist Grassland, that together form important however vulnerable grassland types. Forests form a very small component of the vegetation in the District.

The Eastern Mistbelt Forests are considered endangered, whilst Eastern Temperate Wetlands and Temperate Alluvial Vegetation are considered vulnerable wetland types. The high lying grasslands of the ADM are located in a high rainfall / runoff region of the country and have been included as National Strategic Water Source Areas. Some areas have an estimated mean annual rainfall of between 600-1000mm, which is significantly higher in comparison to the regional average of 450mm.

There are various vulnerable fauna and flora sites identified as well as Critical Biodiversity Areas, as illustrated in Figure 2-3.

---

Within the ADM, the Grassland biome type is likely the most important as it contributes to biodiversity, agricultural production (especially livestock farming) and playing an important role in climate protection, water resource management and social-cultural activities.

The District has identified intensive irrigation farming and tourism as an important mechanism to develop the regional economy (SDF, 2017). This however is dependent on the availability and supply of good quality water to areas with sufficiently arable land. Mining and industry also play important roles in the local and regional economy and are dependent on the environmental resources and infrastructure services.

Figure 2-2 Land Cover

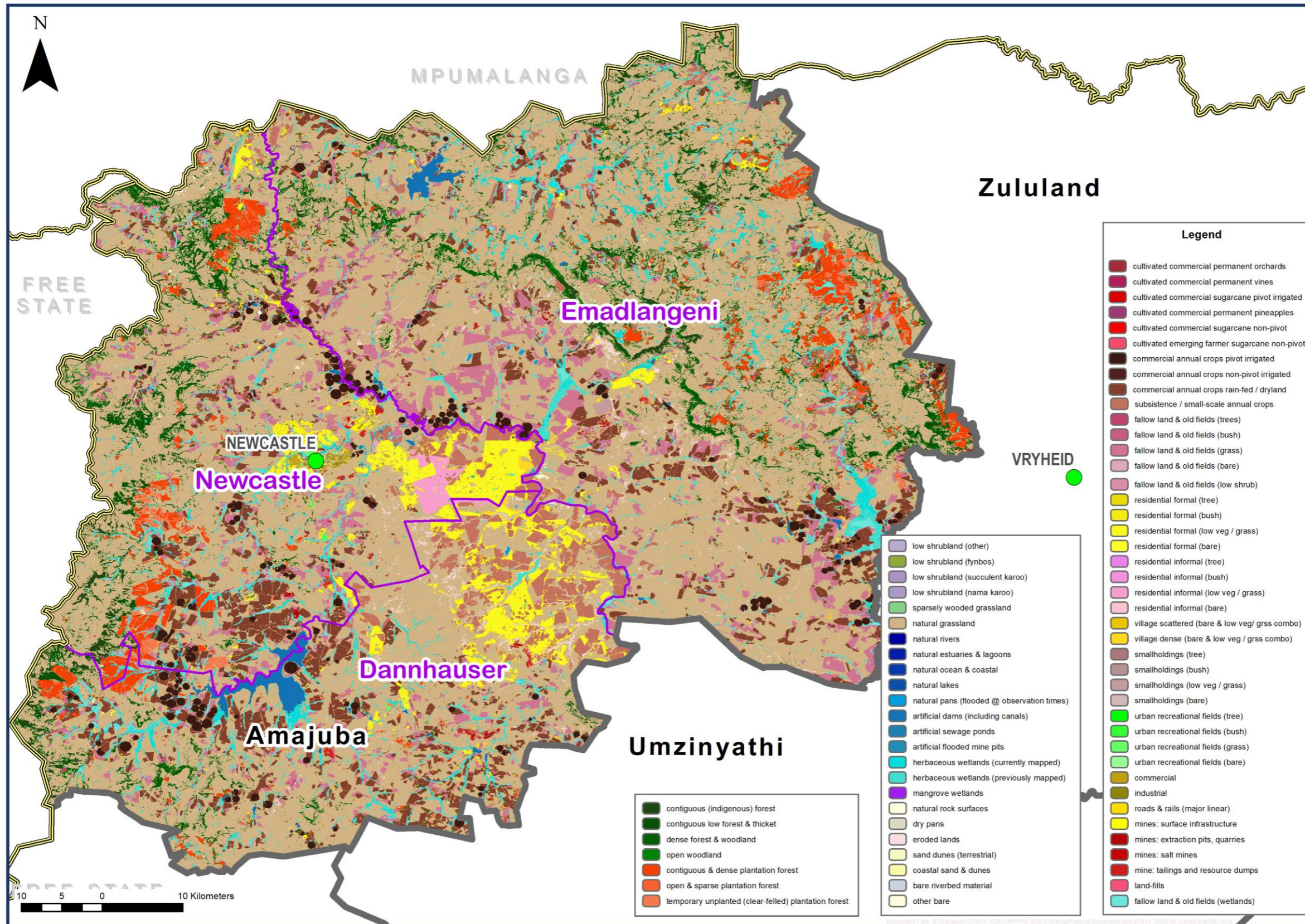
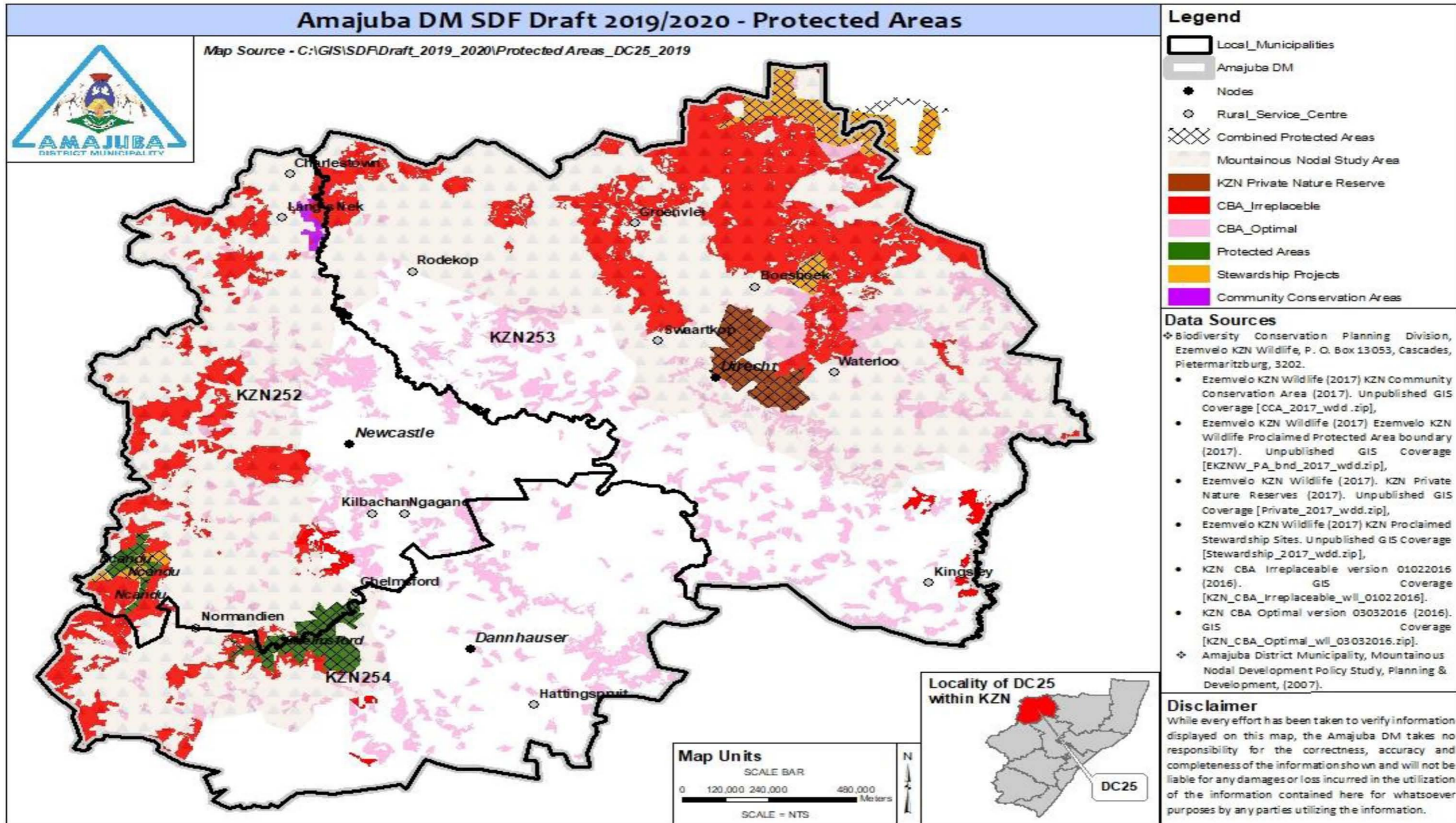


Figure 2-3 Critical Biodiversity Areas





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## 2.6 INSTITUTIONAL ARRANGEMENTS FOR WATER SUPPLY

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The ADM is the Water Services Authority (WSA) for two of the three local municipalities of its area of jurisdiction, namely Dannhauser Local Municipality and Emadlangeni Local Municipality. The ADM is performing secondary bulk and retail water and sanitation services as Water Services Provider for these two LMs. The third local municipality, Newcastle, is itself a WSA for its area of jurisdiction.

Uthukela Water, a municipal-owned entity with its shareholding distributed among the Amajuba District Municipality, uMzinyathi District Municipality and Newcastle Local Municipality. It provides bulk water services to some parts of the listed municipalities, namely the operation and maintenance of the abstraction works for the Biggarsberg and Ngagane WTPs and primary bulk water supply infrastructure.

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## 2.7 ECONOMIC DEVELOPMENT OPPORTUNITIES

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The ADM has developed a District Growth and Development Plan (DGDP), 'Vision 2030' (2019/2020) which is also in alignment with national and provincial growth and development planning. The Plan reports from the Quantec 2010 data of economic sectors, indicating that in the ADM, the sectors contributing most to the ADM's GVA are manufacturing (25.2%), general government (15.2%) and wholesale and retail (12.1%). The Newcastle LM contributes more than 88% of the total Gross Value Added (GVA) which amounts to R10.4 billion (ADM DGDP, 2019/2020).

Agriculture contributes 2.1% to the ADM economy and about 2% to formal employment, but has shown a decline for the reporting period 2005-2009. Mining (mostly coal) contributes 3.4% to the ADM's GVA and about 1% to employment and has also shown a decline in especially larger mining enterprises. Only small-scale mining operations in coal show continued potential for growth (ADM DGDP, 2019/2020).

Manufacturing, retail and industrial activities show the most growth and development, especially in the Newcastle LM, which is also an important provincial node in terms of manufacturing. Tourism has not enjoyed a high profile in the ADM, largely due to the association with mining and industrial activities. However, the ADM has high potential for tourism development such as avi-tourism / birding; nature and game reserves; adventure and sports tourism; and natural, cultural and historical attractions, e.g. Battlefields Route (ADM DGDP, 2019/2020).

The ADM Local Economic Development (LED) Strategy (2019/2020) identified the areas of tourism development, manufacturing, diversification of the agricultural sector and informal trade support and formalisation as opportunities for economic development.

---

The ADM IDP (2019/2020) listed the following catalytic projects, informed by the LED DGDP 2019/2035:

- ✓ Amajuba Livestock Production Programme;
- ✓ Poultry value chain;
- ✓ Development of a regional market;
- ✓ Aquaponics project;
- ✓ Development of a District Development Agency; and
- ✓ Grain Crop Production Programme.

### 3. DEMOGRAPHICS

This section presents the current and projected demographics for the WSA, however information is also reported on the Newcastle LM, itself a WSA for its area of jurisdiction, to provide more context to the ADM and its characteristics. A map of population distribution is provided in Figure 3-1.

Note that the next national census will be conducted in 2021<sup>1</sup>.

#### 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:

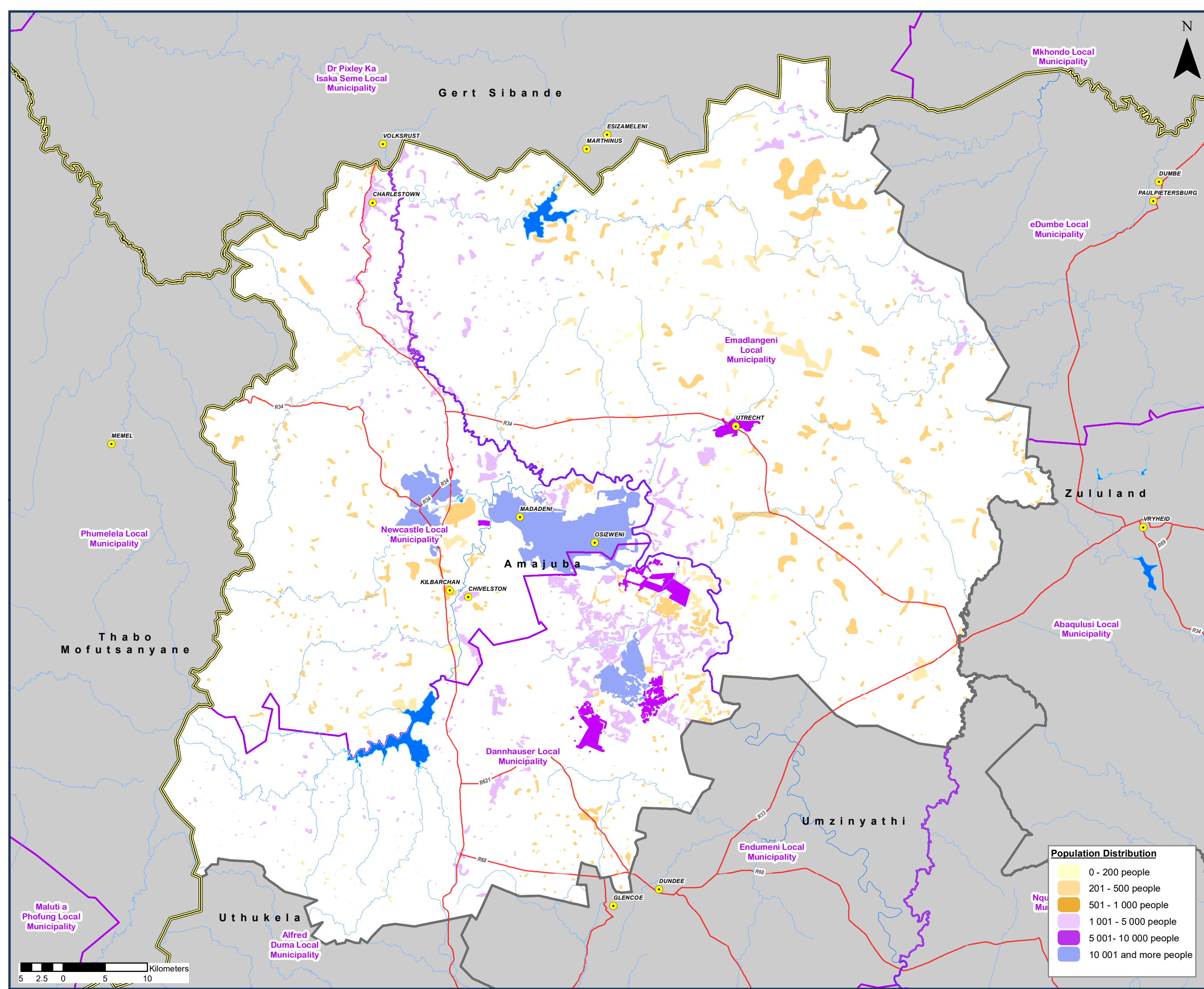
**Table 3-1: Population: 2011 and 2016**

LM Name	Population 2011	Population 2016	Population Growth	Growth Rate pa
Dannhauser	102 937	105 341	2 404	0.47
Emadlangeni	34 442	36 869	2 427	1.41
<b>Total, Growth Rate Average</b>	137 379	142 210	4 831	0.70

Source: StatsSA, 2016 Community Survey

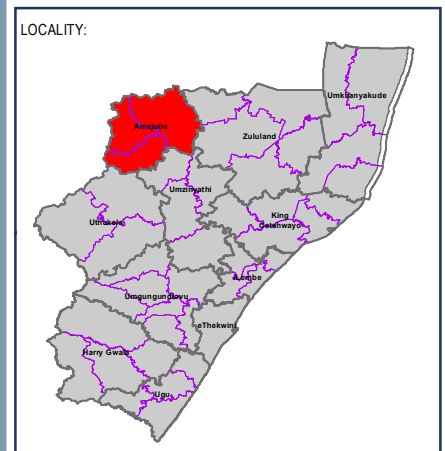
The growth in population as a number is very similar for both the Dannhauser and the Emadlangeni LMs, however as a percentage, it is higher for the Emadlangeni LM.

<sup>1</sup> The timing and undertaking the 2021 or next national census may be affected by the COVID19 pandemic.



**Legend**

- Provincial Boundaries
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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:

**Population Distribution  
Amajuba District Municipality &  
Newcastle Local Municipality**

DATE COMPLETED:

18 June 2020

MAP NO.:

DC25: Figure 3.1

**Population Distribution**

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



### 3.2 SOCIAL AND ECONOMIC INDICATORS

The information for this section was sourced from the ADM District Growth and Development Plan (DGDP), 'Vision 2030' (2019/2020).

Household income can be used as a proxy for economic well-being of household and individuals, as it determines their consumption and savings potentials. Changes in the income by households is one of the direct indicator available that can be used to establish who benefits from economic development and by how much are the beneficiaries benefiting.

Furthermore, data on household income can be used to inform poverty analysis. Table 3-2 illustrate low annual household income figures for the ADM in 2011, with about 70% of the population earning below R38 200 per annum (approximately R3 200 per month). Of those about 74% are households in the Newcastle LM.

**Table 3-2 Household income of ADM per Local Municipality**

Income Category	Dannhauser LM	Emadlangeni LM	ADM Households
<b>No Income</b>	17,0%	11,6%	17,3%
<b>R 1- 4 800</b>	5,3%	3,6%	5,0%
<b>R 4 801- R 9 600</b>	10,3%	10,1%	9,1%
<b>R 9 601- R 19 600</b>	23,9%	20,8%	20,0%
<b>R 19 602- R38 200</b>	23,4%	25,0%	19,9%
<b>R 38 201- R 76 400</b>	11,7%	14%	11,4%
<b>R 76 401- R 153 800</b>	4,9%	7,6%	7,7%
<b>R 153 801- R 307 600</b>	2,2%	4,1%	5,4%
<b>R 307 601- R 614 400</b>	1,1%	2,5%	2,8%
<b>R 614 401- R 1 228 800</b>	0,1%	0,3%	0,8%
<b>R1 228 801- R 2457 600</b>	0,1%	0,3%	0,4%
<b>R2 457 601 or more</b>	0,1%	0,1%	0,4%

Source: Statistics South Africa 2011

The ADM DGDS (2019/2020) further reports on the KZN Multiple Deprivation Index in 2011, developed by KZN Provincial Treasury. The index is based on income levels, employment levels, health, education, access to services, and crime rates.

Each local municipality is allocated a score for each of the indicators, which are then totalled in order to derive the deprivation index for each locality. Fifty-one local municipalities in KZN were analysed, and then ranked in ascending order – from 1 (highest level of deprivation) to 51 (lowest level of deprivation). The Deprivation Index for the ADM is presented in Table 3-3.

**Table 3-3 Amajuba DM Deprivation Index per Local Municipality**

LM	Income	Employment	Health	Education	Living Environment	Crime	Final Ranking
Dannhauser	3	8	44	21	16	28	11/51
Emadlangeni	20	19	5	36	36	29	21/51

Source: KZN Provincial Treasury, 2011

The Dannhauser LM has the highest levels of deprivation within the ADM, ranked 11 out of the 51 municipalities in the province.).

### 3.3 POPULATION GROWTH SCENARIOS

Umgeni Water, in collaboration with Statistics South Africa, developed a population growth scenario for areas 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 ADM from 2015 to 2035, as illustrated in Table 3-4.

**Table 3-4: ADM Demographic Projections – Population, UAP Phase II**

Local Municipality	2015	2020	2025	2030	2035
Dannhauser	107 338	114 935	121 297	128 393	133 333
Emadlangeni	34 386	36 830	39 019	41 437	43 106
<b>TOTAL</b>	<b>141 724</b>	<b>151 765</b>	<b>160 316</b>	<b>169 830</b>	<b>176 439</b>

The UAP Phase III projected population for the ADM, from 2016 to 2050 is illustrated in Table 3-5.

**Table 3-5: ADM Demographic Projections – Population, UAP Phase III**

Local Municipality	2020	2025	2030	2035	2040	2045	2050
Dannhauser	116 370	120 987	126 045	132 949	140 233	147 916	156 022
Emadlangeni	38 954	40 508	42 212	44 533	46 983	49 567	52 293
<b>Total</b>	<b>155 324</b>	<b>161 495</b>	<b>168 257</b>	<b>177 482</b>	<b>187 216</b>	<b>197 483</b>	<b>208 315</b>

---

The average annual population growth rate for the municipalities between 2020 and 2025 is estimated to be 0.79% and from 2030 to 2050, it increases to 1.08%. The next national census is planned to 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

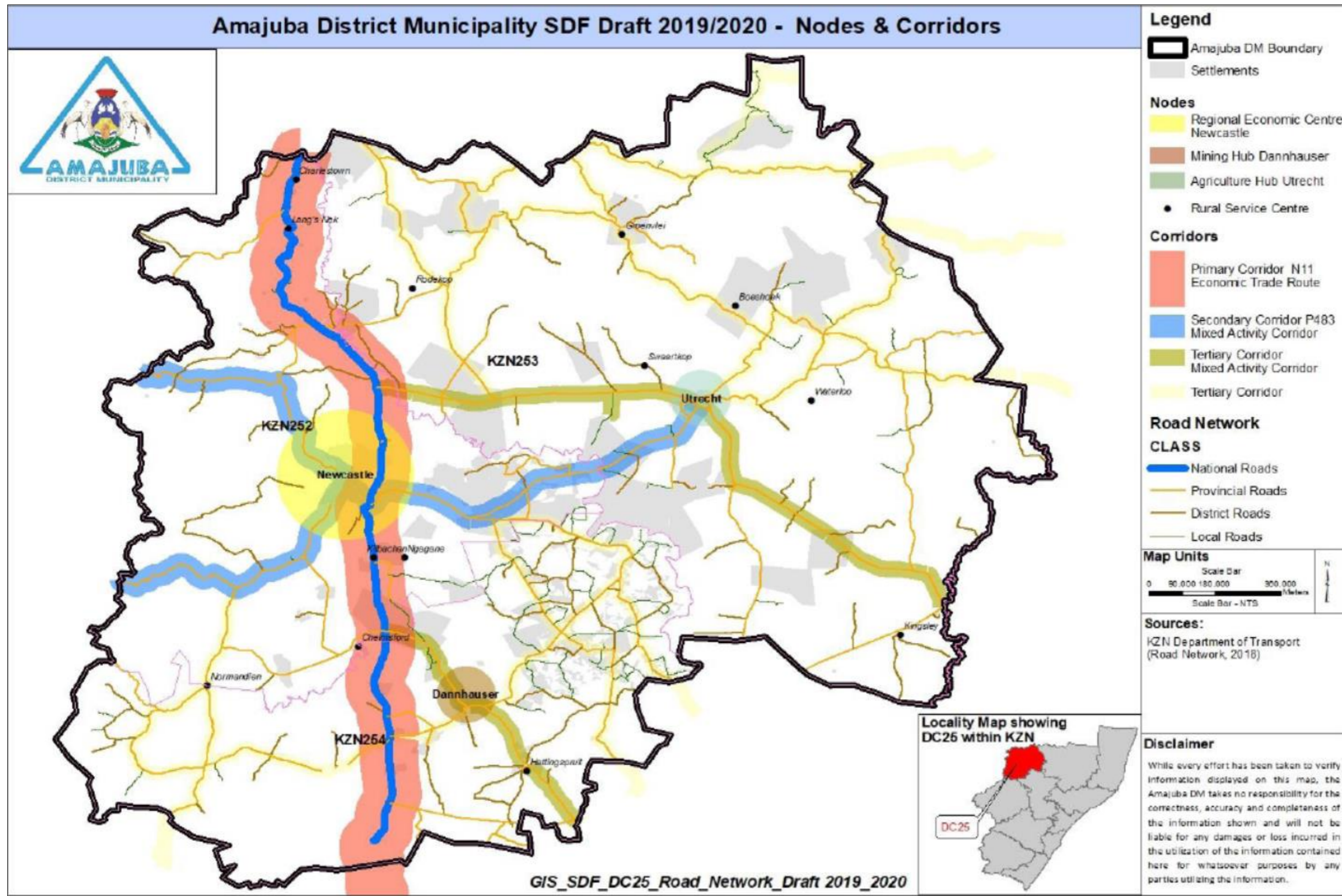
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The ADM SDF (2019/2020) identified the N11 national highway (north-south) as the primary corridor for development, followed by the P483 traversing east-west. The N11 national highway provides access to the port and metropolitan area of eThekweni Metropolitan Municipality in the south and the Mpumalanga mining developments and the economic hub of Gauteng in the north.

Newcastle town was identified as the regional economic centre, Dannhauser town as the mining development node and Utrecht as the agricultural hub.

See Figure 3-2, extracted from the SDF, that provides an overview of the corridors, road network and nodes.

Figure 3-2 ADM Spatial Development Corridors and Nodes





## 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 were discussed with the WSA during this study, to verify the existing status, on a ward level. 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.

