MASTER PLAN

WATER SUPPLY

04 MAY 2011

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AMAJUBA DISTRICT MUNICIPALITY, MASTER PLAN, WATER SERVICES

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1. INTRODUCTION

1.1 Background

In terms of SSI's appointment to update the Amajuba District Municipality's (ADM's) Water Services Development Plan (WSDP) the Water Master Plan is also to be updated as necessary.

1.2 Purpose of Report

The purpose of this Report is to set out the proposed method of supplying water to all the consumers in the ADM's Water Services Authority's (WSA's) area of jurisdiction which includes the Dannhauser, KZ254 and Emadlangeni, KZ253 Local Municipalities. Where identified the proposed sources of water and the approximate location of proposed bulk infrastructure are given.

1.3 Availability of Data

This Master Plan includes population and household (HH) estimates based on Eskom's 2008 HH count and Stats SA's latest estimates of population growth in the areas. In the case of Dannhauser Municipality it has been agreed in conjunction with ADM officials at a meeting on 22 February 2011 that although Stats SA indicates that population growth has been minimal in recent years there is visible evidence that the number of dwellings has increased. An increase of 4,4% over the 2008 Eskom HH count to bring the figures into line with those obtained from ADM's door to door count was agreed. The corresponding figures for Emadlangeni matched well and did not require adjusting indicating a zero growth in HH since 2008.

Eskom GPSed household data, water sources and existing infrastructure have been plotted on two drawings, one for each Local Municipality. These drawings give a pictorial representation of the density of settlement relative to water sources and existing water infrastructure and are included in Annexure D at the back of this document.

Uthukela Water, the Water Services Provider, and the ADM's Deputy Director Engineering have provided GPS co-ordinates of boreholes, streams and springs used as water sources. A schedule of water sources registered with the Department of Water Affairs was also used.

The Emadlangeni Bulk Rural Water Supply Feasibility Report, Draft 1, dated November 2009 includes yields and water quality tests for a limited number of existing and possible water sources and also refers to proposed schemes but information provided is inadequate for planning purposes.

The water quality tests included in the Emadlangeni Bulk Rural Water Supply Feasibility Report, Draft 1 indicate that the bulk of water available from these local sources falls into DWA's Domestic use Class II. Class II water is "Water which poses a definite risk of health effects", following long term or lifetime use, however following short-term or emergency use, health effects are uncommon and unusual. Treatment will be required in order to render the water fit for continued use".

A regional scheme to supply the scattered settlements in Emadlangeni will be prohibitively costly, it being noted that the HH density is less than two per square kilometer. Further investigations are required to verify the approach to be used to supply water to each of the rural settlements and the source of water will have to be local boreholes, streams or springs. The demand, source and yield and quality of water available for each settlement will have to be confirmed.

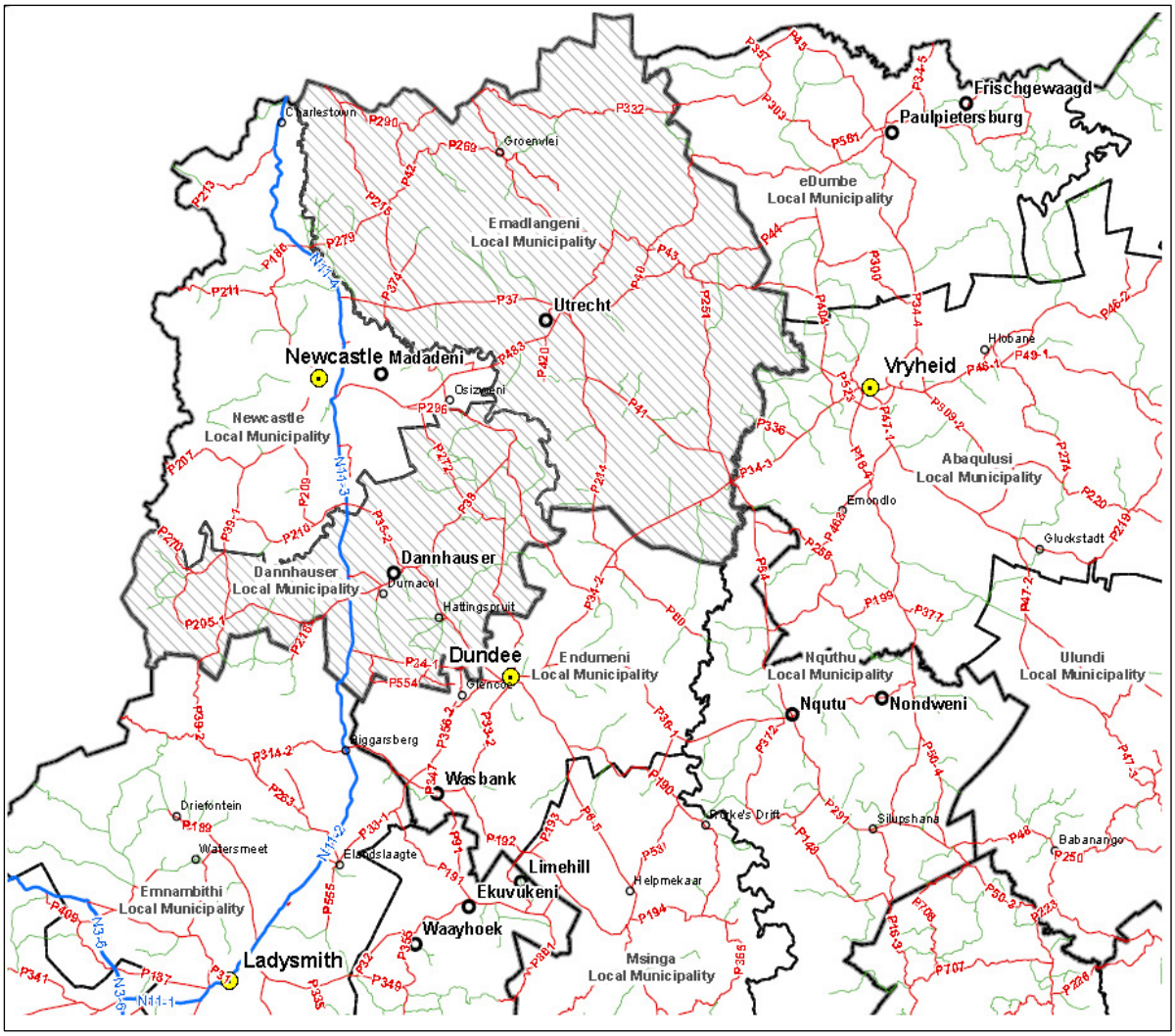
Details of existing and planned infrastructure in the urban areas and Buffalo Flats were obtained from Uthukela Water and SSI.

In July 2005 Uthukela Water submitted an application for a Special Municipal Infrastructure Grant for Phase 1 of the Buffalo River Catchment Regional Water System. This proposed Regional Water System encompasses the construction of a regional bulk water pipeline from the Ngagane water Treatment Works to supply at least 1 350 000 people situated in the Newcastle LM, Amajuba D M, Umzinyathi DM and Uthukela DM. Section 5.1.3 of this report comments, very briefly on the implication of such a scheme for the Amajuba District Municipality.

2. MASTER PLAN AREA AND TOPOGRAPHY

2.1 Locality

The Amajuba District Municipality consists of three local municipalities. One of the three, Newcastle, is a WSA in its own right and is excluded from this Plan. The following plan shows the locality of the two Local Municipalities under consideration.



2.2 Overall Topography

The terrain of the Dannhauser Municipal area is generally flat to rolling, with the altitude varying between 1 160 and 2 110 meters above mean sea level. It contains predominately mixed commercial agriculture, the densely settled rural area known as Buffalo Flats and the urban settlements of Dannhauser, Durnacol and Hattingspruit.

The terrain of the Emadlangeni Municipal area varies from flat to hilly, with the altitude varying between 1 155 and 2 290 meters above mean sea level. It contains predominately commercial agriculture, which is a mixture of grazing, crops and forestry and small very scattered rural settlements with Utrecht being the only small town in the entire Municipal area.