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 Community Survey 2016 Water Supply Levels

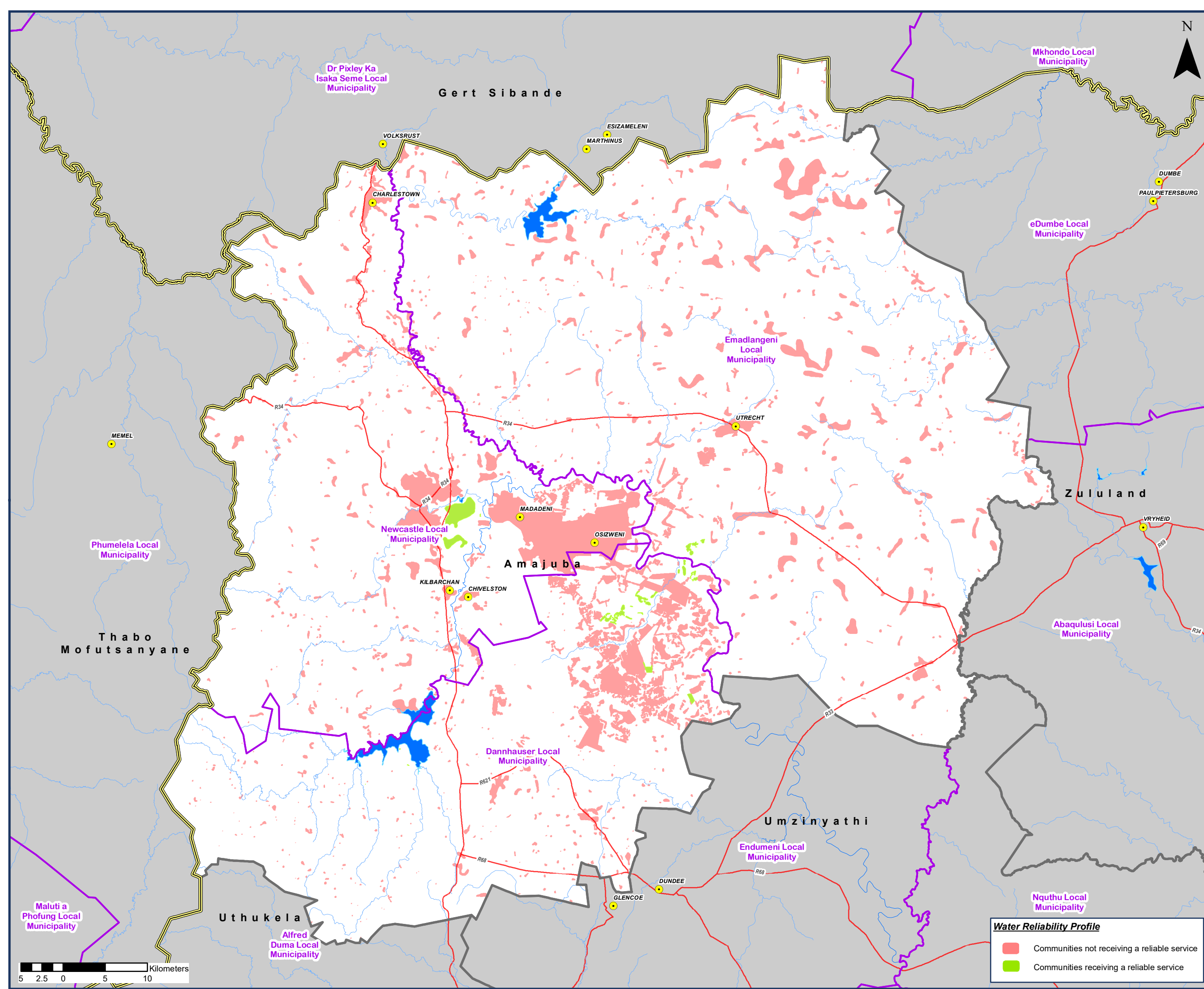
The following service levels are presented from the 2016 Community Survey for the WSA and the Newcastle LM, itself a WSA for its area of jurisdiction:

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

LM Name	Access to safe drinking water		No access to safe drinking water		Total households
	No. of Households	Percentage (%)	No. of Households	Percentage (%)	
Dannhauser	15 670	79.2	4 111	20.8	19 781
Emadlangeni	4 493	67.7	2 143	32.3	6 636
<b>Total</b>	20 163	76.3	6 254	23.7	26 417

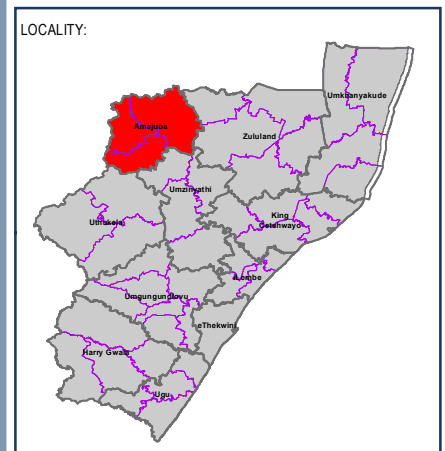
Source: StatsSA, 2016 Community Survey

The municipality with the highest level of service, by number of households having access to safe drinking water, is the Dannhauser LM, representing 59% of the WSA total number of households.



**Legend**

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- National Roads
- Main Roads
- Local Roads
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns



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PROJECT TITLE

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

MAP TITLE:

**Water Supply Reliability Profile  
Amajuba District Municipality &  
Newcastle Local Municipality**

DATE COMPLETED:

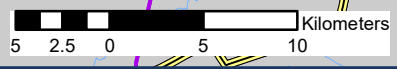
18 June 2020

MAP NO.:

DC25: Figure 4.1

**Water Reliability Profile**

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



#### 4.1.2 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 (%)
Dannhauser	19 648	15 879	81	3 769	19
Emadlangeni	6 459	3 165	49	3 294	51
<b>Total</b>	<b>26 107</b>	<b>19 044</b>	<b>73</b>	<b>7 063</b>	<b>27</b>

Source: DWS RF geodatabase, 2016

The information is corresponding to the 2016 Community Survey for the Dannhauser LM. There is a slight difference in the Emadlangeni LM, with the 2016 Community Survey reporting more households with access to safe water supply.

#### 4.1.3 Water and Sanitation Master Plan

The WSA does not have a recently-prepared water and sanitation master plan. The only Water and Sanitation Master plan is a 20-page document from 2011.

#### 4.1.4 WSA Municipal Infrastructure Forum Reporting

No information could be sourced from the IGR reporting by the WSA.

### 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**

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

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 of R6/kl is reflected in the last column.

**Table 4-3: 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
eThekweni	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 uMhlatuze	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 4-4: 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%
eThekweni	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%
<b>KZN Total</b>	<b>221</b>	<b>38 220</b>	<b>1 409 481</b>	<b>55</b>	<b>10 527 711</b>	<b>2 616 248</b>	<b>78.3%</b>

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 does not seem to have a WC/WDM Strategy.

The DWS did however prepare for all WSAs in KZN: KZN Water Conservation and Water Demand Management Handbook. Guideline Manual in Support of DWS Regulatory Requirements for Water Service Authorities, July 2018, Amajuba DM.

The Handbook provides theoretical information on WC/WDM and should be able to assist WSAs in addressing water conservation and water demand management activities.

#### 4.2.3 WSA Water Balance

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

For the purpose of this UAP report, the water balance information from the DWS can be summarised as follows (based on 2018 data):

- ✓ System input volume of 5 951 777kl/a (16.30Mℓ/d);
- ✓ Authorised consumption of 3 185 726kl/a (8.73Mℓ/d);
- ✓ Water losses totalling 2 766 051kl/a (7.58Mℓ/d), comprising of Apparent losses of 622 361kl/a (1.71Mℓ/d) of and Real losses of 2 143 689kl/a (5.87Mℓ/d).

Information on the level of revenue collection could not be found in the 2018/2019 IDP.

From the 2019/2020 Amajuba IDP it was reported by the Auditor General on revenue from service charges as follows: “During the audit of the service charges, it was noted that reasonable steps were not taken to ensure that the municipality has effective revenue collection systems consistent with section 95 of the MSA and the municipality's credit control and debt collection policy as required by section 64(1), 2(a) of the MFMA.”

#### 4.3 WATER DEMAND MODEL

The Water Demand Model as described within Section 1.5 was applied to the Amajuba 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 ADM, per local municipality in megalitres per day (Mℓ/d).

**Table 4-5: Water Demand Projections per LM, Mℓ/d**

LM Name	Population				Water Demands (Mℓ/d)			
	2020	2030	2040	2050	2020	2030	2040	2050
Dannhauser	122 108	134 795	151 162	169 517	23.22	26.55	30.52	35.09
Emadlangeni	41 168	45 446	50 964	57 152	5.79	9.2	10.41	11.82
<b>Total</b>	<b>163 276</b>	<b>180 241</b>	<b>202 126</b>	<b>226 669</b>	<b>29.01</b>	<b>35.75</b>	<b>40.93</b>	<b>46.91</b>

Source: Water Demand Model, UAP Phase III, 2020

The Dannhauser LM has an increase in requirements of 11.87Mℓ/d from 2020 to 2050, representing the highest growth in demands by volume in the WSA.

#### 4.3.2 Demand per Regional Water Scheme

This sub-section presents the projected population and water demands from 2020 to 2050 for the whole of the ADM, 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.



**Table 4-6: Water Demand Projections per WSS, Mℓ/d**

WSS Number	WSS Name	Population				Water Demands (Mℓ/d)			
		2020	2030	2040	2050	2020	2030	2040	2050
AMA005	Dannhauser 3 WSS Hilltop	9 983	11 021	12 359	13 860	1.59	1.81	2.09	2.42
AMA004	Dannhauser WSS	6 489	7 164	8 034	9 009	2.12	2.36	2.67	3.03
AMA008	Durnacol WSS	3 866	4 267	4 786	5 367	1.38	1.54	1.74	1.96
AMA014	Ngagane/Dannhauser 1 WSS Buffalo Flats	90 657	100 077	112 229	125 856	15.83	18.24	21.01	24.23
AMA003	Skombaren Ngagane WTP WSS	4 381	4 836	5 423	6 082	0.92	1.05	1.21	1.39
AMA016	Utrecht/Ngagane WSS	8 464	9 344	10 478	11 750	2.33	2.61	2.97	3.38
AMA015*	Waterval Ngagane WTP WSS	1 671	1 845	2 069	2 320	0.61	0.67	0.75	0.85
<b>Total</b>		125 511	138 554	155 378	174 244	24.78	28.28	32.44	37.26
AMA010**	Biggarsberg WSS	67 254	75 560	84 245	93 928	21.07	23.82	26.73	30.04

Source: Water Demand Model, UAP Phase III, 2020

\* The Waterval Ngagane WTP WSS represents the Waterval prison, located in the Emadlangeni LM.

\*\* The Biggarsberg WSS encompasses areas of supply in both the Amajuba DM (Dannhauser LM) and neighbouring uMzinyathi DM (Endumeni LM), for which the totals for the WSS are reported, irrespective of the area of jurisdiction. However, the supply to the areas in the ADM only represents about 2% of the supply.

In the WSA area of jurisdiction and excluding the Biggarsberg WSS, supply area of Ngagane / Dannhauser 1 WSS Buffalo Flats has the highest demands, representing 64% of total demands in 2020.

Various areas in the WSA are supplied from the Ngagane WTP, with a total demand for the WSA from the Ngagane WTP being 21.27Mℓ/d in 2020 and in 2050, it becomes 32.26Mℓ/d, should all areas still be supplied from the Ngagane WTP. However, there are plans to construct a new WTP at Durnacol, to supply the Hilltop and Buffalo Flats area from this new WTP.

## 5. EXISTING WATER SUPPLY INFRASTRUCTURE

### 5.1 WATER RESOURCE AVAILABILITY

This section provides an overview of the more important water resources in the WSA and neighbouring WSAs where relevant.

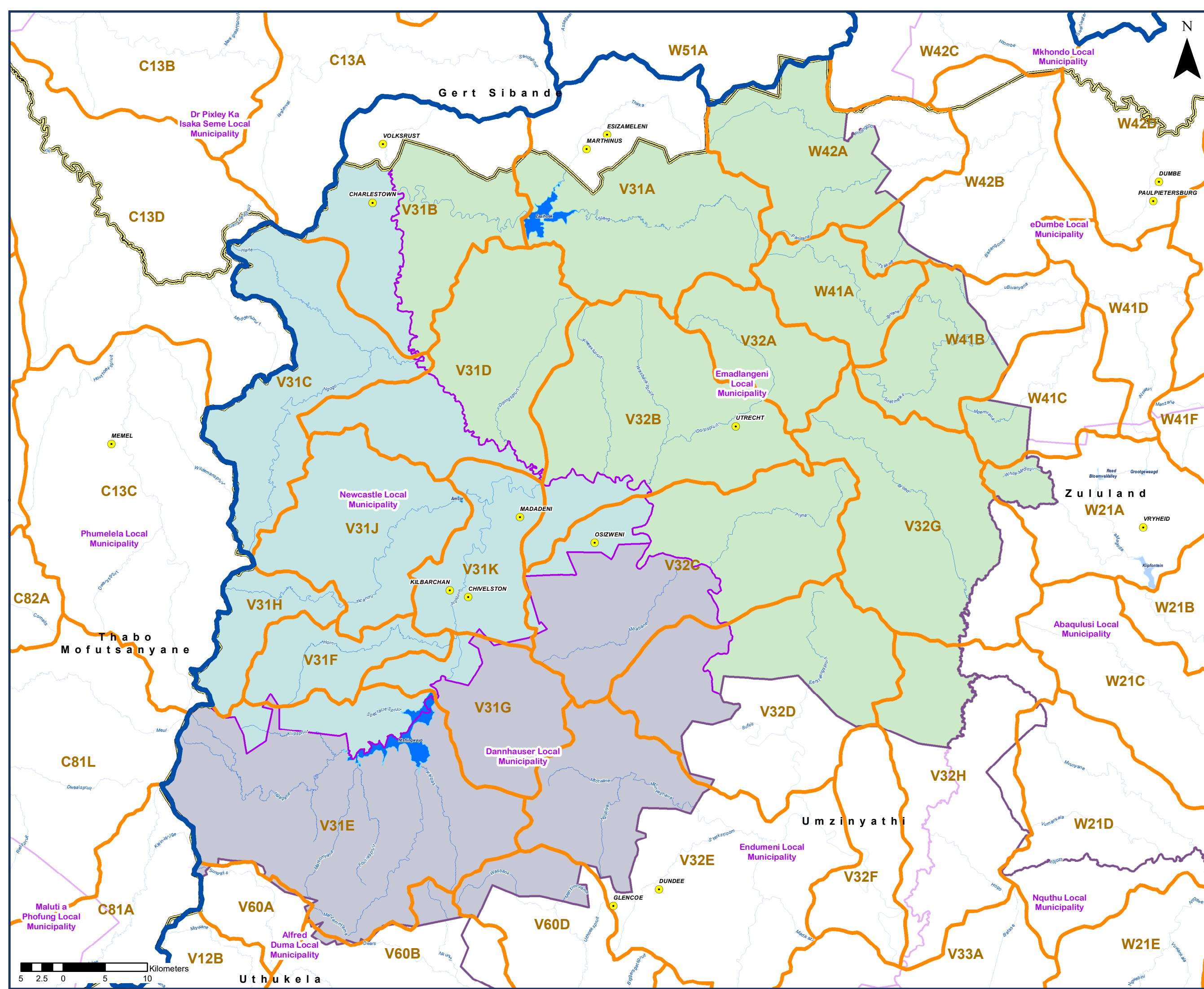
#### 5.1.1 Overview

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.

The most prominent rivers in the WSA are the Buffalo and Ngagane Rivers. Others include the Slang, Ngogo, Harte and Ncandu Rivers. The most prominent dams are the Zaaihoek and Ntshingwayo Dams. The Zaaihoek Dam is a DWS dam built in 1988 to supply the Majuba power station near Volksrust. Currently there are no domestic abstractions from this dam. In the south, there are the smaller dams that supply water to the Biggarsberg WSS.

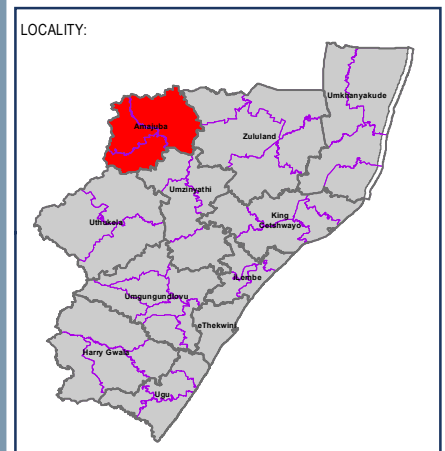
The existing water resources' full supply capacity (FSC) and historic firm yield of relevance are displayed in Table 5-1. There are other smaller dams in the WSA used for small-scale irrigation, or other uses. The actual licensed allocation from each water resources, for type of use, and in the case of WSAs, for domestic use will be different for each water resource.

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



**Legend**

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Water Management Area
- Quaternary Boundaries & Numbers



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PROJECT TITLE

**Universal Access Plan Phase III -  
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MAP TITLE:

**Water Resources  
Amajuba District Municipality &  
Newcastle Local Municipality**

DATE COMPLETED:

22 October 2020

MAP NO.:

DC25: Figure 5.1



**Table 5-1: Water Resources: FSC and HFY**

Water Resource	Tertiary or Quaternary Catchment	FSC	HFY	Note
		Mm <sup>3</sup>	Mm <sup>3</sup> /a	
Buffalo River	V31, V32, V33		Not available	
Buffalo River at Tayside Weir	V32D	Not available	2.92	
Ngagane River	V31E, V31G, V31K		Not available	
Ntshingwayo Dam	V31E	211.258	100% - 75 80% - 68 60% - 60 40% - 52 20% - 38	Available reserve yield of 21Mm <sup>3</sup> /a <sup>2</sup> . DWS 2013: Short-term stochastic yields at various dam level %'s
Dorps Dam (off-channel dam)	V32B	1.1	Not available	
Nywerheids Dam	V32A	Not available	Not available	
Tom Worthington Dam	V32E	1.89	1.9	
Verdruk Dam (off-channel dam)	V32E	1.29		
Donald McHardy Dam	V32E	2.68	1.1	
Preston Pan	V32E	0.27		
Upper & Lower Mpate Dams	V32E	0.40	0.4	
Zaaihoek Dam	V31A	184.87	47	Currently used for Eskom

Source: DWS, 2012, 2019, Umgeni Water (2020)

### 5.1.2 All Towns Strategy (2015)

This section provides pertinent information from the All Towns Strategy (2015) prepared for the Ntshingwayo Dam Supply Area, which includes the areas in Newcastle, Emadlangeni and Dannhauser Local Municipalities.

The Strategy reports the available yield of the supply area and downstream demands, having taken into account irrigation water requirements and water transfers to Majuba power station, which includes an allocation for Volksrust, as 72.31million m<sup>3</sup>/a (198.11Mℓ/d). This includes an allocation of 2.9 million m<sup>3</sup>/a for the Biggarsberg WSS supply area from the Tayside weir on the Buffalo River.

The allocation to the Newcastle, Madadeni and Osizweni WSS was 56 million m<sup>3</sup>/a, and recently an additional allocation of 5 million m<sup>3</sup>/a was made, totalling ~61 million m<sup>3</sup>/a (167.12Mℓ/d) for this WSS.

<sup>2</sup> Draft District Rural Development Plan. Amajuba District Municipality. 2016. Department of Rural Development and Land Reform.

The Strategy further emphasises that although local water resources are currently sufficient, there are high water losses, but also high growth expected in this area.

The following recommendations were made:

- ✓ Implement water conservation and demand management measures;
- ✓ Increase the allocation from Ntshingwayo Dam for domestic use to support growth in demand, but it has to be coordinated between the supplies to the Newcastle, Madadeni and Osizweni WSS, the Dannhauser Buffalo Flats WSS, Dannhauser WSS and the Biggarsberg WSS;
- ✓ Development of storage system from the Buffalo River (potentially in the upper Buffalo); and
- ✓ Development of a dam in one of the tributaries of Buffalo River (potentially in the upper Buffalo River catchment).

Note: The DWS to confirm the licensed water allocations for this area's water resources.

### 5.1.3 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.

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

**Table 5-2: Water Use Licensing, 2019. Amajuba District Municipality.**

Water User Sector	Resource Type	Registered Volume (m <sup>3</sup> )	Time Interval	Registered Volume in Mℓ/d
Domestic	BOREHOLE	94 535.00	PER YEAR	0.26
Other user sector	BOREHOLE			
Other user sector	BOREHOLE	1 450 242.00	PER YEAR	3.97
Other user sector	DAM	15 462 516.00	PER YEAR	42.36
Other user sector	RIVER/STREAM	30 266 994.00	PER YEAR	82.92
Other user sector	SCHEME			
Other user sector	SCHEME	12 076 007.00	PER YEAR	33.08
Another user sector	SPRING/EYE	251 535.00	PER YEAR	0.69

Source: DWS KZN Regional Office, 2019

The information provided should include all allocations for the District Municipality, irrespective of Water Services Authority status, therefore Newcastle Local Municipality's allocations should be included. However, it seems that the only domestic water use registered, is for supply from boreholes, to the volume of 0.26Mℓ/d. The water use license information on the WARMS, from the Ntshingwayo Dam, for domestic water supply, should be verified by the DWS.

#### 5.1.4 Surface Water Resources

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

##### 5.1.4.1 Buffalo River

The Internal Strategic Perspective report for the Thukela Water Management Area (2004), describes the Buffalo River Key area as follows:

*“The Buffalo River is the main northern tributary of the Thukela River and flows in a south-easterly direction from the eastern escarpment (Newcastle area) to its confluence with the Thukela River near Nkandla.”*

The ISP listed the following Key Area for the WMA:

- ✓ Buffalo (tertiary catchments V31, V32 and quaternaries, V33A and B);

The ADM comprises all or part of the following tertiary catchments: V31 and V32 and small parts in the north-east of the ADM: W41 and W42. The latter tertiary catchments form part of the previously-demarcated Usutu to Mhlatuze WMA.

The ISP report further states that irrigation forms the larger part of water requirements (55million m<sup>3</sup>/a), but combined, the domestic water requirements and water transfers account for an estimated 50million m<sup>3</sup>/a.

The Buffalo River is the primary water source of the Biggarsberg WSS to Dundee, Glencoe and Hattingspruit, where water is abstracted at the Tayside Weir located in the neighbouring Endumeni LM. The water released (more or less annually) from the Ntshingwayo Dam ensures continued supply at the Tayside weir. Furthermore, treated effluent water from the Newcastle, Osizweni and Madadeni Wastewater treatments plant are also released into the Buffalo River, making it available for abstraction and use in this WSS.

The Biggarsberg WSS is reliant on the operating rules of the Ntshingwayo Dam and return flows into the Buffalo River. The Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes (DWS, 2013) indicated that the Buffalo River abstraction should be used as first priority, followed by use from the municipal dams for this WSS. According to these rules, the WTP's

recommended abstraction from the Buffalo River Tayside Weir is limited to the size of abstraction infrastructure, i.e. 14Ml/day.

The Buffalo River is also used as one of the water sources to the Newcastle, Madadeni and Osizweni WSS. However, the supply is unreliable, especially during the winter months.

#### **5.1.4.2 Ngagane and Ncandu Rivers**

The Ngagane River rises at 1993m MSL near Die Ark on the Normandien Pass (quaternary V31E) on the opposite side of the watershed of the Ncandu River (quaternary V31H and V31J). The Ntshingwayo Dam captures the flow of the river south of Newcastle.

The Ncandu River, a tributary of the Ngagane River, joins the Ngagane River north-west of Madadeni from where the Ngagane River flows in an easterly direction towards the confluence with the Buffalo River just north of Madadeni.

The Ngagane River and Ntshingwayo Dam are used as water sources to the Newcastle, Madadeni and Osizweni WSS.

#### **5.1.4.3 Slang River**

The Slang River (quaternaries V31A and V31B) is the first major tributary of the Buffalo River, joining the Buffalo River 4km south-east of Volksrust. Rising at 2 275msl south of Wakkerstroom on the high Balelesberg-Skurweberg Plateau, the Slang River flows westerly – a unique feature in Natal – to the Zaaihoek Dam, from where water is pumped to the Majuba coal-fired power station at a rate of 55 Mm<sup>3</sup>/annum.

#### **5.1.4.4 Zaaihoek Dam**

The Zaaihoek Dam is located on the border between the V31A and V31B catchments, on the Slang River. The yield of the Zaaihoek Dam according to White Paper WPE 86 is 47Mm<sup>3</sup>/annum. The excess water is allocated to the Vaal system. Only water for ecological purposes and for irrigators at an agreed pattern is generally released from this Dam on a continuous basis. In emergency situations, depending on the urgency of supply to the Vaal system, water may be released into the Buffalo river system.

The report – Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System (2013) – listed the water requirements transfer from the Zaaihoek Dam for the Majuba Power Station as 26Mm<sup>3</sup>/a during 2015/2016. The Full Supply Capacity (FSC) of the Zaaihoek Dam is 184.87Mm<sup>3</sup>/a. The reported HFY was 59Mm<sup>3</sup>/a without the environmental reserve.

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#### 5.1.4.5 *Ntshingwayo Dam*

The Ntshingwayo Dam (previously the Chelmsford Dam) is located (quaternary V31D) on the Ngagane River about 18km south-west of Newcastle. The majority of the dam area is in the Dannhauser LM and the remainder in the Newcastle LM. The capacity of the dam is 194million m<sup>3</sup> with an available reserve yield of 21million m<sup>3</sup>/annum. The reserve yield should be preserved for the expected domestic and industrial growth of the supply area of between 11million m<sup>3</sup> and 39million m<sup>3</sup> over the next 20 years (2034) if other dams are not constructed in the demand area not taking account of the associated increase in return flows.

The Newcastle LM 2019/2020 IDP stated that the dam wall was raised during 1982 and cannot be augmented further to increase the yield.

The Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme Prefeasibility Study Revised, June 2017, performed a yield analysis on the Ntshingwayo Dam. This report stated the yield of the Dam, without the Ecological Water Reserve (EWR) as 61.8million m<sup>3</sup>/a, and with the EWR, the yield was reduced to 39.6million m<sup>3</sup>/a (equates to a yield of 108.49Mℓ/d with the EWR).

The report – Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System (2013) – confirmed the order of water resources supply to the Newcastle, Madadeni & Osizweni WSS as the Ntshingwayo Dam then the Ngagane River, and lastly the Buffalo River.

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#### 5.1.5 *Proposed Potential Surface Water Sources*

The following are proposed potential dams within the WSA:

- ✓ Ncandu Dam on the Ncandu River, near the town of Newcastle;
- ✓ Horn River Dam on the Horn River flowing south-west from Newcastle.

Both dam sites have yet to be fully investigated and both rivers are tributaries of the Ngagane River. A proposal exists for Ncandu Dam to be constructed upstream of the confluence of the Ngagane River and Ncandu River. The yield of the proposed dam is indicated as 16.87Mm<sup>3</sup>/annum with a capacity to sustain another 46Mℓ/day of water supply. This proposal is still subject to evaluation against other potential resources such as the proposed Ngogo and Womeni Dams (uThukela Water Master plan) and further exploitation of Buffalo River.

Costing for the planning and construction of the Ncandu Dam is included under the Newcastle LM, but for reference, provision is made for R1.007billion.



The Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017, performed a yield analysis on the proposed Ncandu Dam. This report stated the yield of the Dam, without the Ecological Water Reserve (EWR) as 7.68million m<sup>3</sup>/a, and with the EWR, the yield was reduced to 5.04million m<sup>3</sup>/a (equates to a yield of 13.8Mℓ/d with the EWR).

The Horn River Dam option along with the Ncandu Dam option were discussed in the report by RAWs Consulting Engineers: AMAJUBA / GIJIMA WATER / AGRICULTURAL SYNERGIES. REPORT ON IRRIGATION PROPOSALS (2007). Further information to be sourced from the ADM; the DWS is not aware of this potential dam (2019).

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.

#### **5.1.6 Groundwater Sources**

There are a number of households in the non-urban areas that are supplied from groundwater sources. Groundwater is also utilised for agriculture, irrigation and industrial activities, but little information is registered on the WARMS database. Groundwater quality is often affected by the coal mining activities in the region.

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<sup>3</sup>/a, which is only 0.4% of the mean annual recharge over the area) and significant opportunity exists for further development.

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

- ✓ At outlet of Key Area: 6million m<sup>3</sup>/a;
- ✓ At Ntshingwayo Dam: 6million m<sup>3</sup>/a.

There are 988 boreholes in the Buffalo Flats area of the Dannhauser LM which will remain as backup supply once this area is supplied from the Ngagane WTP (Amajuba District Municipality Master Plan for Water Supply, 2011). The functionality of the existing boreholes is unknown.

The Ntshingwayo Dam Supply Area All Towns Strategy for 2014 contains very little information on groundwater sources in this area. It stipulated that there is limited potential for significant groundwater development.

Groundwater is one of the main sources other than rivers or streams, for rural areas of the Emadlangeni LM. Groundwater in the northern portion of the Emadlangeni LM is of general good quality, but deteriorates towards the south. SRK Consulting (appointed by DWS) undertook an extensive borehole rehabilitation and drilling program within the Emadlangeni Local Municipality recently. This report is available upon request from SRK. Findings of this report was incorporated and applied in the report: First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality, (2014).

The Master Plan developed the first full proposed scheme footprint for water supply to most rural consumers in the Emadlangeni LM. From this report, it was found that a regional water supply scheme will not be economically feasible. A total of 36 individual schemes were proposed, in an order of priority, at a total cost of R 234 087 271 including VAT and professional fees. The planning horizon was for 2031, to serve an estimated 2 331 households

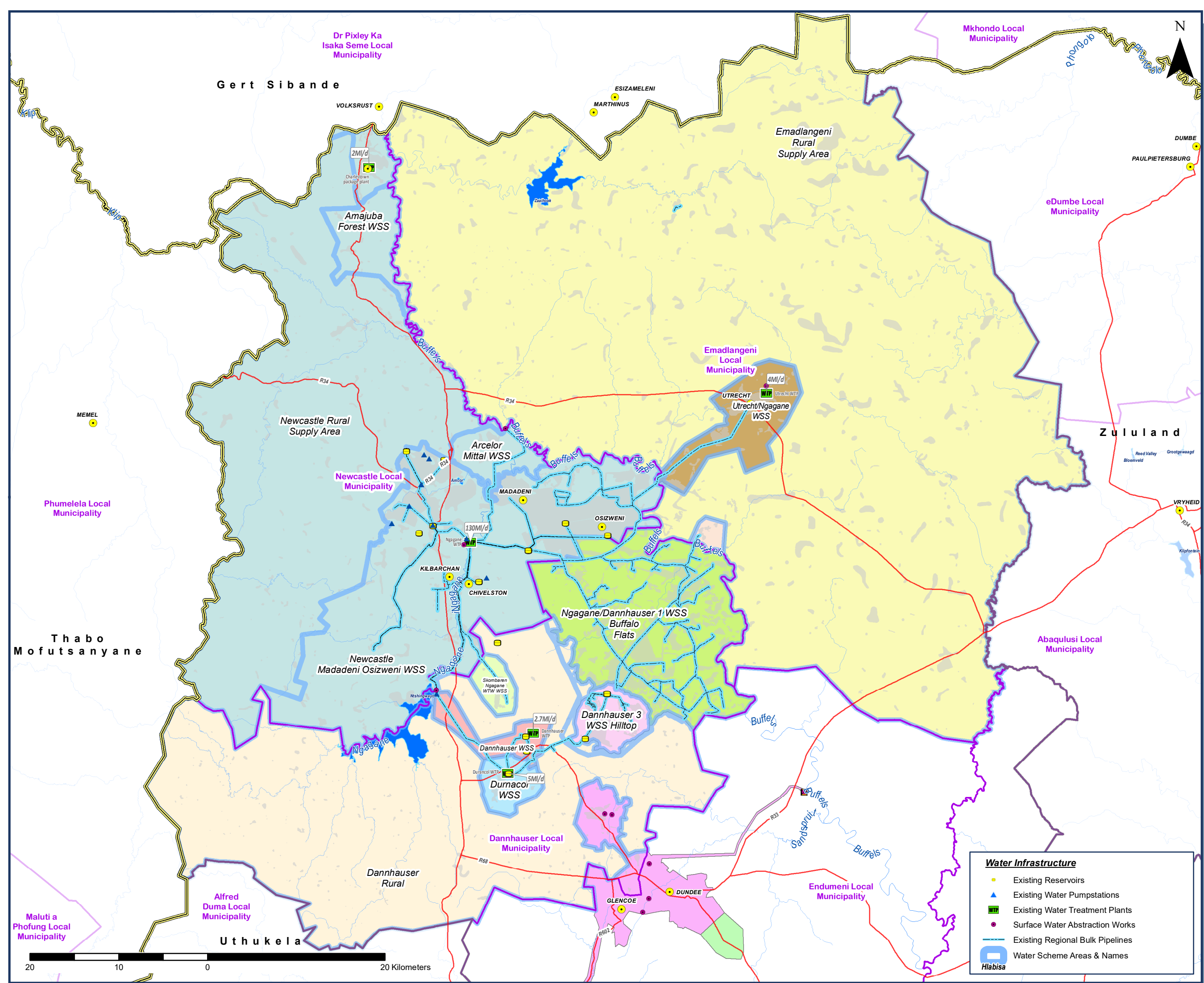
The Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017, performed a desktop evaluation of groundwater exploitation potential for the study area. The groundwater exploitation potential was estimated to be 66Mm<sup>3</sup>/a for the whole of the study area and only 6-7Mm<sup>3</sup>/a was utilised. The Newcastle LM (part of Amajuba DM) and Endumeni LM (part of Umzinyathi DM) were found to have higher yielding boreholes (25% yielding >2l/s) than in the other parts of the study area (18% yielding >2l/s).

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.

## 5.2 EXISTING WATER SUPPLY INFRASTRUCTURE

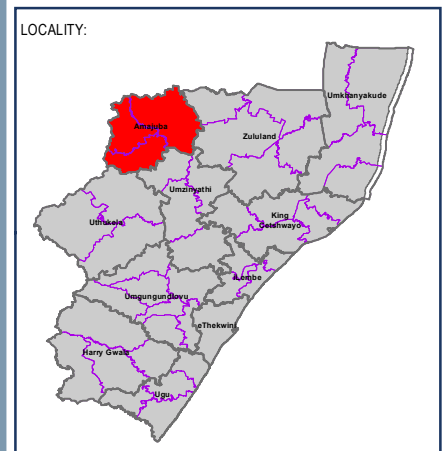
Since the completion of the UAP Phase II studies, the WSA has commenced and completed projects for water supply and sanitation development.

This section provides a brief overview of the existing bulk and local water supply schemes (see Figure 5-2). Discussions were held with the ADM technical and PMU officials during May and June 2019. The ADM 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.



**Legend**

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PROJECT TITLE

**Universal Access Plan Phase III -  
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MAP TITLE:

**Existing Scheme Areas &  
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Amajuba District Municipality**

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MAP NO.:

DC25: Figure 5.2

**Water Infrastructure**

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



The urban water supply schemes in the Newcastle LM are dealt with in the Newcastle LM UAP Phase III report, but for reference, are the following:

- ✓ Charlestown WSS; and
- ✓ Newcastle, Madadeni and Osizweni WSS.

The Newcastle, Madadeni and Osizweni WSS uses the same water source, namely the Ntshingwayo Dam, for its water supply as the Dannhauser Buffalo Flats WSS and Dannhauser WSS.

### 5.2.1 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 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 5-3.

**Table 5-3: Summary of WTPs**

DM or LM Name	Plant Name	Design Capacity (Mℓ/d)	Annual Average Production (Operational) (Mℓ/d)
Dannhauser LM	Dannhauser	2.7	not in use at present**
	Durnacol	5.0	3.5
Emadlangeni LM	Utrecht	4.0	2.00
<b>Total for the ADM</b>		11.7	2.9 – 3.2
uMzinyathi DM	Biggarsberg*	17.0	13-14

Source: Amajuba DM correspondence received and from interviews with ADM and Uthukela Water (June, 2019); Umgeni Water (2020)

\* The Biggarsberg WTP supplies areas in the ADM and to the towns of Dundee and Glencoe in the uMzinyathi DM.

\*\* The Durnacol WTP now supplies the areas of Durnacol and Dannhauser. The information for the Dannhauser WTP is provided for completeness.

#### 5.2.1.1 Skombaren WSS

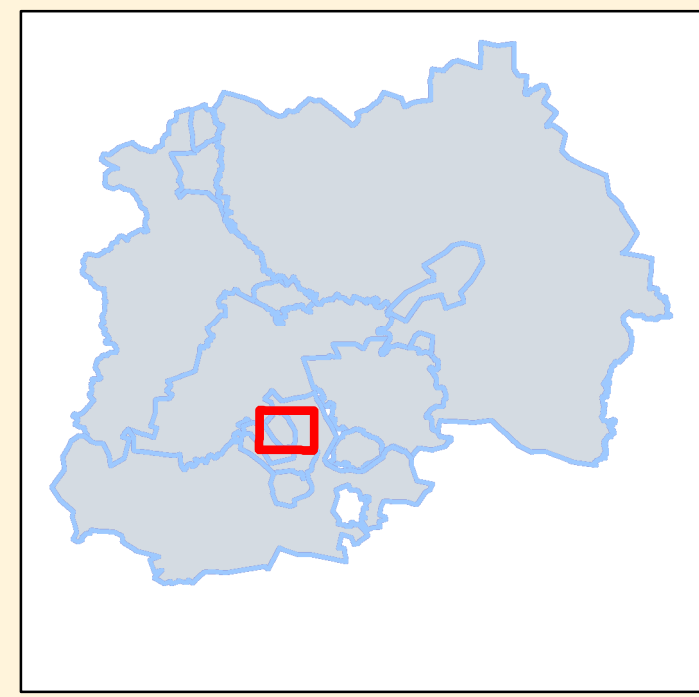
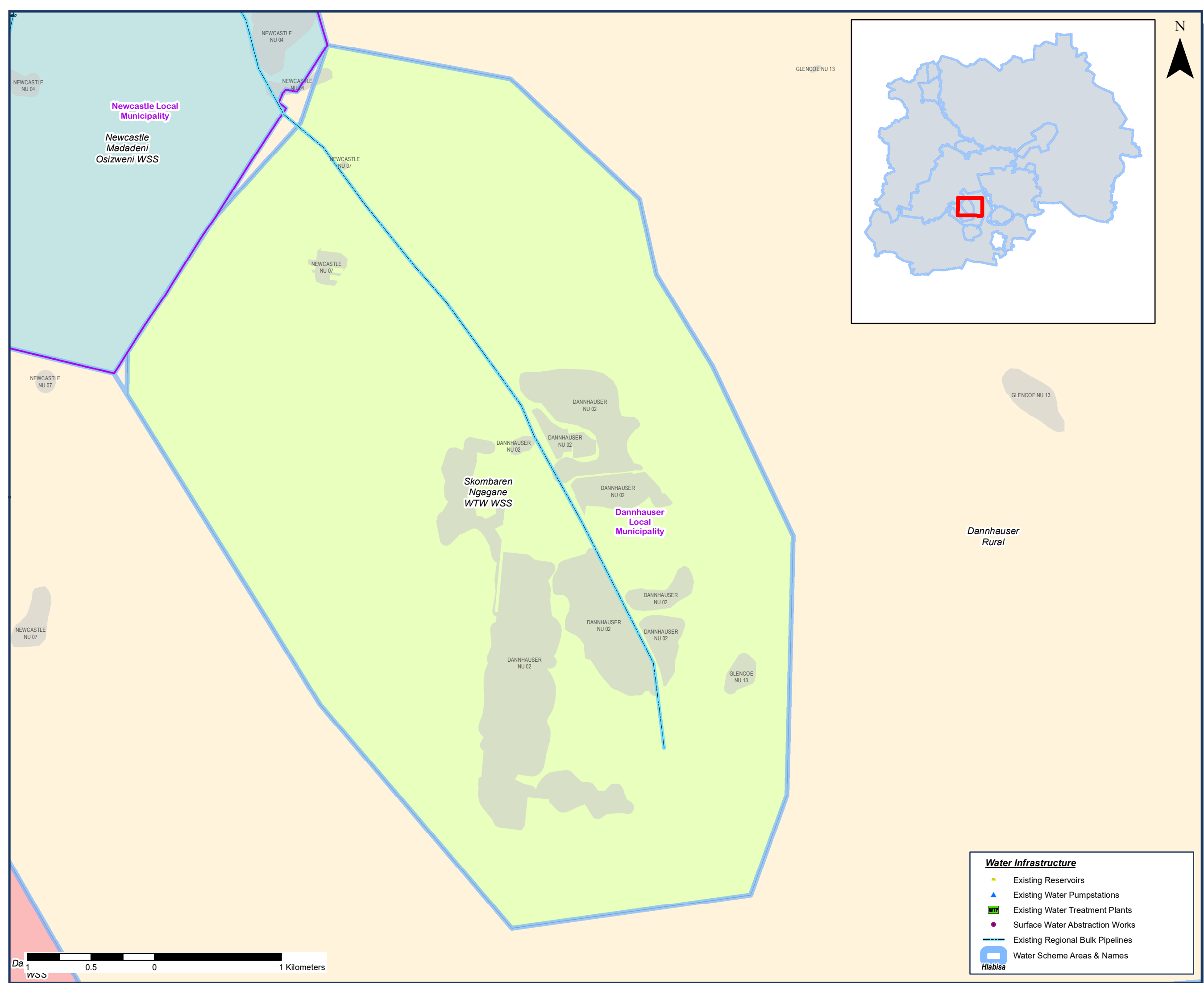
Most information for this scheme, depicted in Figure 5-3, is obtained from the UAP Phase II report.

The Skombaren WSS only includes the town of Skombaren with a population of 3 665 (785 households) as per the 2011 Census. The Census further reported that 49% of households had water supply up to yard

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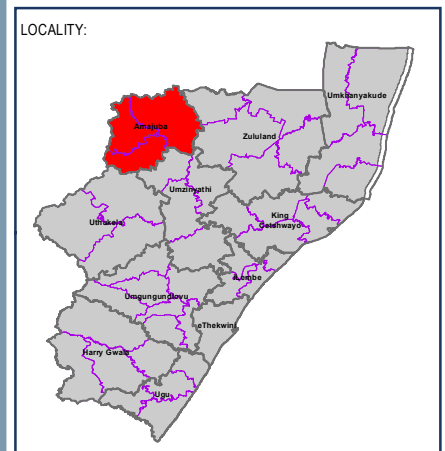
connection, 25% having been supplied from community standpipes within 200m walking distance and 22% having had house connections.

This WSS area is served with treated water from the Ngagane WTP (located in the Newcastle LM) water via a pipeline of undisclosed size and material. The pipeline serving the area serves Skombaren via Alcockspruit (located in the Newcastle LM) and is an estimated length of 20km.



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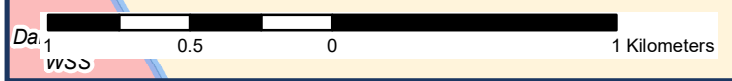
MAP NO.:

**DC25:      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

Hlabisa



### 5.2.1.2 Dannhauser Buffalo Flats WSS and Dannhauser 3 WSS Hilltop

Most information for this scheme, depicted in Figure 5-4, is obtained from the

- ✓ UAP Phase II report; and
- ✓ Supporting information provided such as the Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). This report includes the Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017.

The Dannhauser – Buffalo Flats WSS includes the towns of Inverness, Mtendeka, Mafahlawane, Naas, Surrey, Phillip, Martha, Uitkyk, Mbanane, Nellie Valley, Kilegethe, Dorset, Curragh and Cloneen in the Buffalo Flats area.

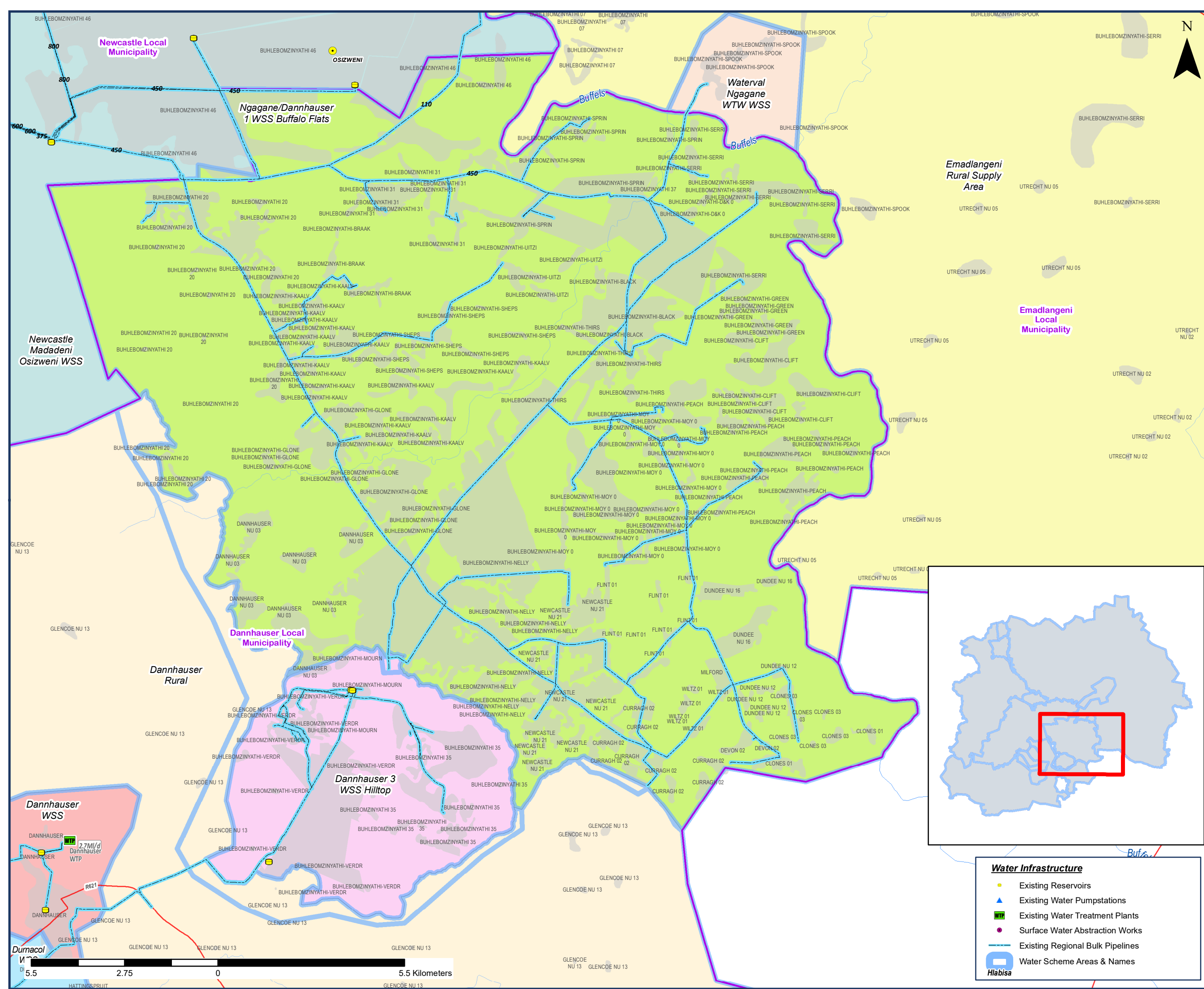
Water is supplied from the following:

- ✓ Ngagane WTP via the Braakfontein Reservoirs: obtaining water from the Ntshingwayo Dam, Ngagane River and Buffalo River – see the section on the Newcastle, Madadeni and Osizweni WSS. Update from 2019: There is a 20Mℓ/d allocation to the Buffalo Flats area, but the capacity of the infrastructure only allows for 10Mℓ/d. The 2018 Feasibility report makes mention of an additional 10Mℓ/d from the planned Dannhauser Regional Scheme, once a new 20Mℓ/d is constructed at the Ntshingwayo Dam.

There are however also areas reliant on groundwater supplies and water tankers, such as Chester, Cork, Flint, Greenock, Mullingar, Nyanyadu, Spookmill and Zondo in the north-east and Geduld, Hilltop, Kempshoek, Kliprand, Nguqunguqu, Strijbank, Twhatgwha and Verdriet in the southern part of the scheme area. The volume of groundwater supplied should be established as well as the potential for increased conjunctive use of groundwater and surface water in this area.

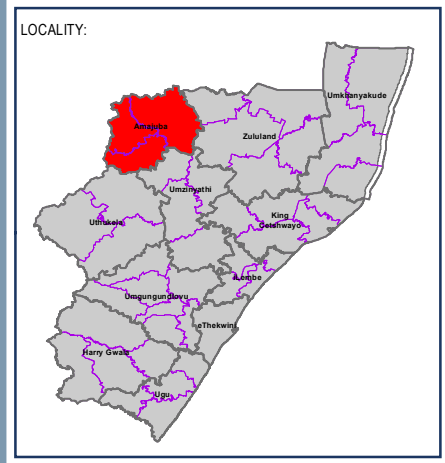
Uthukela Water did not provide updated information on the bulk storage available (2020).

The 2018 Feasibility report indicated that water supply to the Buffalo Flats area from the Ngagane WTP does not meet the demand. Furthermore, the ADM has embarked on upgrading of the water supply service levels to yard connections that increase the water consumption. The proposed Phase 2 from this report, will be able to augment water supply to Buffalo Flats, when the proposed new 20Mℓ/d WTP at the Ntshingwayo Dam is commissioned along with the supporting infrastructure to become the Dannhauser Regional Water Supply Scheme. However, the DWS did not approve the business plan (Umgeni Water, 2020).



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

MAP TITLE:

**Existing Scheme Areas & Infrastructure Components - Dannhauser Buffalo Flats WSS & Dannhauser 3 WSS Hilltop**

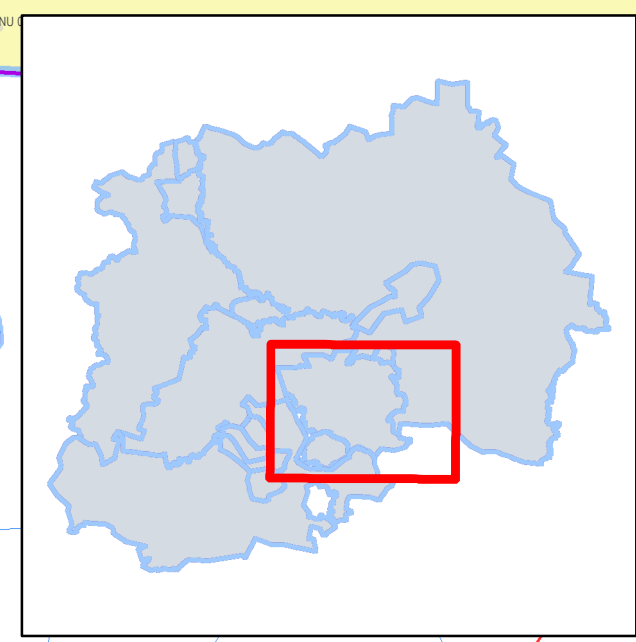
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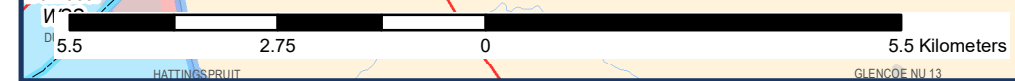
MAP NO.:

**DC25: Figure 5.4**



### Water Infrastructure

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





### 5.2.1.3 Dannhauser WSS & Durnacol WSS

Most information for this scheme, depicted in Figure 5-5, is obtained from the

- ✓ UAP Phase II report; and
- ✓ Supporting information provided such as the Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). This report includes the Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017.












The Dannhauser WSS includes the towns of Dannhauser, Durnacol, Emafusini and Rocky Spruit.

Water is supplied from the Ntshingwayo Dam where it is treated at the Durnacol WTP. There is also the Dannhauser WTP, but it is not used since the full supply can be met from the Durnacol WTP. The design capacities of the plants are 5.0Mℓ/d and 2.7Mℓ/d respectively. The 2018 Feasibility report indicated that the Durnacol WTP can be operated at 6Mℓ/d (supplying 3Mℓ/d to Durnacol and Dannhauser) as interim measure to augment supply in the Dannhauser LM. It is envisaged that a new 20Mℓ/d WTP be constructed at the Ntshingwayo Dam as part of the Amajuba DM Regional Water Supply Scheme and will be able to supply the Buffalo Flats area as well as Hattingspruit and surrounding areas. However, the DWS did not approve the business plan (Umgeni Water, 2020).

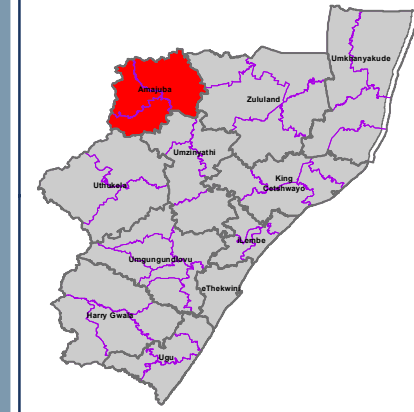
During 2019, the volume supplied from the Durnacol WTP was reported as 0.9-1.2Mℓ/d and from the Dannhauser WTP the operating volume of water supplied is ~2.7Mℓ/d (ADM, 2019). Since March 2020, the Durnacol WTP provides water to the areas of Durnacol as well as Dannhauser at a rate of 3.5Mℓ/d (Umgeni Water, 2020).

The areas are affected by the Eskom load shedding incidents (power outages) as pipelines are damaged due to water hammer. This causes breakages and leakages in the pipelines therefore interrupted supply and water losses.

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**Universal Access Plan Phase III -  
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MAP TITLE:

**Existing Scheme Areas &  
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Dannhauser WSS & Durnacol WSS  
Amajuba District Municipality**







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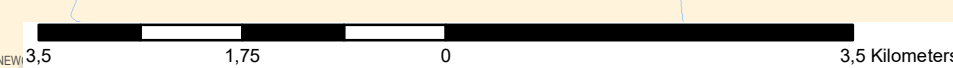
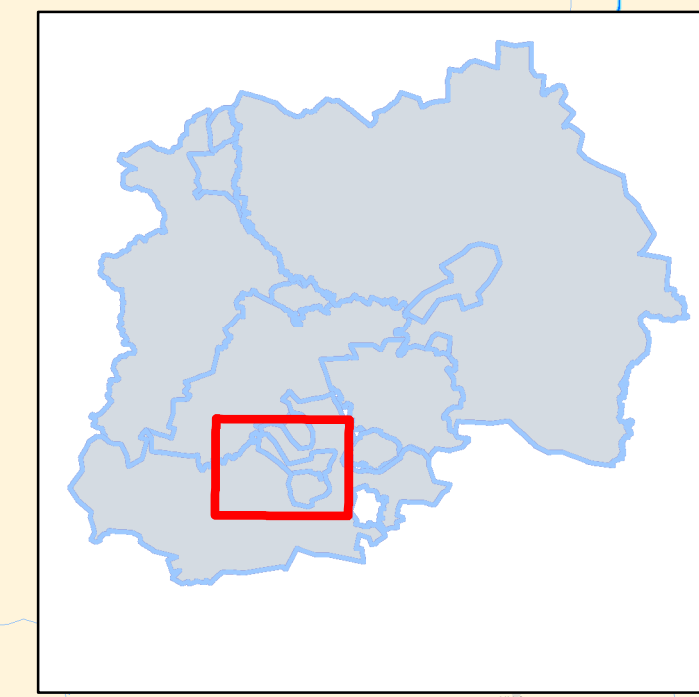
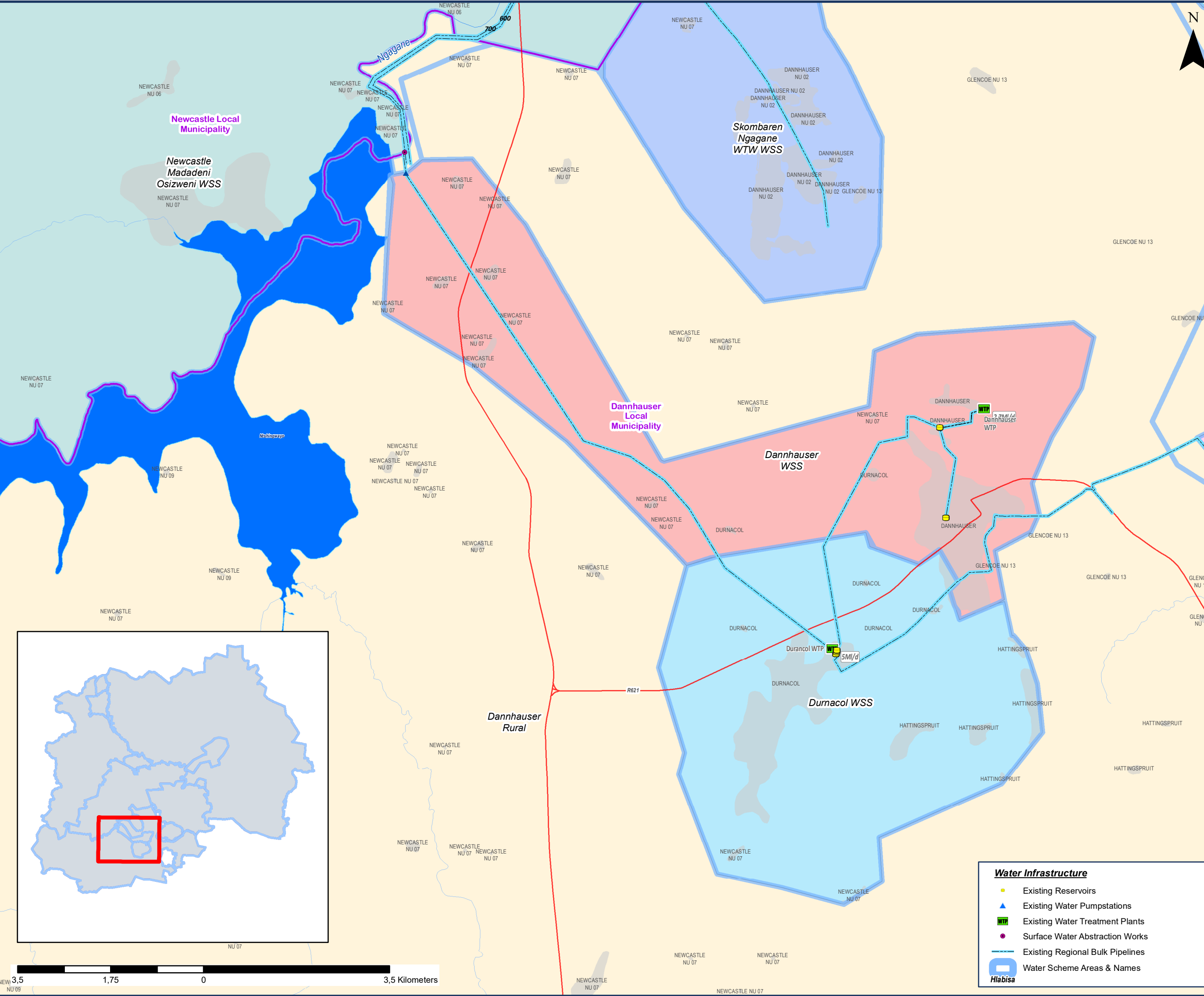
MAP NO.:

DC25: Figure 5.5

**Water Infrastructure**

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

Hlabisa



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#### 5.2.1.4 *Utrecht WSS*

Most information for this scheme, depicted in Figure 5-6, is obtained from the UAP Phase II and from inputs from ADM officials, consultants, Uthukela Water and Umgeni Water (2019, 2020).