3. DEMOGRAPHICS

3.1 Urban / Rural Population Distribution

3.1.1 Danhauser Local Municipality

Urban population	7 436
Non-urban population	95 339

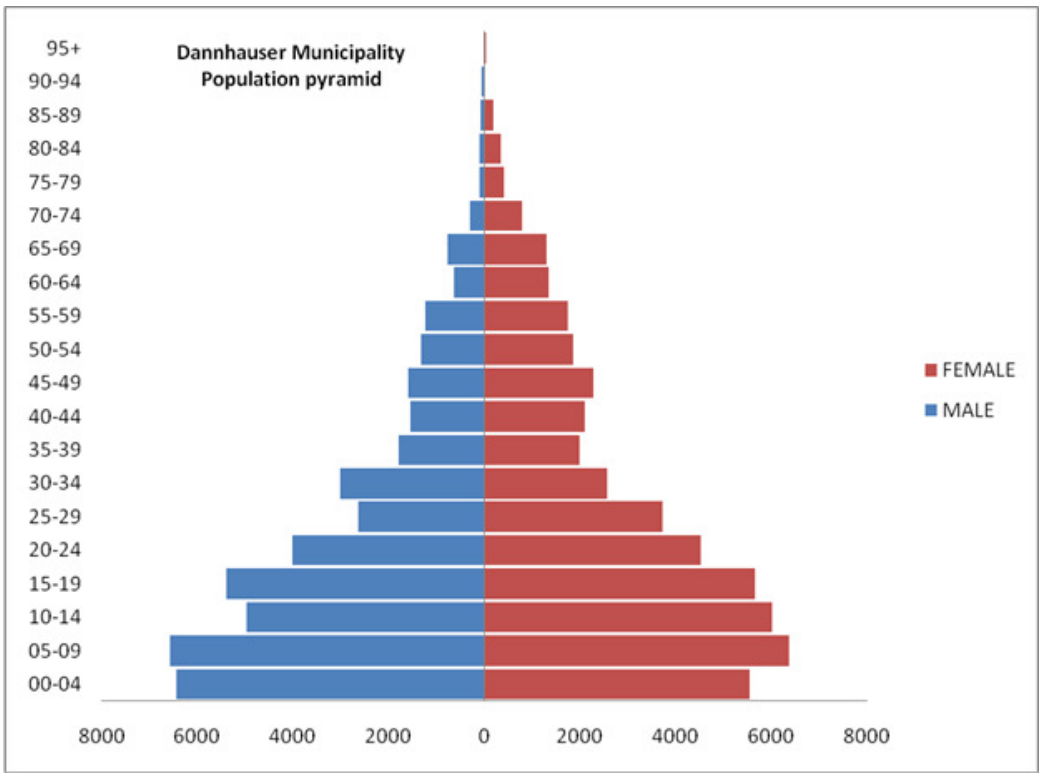
3.1.2 Emadlangeni Local Municipality

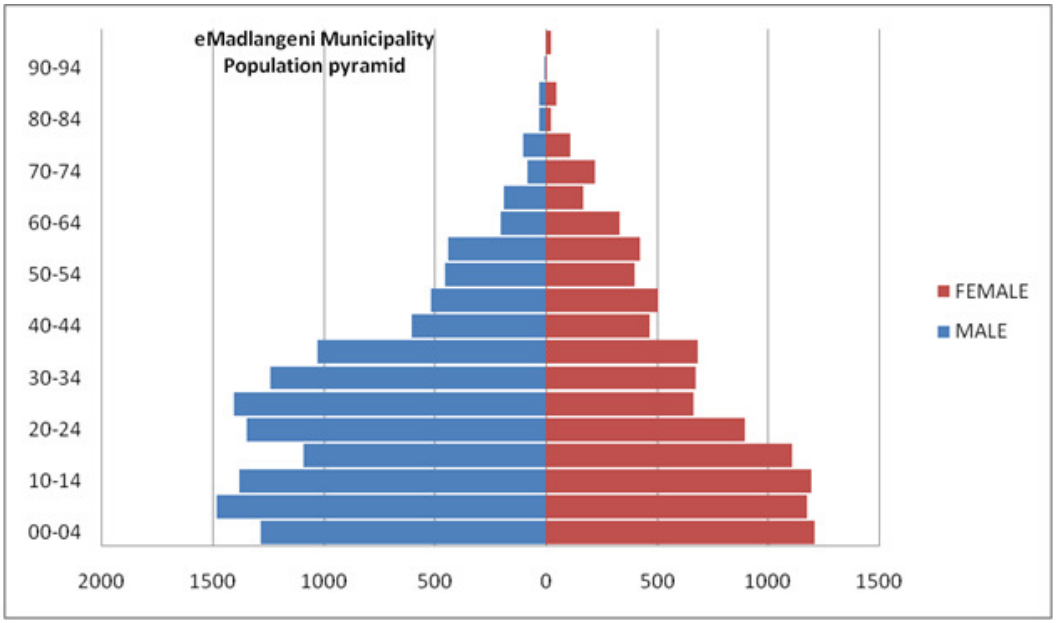
Urban population	7 309
Non-urban population	24 968