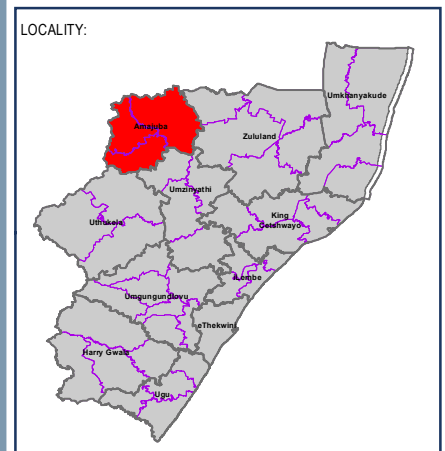
The Utrecht WSS includes the towns of Utrecht, Khayaletu, Bendsorp, White City and Balgray. Water is supplied from two off-channel storage dams (Dorps and Nywerheids) from the Dorpspruit River and treated at the Utrecht WTP. The areas of Berouw and Amangthungwa are supplied via standpipes from the bulk water supplied from the Ngagane WTP. The Utrecht WTP has a design capacity of 4Mℓ/d and is operating at 2Mℓ/d (50%) under normal conditions.

A bulk water line has been connected from the Ngagane WTP to Utrecht and has a maximum capacity to provide 2Mℓ/d. The town of Utrecht started utilising this option in September 2015 due to the drought conditions and local sources not being able to meet the demand. It therefore serves as backup should the yield from local sources be affected by the drier winter months or drought conditions.



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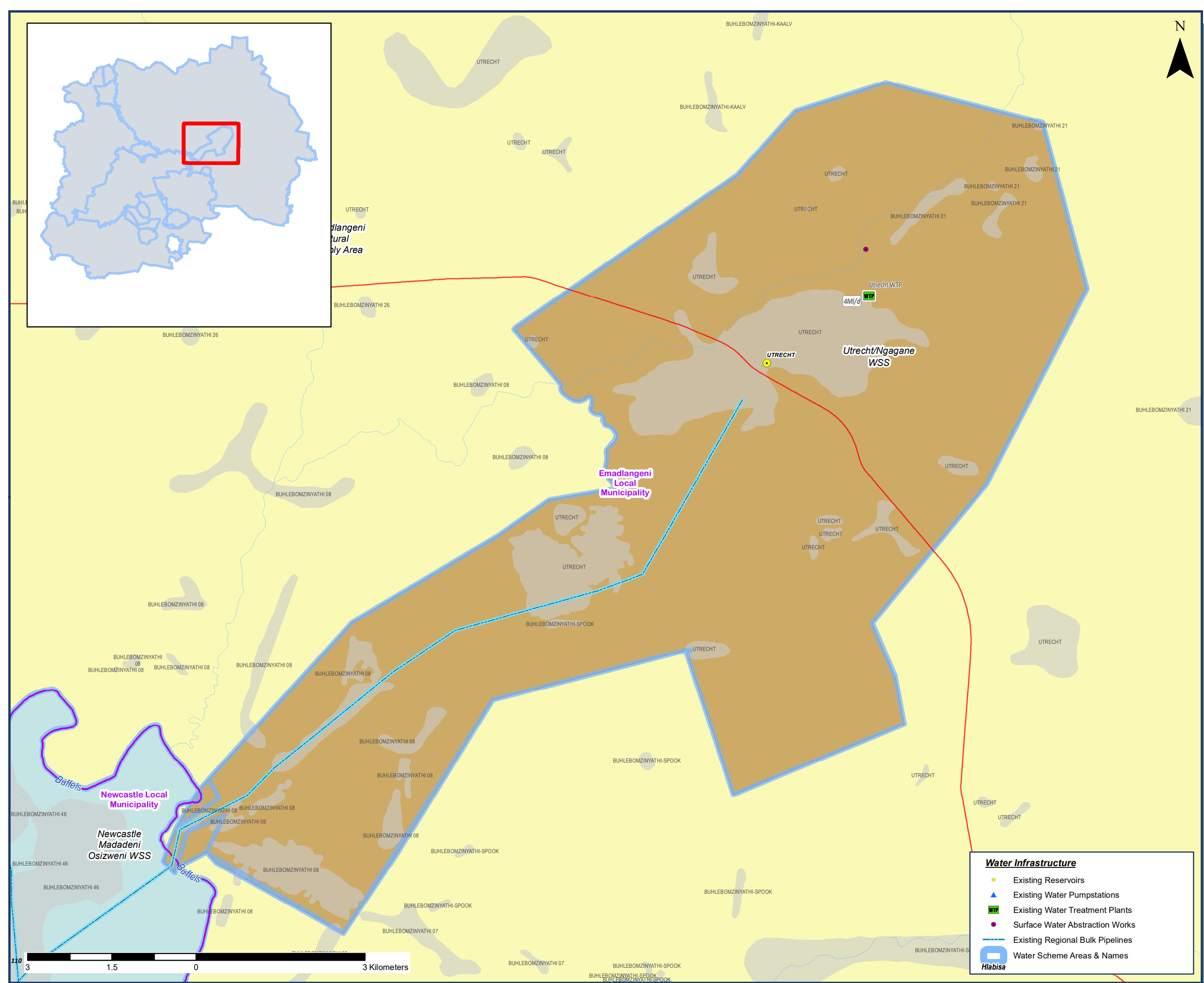
**Existing Scheme Areas &  
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Utrecht WSS  
Amajuba District Municipality**

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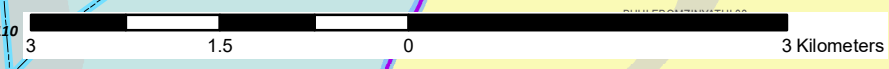
DC25: Figure 5.6



**Water Infrastructure**

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

**Hlabisa**



### 5.2.1.5 Biggarsberg WSS to Dundee, Glencoe and Hattingspruit

The majority of consumers in the Biggarsberg WSS, depicted in Figure 5-7, is located in the neighbouring WSA, the uMzinyathi District Municipality. Details on the scheme planning, till 2050, should be sourced from the uMzinyathi DM's UAP Phase III report.

Most information for this scheme is obtained from the

- ✓ UAP Phase II report; and
- ✓ Supporting information provided such as the Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). This report includes the Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017.

Where necessary, the information is updated from discussions with the NLM and Uthukela Water, held on 14 May 2019 and subsequent correspondence.

Hattingspruit, Bright Home and Springlake Colliery Mine (total population of 1 471 and 362 households, Census, 2011) are located in the Dannhauser LM whereas Dundee and Glencoe (total population of 52 472 and 14 179 households, Census, 2011) are located in the neighbouring Endumeni LM (uMzinyathi DM). The Biggarsberg WSS further supplies the areas of Wasbank and Ruigtefontein (total population of 3 028 and 641 households, Census, 2011), also in the Endumeni LM.

Water supplied by this scheme from the Biggarsberg WTP (design: 17Mℓ/d, operation in 2019 is 13-14Mℓ/d) is obtained from the following water sources:

- Tom Worthington Dam, FSC of 2.00Mm<sup>3</sup>/a (Amajuba DM);
- Verdruk Dam, FSC of 0.27Mm<sup>3</sup>/a (Amajuba DM);
- Donald McHardy Dam, FSC of 2.68Mm<sup>3</sup>/a (uMzinyathi DM);
- Preston Pan, FSC of 0.27Mm<sup>3</sup>/a (uMzinyathi DM);
- Upper and Lower Mpate Dams, FSC of 0.26Mm<sup>3</sup>/a and 0.14Mm<sup>3</sup>/a respectively (uMzinyathi DM); and
- Buffalo River at Tayside weir, yield ~ 5Mm<sup>3</sup>/a (13.75Mℓ/d) (uMzinyathi DM).

The Tom Worthington Dam is supplied from the Hattingspruit and a small tributary of the Ngobiya River. The Verdruk Dam is supplied from the Ngobiya River. Both Dams are located just east of Hattingspruit and about eight kilometres north of the Biggarsberg WTP. Their combined Historic Firm Yield (HFY) is 1.9Mm<sup>3</sup>/a without the environmental reserve.

The Donald McHardy Dam and Preston Pan are located just east of Glencoe (before Dundee) and about five kilometres (as the crow flies) south of the Biggarsberg WTP. Their combined Historic Firm Yield (HFY) is 1.1Mm<sup>3</sup>/a without the environmental reserve.

The Upper and Lower Mpate Dams are located at the Biggarsberg WTP and their combined Historic Firm Yield (HFY) is 0.4Mm<sup>3</sup>/a without the environmental reserve. Water quality issues have been reported in the Lower Mpate Dam: iron and manganese levels are too high for using this water for human consumption.

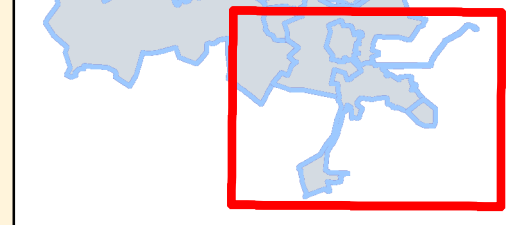
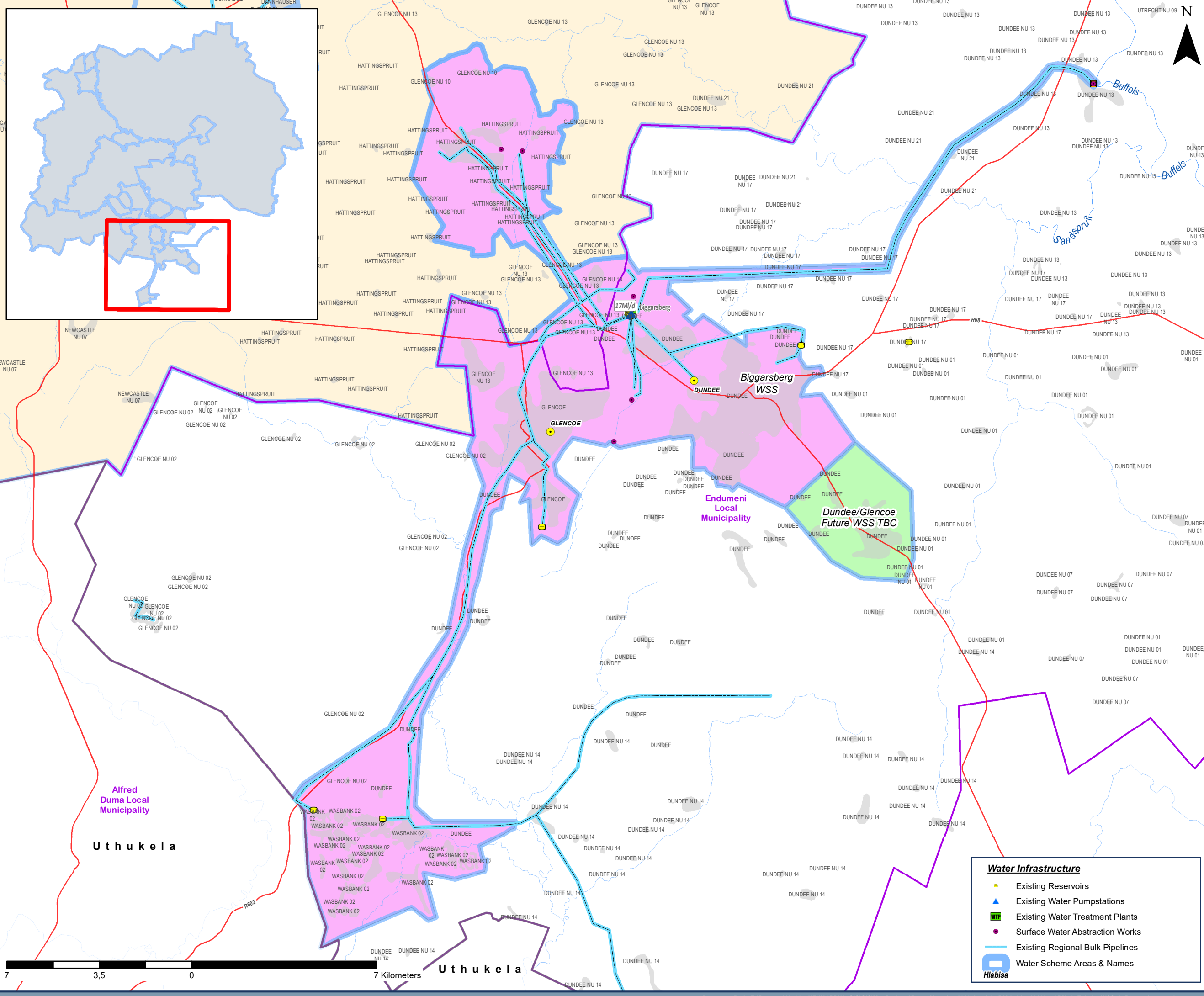
The water released (more or less annually) from the Ntshingwayo Dam ensures continued supply at the Tayside weir. Furthermore, treated effluent water from the Newcastle, Madadeni and Osizweni Wastewater treatment plants are also released into the Buffalo River, making it available for abstraction and use in this WSS. This scheme is reliant on the operating rules of the Ntshingwayo Dam and return flows into the Buffalo River.

The Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes (DWS, 2013) indicated that the Buffalo River abstraction should be used as first priority, followed by use from the municipal dams for this WSS. According to these rules, the WTP's recommended abstraction from the Buffalo River Tayside Weir is limited to the size of abstraction infrastructure, i.e. 14Mℓ/day. However, the licensed abstraction from the Buffalo River from this site needs to be confirmed and likely updated as no information was available in the DWS-supplied DW 760 WARMS report.

Uthukela Water (2019) are busy with upgrades at the Tayside Weir, but need more funding to implement all planned upgrades at the abstraction point and treatment infrastructure.

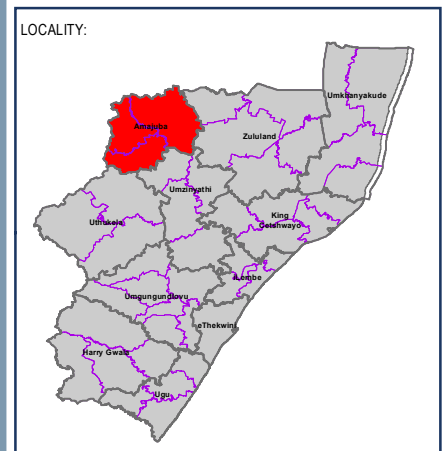
The 2018 Feasibility report indicated that water supply to Hattingspruit is at capacity and that there is insufficient capacity to also supply the Ramaphosa settlement: "The reticulation in Hattingspruit and Ramaphosa are currently served via a 300kℓ concrete reservoir located in town by way of a pressure sustaining pump. The reservoir is supplied via a 90mm HDPE pipeline from the Biggarsberg WTP. Currently this supply is not sufficient to supply both Hattingspruit and Ramaphosa. As a result, Ramaphosa Settlement is experiencing intermittent water supply."

Uthukela Water (2019) further reported that new developments in the Dundee area, but also in the Wasbank and Ruigtefontein areas (located in neighbouring Endumeni LM) put further supply pressure on this scheme. An additional 5-6Mℓ/d is required to serve consumers.



**Legend**

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PROJECT TITLE

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

MAP TITLE:

**Existing Scheme Areas &  
Infrastructure Components -  
Biggarsberg WSS  
Amajuba District Municipality**

DATE COMPLETED:

2020/11/26

MAP NO.:

DC25: Figure 5.7

**Water Infrastructure**

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



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## 5.2.2 Other Water Supply Schemes

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The remainder of the ADM are mostly rural and farming homesteads.

Areas that are extensively rural, with dispersed households and that are not near 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<sup>3</sup>) 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.

### 5.2.2.1 Dannhauser Local Municipality

Apart from the water supply schemes already discussed, the majority of the consumers in the rural areas of the Dannhauser LM are on farmsteads and obtain water from boreholes and springs, else from water tankers.

The UAP Phase II planning did not include this area as part of the water requirements costing due to the sparsely populated places. The study did project the 2020 water requirements as 0.7Mℓ/d and the 2035 water requirements as 1.0Mℓ/d.

For the UAP Phase III planning, a minimum water requirement of 100 litres per capita per day was used, but considering these to be serviced connections. Under the UAP Phase III water requirements modelling, the projected population for this area in 2020 is 4 975 persons and the water requirements are 0.97Mℓ/d.

### 5.2.2.2 Emadlangeni Local Municipality

Apart from the water supply schemes already discussed, just more than a third of consumers in the Emadlangeni LM obtain water from boreholes and springs, just less than a third from rivers or streams and the remainder either from existing services, water tankers or other sources.

Groundwater in the northern portion of the Emadlangeni LM is of general good quality but deteriorates towards the south. SRK Consulting (appointed by DWS) undertook an extensive borehole rehabilitation and drilling program within the Emadlangeni LM. This report is available upon request from SRK. Findings

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<sup>3</sup> SDG 6: Ensure availability and sustainable management of water and sanitation for all



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of this report was incorporated and applied in the report: First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality, (2014).

The Master Plan developed the first full proposed scheme footprint for water supply to most rural consumers in the Emadlangeni LM. From this report, it was found that a regional water supply scheme will not be economically feasible.

A total of 36 individual schemes were proposed, in an order of priority, at a total cost of R 234 087 271 including VAT and professional fees. The planning horizon was for 2031, to serve an estimated 2 331 households, having a total demand for the high scenario of 1 059kl/day, based on a minimum water requirement of 60 litres per capita per day. The 36 individual scheme areas fall within the AMA009 Emadlangeni Rural WSS area.

For the UAP Phase III planning, a minimum water requirement of 100 litres per capita per day was used, but considering these to be serviced connections. For comparison, the UAP Phase III water requirements for the 2020 planning horizon for the rural areas in the Emadlangeni LM comes to 2.86Ml/d, and the projected population 31 033.

## 6. EXISTING SANITATION BULK INFRASTRUCTURE

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

## 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
Dannhauser	2 111	240	4 322	11 920	1 391	-	14	245
Emadlangeni	2 182	183	819	2 249	827	16	43	348
<b>Total</b>	<b>4 293</b>	<b>423</b>	<b>5 141</b>	<b>14 169</b>	<b>2 218</b>	<b>16</b>	<b>57</b>	<b>593</b>

Source: StatsSA, 2016 Community Survey

The municipality with the highest level of service, by number of households having access to flush or VIP sanitation services, is the Dannhauser LM (18 593HH), representing 69% of the WSA total number of households. There is a total of 2 884 households (11%) not having a sanitation services level of VIP or better.

### 6.1.2 DWS Reference Framework Water Supply Levels

The settlement's service levels presented in Table 6-2 and Figure 6-1 were 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
Dannhauser	19 648	17 582	89%	2 066	11%
Emadlangeni	6 459	6 328	98%	131	2%
<b>Total</b>	<b>118 592</b>	<b>115 809</b>	<b>98%</b>	<b>2 783</b>	<b>2%</b>

Source: DWS RF geodatabase, 2016

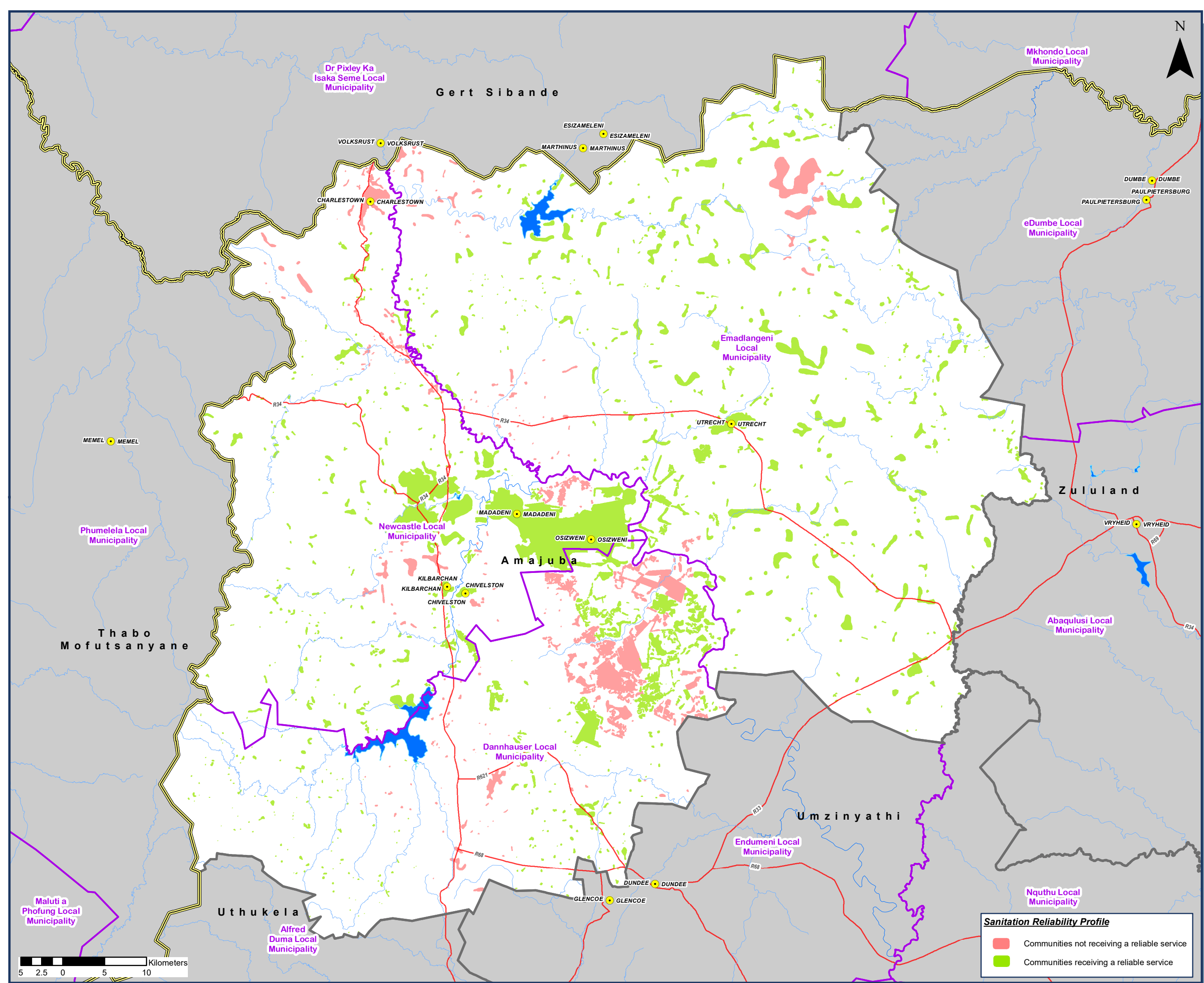
The information is not corresponding to the 2016 Community Survey, with the DWS data reflecting a higher percentage of households having access to sanitation services at or above RDP standards (98%) and only 2% not having access to at or above RDP standards.

### 6.1.3 Water and Sanitation Master Plan

The WSA does not have a recently-prepared water and sanitation master plan.

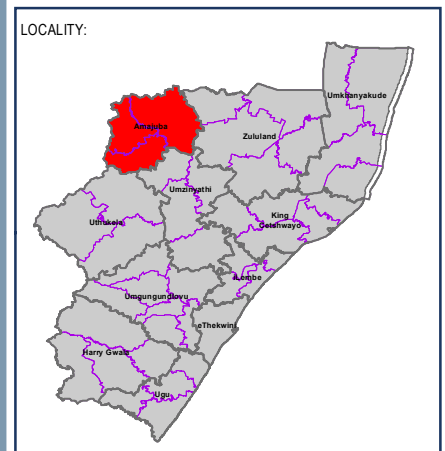
### 6.1.4 WSA Municipal Infrastructure Forum Reporting

No information could be sourced from the IGR reporting by the WSAs.



**Legend**

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PROJECT TITLE

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

MAP TITLE:

**Sanitation Reliability Profile  
Amajuba District Municipality &  
Newcastle Local Municipality**

DATE COMPLETED:

18 June 2020

MAP NO.:

DC25: Figure 6.1

**Sanitation Reliability Profile**

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



## 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.

A summary of the Wastewater treatment plants is provided in Table 6-3.

**Table 6-3: Summary of WWTPs**












LM Name	Plant Name	Design Capacity (Mℓ/d)	Annual Average Volume Treated (Operational) (Mℓ/d)	Class of Plant
Dannhauser	Dannhauser (Tweediedale sewer ponds)	2	1.8	D
	Durnacol	2	0.9	TBC
Emadlangeni	Utrecht (existing sewer ponds)	1	1	D
	Utrecht (to be completed by 2020)	2		TBC
<b>Total Capacity based on known information</b>		6	3.7	

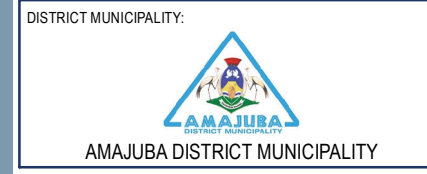
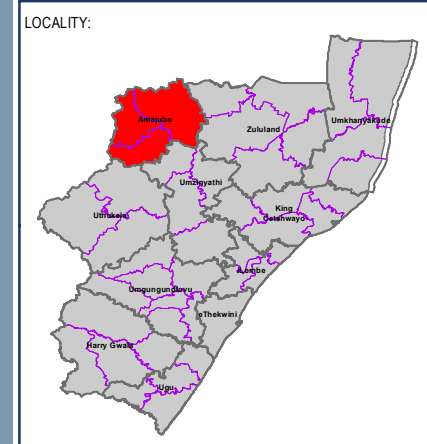
Source: Amajuba DM correspondence and from interviews with consultants (June, 2019)

The Utrecht ponds are operating at capacity, but the ADM is in the process of constructing a new 2Mℓ/d wastewater treatment plant.

Information on beneficiation from these plants such as the production of biogas or electricity, or the production of fertiliser should still be obtained, however the capacities of these WWTPs are very small and it may not be feasible to consider co-beneficiation options.

**Legend**

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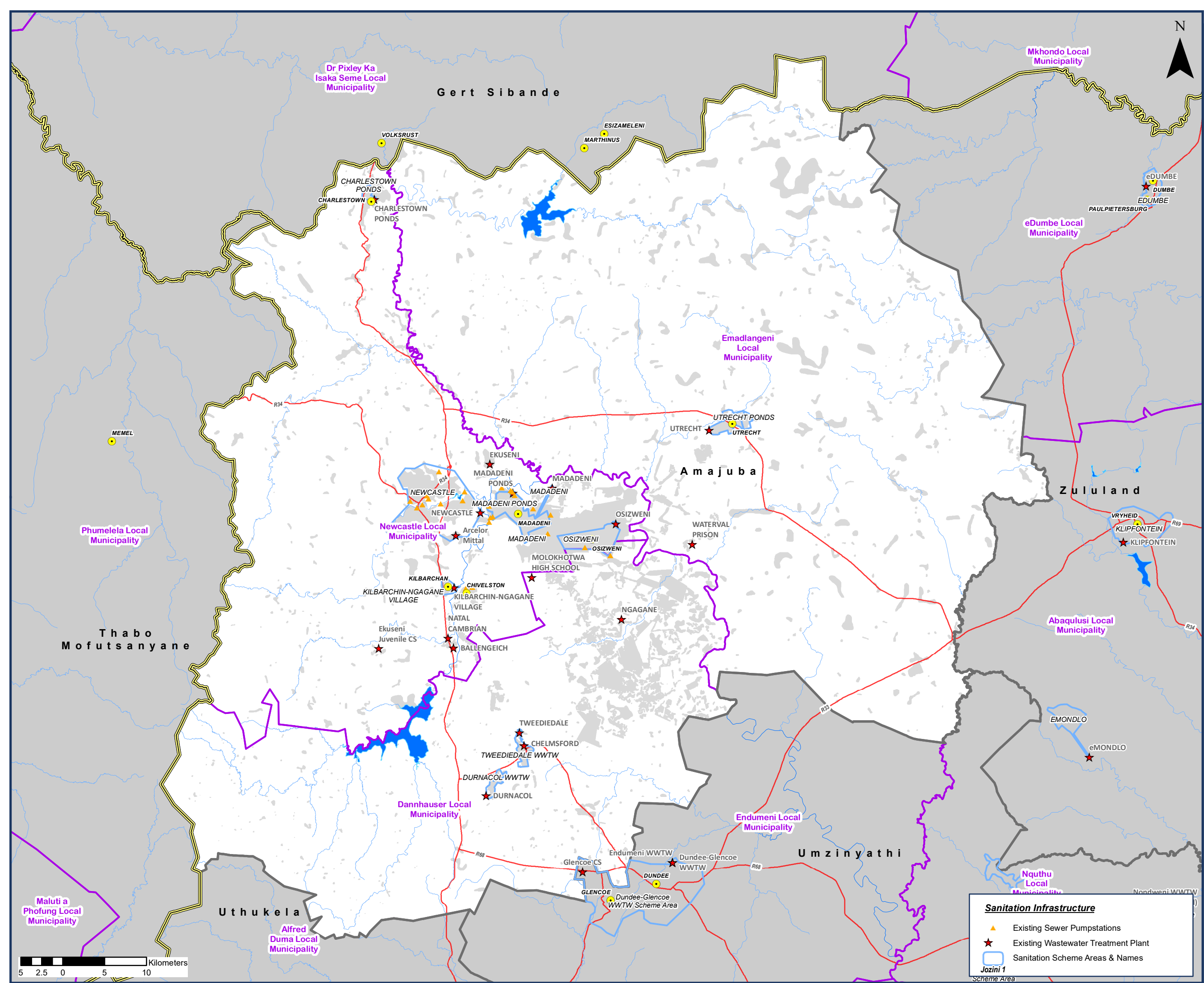
**Universal Access Plan Phase III -  
Progressive Development of a  
Regional Concept Secondary  
Bulk Water Master Plan**

MAP TITLE:




**Existing Sanitation Infrastructure  
Amajuba District Municipality &  
Newcastle Local Municipality**

DATE COMPLETED: 18 June 2020

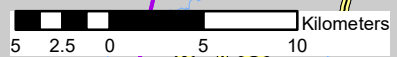
MAP NO.: DC25: Figure 6.2



**Sanitation Infrastructure**

-  Existing Sewer Pumpstations
-  Existing Wastewater Treatment Plant
-  Sanitation Scheme Areas & Names

**Jozini 1**  
Scheme Area



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### 6.2.1 Skombaren SS

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The Skombaren SS only includes the town of Skombaren, having had a population of 3 665 persons (785 households) as per the 2011 Census. The Census further reported that 50% of households had chemical toilets for sanitation, a further 15% had VIPs, another 15% had pit toilets and only 1% had waterborne sanitation.

The current level of service to be confirmed.

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### 6.2.2 Dannhauser Buffalo Flats SS

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Most information for this scheme is obtained from inputs from officials and supporting information provided such as the Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). This report includes the Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017.

The Dannhauser – Buffalo Flats SS includes the towns of Inverness, Mtendeka, Mafahlawane, Naas, Surrey, Phillip, Martha, Uitkyk, Mbanane, Nellie Valley, Kilegethe, Dorset, Curragh and Cloneen in the Buffalo Flats area. At the time of the 2011 Census, this area included 16 261 households, of which 74% had pit latrines and 11 VIPs.

This area is still served by VIPs and pit latrines and it is not foreseen to change in the short to medium-term future (2019).

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### 6.2.3 Dannhauser SS

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Most information for this scheme is obtained from inputs from officials and supporting information provided such as the Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). This report includes the Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme. Prefeasibility Study Revised, June 2017.

The Dannhauser SS includes the towns of Dannhauser, Durnacol, Emafusini and Rocky Spruit. At the time of the 2011 Census, this area included 2 234 households, of which 96% had waterborne sanitation.

From a discussion with SiVest (2019), currently doing work on the bulk sanitation, there is one wastewater treatment plant at Durnacol with a design capacity of 2Mℓ/d and it is operating at 0.9M/d. The Tweediedale sewer ponds serving Dannhauser has a capacity of 2Mℓ/d and is currently operating at 1.8Mℓ/d.



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The planned housing development of 1 000 near Dannhauser will connect to Durnacol WWTP. It is anticipated that the top structures for this development be completed by 2021.

#### **6.2.4 Utrecht SS**

---

Most information for this scheme is obtained from inputs from officials and consultants.

The Utrecht SS only includes the town of Utrecht with a population of 5 290 (1 445 households) as per the 2011 Census. The Census further reported that 92% of households had waterborne sanitation with the remainder serviced via septic tanks or VIPs.

From a discussion with SiVest (2019), involved in planning and design of upgrades to the bulk sanitation, the sewer ponds currently serving Utrecht are fully utilised, having a capacity of 1Mℓ/d. However, they will form part of the treatment process of the new WWTP with a design capacity of 2Mℓ/d. It is envisaged that the new WWTP will be completed by 2020. This should be sufficient to provide for the newly planned housing development (600 HH) at Goedehoop.

#### **6.2.5 Hattingspruit SS**

---

Most information for this scheme is obtained from inputs from officials and consultants.

The Hattingspruit SS only includes the town of Hattingspruit, having had a population of 952 persons (241 households) as per the 2011 Census. The Census further reported that 19% of households had waterborne sanitation with the remainder serviced via septic tanks (22%) or pit latrines (51%).

From 2019 discussions, most consumers are now served either via waterborne sanitation, or septic tanks, however in Ramaphosa village, there are mostly VIPs.

## 7. BULK WATER SUPPLY PROJECTS CURRENTLY IN PLANNING

The existing funding grants for the municipal capital projects and operating subsidies for water services are mainly funded by the Municipal Infrastructure Grant (MIG) followed by the Regional Bulk Infrastructure Grant (RBIG) and the Water Services infrastructure Grant (WSIG). The main objective of MIG and 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<sup>4</sup> or sub regional <sup>5</sup>scale (over vast distances<sup>6</sup>), with internal bulk 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	Municipality	Project Name	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)
	No allocations for ADM as WSA				

Source: Division of Revenue Bill (B5-2019)

<sup>4</sup> “Macro” is defined as infrastructure serving extensive areas across multi-municipal boundaries

<sup>5</sup> “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

<sup>6</sup> 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)
Allocation to ADM	R41 039	R43 214	R46 343	R46 000	R50 000	R65 000

Source: Division of Revenue Bill (B5-2019)

## 7.2 AMAJUBA DM AND LOCAL MUNICIPALITIES

The following capital projects were reported in the 2018/2019 IDP of the Amajuba DM (DC25 Amajuba - Supporting Table SA36 Detailed capital budget, pg. 252).

- ✓ ENG002, EMANDLANGENI SANITATION-MIG;
- ✓ ENG003, ENG004;
- ✓ ENG004, Dannhauser Housing Development Bulk Water and Sanitation;
- ✓ ENG005, Buffalo Flats Water Supply Scheme Phase 3B;
- ✓ ENG006, Amajuba Disaster Management Centre Phase 2;
- ✓ ENG007, Emxhakeni reticulation water scheme is an extension of existing water reticulation scheme to serve 500 households;
- ✓ ENG008, Pipeline extension and infrastructure in Skombaren and Alcockspruit;
- ✓ ENG009; Construction of VIP toilets in Dannhauser;
- ✓ ENG010, Refurbishment of DNC WWTP, Tweediedale and Utrecht WTP;
- ✓ ENG011, Refurbishment and upgrade of Durnacol Water Treatment Works in Dannhauser;
- ✓ ENG012, Construction of Brakfontein reservoir;
- ✓ ENG013, Upgrade of Critical system;
- ✓ ENG014, Emergency water supply to Ramaphosa, Skombaren and 2 megalitre reservoir at Hilltop - Emadlangeni LM;
- ✓ ENG015, Dannhauser Borehole Refurbishment Program.

Some of the above projects relate to the Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018).

Additional projects are listed in the SDBIP, part of the Draft IDP 2019/2020 (Table 61: Service Delivery Plan 2014-2020):

- ✓ Construction of the Ncandu and Horn river dams;
- ✓ Buffalo Flats phase 3;
- ✓ Buffalo Flats Water Supply Scheme Phase 4 (Phase 1 to 3 infills);

- ✓ MWIG WCWD (water loss) within ward 2- 11 in the Dannhauser LM area: MWIG Application underway;
- ✓ Refurbishment and/or Upgrading of WTPs -Dannhauser LM-Ring feed;
- ✓ Emadlangeni Rural water Supply phase1;
- ✓ Emadlangeni Rural Water Supply Phase 2 (Network Reticulations);
- ✓ Dannhauser LM Sanitation needs;
- ✓ Buffalo flats sanitation;
- ✓ Emadlangeni Sanitation upgrade and provision.

The ADM Draft IDP 2019/2020 lists the several capital water projects (Table 64: Water programme 2017/18 – 2021/22) for rural areas as well as:

- ✓ Upgrading of Ngagane WTP by additional 5 Mℓ/day;
- ✓ Construction of a Pump station at Durnacol WTP to Dannhauser Bulk Reservoir;
- ✓ Construction of a 600mm Dia HDPE x 10 km rising main from Durnacol WTP to proposed Dannhauser Bulk Reservoir;
- ✓ Construction of 10 Mℓ Bulk Reservoir in Dannhauser;
- ✓ Construction of 400m dia HDPE x 6 km long gravity main between Dannhauser Bulk and the existing Dannhauser and Durnacol Reservoirs;
- ✓ Construction of 200mm Dia mPVC x 9 km long gravity main to Hattingspruit.

And (Table 65: Capital Infrastructure Projects 2019/20 – Amajuba District Municipality)

- ✓ Goedehoop bulk water and sanitation;
- ✓ Dannhauser Housing Development Bulk Water and Sanitation;
- ✓ Buffalo Flats Water Supply Scheme Phase 3B;
- ✓ Amajuba Disaster Management Centre Phase 2;
- ✓ Emxakheni Water Scheme;
- ✓ Buffalo Flats Water Supply Scheme Phase 4 (infills);
- ✓ Rural Household Infra Projects: sanitation infills;
- ✓ Refurbishment of water and wastewater treatment plants;
- ✓ Refurbishment and upgrade of Durnacol Water Treatment Works;
- ✓ Construction of Brakfontein reservoir;
- ✓ Upgrade of Citicall system;
- ✓ Emergency water supply to Ramaphosa, Hilltop and Skombaren - Dannhauser LM;
- ✓ Emadlangeni Borehole Prog;
- ✓ WC/WDM Program;
- ✓ Drought relief Program.

## 8. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

A gap analysis has been undertaken for the water schemes in the ADM. 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.

### 8.1.1 Skombaren WSS

The Skombaren WSS only includes the town of Skombaren, which is served with treated water from the Ngagane WTP (located in the Newcastle LM).

The area of Skombaren is included in the ADM's Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). Phase 1's planning horizon is for 5-10 years and estimated the water requirements for Skombaren as 1.24Mℓ/d. The new proposed infrastructure is mainly for supply of Hilltop and the Ramaphosa Settlement.

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 are 1.39Mℓ/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: Skombaren Gap Analysis**

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d) – Ngagane WTP	130		130	170	40 Note that this is mainly for the Newcastle, Madadeni and Osizweni WSS
Storage (Mℓ)					
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	1.60		1.60	1.92	0.32

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

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### 8.1.2 Dannhauser Buffalo Flats WSS and Hilltop

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Water supply to the Buffalo Flats area is currently provided from the Ngagane WTP and groundwater in the form of production boreholes.

The area of Buffalo Flats is included in the ADM's Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme (2018). Phase 1's planning horizon is for 5-10 years and estimated the water requirements for Buffalo Flats and Hilltop as 11.93Mℓ/d.

The 2018 Feasibility report indicated that water supply to the Buffalo Flats area from the Ngagane WTP does not meet the demand. Furthermore, that the ADM has embarked on upgrading of the water supply service levels to yard connections, which increase the water consumption. The proposed Phase 2 from this report, will be able to augment water supply to Buffalo Flats, when the proposed new 20Mℓ/d WTP at the Ntshingwayo Dam is constructed along with the supporting infrastructure to become the Dannhauser Regional Water Supply Scheme. However, the DWS did not approve the business plan (Umgeni Water, 2020).

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 Buffalo Flats area are 23.23Mℓ/d and for the Hilltop area as 2.42Mℓ/d.

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

**Table 8-2: Dannhauser Buffalo Flats WSS and Hilltop Gap Analysis**

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d) – Ngagane WTP	130		130	170	40 Note that this is mainly for the Newcastle, Madadeni and Osizweni WSS
Water Treatment (Mℓ/d) – Durnacol WTP	5		5		
Water Treatment (Mℓ/d) – Durnacol WTP at the Ntshingwayo Dam*		20	20	20	
Storage (Mℓ)					16 (Buffalo Flats) 6.3 (Hilltop)
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	368.7 (Buffalo Flats) 59.30 (Hilltop)		368.7 (Buffalo Flats) 59.30 (Hilltop)	442.44 (Buffalo Flats) 73.8 (Hilltop)	73.74 (Buffalo Flats) 14.5 (Hilltop)

\* However, the DWS did not approve the business plan (Umgeni Water, 2020).

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

### 8.1.3 Dannhauser WSS and Durnacol WSS

Water is supplied from the Ntshingwayo Dam where it is treated at the Durnacol WTP and Dannhauser WTP. The design capacities of the plants are 5.0Mℓ/d and 2.7Mℓ/d, respectively. The 2018 Feasibility report indicated that the Durnacol WTP can be operated at 6Mℓ/d (supplying 3Mℓ/d to Durnacol and Dannhauser) as interim measure to augment supply in the Dannhauser LM. It is envisaged that a new 20Mℓ/d WTP be constructed at the Ntshingwayo Dam as part of the Amajuba DM Regional Water Supply Scheme and will be able to supply the Buffalo Flats area as well as Hattingspruit and surrounding areas. However, the DWS did not approve the business plan (Umgeni Water, 2020).

During 2019, the volume supplied from the Durnacol WTP was reported as 0.9-1.2Mℓ/d and from the Dannhauser WTP the operating volume of water supplied is 2.7Mℓ/d (ADM, 2019). Since March 2020, the Durnacol WTP provides water at a rate of 3.5 Mℓ/d to the areas of Durnacol as well as Dannhauser (Umgeni Water, 2020).

Phase 1 of the feasibility report's planning horizon is for 5-10 years and estimated the water requirements for Dannhauser and Durnacol urban areas as 8.04Mℓ/d. Furthermore, the Hattingspruit urban areas' water requirements were estimated as 1.27Mℓ/d.

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 Dannhauser urban area are 3.03Mℓ/d, for the Durnacol urban area as 1.96Mℓ/d and for the Hattingspruit urban areas as 0.62Mℓ/d.

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

**Table 8-3: Dannhauser WSS and Durnacol WSS Gap Analysis**

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d) – Durnacol WTP	5		5		
Water Treatment (Mℓ/d) – Durnacol WTP at the Ntshingwayo Dam*		20	20	20	
Water Treatment (Mℓ/d) – Dannhauser WTP	2.7	not in use anymore	2.7		
Storage (Mℓ)				6	6
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	30.4 (Dannhauser) 23.3 (Durnacol)		30.4	36.48 (Dannhauser) 35.96 (Durnacol)	6.08 (Dannhauser) 12.66 (Durnacol)

\* The Business Plan for the planned scheme upgrade and extension has not been approved by the DWS (Umgeni Water, 2020).

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

#### 8.1.4 Utrecht WSS

The area of Utrecht is supplied from the Utrecht WTP. The bulk line from the Ngagane WTP can be utilised in case of emergency or should the yield from local sources be affected by the drier winter months or drought conditions.



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 Utrecht area are 3.38Mℓ/d.

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

**Table 8-4: Utrecht Gap Analysis**

Criteria	Existing Capacity	Planned Additional	Total	Desired 2050	Additional Requirements
Water Treatment (Mℓ/d)	4		4	4	
Storage (Mℓ)				6.8	
Bulk conveyance - Raw Water (Mℓ/d)					
Bulk conveyance - Clear Water (Mℓ/d)	3.4		3.4	4.08	0.68

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

## 9. PROPOSED BULK WATER SUPPLY INTERVENTION AREAS

This section details the water supply reconciliation options for bulk water services within the Amajuba DM – considering existing 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

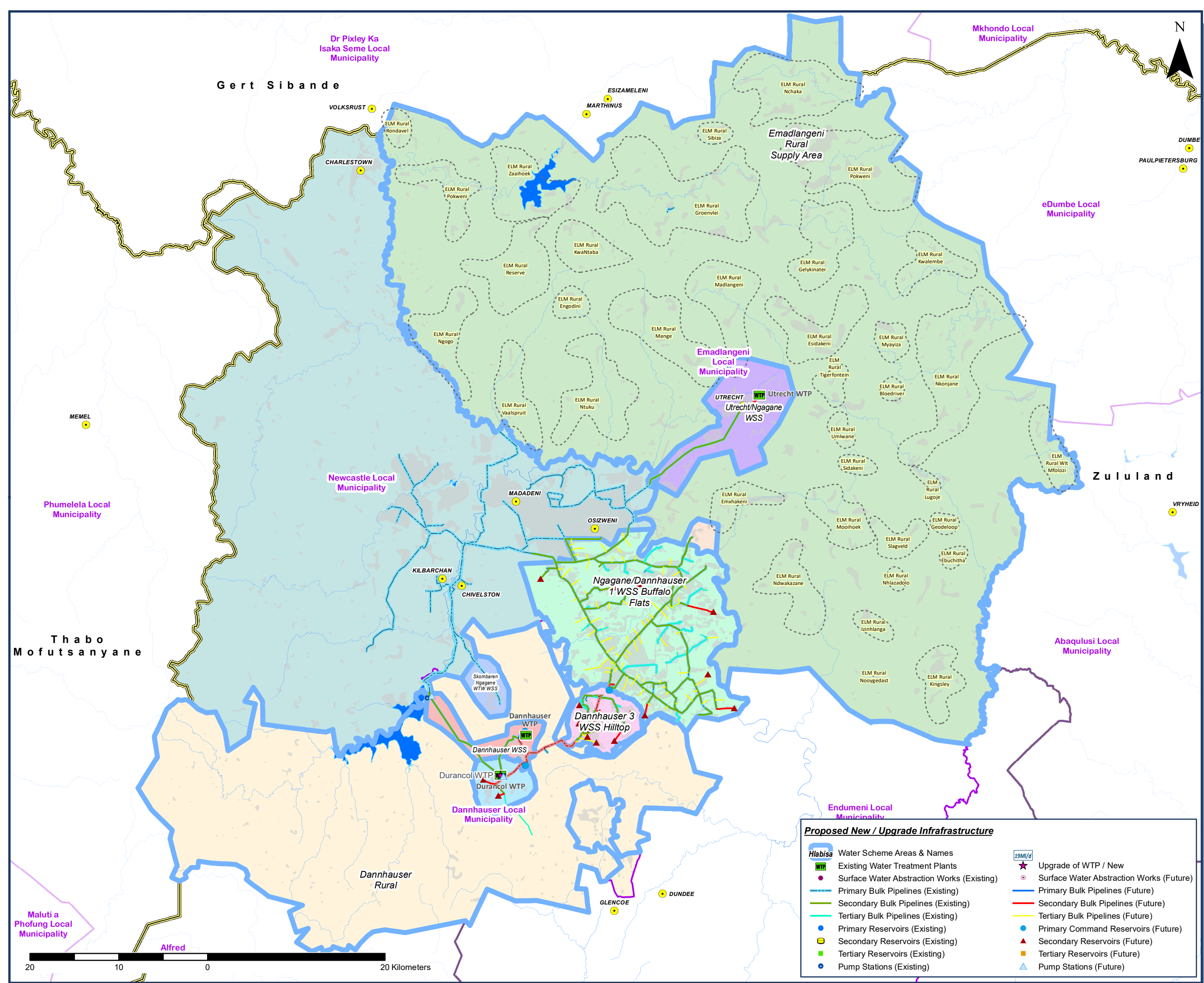
The demand model that was proposed to be used within UAP Phase III will be used to determine the proposed bulk infrastructure requirements and would be sized accordingly to meet the demand of 2050. An overview of the proposed Total Bulk Water Supply Intervention Areas is illustrated in Figure 9-1.

For the Amajuba DM as WSA, the applicable WSIA's for UAP Phase III are:

- ✓ AMA003: Skombaren Ngagane WTP WSS;
- ✓ AMA004: Dannhauser WSS and AMA008: Durnacol WSS;
- ✓ AMA005: Dannhauser 3 WSS Hilltop and AMA014: Ngagane/Dannhauser 1 WSS Buffalo Flats;
- ✓ AMA016: Utrecht/Ngagane WSS;
- ✓ AMA006: Dannhauser Rural;
- ✓ AMA009: Emadlangeni Rural Supply Area; and
- ✓ AMA015: Waterval Ngagane WTW WSS.

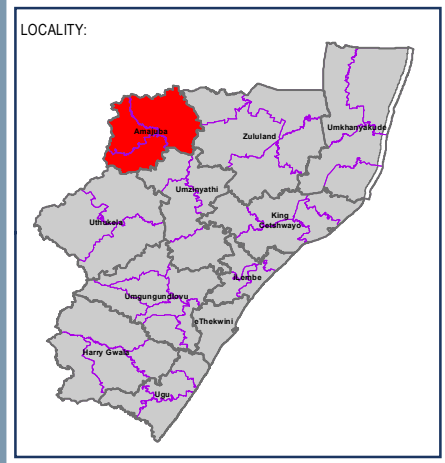
Each of the 2020 WSIA's' proposed interventions are briefly discussed in the following sub-sections.

For the rural areas of the Emadlangeni LM, AMA009 was identified to serve the rural areas with groundwater as one of the main sources other than rivers or streams. The report: First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality, (2014) included the development of proposed scheme footprints for water supply to most rural consumers in the Emadlangeni LM. From this report, it was found that a regional water supply scheme will not be economically feasible. A total of 36 individual schemes were proposed, in an order of priority, at a total cost of R 234 087 271 including VAT and professional fees. The planning horizon was for 2031, to serve an estimated 2 331 households.



**Legend**

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns
- Rudimentary Supply Areas



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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  
Amajuba District Municipality**

DATE COMPLETED:

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MAP NO.:

DC25: Figure 9.1

**Proposed New / Upgrade Infrastructure**

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



## 9.2 AMA003: SKOMBAREN NGAGANE WTP WSS

### 9.2.1 Water Demand

The water demand for the Skombaren Ngagane WTP WSS was determined for 2020 and 2050 and included within Table 9-1. The town of Skombaren is served from the Ngagane WTP in the Newcastle LM, operated by Uthukela Water.

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

Population	Population 2020	Population 2050
	4 381	6 082
Water Demand	Demand 2020	Demand 2050
	0.92	1.39

### 9.2.2 Water Resource Consideration

The Skombaren area is supplied from the Ngagane WTP. Water is supplied from the Ntshingwayo Dam (92Mℓ/d supplied, 110Mℓ/d licensed allocation), Ngagane River (18Mℓ/d supplied, 30Mℓ/d allocation) and Buffalo River (unreliable supply during winter months: allocation of 30Mℓ/d with system capacity of up to 25Mℓ/d, dependent on the level of the river), then treated at the Ngagane WTP (130Mℓ/d design capacity).

### 9.2.3 Water Supply Infrastructure

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

The water requirements for the Skombaren WSS are small and will not necessarily affect upgrade plans of the Ngagane WTP and the larger areas it supplies.

- ✓ The upgrade and costing of the Ngagane WTP is discussed in the UAP Phase III report of the Newcastle LM. For noting, it was proposed to upgrade the Ngagane WTP to 170Mℓ/d to meet the demands of 2050.
- ✓ For the Skombaren WSS, it is proposed to install a 200mm diameter secondary bulk pipeline, of 9.9km.

No other infrastructure upgrades are proposed for this scheme area.