3.2 Socio Economic Aspects

3.2.1 Age Distribution

As per 2007 community survey





3.2.2 Income

Emadlangeni Municipality KZ253	Income Range	Dannhauser Municipality KZ254
9,022	No income	45,185
5,238	R1 - R400	24,244
1,548	R401 - R800	5,666
2,509	R801 - R1 600	11,528
292	R1 601 - R3 200	1,455
518	R3 201 - R6 400	582
618	R6 401 - R12 800	269
160	R12 801 - R25 600	79
32	R25 601 - R51 200	0
25	R51 201 - R102 400	0
0	R102 401 - R204 800	0
35	R204 801 or more	0
19,997	Subtotal	89,008
32,277	Population count	102,775
417	Response not given	2,054
2,850	Institutions	308

Source Stats SA 2007

4. WATER SUPPLY STATUS QUO

4.1 Existing Water Sources

4.1.1 Dannhauser Municipality

Town/Area Name	Raw Water Source	Water Treatment Works	**Present Demand Ml/day** (includes Buffalo Flats Water Scheme Completion scheduled for 2014, allows 150 l/d /HH Standpipes and House Connections, 1 000 l/d/HH for Upmarket Residences, 30% for losses & commercial)	**Future Demand Ml/day** (includes Buffalo Flats Water Scheme Completion scheduled for 2014, allows 360 l/d /HH Standpipes and House Connections, 1 000 l/d/HH for Upmarket Residences, 30% for losses & commercial)
Dannhauser including Emafusini	Ntshingwayo Dam	Danhauser WTW	1,000	1,151
Durnacol	Ntshingwayo Dam	Durnacol WTW	0,852	0,852
Hattingspruit	Tom Worthington Dam	Biggarsberg WTW	0,174	0,174
Alcockspruit/Koppie Alleen	Ntshingwayo Dam	Ngagane WTW	0,111	0,267
Buffalo Flats	Ntshingwayo Dam	Ngagane WTW	1,415	3,397
Ngagane (Part of Buffalo Flats)	Ntshingwayo Dam	Ngagane WTW	1,800	4,321
TOTAL			**5,353**	**10,161**

Drawing Nº W01.PZB.0187/P12, titled Master Plan, Water Sources, Dannhauser Municipality, included in Annexure 4 at the back of this document shows the existing and planned water infrastructure against the Eskom GPSed households. It should be noted that there are 988 boreholes in the Buffalo Flats area, shown in the inset on the drawing, which it is proposed to continue to use as a backup supply, even after the Buffalo Flats Scheme is extended to supply the area.

4.1.2 Emadlangeni Municipality

Drawing Nº W01.PZB.0187/P11, titled Master Plan, Water Sources, Emadlangeni Municipality, included in Annexure D at the back of this document shows the existing and planned water infrastructure against the Eskom GPSed households.

The town of Utrecht is supplied with potable water from its own WTW. Water is sourced from the Dam on the Dorpspruit at the town.

The Waterval Prison is supplied from the Ngagane WTW via the Ngagane Scheme.

Town/Area Name	Raw Water Source	Water Treatment Works	Demand Ml/day (Allows 30% for losses and commercial)
Utrecht	Dorpspruit Dam	Utrecht WTW	1,11
Waterval Prison	Ntshingwayo Dam	Ngagane WTW	1,3
TOTAL			**2,41**

The rural areas are supplied from:

- 78 boreholes of which 3 are without pumps, 3 are dry, 18 have submersible pumps, 2 have play pumps, 34 have hand pumps, 7 have windpumps and the type of pump fitted to 12 new boreholes is to be confirmed.
- 21 springs.
- 1 dam.
- 2 streams.
- 10 JoJo Tanks, these are supplied by tankers.
- 17 Stand pipes, these are reticulated from nearby boreholes/springs.

The ADM has one tanker of their own and two hired tankers used primarily to supply the heavily settled semi urban areas. In times of drought the rural areas are supplied using tankers where emergencies exist.