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

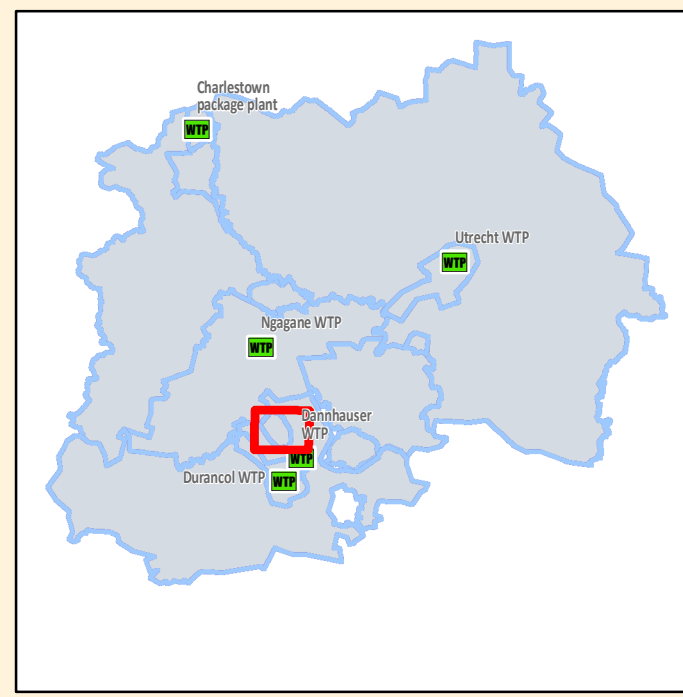
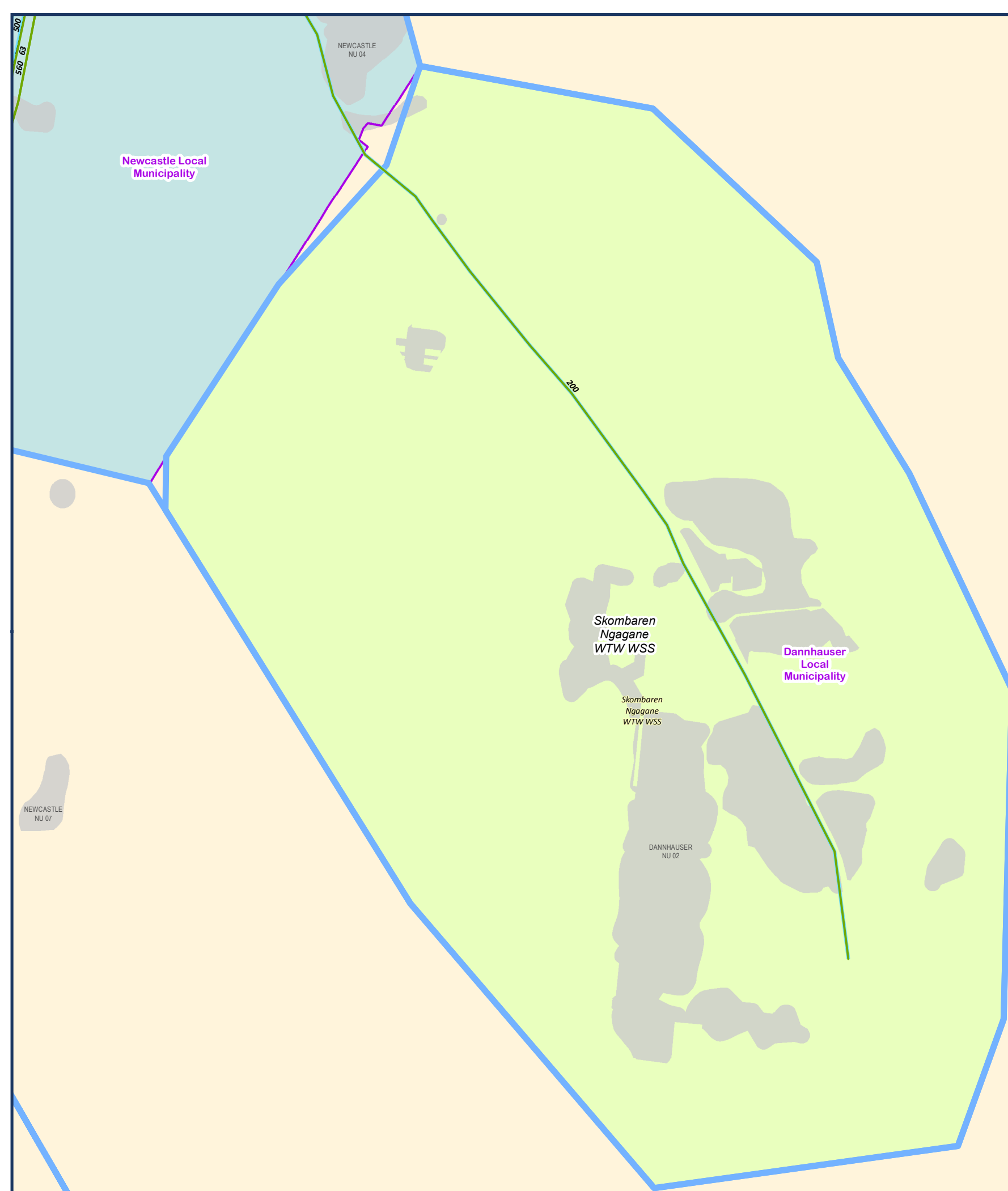
#### 9.2.4 Financial Requirements

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

**Table 9-2: Cost Requirement**

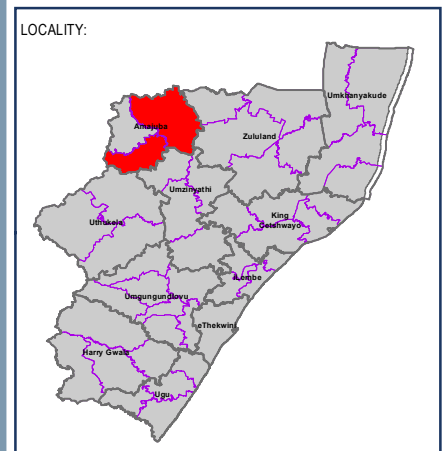
	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
<b>Primary</b>	R0	R0	R0
<b>Secondary</b>	R9 405 000	R940 500	R10 345 500
<b>Tertiary</b>	R0	R0	R0
<b>Total</b>	<b>R9 405 000</b>	<b>R940 500</b>	<b>R10 345 500</b>

The total bulk cost requirement is R10.3 million (excl VAT). The scheme development cost per household is approximately R8 587.



**Legend**

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns



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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 - Skombaren Ngagane WTW WSS Amajuba District Municipality**

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MAP NO.:

DC25: Figure 9.2

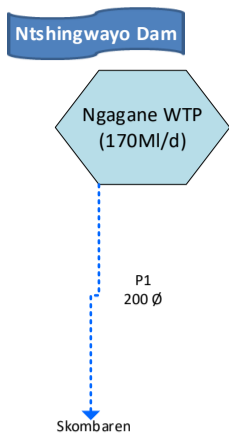
**Proposed New / Upgrade Infrastructure**

Water Scheme Areas & Names	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)	



**Figure 9-3**

**WSIA: AMA003 Skombaren Ngagane WTP WSS**



**LEGEND**

- Raw Water
- Clarified Water
- Treated Water**
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Existing Reservoir (Res 23, 0.4MI)
- Future Reservoir (Res 24, 0.92MI)

All diameters in mm  
All flows in MI/day

### 9.3 AMA004: DANNHAUSER WSS AND AMA008: DURNACOL WSS

#### 9.3.1 Water Demand

The water demand for the Dannhauser WSS and Durnacol WSS was determined for 2020 and 2050 and included within Table 9-3. The Durnacol WTP supplies both areas and plans are to construct a new 20M<sup>3</sup>/d WTP at the Ntshingwayo Dam, however, the DWS did not approve the business plan (Umgeni Water, 2020), therefore the Dannhauser and Durnacol supply schemes are still listed separately.

The Dannhauser WTP is not in use at present.

**Table 9-3: Population and Water demand (M<sup>3</sup>/day) 2020 and 2050**

	Population 2020	Population 2050
Dannhauser	6 489	9 009
Durnacol	3 866	5 367
<b>Total</b>	<b>10 355</b>	<b>14 376</b>
	Demand 2020	Demand 2050
Dannhauser	2.12	3.03
Durnacol	1.38	1.96
<b>Total</b>	<b>3.50</b>	<b>4.99</b>

#### 9.3.2 Water Resource Consideration

The Durnacol WTP is supplied from the Ntshingwayo Dam. There are only two active Water Services Provider Water as Customer Type in the Water use Authorization & Registration Management System (WARMS). The first registration volume is 32.85 million m<sup>3</sup>/a, representing 90M<sup>3</sup>/d and is likely for the Ngagane WTP in the Newcastle LM. The second registration volume is 41.4 million m<sup>3</sup>/a, representing 113.42M<sup>3</sup>/d and is likely referring to the upgrade of Ngagane WTP to 110M<sup>3</sup>/d.

There are no other entries in the WARMS, for a Water Services Provider, from the Ntshingwayo Dam. The water use licensing for the Amajuba DM, for its use from the Ntshingwayo Dam has to be confirmed by the DWS. According to Umgeni Water (2020), the water use license allocation for the ADM is recorded under the Ngagane WTP.

#### 9.3.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Dannhauser and Durnacol WSS and are illustrated within Figure 9-4 followed by the schematic layout of the WSIA within Figure 9-5.



- ✓ For both the Dannhauser WSS and Durnacol WSS, it is anticipated that water will continue to be supplied from the Durnacol WTP, with the planned construction of a proposed new 20Mℓ/d WTP supplied from the Ntshingwayo Dam. The existing Dannhauser WTP is currently not in use.
- ✓ A new 660mm diameter secondary bulk pipe, having a capacity of 32Mℓ/d, would provide water from the Ntshingwayo Dam, to Durnacol and from there, four additional secondary bulk pipes ranging in diameter from 63-110mm, total length of 4.4km would supply the areas of Durnacol. The areas of Dannhauser would be supplied from secondary bulk pipes ranging in diameter from 90-160mm and total length of 1.64km. In total, the scheme will be extended through 9.05km of primary, 52.62km of secondary bulk and one tertiary pipe of 110mm in diameter and 6.40km in length.
- ✓ The existing storage should be increased by six (6) primary reservoirs, having a total storage capacity of 8 340kl and three secondary reservoirs with a total storage capacity of 1 600kl.
- ✓ There is a requirement for three (3) pump stations, totalling 550.046kW to ensure conveyance of water to all the supply areas.

It is furthermore proposed that an allocation of 4.2Mℓ/d be supplied from the 20Mℓ/d Durnacol WTP, to the Buffalo Flats area to augment this area's supply from the Ngagane WTP.

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

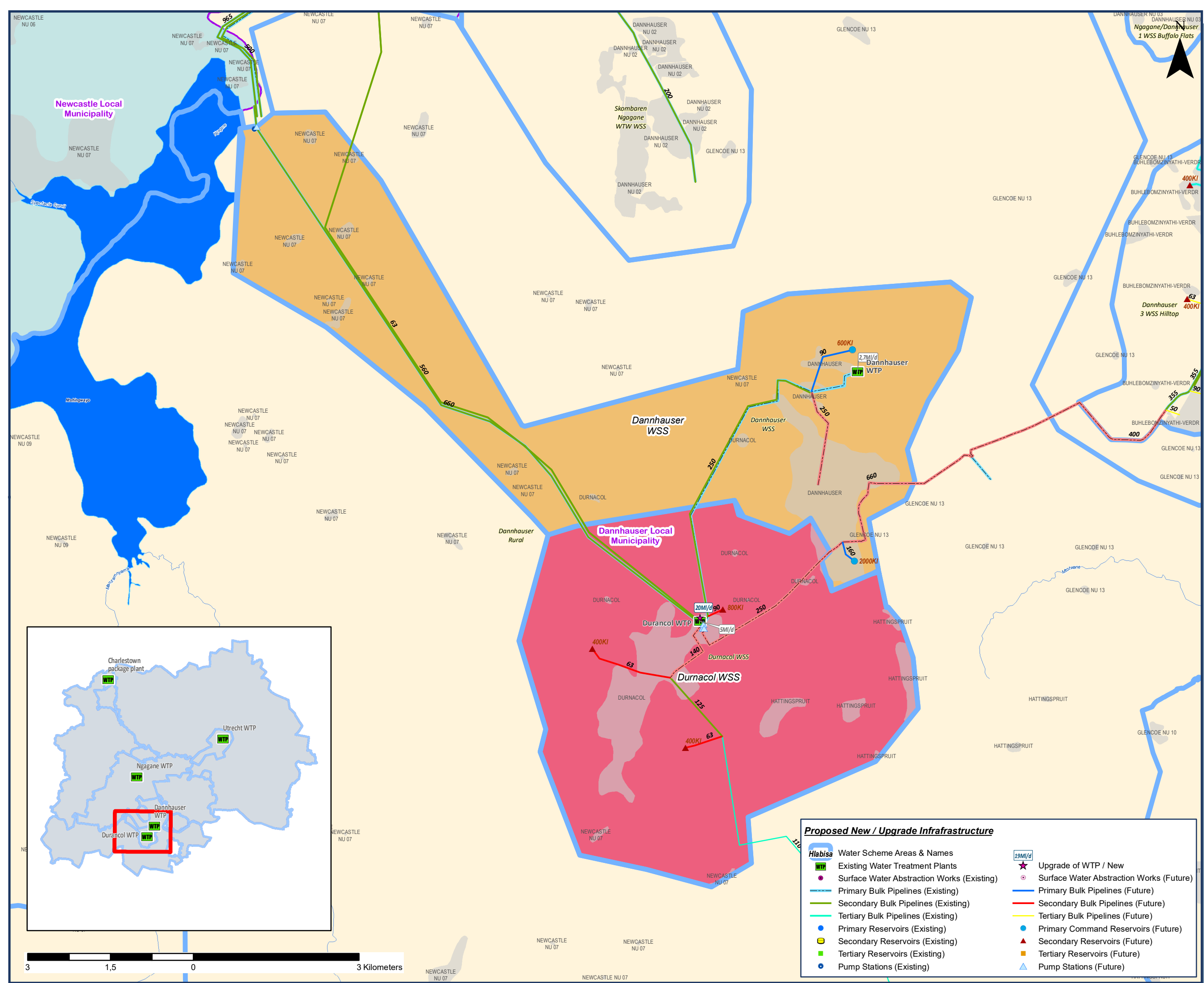
#### 9.3.4 Financial Requirements

The bulk cost requirement for the Dannhauser and Durnacol WSS is provided within Table 9-4 below.

**Table 9-4: Cost Requirement**

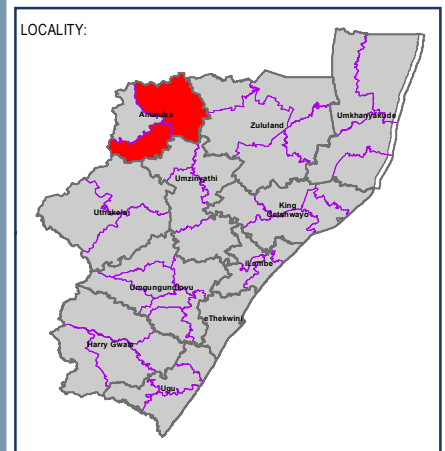
	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
<b>Primary</b>	R164 817 000	R16 481 700	R181 298 700
<b>Secondary</b>	R165 432 000	R16 543 200	R181 975 200
<b>Tertiary</b>	R1 866 000	R186 600	R2 052 600
<b>Total</b>	<b>R332 115 000</b>	<b>R33 211 500</b>	<b>R365 326 500</b>

The total bulk cost requirement is R365.3 million (excl VAT). The scheme development cost per household is approximately R157 222.



### Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Farm Land & Conservation Areas
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns



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Project No.: 27814

PROJECT TITLE

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

MAP TITLE:

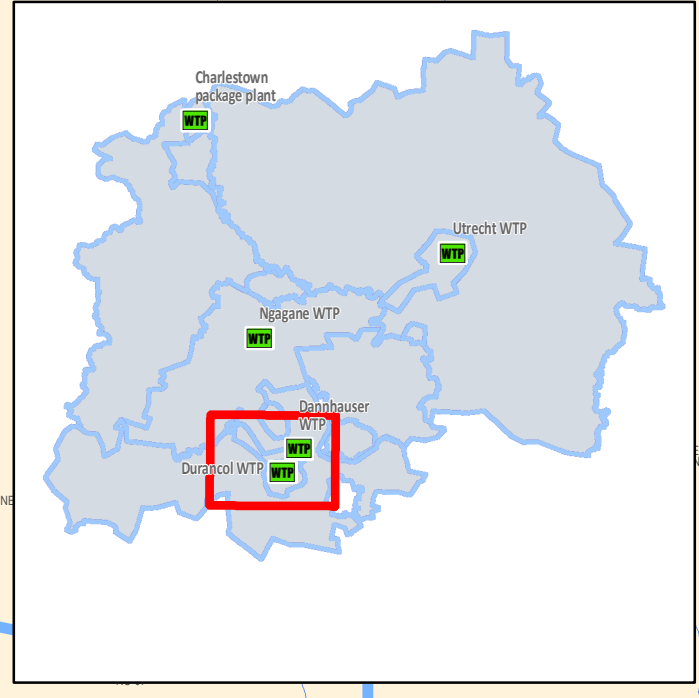
**Total Bulk Water Supply  
Interventions -  
Dannhauser WSS & Durnacol WSS  
Amajuba District Municipality**

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MAP NO.:

DC25: Figure 9.4



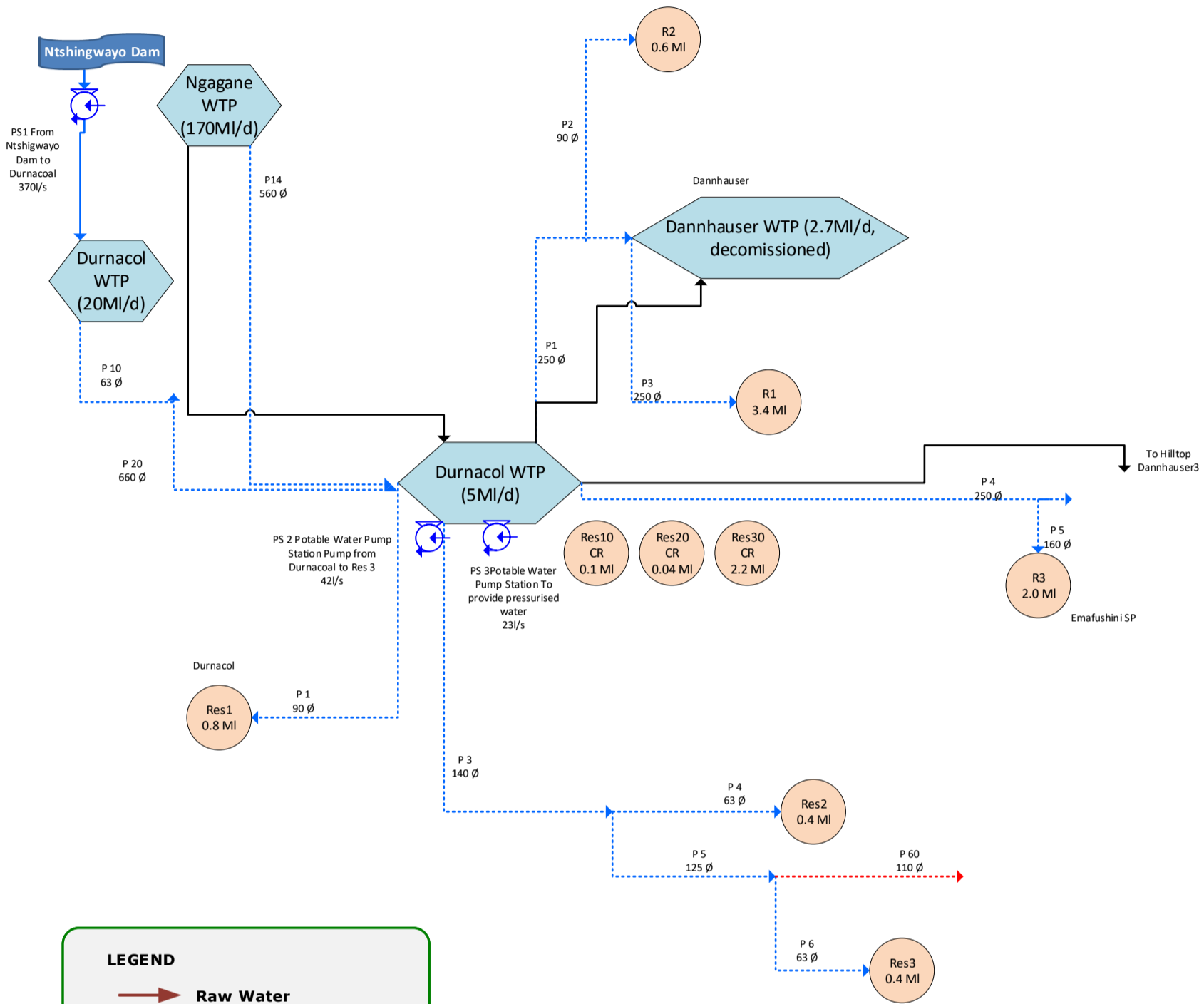
### Proposed New / Upgrade Infrastructure

Existing Water Treatment Plants	Upgrade of WTP / New
Surface Water Abstraction Works (Existing)	Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Existing)	Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Existing)	Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Existing)	Primary Command Reservoirs (Future)
Primary Reservoirs (Existing)	Secondary Reservoirs (Future)
Secondary Reservoirs (Existing)	Tertiary Reservoirs (Future)
Tertiary Reservoirs (Existing)	Pump Stations (Future)
Pump Stations (Existing)	



**Figure 9-5**

**WSIA: AMA004: Dannhauser WSS and AMA008: Durnacol WSS**



**LEGEND**

- Raw Water
- Clarified Water
- Treated Water**
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Existing Reservoir
- Future Reservoir

**All diameters in mm**  
**All flows in MI/day**

## 9.4 AMA005: DANNHAUSER 3 WSS HILLTOP AND AMA014: NGAGANE/DANNHAUSER 1 WSS BUFFALO FLATS

### 9.4.1 Water Demand

The water demand for the Dannhauser 3 WSS Hilltop and Ngagane/Dannhauser 1 WSS Buffalo Flats was determined for 2020 and 2050 and included within Table 9-5. The Durnacol WTP supplies both areas and plans are to construct a new 20Mℓ/d WTP at the Ntshingwayo Dam, however, the DWS did not approve the business plan (Umgeni Water, 2020), therefore the Hilltop and Buffalo Flats supply schemes are still listed separately.

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

	Population 2020	Population 2050
Dannhauser 3 WSS Hilltop	9 983	13 860
Ngagane/Dannhauser 1 WSS Buffalo Flats	90 657	125 856
<b>Total</b>	<b>100 640</b>	<b>139 716</b>
	Demand 2020	Demand 2050
Dannhauser 3 WSS Hilltop	1.59	2.42
Ngagane/Dannhauser 1 WSS Buffalo Flats	15.83	24.23
<b>Total</b>	<b>17.42</b>	<b>26.65</b>

### 9.4.2 Water Resource Consideration

The Hilltop area is supplied from the Durnacol WTP, obtaining water from the Ntshingwayo Dam. The Buffalo Flats area is supplied from the Ngagane WTP that obtains water from the Ntshingwayo Dam (110Mℓ/d licensed allocation), Ngagane River (30Mℓ/d allocation) and Buffalo River (unreliable supply during winter months: allocation of 30Mℓ/d). The Buffalo Flats area is further augmented through groundwater.

It is proposed to augment supply to the Buffalo Flats area with 4.2Mℓ/d, from the new 20Mℓ/d WTP at the Ntshingwayo Dam, however, the DWS did not approve the business plan (Umgeni Water, 2020). Another 20Mℓ/d is planned to be supplied from the Ngagane WTP to the Buffalo Flats area.

The water use licensing for the Amajuba DM, for its use from the Ntshingwayo Dam has to be confirmed by the DWS.

### 9.4.3 Water Supply Infrastructure

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Dannhauser 3 WSS Hilltop and Ngagane/Dannhauser 1 WSS Buffalo Flats and are illustrated within Figure 9-6 overleaf followed by the schematic layout of the WSIA within Figure 9-7 .

- ✓ The upgrade and costing of the Ngagane WTP is discussed in the UAP Phase III report of the Newcastle LM. For noting, it was proposed to upgrade the Ngagane WTP to 170Mℓ/d to meet the demands of 2050. An allocation of 20Mℓ/d is planned for supply to the Buffalo Flats area.
- ✓ It is further anticipated that 4.2Mℓ/d be supplied from the Durnacol WTP, with the planned construction of a new 20Mℓ/d WTP supplied from the Ntshingwayo Dam. The existing Dannhauser WTP is currently not in use.
- ✓ A new 400mm diameter primary bulk pipe, having a capacity of 10.56Mℓ/d, would provide water from the existing Durnacol WTP to Hilltop and one 315mm diameter primary pipe of 1.78km. The Hilltop area is further to be served by secondary bulk pipes ranging in diameter from 50-355mm and total length of 22.32km and nine tertiary pipes ranging in diameter from 50-90mm and total length of 7.46km.
- ✓ The Buffalo Flats area to be served by one primary bulk pipe of 315mm in diameter and total length of 0.66km. The Buffalo Flats area is further to be served by secondary bulk pipes ranging in diameter from 50-630mm and total length of 130.10km and tertiary pipes ranging in diameter from 50-500mm and total length of 103.29km.
- ✓ Storage for the Hilltop area comprises one primary reservoir with a capacity of 1 500kl, supplemented by 13 secondary reservoirs having a total capacity of 4 800kl.
- ✓ Storage for the Buffalo Flats area comprises one primary reservoir with a capacity of 8 400kl, supplemented by seven secondary reservoirs having a total capacity of 7 600kl.
- ✓ A new pump station (17.34kW) at the existing Durnacol WTP to support water provision to Buffalo Flats.

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

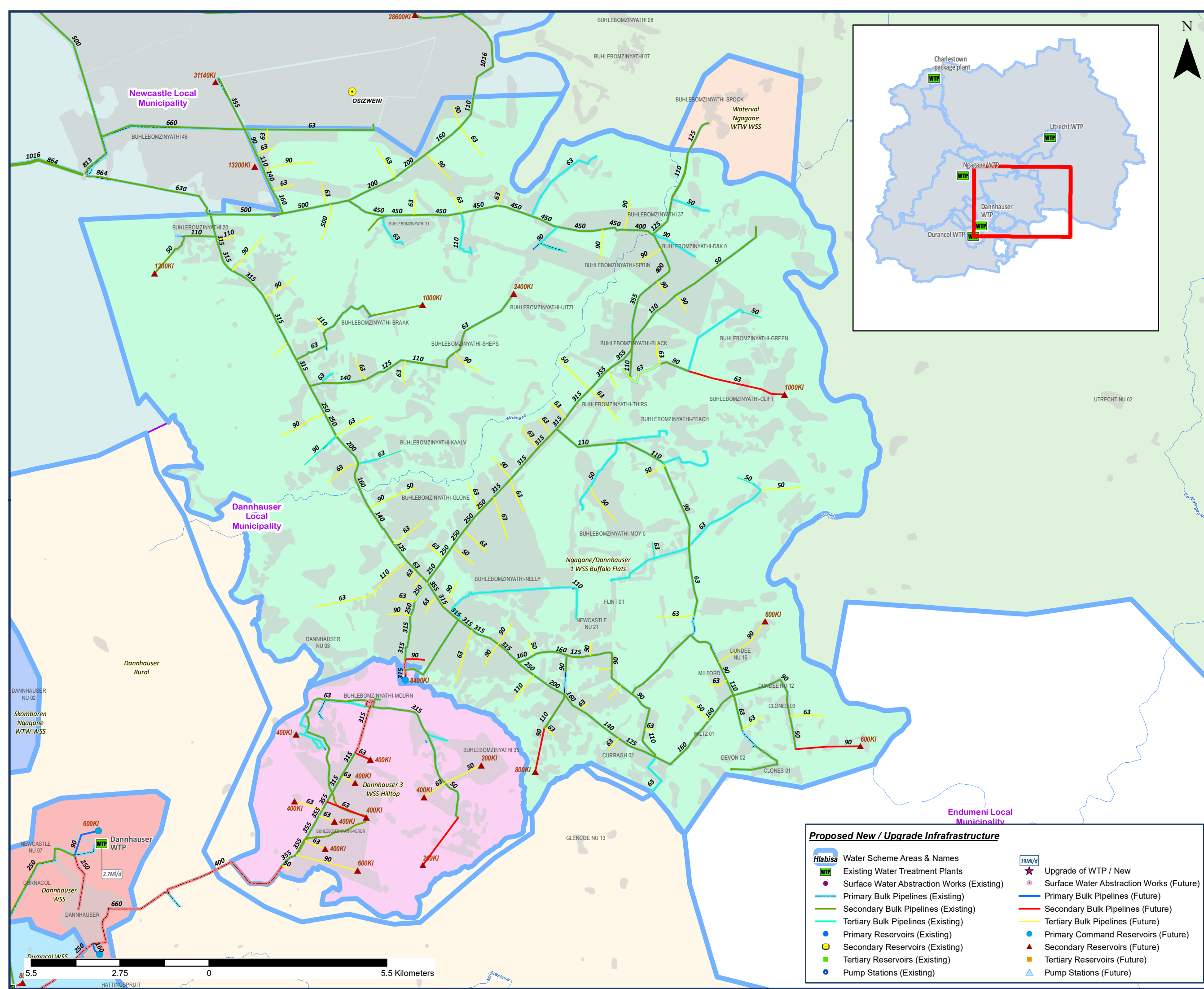
#### 9.4.4 Financial Requirements

The bulk cost requirement for the Dannhauser 3 WSS Hilltop and Ngagane/Dannhauser 1 WSS Buffalo Flats is provided within Table 9-6 below.