4.2 Backlogs

4.2.1 Dannhauser Municipality

Dannhauser Local Municipality			
Ward	Total Nº on HH 4,4% increase on Eskom 2008 count	Water Backlog	
		Nº of HH	Percentage
1	2 233	1 529	68%
2	1 971	78	4%
3	1 991	1 991	100%
4	1 635	615	38%
5	2 249	427	19%
6	1 422	670	47%
7	1 894	9	0%
8	2 077	751	36%
9	2 780	668	24%
10	2 554	217	9%
TOTAL BACKLOG	**20 805**	**6 956**	**33%**

4.2.2 *Emadlangeni Municipality*

Emadlangeni Local Municipality			
		Water Backlog	
WARD	Total Nº of HH	Nº of HH	Percentage
1	1 861	1 655	89%
2	1 303	300	23%
3	1 340	1 256	94%
4	2 299	2 032	88%
TOTAL HH	**6 803**	**5 194**	**76%**

5. PROPOSED APPROACH TO WATER SUPPLY

The norms and standards of the ADM for the provision of water will be used, namely the minimum upgraded RDP requirement of:

- Initially 25 liters per capita per day, within 200 meters of the house in rural areas.
- In the long term it is proposed to supply rural HH's with house connections with 60 liters per capita per day.
- 360 liters per day for RDP houses
- 1000 liters per day for up-market urban residential dwellings.

5.1 Water Supply Areas and Water Sources

5.1.1 *Danhauser Local Municipality*

Drawing Nº W01.PZB.0187/P12, titled Master Plan, Water Sources, Dannhauser Municipality, included in Annexure D shows the existing and planned water infrastructure against the background of the 2008 Eskom GPSed HH's.

The inset in the top left hand corner shows the areas that the various phases of the Buffalo Flats Water Scheme will supply. The bulks in this scheme are sized to supply 25 liters per capita per day via standpipes. This scheme is scheduled for completion in the year 2014 at which stage the great majority of the Municipality's Backlog in the provision of water will have been eradicated.

To provide for the ultimate 60ℓ/capita per day an additional bulk supply will have to be provided from the PROPOSED Regional Scheme discussed in 5.1.3.

5.1.2 *Emadlangeni Local Municipality*

As can be seen on Drawing Nº W01.PZB.0187/P11, titled Master Plan, Water Sources, Emadlangeni Municipality, included in Annexure D houses in the rural areas are very scattered, and the cost implications of conforming to the maximum distance to collect potable water of 200 meters will have to be assessed in relation to other priorities.

A bulk pipeline from the Ngagane WTW to Utrecht is under construction. This pipeline will supply Utrecht as well as the densely settled areas of Amangthungwa and Berouw. The Utrecht WTW will then be decommissioned. This is scheduled for 2014.

In order to get an idea of the scale of the challenge of supplying potable water to the rural HH's in Emadlangeni the Municipality has been divided into 40 areas named eMad1 to eMad40. The boundaries of the areas are shown on drawing Nº W01.PZB.0187/P11 in green. The boundaries of the areas have been selected to group HH's that could possibly be supplied from a single reservoir. All water sources, whatever their quality, where GPS co-ordinates have been provided have been plotted on the plan. It must be noted that the boundaries are at this stage provisional and must be amended once suitable water sources have been confirmed.

A spread sheet capturing all relevant supplied information is included as Annexure C, Emadlangeni, Demand versus Water Sources per Settlement. An examination of this spread sheet reveals:

- The great majority of spring and borehole water is suitable only for short term use. It is understood that this problem is Province wide with approximately 50% of rural drinking water falling into this category.
- Inadequate data is available to make an informed decision on how best to supply and reticulate potable water to the majority of the rural settlements.

5.1.3 Regional Schemes

The long term plan is to construct a regional scheme to supply water extracted from the Ntshingwayo Dam and treated at an upgraded Ngagane WTW to:

- Koppie Alleen/Alcockspruit.
- Dannhauser.
- Durnacol.
- Hattingspruit.
- Dundee, Glencoe and Wasbank in Mzinyathi Local Municipality.
- Buffalo Flats upgraded to house connections.

The introduction of this regional scheme would result in the closing down of:

- Dannhauser WTW.
- Durnacol WTW.
- Biggarsberg WTW..

It is noted that the present consumption of Dundee, Glencoe and Wasbank in Mzinyathi is in the order of 16 Ml/day. If costs of the regional scheme are shared in proportion to the demand Mzinyathi would bear 75% of the costs.

Utrecht, Amangthungwa and Berouw will continue to be supplied from Ngagane WTW.

5.2 Demand Versus Proven Water Sources

The proposed regional scheme will result in all distributed potable water in Dannhauser Municipality being extracted from Ntshingwayo Dam and treated at Ngagane WTW. On the assumption that all standpipes will be upgraded to house connections with a consumption of 60 liters per capita per day, the present estimated demand of approximately 5,4 Ml/day will increase to 10,2 Ml/day.

The proposed 1 000 HH Springboklaagte at Dannhauser and 100 HH Ramaposa at Hattingspruit housing developments will add an additional 0,3 Ml/day.

This will result in the total estimated demand for Dannhauser Municipality of approximately 11 Ml/day. This figure assumes zero growth in the number of HH.

The proposed regional scheme will also supply the town of Utrecht, the Waterval Prison and the densely settled areas of Berouw and Amangthungwa.

Town/Area Name	**Demand Ml/day** (Allows 30% for losses and commercial) zero growth
Utrecht	1,11
Waterval Prison	1,30
Amangthungwa	0,30
Berouw	0,16
TOTAL	**2,87**

This will result in the total estimated demand for Emadlangeni Municipality of say 3 Ml/day. This figure assumes zero growth in the number of HH.

Uthukela Water has a combined extraction license for water from Ntshingwayo Dam for the numerous municipalities they are acting as WSP for. There is additional capacity of 23 million m³ per annum (63 Ml/day) available and Uthukela Water is in the process of applying to DWA for additional capacity as they are at present extracting close to the authorised volume.

5.3 Interim Water Supply Measures

In the Dannhauser Municipal area the bulk infrastructure for Buffalo Flats has been sized for the 25 liters per capita per day. This is considered to be an interim level of service. Reticulation has been sized for the proposed 60 liter per capita per day. In the areas not yet reticulated boreholes are providing water in the interim.

In the Emadlangeni Municipal area there are 119 registered water sources described in 4.2.1 above. Numerous other potential sources have been sampled to test the quality of the water. In times of drought water tankers are used to deliver potable water to communities where their water sources are inadequate.

5.4 Proposed Infrastructure

5.4.1 Danhauser

The proposed regional scheme will require:

- The upgrading of Ngagane WTW by 5 Ml/day plus growth for Dannhauser Municipality.
- A new pump station to pump water from Ngagane WTW to a new reservoir near Dannhauser.
- A 27 km long rising main from Ngagane WTW to the new Reservoir near Dannhauser.
- A new 7,5 Ml reservoir near Dannhauser.
- A new 6 km long gravity main between the new reservoir near Dannhauser and the existing Dannhauser and Durnacol Reservoirs.

- A new 14 km long gravity main from the new Reservoir near Dannhauser to the Annieville Reservoir in Buffalo Flats.
- A new 8 km long gravity main to Hattingspruit (this main will continue for a further 16 kms on to Dundee).

5.4.2 Emadlangeni

The bulk pipelines from Ngagane WTW to Utrecht and the off-take to Amangthungwa and Berouw have been designed and budgeted for.

The reticulation to the approximately 637 households in Amangthungwa and 345 households in Berouw must be budgeted for and designed and constructed.

As discussed in 5.1.2 insufficient information is available to make an informed recommendation on how water should be supplied to the rural areas of Emadlangeni.

6. COST ESTIMATE

6.1 Assumptions

6.1.1 For the regional scheme to be economically viable it is imperative that uMzinyathi Municipality comes on board. Assuming costs of the shared pumpstation and pipelines are split in the ratio of the demands of the municipalities the split is 75% uMzinyathi to 25% ADM.