**Table 9-6: Cost Requirement**

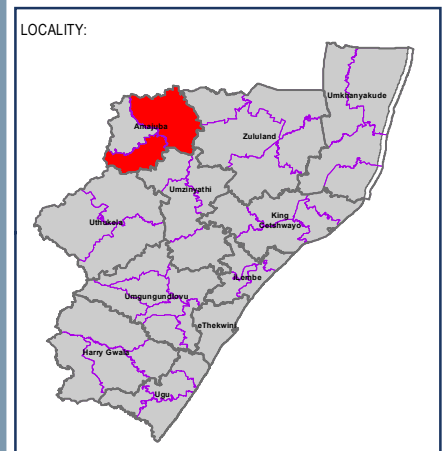
	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
<b>Primary</b>	R64 103 000	R6 410 300	R70 513 300
<b>Secondary</b>	R324 705 000	R32 470 500	R357 175 500
<b>Tertiary</b>	R23 639 000	R2 363 900	R26 002 900
<b>Total</b>	<b>R412 447 000</b>	<b>R41 244 700</b>	<b>R453 691 700</b>

The total bulk cost requirement is R453.69 million (excl VAT). The scheme development cost per household is approximately R26 432.



### Legend

- Provincial Boundaries
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- Settlements
- Major Towns



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CONSULTANTS:

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CONSULTING

Project No.: 27814

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 - Dannhauser 3 WSS Hilltop;  
Dannhauser Buffalo Flats WSS  
Amajuba District Municipality**

DATE COMPLETED:

2020/11/26

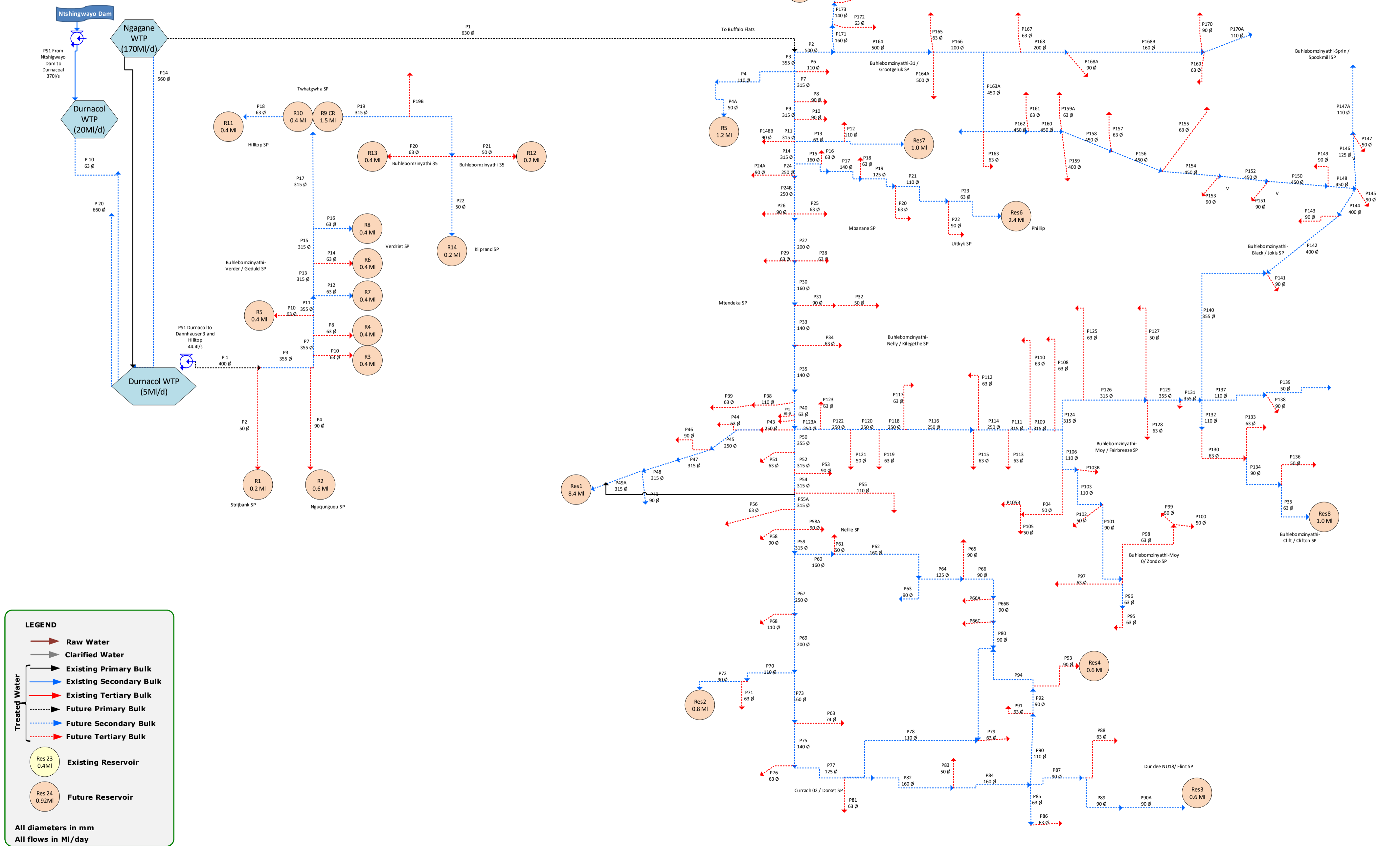
MAP NO.:

DC25: Figure 9.6

### Proposed New / Upgrade Infrastructure

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

**Figure 9-7**  
**WSIA: AMA005 Dannhauser 3 WSS Hilltop and AMA014 Ngagane/Dannhauser 1 WSS Buffalo Flats**



**LEGEND**

- Raw Water
- Clarified Water
- Existing Primary Bulk
- Existing Secondary Bulk
- Existing Tertiary Bulk
- Future Primary Bulk
- Future Secondary Bulk
- Future Tertiary Bulk
- Existing Reservoir (Res 23 0.4MI)
- Future Reservoir (Res 24 0.92MI)

All diameters in mm  
 All flows in MI/day



## 9.5 AMA016: UTRECHT/NGAGANE WSS

### 9.5.1 Water Demand

The water demand for the Utrecht/Ngagane WSS was determined for 2020 and 2050 and included within Table 9-7. The areas of Utrecht, Khayaletu, Bendsdorp, White City and Balgray are served from the Utrecht WTP. There is a bulk line connected to the Ngagane WTP in the Newcastle LM, operated by Uthukela Water, which can be used in cases of emergency or should the yield from local sources be affected by the drier winter months or drought conditions.

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

Population	Population 2020	Population 2050
		8 464
Water Demand	Demand 2020	Demand 2050
		2.33

### 9.5.2 Water Resource Consideration

Water is supplied from two off-channel storage dams (Dorps and Nywerheids) from the Dorpspruit River and treated at the Utrecht WTP. The full supply capacity of the Dorps dam is 1.1Mm<sup>3</sup>, but the historic firm yield for both the Dorps and Nywerheids dams is not known.

The yield from local sources are often affected by the drier winter months or drought conditions. Supply is then reverted from the Ngagane WTP in Newcastle LM.

The areas of Berouw and Amangthungwa are supplied via standpipes from the bulk water supplied from the Ngagane WTP that obtains water from the Ntshingwayo Dam (110Mℓ/d licensed allocation), Ngagane River (30Mℓ/d allocation) and Buffalo River (unreliable supply during winter months: allocation of 30Mℓ/d).

### 9.5.3 Water Supply Infrastructure

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

- ✓ The upgrade and costing of the Ngagane WTP is discussed in the UAP Phase III report of the Newcastle LM. For noting, it was proposed to upgrade the Ngagane WTP to 170Mℓ/d to meet the demands of 2050.
- ✓ For the Utrecht WSS, it is proposed to install a 250mm diameter secondary bulk pipeline, of 3.0km.
- ✓ It is further proposed to construct a tertiary reservoir with a capacity of 6 800kl.

No other infrastructure upgrades are proposed for this scheme area.

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

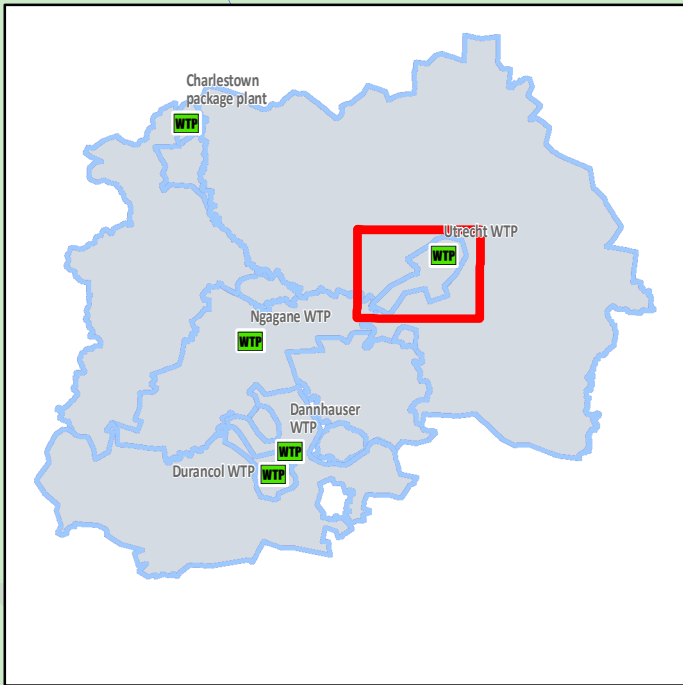
#### 9.5.4 Financial Requirements

The bulk cost requirement for the Utrecht WSS is provided within Table 9-8 below.

**Table 9-8: Cost Requirement**

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
<b>Primary</b>	R0	R0	R0
<b>Secondary</b>	R4 496 000	R449 600	R4 945 600
<b>Tertiary</b>	R22 244 000	R2 224 400	R24 468 400
<b>Total</b>	<b>R26 740 000</b>	<b>R2 674 000</b>	<b>R29 414 000</b>

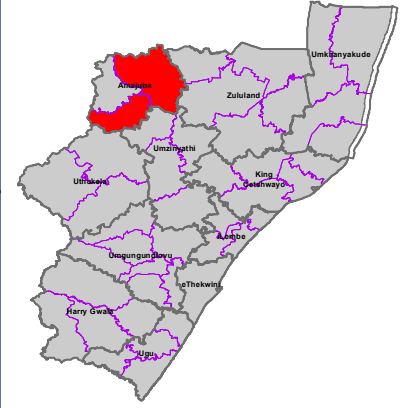
The total bulk cost requirement is R29.4 million (excl VAT). The scheme development cost per household is approximately R12 637.



**Legend**

- Provincial Boundaries
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- Rivers
- Settlements
- Major Towns

LOCALITY:



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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 -  
Utrecht / Ngagane WSS  
Amajuba District Municipality**

DATE COMPLETED:

2020/11/26

MAP NO.:

DC25: Figure 9.8

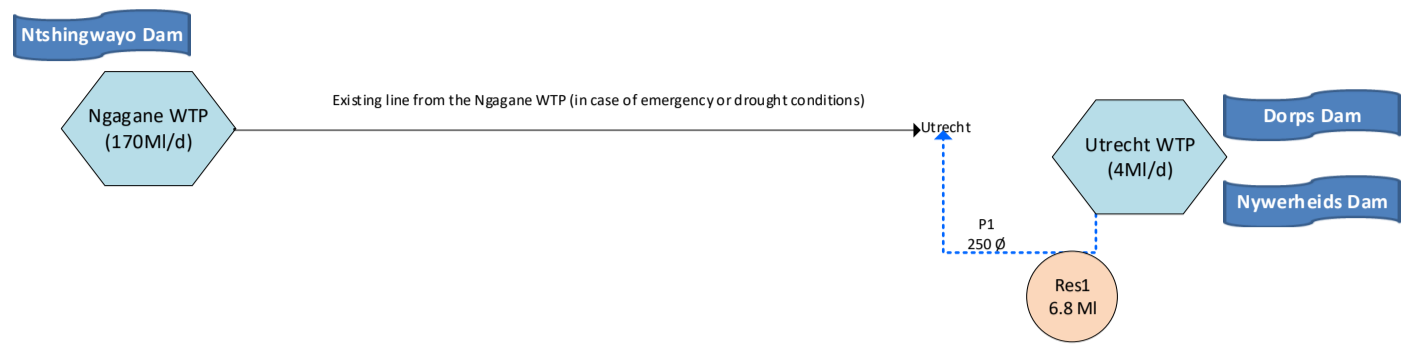
**Proposed New / Upgrade Infrastructure**

- |  |  |
|--|--|
| Water Scheme Areas & Names                 | 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)                   |  |



**Figure 9-9**

**WSIA: AMA016: Utrecht / Ngagane WSS**



**LEGEND**

- Raw Water
- Clarified Water
- Treated Water
  - Existing Primary Bulk
  - Existing Secondary Bulk
  - Existing Tertiary Bulk
  - Future Primary Bulk
  - Future Secondary Bulk
  - Future Tertiary Bulk
- Existing Reservoir (Res 23 0.4ML)
- Future Reservoir (Res 24 0.92ML)

All diameters in mm  
All flows in ML/day

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## 9.6 AMA006: DANNHAUSER RURAL

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The rural areas of the Dannhauser Local Municipality are illustrated in Figure 9-10.

Under the UAP Phase III study, the water requirements were modelled with a minimum allocation of 100 litres per capita per day. The estimated water requirements for this area, under the 2050 planning horizon is 1.45Mℓ/d and the projected population 6 907.

To consider supplying all households with groundwater-sourced supply, would require an estimated R58 661 606 (ex VAT). It is further proposed to review and update the groundwater hydrology to verify the water resource availability to meet the water requirements for the rural areas in the Dannhauser LM (1 131km<sup>2</sup>) for the 2050 planning horizon. A cost allocation of R5million (excluding VAT) is provided for this study.

A total cost of R63 661 606 excluding VAT is allocated this supply area.

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## 9.7 AMA009: EMADLANGENI RURAL SUPPLY AREA

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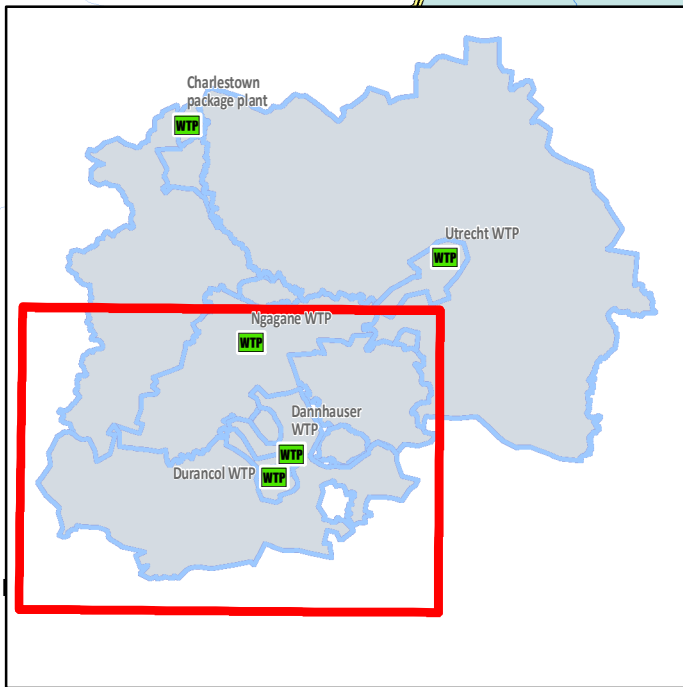
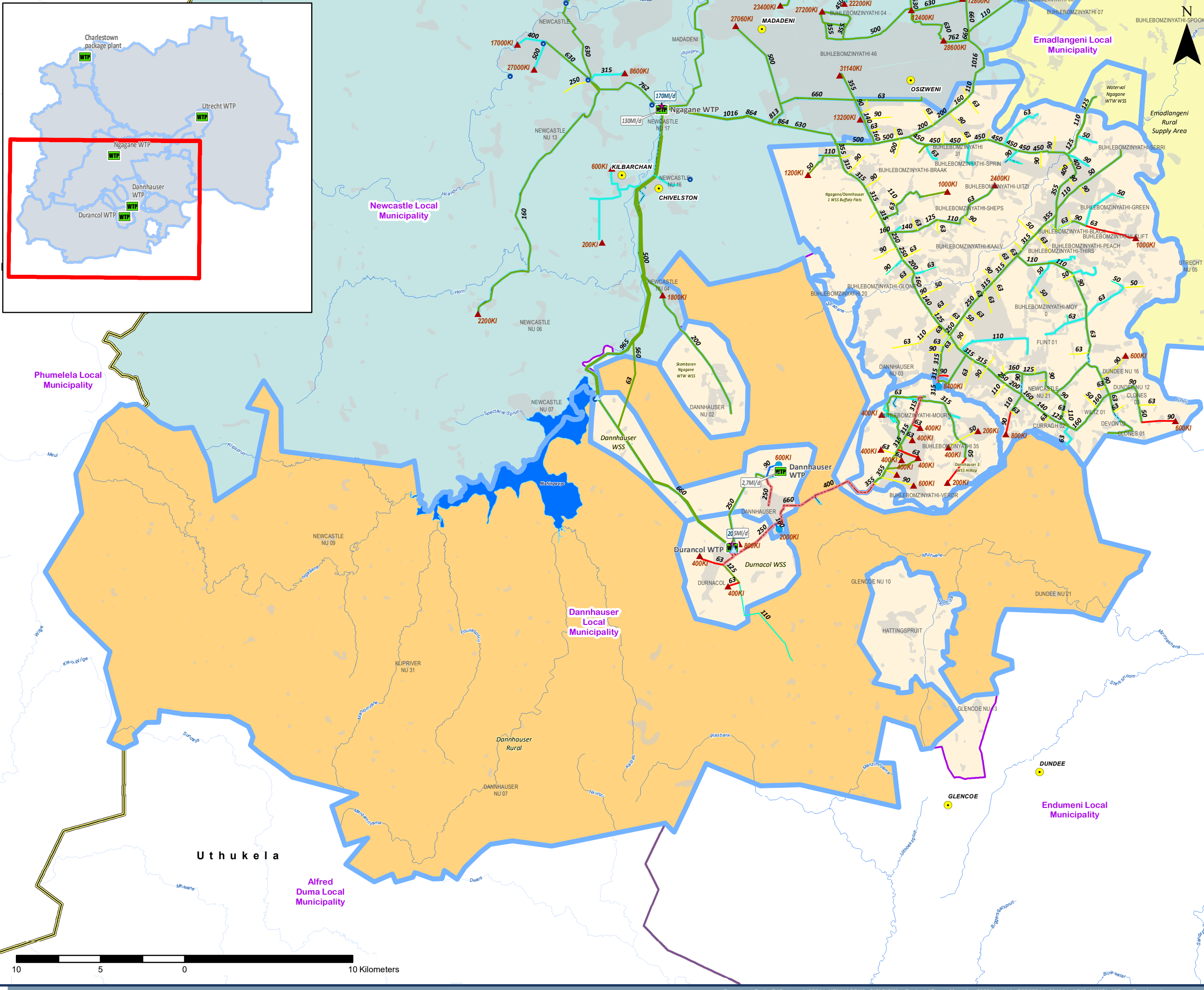
The First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality, (2014) proposed 36 individual schemes to serve the Emadlangeni LM's rural areas, as illustrated in Figure 9-11.

The planning horizon in the 2014 study was to meet the water requirements up to 2031, for 2 331 households. The estimated costs were R 234 087 271 including VAT and professional fees.

Under the UAP Phase III study, the costs can be escalated to 2020 and the water requirements reviewed with a minimum allocation of 100 litres per capita per day. The estimated water requirements for this area, under the 2050 planning horizon is 7.6Mℓ/d and the projected population 43 082.

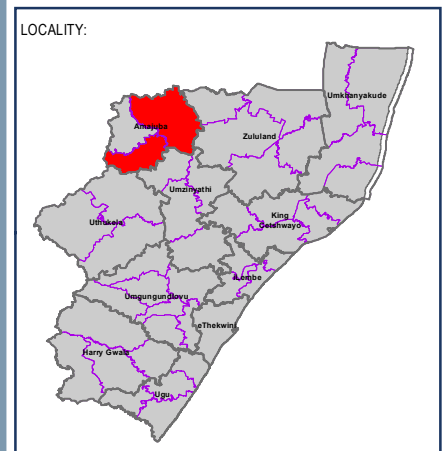
Furthermore, it is proposed to review and update the groundwater hydrology to verify the water resource availability to meet the water requirements for the rural areas in the Emadlangeni LM (3 429km<sup>2</sup>) for the 2050 planning horizon. A cost allocation of R5million (excluding VAT) is provided for this study.

A total cost of R304 619 858 excluding VAT (about R41 227 per household) is allocated to the Amajuba DM for the rural schemes' development in the Emadlangeni LM under the UAP Phase III study.



**Legend**

- Provincial Boundaries
- District Municipality Boundaries
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- Farm Land & Conservation Areas
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- Rivers
- Settlements
- Major Towns



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PROJECT TITLE

**Universal Access Plan Phase III -  
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Regional Concept Secondary  
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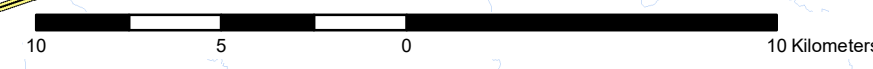
**Total Bulk Water Supply  
Interventions -  
Dannhauser LM Rural  
Amajuba District Municipality**

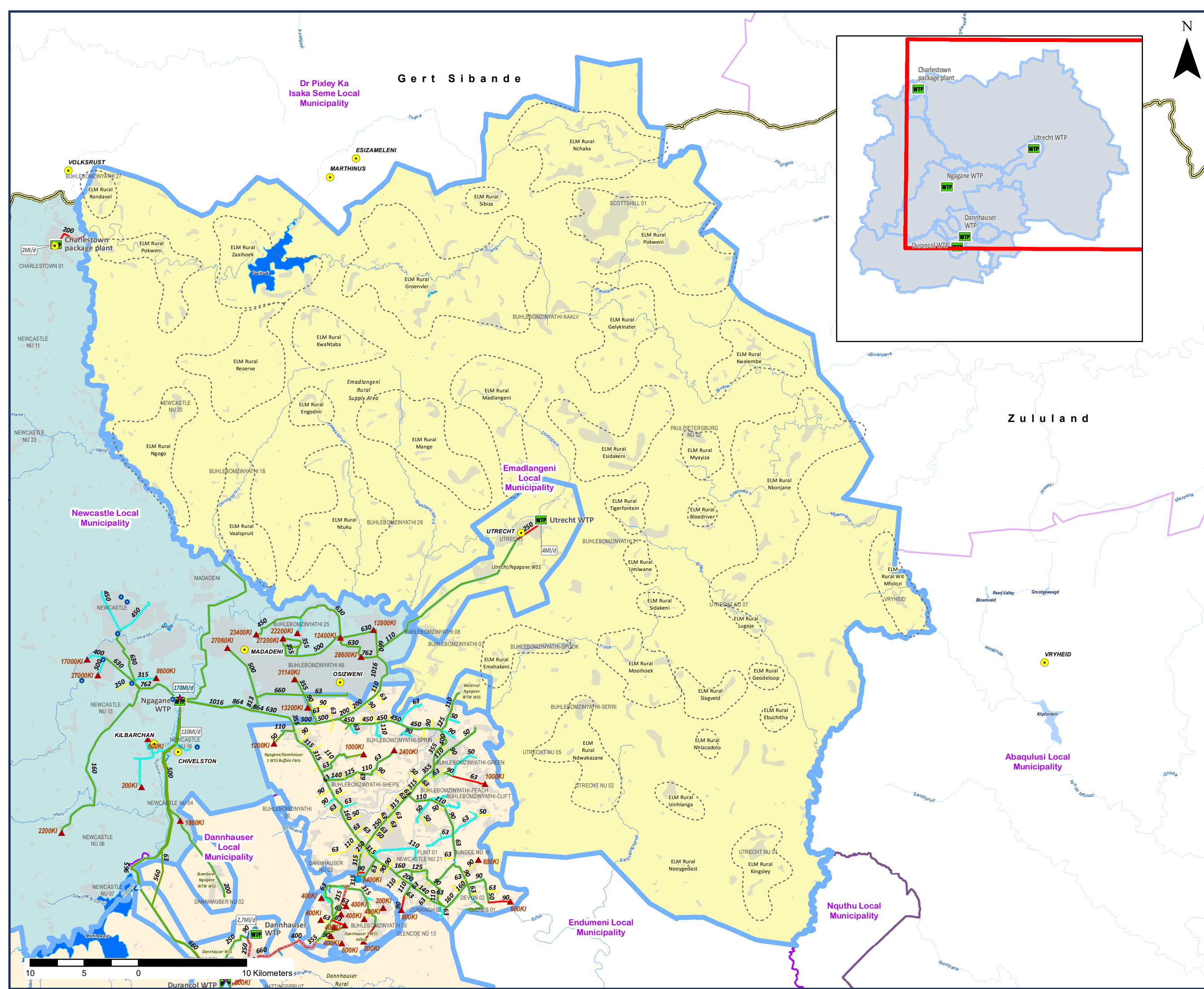
DATE COMPLETED:

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MAP NO.:

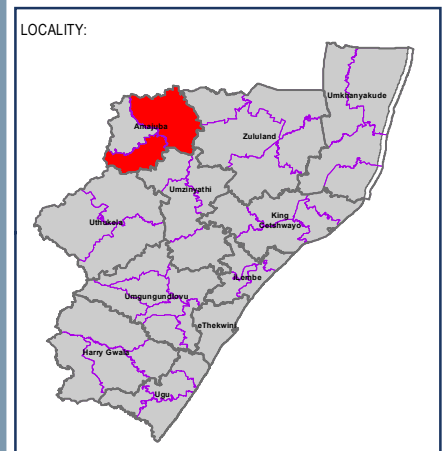
DC25: Figure 9.10





**Legend**

- Provincial Boundaries
- District Municipality Boundaries
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- Farm Land & Conservation Areas
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- Rivers
- Settlements
- Major Towns
- Rudimentary Supply Areas



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MAP TITLE:

**Total Bulk Water Supply  
Interventions -  
Emadiangeni LM Rural  
Amajuba District Municipality**

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2020/11/26

MAP NO.:

DC25: Figure 9.11

## 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
AMA003	Skombaren Ngagane WTP WSS	4 381	0.92	0.93	1.05	1.06	1.21	1.22	1.39
AMA004 and AMA008	Dannhauser WSS	6 489	2.12	2.10	2.36	2.36	2.67	2.68	3.03
	Durnacol WSS	3 866	1.38	1.37	1.54	1.54	1.74	1.74	1.96
<b>Total: AMA004 and AMA008</b>		<b>10 355</b>	<b>3.50</b>	<b>3.48</b>	<b>3.89</b>	<b>3.90</b>	<b>4.41</b>	<b>4.42</b>	<b>4.99</b>
AMA005 and AMA014	Dannhauser 3 WSS Hilltop	9 983	1.59	1.59	1.81	1.83	2.09	2.12	2.42
	Ngagane/Dannhauser 1 WSS Buffalo Flats	90 657	15.83	16.01	18.24	18.44	21.01	21.26	24.23
<b>Total: AMA005 and AMA014</b>		<b>100 640</b>	<b>17.41</b>	<b>17.61</b>	<b>20.04</b>	<b>20.27</b>	<b>23.10</b>	<b>23.38</b>	<b>26.65</b>
AMA016	Utrecht/Ngagane WSS	8 464	2.33	2.32	2.61	2.62	2.97	2.98	3.38
AMA015	Waterval prison	1 671	0.61	0.60	0.67	0.67	0.75	0.75	0.85
AMA006	Dannhauser Rural Supply Areas	4 975	0.97	1.04	1.10	1.18	1.26	1.35	1.45
AMA009	Emadlangeni Rural Supply Areas	31 033	2.86	4.32	5.92	6.29	6.69	7.13	7.60
<b>TOTAL</b>		<b>159 849</b>	<b>28.60</b>	<b>30.29</b>	<b>35.28</b>	<b>35.99</b>	<b>40.39</b>	<b>41.23</b>	<b>46.30</b>

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 10-2:

**Table 10-2: Water Resources Required vs proposed WSI**

WSIA	WSIA Name	Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm <sup>3</sup> /a)	[A] Existing Resources (Mm <sup>3</sup> /a)*	[B] Proposed Additional Demand under UAP Phase III (Mm <sup>3</sup> /a)	[A+B] Total Demand (Mm <sup>3</sup> /a)	Balance (Mm <sup>3</sup> /a)
AMA003	Skombaren Ngagane WTP WSS	6 082	1.39	0.51	170	0.17	170.17	
AMA004 and AMA008	Dannhauser WSS	9 009	3.03	1.10		0.33		
	Durnacol WSS	5 367	1.96	0.72		0.21		
<b>Total: AMA004 and AMA008</b>		14 376	4.99	1.82	170	0.54	170.54	
AMA005 and AMA014	Dannhauser 3 WSS Hilltop	13 860	2.42	0.88		0.31		
	Ngagane/Dannhauser 1 WSS Buffalo Flats	125 856	24.23	8.84		3.07		
<b>Total: AMA005 and AMA014</b>		139 715	26.65	9.73	170	3.37	173.37	
AMA016	Utrecht/Ngagane WSS	11 750	3.38	1.23	1.1**	0.38	1.48	
<b>TOTAL</b>		171 923	36.40	13.29		4.47		

\* The licensed allocation to the Ngagane WTP from its three water sources totals 170Mℓ/d (62.05Mm<sup>3</sup>/a).

\*\* The full supply capacity of the Dorps dam is 1.1Mm<sup>3</sup>, but the historic firm yield for both the Dorps and Nywerheids dams is not known.

The groundwater availability in the Buffalo Flats area is unknown.

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### 10.3 TOTAL WATER RESOURCES REQUIRED

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

### 10.3.1 AMA003: Skombaren Ngagane WTP WSS

Table 10-3: WSIA Summary for AMA003: Skombaren Ngagane WTP WSS

Skombaren Ngagane WTP WSS							
Item	Description		Scheme No	Population 2020	Population 2050		
1	Population	Scheme Name	AMA003	4 381	6 082		
		Skombaren Ngagane WTP WSS					
2	Demand	Scheme Name	AMA003	0.92	1.39		
		Skombaren Ngagane WTP WSS					
						<b>Comments</b>	
3	Water Resource	Dam	Ntshingwayo Dam	FSC: 211.258Mm <sup>3</sup> . HFY: 100% - 75Mm <sup>3</sup> /a 80% - 68Mm <sup>3</sup> /a 60% - 60Mm <sup>3</sup> /a 40% - 52Mm <sup>3</sup> /a 20% - 38Mm <sup>3</sup> /a	Available reserve yield of 21Mm <sup>3</sup> /a . DWS 2013: Short-term stochastic yields (May Decision) at various dam level %'s.		
		River					
4	Infrastructure			Class	Size / No	Capacity (Mℓ/d or kl or km or kW)	
4.1	Existing	WTP	Ngagane WTP	Primary Bulk		130	
			Ngagane WTP upgrade	Primary Bulk		170	
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		0	0
				Secondary Bulk	200 ømm		9.92
				Tertiary Bulk		0	0
Reservoirs	Command Reservoir	Primary Bulk					

			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk		
		Pump stations		Primary Bulk		
4.2	Future	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	0	0
				Tertiary Bulk		
		WTP		Primary Bulk		
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk		
Pump stations		Primary Bulk				
5	Cost Requirement		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	R0	R0	R0	
		Secondary	R9 405 000	R940 500	R10 345 500	
		Tertiary	R0	R0	R0	
		<b>Total</b>	<b>R9 405 000</b>	<b>R940 500</b>	<b>R10 345 500</b>	

10.3.2 AMA004: Dannhauser WSS and AMA008: Durnacol WSS

Table 10-4: WSIA Summary for AMA004: Dannhauser WSS and AMA008: Durnacol WSS

Dannhauser WSS & Durnacol WSS						
Item	Description					
1	Population	Scheme Name	Scheme No	Population 2020	Population 2050	
		Dannhauser WSS & Durnacol WSS	AMA004 & AMA008	10 355	14 376	
2	Demand	Scheme Name	Scheme No	Demand 2020	Demand 2050	
		Dannhauser WSS & Durnacol WSS	AMA004 & AMA008	3.5	4.99	
					<b>Comments</b>	
3	Water Resource	Dam	Ntshingwayo Dam	FSC: 211.258Mm <sup>3</sup> . HFY: 100% - 75Mm <sup>3</sup> /a 80% - 68Mm <sup>3</sup> /a 60% - 60Mm <sup>3</sup> /a 40% - 52Mm <sup>3</sup> /a 20% - 38Mm <sup>3</sup> /a	Available reserve yield of 21Mm <sup>3</sup> /a . DWS 2013: Short-term stochastic yields (May Decision) at various dam level %'s.	
		Water Resource Development			Buffalo River catchment stochastic analysis, R4million.	
4	Infrastructure			Class	Size / No	Capacity (Ml/d or kl or km or kW)
4.1	Existing	WTP	Durnacol WTP	Primary Bulk		5
				0	Primary Bulk	
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	140 - 660 ømm	9.05
				Secondary Bulk	90 - 660 ømm	50.07
				Tertiary Bulk	110 ømm	6.40
Reservoirs	Command Reservoir	Primary Bulk		4	5 740	

			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk		
		Pump stations		Primary Bulk	3	550.046
4.2	Future	Bulk Pipelines		Primary Bulk	90 - 160 ømm	1.64
				Secondary Bulk	63 - 90 ømm	2.55
				Tertiary Bulk	0	0
		WTP	Durnacol WTP at Ntshingwayo Dam	Primary Bulk		20
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk	2	2 600
			Command Reservoir	Secondary Bulk	3	1 600
Supply Reservoirs	Tertiary Bulk					
	Pump stations		Primary Bulk			
5	Cost Requirement		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	R164 817 000	R16 481 700	R181 298 700	
		Secondary	R165 432 000	R16 543 200	R181 975 200	
		Tertiary	R1 866 000	R186 600	R2 052 600	
		<b>Total</b>	<b>R332 115 000</b>	<b>R33 211 500</b>	<b>R365 326 500</b>	

10.3.3 AMA005: Dannhauser 3 WSS Hilltop and AMA014: Ngagane/Dannhauser 1 WSS Buffalo Flats

Table 10-5: WSIA Summary for AMA005: Dannhauser 3 WSS Hilltop and AMA014: Ngagane/Dannhauser 1 WSS Buffalo Flats

Dannhauser 3 WSS Hilltop & Ngagane/Dannhauser 1 WSS Buffalo Flats						
Item	Description					
1	Population	Scheme Name	Scheme No	Population 2020	Population 2050	
		Dannhauser 3 WSS Hilltop & Ngagane/Dannhauser 1 WSS Buffalo Flats	AMA005 & AMA014	100 640	139 716	
2	Demand	Scheme Name	Scheme No	Demand 2020	Demand 2050	
		Dannhauser 3 WSS Hilltop & Ngagane/Dannhauser 1 WSS Buffalo Flats	AMA005 & AMA014	17.42	26.65	
3	Water Resource	Dam	Ntshingwayo Dam	FSC: 211.258Mm <sup>3</sup> . HFY: 100% - 75Mm <sup>3</sup> /a 80% - 68Mm <sup>3</sup> /a 60% - 60Mm <sup>3</sup> /a 40% - 52Mm <sup>3</sup> /a 20% - 38Mm <sup>3</sup> /a	Available reserve yield of 21Mm <sup>3</sup> /a . DWS 2013: Short-term stochastic yields (May Decision) at various dam level %'s.	
		River				
		Groundwater	Boreholes			
4	Infrastructure			Class	Size / No	Capacity (Ml/d or kl or km or kW)
4.1	Existing	WTP	Ngagane WTP	Primary Bulk		130

			Ngagane WTP upgrade	Primary Bulk		170
			Durnacol WTP	Primary Bulk		5
			0	Primary Bulk		0
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	315 - 400 ømm	6.88
				Secondary Bulk	50 - 630 ømm	141.64
				Tertiary Bulk	50 - 110 ømm	34.67
		Reservoirs	Command Reservoir	Primary Bulk	1	1500
			Command Reservoir	Secondary Bulk	2	600
			Supply Reservoirs	Tertiary Bulk		
		Pump stations		Primary Bulk		
4.2	Future	Bulk Pipelines		Primary Bulk	0	0
				Secondary Bulk	63 - 90 ømm	10.78
				Tertiary Bulk	50 - 500 ømm	76.08
		WTP	Durnacol WTP at Ntshingwayo Dam	Primary Bulk		20
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk	1	8400
			Command Reservoir	Secondary Bulk	18	11800
			Supply Reservoirs	Tertiary Bulk		
Pump stations	PS1 Durnacol to Dannhauser 3 and Hilltop	Primary Bulk		17.34		
5	Cost Requirement		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	<b>R64 103 000</b>	<b>R6 410 300</b>	<b>R70 513 300</b>	
		Secondary	R324 705 000	R32 470 500	<b>R357 175 500</b>	
		Tertiary	R23 639 000	R2 363 900	<b>R26 002 900</b>	
		<b>Total</b>	<b>R412 447 000</b>	<b>R41 244 700</b>	<b>R453 691 700</b>	



### 10.3.4 AMA016: Utrecht/Ngagane WSS

Table 10-6: WSIA Summary for AMA016: Utrecht/Ngagane WSS

Utrecht/Ngagane WSS						
Item	Description					
1	Population	Scheme Name	Scheme No	Population 2020	Population 2050	
		Utrecht/Ngagane WSS	AMA016	8 464	11 750	
2	Demand	Scheme Name	Scheme No	Demand 2020	Demand 2050	
		Utrecht/Ngagane WSS	AMA016	2.33	3.38	
					Comments	
3	Water Resource	Dam	Dorps Dam (off-channel dam)	HFY: 1.1Mm <sup>3</sup> /a	Should the local sources' yield be affected, supply is reverted from the Ntshingwayo Dam	
			Nywerheids Dam	HFY: Not available		
		River				
4	Infrastructure			Class	Size / No	Capacity (ME/d or kl or km or kW)
4.1	Existing	WTP	Utrecht WTP	Primary Bulk		4
			Ngagane WTP	Primary Bulk		130
			Ngagane WTP upgrade	Primary Bulk		170
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	0	0
				Secondary Bulk	0	0
				Tertiary Bulk	0	0
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		

			Supply Reservoirs	Tertiary Bulk		
		Pump stations		Primary Bulk		
4.2	Future	Bulk Pipelines		Primary Bulk	0	0
				Secondary Bulk	250 ømm	3.03
				Tertiary Bulk	0	0
		WTP		Primary Bulk		
				Secondary Bulk		
		Reservoirs	Command Reservoir	Primary Bulk		
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk	1	6800
	Pump stations		Primary Bulk			
5	Cost Requirement		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	<b>R0</b>	<b>R0</b>	<b>R0</b>	
		Secondary	R4 496 000	R449 600	<b>R4 945 600</b>	
		Tertiary	R22 244 000	R2 224 400	<b>R24 468 400</b>	
		<b>Total</b>	<b>R26 740 000</b>	<b>R2 674 000</b>	<b>R29 414 000</b>	

## 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 10-7: Financial Requirements based on Demand Model Interventions**

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
AMA003	Skombaren Ngagane WTP WSS	R0	R9 405 000	R0	R940 500	R10 345 500
AMA004	Dannhauser WSS	R61 434 000	R8 344 000	R0	R6 977 800	R76 755 800
AMA008	Durnacol WSS	R103 383 000	R157 088 000	R1 866 000	R26 233 700	R288 570 700
<b>Total: AMA004 and AMA008</b>		<b>R164 817 000</b>	<b>R165 432 000</b>	<b>R1 866 000</b>	<b>R33 211 500</b>	<b>R365 326 500</b>
AMA005	Dannhauser 3 WSS Hilltop	R36 158 000	R60 233 000	R833 000	R9 722 400	R106 946 400
AMA014	Ngagane/ Dannhauser 1 WSS Buffalo Flats	R27 945 000	R264 472 000	R22 806 000	R31 522 300	R346 745 300
<b>Total: AMA005 and AMA014</b>		<b>R64 103 000</b>	<b>R324 705 000</b>	<b>R23 639 000</b>	<b>R41 244 700</b>	<b>R453 691 700</b>
AMA016	Utrecht/ Ngagane WSS	R0	R4 496 000	R22 244 000	R2 674 000	R29 414 000
AMA015	Waterval prison	R0	R996 000	R0	R99 600	R1 095 600
AMA006	Dannhauser Rural					R63 661 606
AMA009	Emadlangeni Rural Supply Area					R304 619 858
<b>Total</b>		<b>R228 920 000</b>	<b>R505 034 000</b>	<b>R47 749 000</b>	<b>R78 170 300</b>	<b>R1 228 154 764</b>

Source: Water Demand Model, UAP Phase III, 2020

A total estimate of approximately R1 228.15 million is required to address the total bulk water supply requirement by 2050.

## 10.5 FUNDING OPTIONS

The ADM 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 ADM could consider is additional loan funding through the Development Bank of Southern Africa (DBSA). They have an existing loan with the DBSA (expiry date not provided) and depends 99.76% on grant funding (ADM IDP, 2019/2020).

Special submissions to National Treasury could also be considered to create an awareness of the DM's planning and implementation readiness.

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## 10.6 IMPLEMENTATION PROGRAMME

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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 Dannhauser, Durnacol, Hilltop, Buffalo Flats and the Newcastle-Osizweni-Madadeni areas, would be an implementation priority for the ADM and Newcastle but 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.

## 11. RECOMMENDATIONS

### 11.1 RESPONSIBILITIES

The provision of water services remains the responsibility of the ADM as the WSA. The ADM 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 ADM to take this process further, in consultation with Uthukela Water and the Newcastle LM.

### 11.2 SELECTION OF SOLUTIONS

The proposed water supply intervention areas (WSIAs) for bulk water supply development within ADM are as follows:

- ✓ AMA003: Skombaren Ngagane WTP WSS;
- ✓ AMA004: Dannhauser WSS & AMA008: Durnacol WSS;
- ✓ AMA005: Dannhauser 3 WSS Hilltop and AMA014: Ngagane/Dannhauser 1 WSS Buffalo Flats;
- ✓ AMA016: Utrecht/Ngagane WSS;
- ✓ AMA006: Dannhauser Rural;
- ✓ AMA009: Emadlangeni Rural Supply Area; and
- ✓ AMA015: Waterval Ngagane WTW WSS.

### 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.

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### **11.3.1 Municipal Structures Act**

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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.

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### **11.3.2 Municipal Systems Act**

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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.

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### **11.3.3 Water Services Act**

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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.

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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.

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**ANNEXURE A – REFERENCES**



## Reference List

<b>Amajuba District Municipality</b>	Feasibility Report: Phase 1 Emergency Water Supply to Ramaphosa Settlement, Skombaren and 2 Megalitre reservoir at Hilltop. Phase 2 Dannhauser Regional Water Supply Scheme. 2018.
<b>DWAF</b>	Thukela WMA: Internal Strategic Perspective. DWAF Report No : P WMA 07/000/00/0304. 2004
<b>DWS</b>	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.
<b>DWS</b>	Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System. 2013
<b>DWS</b>	Reference Framework Geo database, March 2018.
<b>IDP</b>	Amajuba District Municipality IDP Review, 2019/2020. Newcastle Local Municipality IDP Review, 2019/2020.
<b>Statistics SA</b>	Census 2011; Community Survey 2016.
<b>Umgeni Water</b>	UAP Phase II: Towards the Development of a Regional Bulk Water Requirements for the Amajuba District Municipality and Newcastle Local Municipality, June 2015. Umgeni Water Infrastructure Master Plan, 2019. Umgeni Water Infrastructure Master Plan, 2020. Amajuba DM, Umzinyathi DM & Newcastle LM Regional Bulk Water Supply Scheme Prefeasibility Study Revised, June 2017, cited in the Umgeni Water Infrastructure Master Plan, 2020.
<b>Uthukela Water</b>	Bulk Infrastructure Implementation Plans. 2015. Ngagane Bulk Water Upgrade Regional Bulk Infrastructure Project Business Plan. 2019.
<b>UWP Consulting</b>	First Order Water Services Master Plan for the Rural Areas of Emadlangeni Local Municipality. 2014.

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**ANNEXURE B – DETAILED PROPOSED WSI INFRASTRUCTURE COMPONENT COSTS**

### AMA003: Skombaren Ngagane WTP WSS

The total bulk cost requirement is R10.3 million (excl VAT). The scheme development cost per household is approximately R8 587.

Skombaren Ngagane WTP WSS						
Item	Description					
<b>1</b>	<b>Population</b>	<b>Scheme Name</b>	<b>Scheme No</b>	<b>Population 2020</b>	<b>Population 2050</b>	
		Skombaren Ngagane WTP WSS	AMA003	4 381	6 082	
		<b>Total</b>		<b>4 381</b>	<b>6 082</b>	
<b>2</b>	<b>Demand</b>	<b>Scheme Name</b>	<b>Scheme No</b>	<b>Demand 2020</b>	<b>Demand 2050</b>	
		Skombaren Ngagane WTP WSS	AMA003	0.92	1.39	
		<b>Total</b>		<b>0.92</b>	<b>1.39</b>	
					<b>Comments</b>	
<b>3</b>	<b>Water Resources</b>	<b>Dam</b>	Ntshingwayo Dam	FSC: 211.258Mm <sup>3</sup> . HFY: 100% - 75Mm <sup>3</sup> /a 80% - 68Mm <sup>3</sup> /a 60% - 60Mm <sup>3</sup> /a 40% - 52Mm <sup>3</sup> /a 20% - 38Mm <sup>3</sup> /a	Available reserve yield of 21Mm <sup>3</sup> /a . DWS 2013: Short-term stochastic yields (May Decision) at various dam level %'s.	
		<b>River</b>				
<b>4</b>	<b>Infrastructure</b>			<b>Class</b>	<b>Size / No</b>	<b>Capacity (Mℓ/d or kl or km or kW)</b>
<b>4.1</b>	<b>Existing</b>	WTP	Ngagane WTP	Primary Bulk		130
			Ngagane WTP upgrade	Primary Bulk		170
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		

				Secondary Bulk	200 ømm	9.92
				Tertiary Bulk		
		Reservoirs		Primary Bulk		
		Pump stations		Primary Bulk		
<b>4.2</b>	<b>Future</b>	Bulk Pipelines		Primary Bulk		
				Secondary Bulk		
				Tertiary Bulk		
		WTP		Primary Bulk		-
						-
		Reservoirs		Secondary Bulk		
		Pump stations				
<b>5</b>	<b>Cost Requirement</b>		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	<b>R0</b>	<b>R0</b>	<b>R0</b>	
		Secondary	R9 405 000	R940 500	R10 345 500	
		Tertiary	R0	R0	R0	
		<b>Total</b>	<b>R9 405 000</b>	<b>R940 500</b>	<b>R10 345 500</b>	

### AMA004: Dannhauser WSS and AMA008: Durnacol WSS

The total bulk cost requirement is R365.3 million (excl VAT). The scheme development cost per household is approximately R157 222.

Dannhauser WSS & Durnacol WSS					
Item	Description				
1	Population	Scheme Name	Scheme No	Population 2020	Population 2050
		Dannhauser WSS & Durnacol WSS	AMA004 & AMA008	10 355	14 376
		<b>Total</b>		<b>10 355</b>	<b>14 376</b>
2	Demand	Scheme Name	Scheme No	Demand 2020	Demand 2050
		Dannhauser WSS & Durnacol WSS	AMA004 & AMA008	3.5	4.99
		<b>Total</b>		<b>3.5</b>	<b>4.99</b>
3	Water Resources	Dam	Ntshingwayo Dam	FSC: 211.258Mm <sup>3</sup> . HFY: 100% - 75Mm <sup>3</sup> /a 80% - 68Mm <sup>3</sup> /a 60% - 60Mm <sup>3</sup> /a 40% - 52Mm <sup>3</sup> /a 20% - 38Mm <sup>3</sup> /a	Available reserve yield of 21Mm <sup>3</sup> /a . DWS 2013: Short-term stochastic yields (May Decision) at various dam level %'s.
		<b>Water Resource Development</b>			Buffalo River catchment stochastic analysis, R4million.

4	Infrastructure			Class	Size / No	Capacity (Ml/d or kl or km or kW)
4.1	Existing	WTP	Durnacol WTP	Primary Bulk		5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	140 - 660 ømm	9.05
				Secondary Bulk	90 - 660 ømm	50.07
				Tertiary Bulk	110 ømm	6.40
		Reservoirs	R1	Primary Bulk		3400
			Res10 CR	Primary Bulk		100
			Res20 CR	Primary Bulk		40
			Res30 CR	Primary Bulk		2200
		Pump stations	PS1 From Ntshigwayo Dam to Durnacoal	Primary Bulk	0.370 m <sup>3</sup> /s	539.688
			PS2 Potable Water Pump Station Pump from Durnacoal to Res 3	Primary Bulk	0.042 m <sup>3</sup> /s	2.390
			PS3 Potable Water Pump Station To provide pressurised water	Primary Bulk	0.023 m <sup>3</sup> /s	7.968
4.2	Future	Bulk Pipelines		Primary Bulk	90 - 160 ømm	1.64
				Secondary Bulk	63 - 90 ømm	2.55
				Tertiary Bulk		
		WTP	Durnacol WTP at Ntshigwayo Dam	Primary Bulk	-	20
					-	-
		Reservoirs	R2	Primary Bulk		600
			R3	Primary Bulk		2000
			Res3	Secondary Bulk		400
			Res2	Secondary Bulk		400
			Res1	Secondary Bulk		800

		Pump stations			
5	Cost Requirement		Capital Cost	10% Contingencies	Total Cost (Excl VAT)
		Primary	R164 817 000	R16 481 700	R181 298 700
		Secondary	R165 432 000	R16 543 200	R181 975 200
		Tertiary	R1 866 000	R186 600	R2 052 600
		<b>Total</b>	<b>R332 115 000</b>	<b>R33 211 500</b>	<b>R365 326 500</b>

### AMA005: Dannhauser 3 WSS Hilltop and AMA014: Ngagane/Dannhauser 1 WSS Buffalo Flats

The total bulk cost requirement is R453.691 million (excl VAT). The scheme development cost per household is approximately R26 432.

Dannhauser 3 WSS Hilltop & Ngagane/Dannhauser 1 WSS Buffalo Flats					
Item	Description				
1	Population	Scheme Name	Scheme No	Population 2020	Population 2050
		Dannhauser 3 WSS Hilltop & Ngagane/Dannhauser 1 WSS Buffalo Flats	AMA005 & AMA014	100 640	139 716
		<b>Total</b>		<b>100 640</b>	<b>139 716</b>
2	Demand	Scheme Name	Scheme No	Demand 2020	Demand 2050
		Dannhauser 3 WSS Hilltop & Ngagane/Dannhauser 1 WSS Buffalo Flats	AMA005 & AMA014	17.42	26.65
		<b>Total</b>		<b>17.42</b>	<b>26.65</b>
3	Water Resources	Dam	Ntshingwayo Dam	FSC: 211.258Mm <sup>3</sup> . HFY: 100% - 75Mm <sup>3</sup> /a 80% - 68Mm <sup>3</sup> /a 60% - 60Mm <sup>3</sup> /a 40% - 52Mm <sup>3</sup> /a 20% - 38Mm <sup>3</sup> /a	Available reserve yield of 21Mm <sup>3</sup> /a . DWS 2013: Short-term stochastic yields (May Decision) at various dam level %'s.
		River			
		Groundwater	Boreholes		
4	Infrastructure			Class	Size / No
4.1	Existing	WTP	Ngagane WTP	Primary Bulk	Capacity (Ml/d or kl or km or kW)
					130



			Ngagane WTP upgrade	Primary Bulk		170
			Durnacol WTP	Primary Bulk		5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	315 - 400 ømm	6.88
				Secondary Bulk	50 - 630 ømm	141.64
				Tertiary Bulk	50 - 110 ømm	34.67
		Reservoirs	R9 CR	Primary Bulk		1500
			R1	Secondary Bulk		200
			R10	Secondary Bulk		400
		Pump stations		Primary Bulk		
<b>4.2</b>	<b>Future</b>	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	63 - 90 ømm	10.78
				Tertiary Bulk	50 - 500 ømm	76.08
		WTP	Durnacol WTP at Ntshingwayo Dam	Primary Bulk	-	20
					-	-
		Reservoirs	Res1	Primary Bulk		8400
			Res2	Secondary Bulk		800
			Res3	Secondary Bulk		600
			Res4	Secondary Bulk		600
			Res5	Secondary Bulk		1200
			Res6	Secondary Bulk		2400
			Res7	Secondary Bulk		1000
			Res8	Secondary Bulk		1000
			R11	Secondary Bulk		400
			R12	Secondary Bulk		200
			R13	Secondary Bulk		400
			R14	Secondary Bulk		200
			R2	Secondary Bulk		600

			R3	Secondary Bulk		400
			R4	Secondary Bulk		400
			R5	Secondary Bulk		400
			R6	Secondary Bulk		400
			R7	Secondary Bulk		400
			R8	Secondary Bulk		400
		Pump stations	PS1 Durnacol to Dannhauser 3 and Hilltop	Primary Bulk		17.340
5	Cost Requirement		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	<b>R64 103 000</b>	<b>R6 410 300</b>	<b>R70 513 300</b>	
		Secondary	R324 705 000	R32 470 500	R357 175 500	
		Tertiary	R23 639 000	R2 363 900	R26 002 900	
		<b>Total</b>	<b>R412 447 000</b>	<b>R41 244 700</b>	<b>R453 691 700</b>	

## AMA016: Utrecht/Ngagane WSS

The total bulk cost requirement is R29.4 million (excl VAT). The scheme development cost per household is approximately R12 367.

Utrecht/Ngagane WSS						
Item	Description					
1	Population	Scheme Name	Scheme No	Population 2020	Population 2050	
		Utrecht/Ngagane WSS	AMA016	8 464	11 750	
		<b>Total</b>		<b>8 464</b>	<b>11 750</b>	
2	Demand	Scheme Name	Scheme No	Demand 2020	Demand 2050	
		Utrecht/Ngagane WSS	AMA016	2.33	3.38	
		<b>Total</b>		<b>2.33</b>	<b>3.38</b>	
3	Water Resources	Dam	Dorps Dam (off-channel dam)	HFY: 1.1Mm <sup>3</sup> /a	Should the local sources' yield be affected, supply is reverted from the Ntshingwayo Dam	
			Nywerheids Dam	HFY: Not available		
		River				
4	Infrastructure			Class	Size / No	
					Capacity (Mℓ/d or kl or km or kW)	
4.1	Existing	WTP	Utrecht WTP	Primary Bulk	4	
			Ngagane WTP	Primary Bulk	130	
			Ngagane WTP upgrade	Primary Bulk	170	
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk		
				Tertiary Bulk		
		Reservoirs		Primary Bulk		
Secondary Bulk						

		Pump stations		Primary Bulk		
<b>4.2</b>	<b>Future</b>	Bulk Pipelines		Primary Bulk		
				Secondary Bulk	250 ømm	3.03
				Tertiary Bulk		
		WTP		Primary Bulk	-	
					-	-
		Reservoirs	Res1	Tertiary Bulk		6800
		Pump stations				
<b>5</b>	<b>Cost Requirement</b>		<b>Capital Cost</b>	<b>10% Contingencies</b>	<b>Total Cost (Excl VAT)</b>	
		Primary	<b>R0</b>	<b>R0</b>	<b>R0</b>	
		Secondary	R4 496 000	R449 600	R4 945 600	
		Tertiary	R22 244 000	R2 224 400	R24 468 400	
		<b>Total</b>	<b>R26 740 000</b>	<b>R2 674 000</b>	<b>R29 414 000</b>	