6.1.2 Growth statistics for ADM show that:

- Population growth rate in 1996 was 1,97%. This rate has reduced annually until the latest available statistic which is for 2009 when the growth rate was 0,51%.
- The Integrated Development Plan Review (IDP) for 2010/11 reports that between 2001 and 2006 approximately 2,18 % of the population of ADM migrated out of the municipal area.
- The IDP also however indicated that household sizes had reduced in Danhauser from 5,3 in 2001 to 5,1 in 2008 and over the same period increased from 5,2 to 5,7 in Emadlangeni.
- For the whole of ADM including Newcastle the increase in HH's per annum was 4,32% in 1997 and has reduced annually to 1,13 % in 2008 the most recent year for which statistics are available.
- Based on the population and HH growth rates above it is concluded that over the next 20 years growth will be minimal and a zero population and HH growth rate for Dannhauser and Emadlangeni has been assumed.

6.2 Summary per Local Municipality

6.2.1 Dannhauser Municipality

The following table summarizes the estimated cost of the proposed regional scheme including Engineering Fees and VAT.

Description	Unit	Quantity	Rate	Amount	ADM portion
Upgrade Ngagane WTW	Ml/day	5	R4 000 000,00	R20 000 000,00	R20 000 000,00
Pump station	l/s	90	R50 000,00	R4 500 000,00	R4 500 000,00
Rising main to Dannhauser	m	27 000	R2 200,00	R59 400 000,00	R14 850 000,00
Reservoir	Ml	7,50	R3 000 000,00	R22 500 000,00	R5 625 000,00
Gravity main to Dannhauser & Durnacol	m	6 000	R800,00	R4 800 000,00	R4 800 000,00
Gravity main to Annieville Reservoir	m	14 000	R1 400,00	R19 600 000,00	R19 600 000,00
Gravity main to Hattingspruit	m	8 000	R1 800,00	R14 400 000,00	R3 600 000,00
TOTAL					**R72 975 000,00**

6.2.2 Emadlangeni Municipality

The reticulation to the approximately 637 households in Amangthungwa and 345 households in Berouw is estimated to cost R9 000 per HH giving a total of R8 838 000 including Engineering fees and VAT.

As discussed in 5.1.2 inadequate information is available to make an informed recommendation on how water should be supplied to the rural areas of Emadlangeni. The Backlog of water supply in Emadlangeni is estimated at 5 243 HH's. Based on a cost per HH of R9 000, the cost of supplying water would be R47 187 000. However considering the scattered nature of the HH's in the area and the large number of water sources that are likely to be used, the actual cost is likely to be far greater than the estimated figure.

7. THE WAY FORWARD

7.1 The rural settlements in Emadlangeni require the most urgent attention.

7.2 Annexure C and drawings Nº PZB 0187/P11 and /P13 of this report should be used as a starting point. The first step is for a service provider to be appointed to, together with ADM and Uthukela Water Officials, land owners and community representatives, confirm where the 40 "settlements" in Emadlangeni shown on the Drawings are at present obtaining water. The schedule in Annexure C should contain the bulk of these sources. Where additional sources are identified these must be added to the schedule.

7.3 A decision must then be made on whether to use water of quality class 2 for distribution as an interim measure or whether to treat it to make it acceptable for long term use. This decision will probably depend on the cost of treating the water. A suitable service provider should therefore immediately be appointed to research the most appropriate method to purify the water and make recommendations in this regard. There are various impurities identified in AIM's November 2009 report, each requiring different methods of treatment to achieve class 1 status.

7.4 A decision must be made on whether to implement the 60 litres per capita per day provision immediately in Emadlangeni or to use the minimum RDP level of 25 litres per capita per day as an interim measure. The additional cost of the reticulation to carry the water for the higher standard is minimal compared to having to upgrade the network later so it is recommended that the higher level of service be targeted for reticulation. The decision on whether or not to opt for the higher level of service for bulk supply is likely to be site specific, with certain boreholes or springs likely to have adequate yield for the higher level of service. The decision will only be required where the identified source is adequate only for the lower level of service.

7.5 A service provider should then be appointed to undertake the Normal Services as defined in Government Gazette Nº 33892 Board Notice 190 of 2010 for the provision of water to the 40 settlements in Emadlangeni identified in Annexure C.

7.6 The service provider should in conjunction with the Uthukela Water and ADM ascertain which settlements are most in need of water and prioritize the provision of water to the 40 “Settlements” scheduled in Annexure C. Once the sources of water have been confirmed, where considered appropriate the boundaries of settlements must be amended. Should settlements where upgrading the water supply is critical be identified, the provision of water to these settlements should be fast tracked.

7.7 The proven yield of potable water from water sources in Annexure C for each of the Settlements prioritized must then be checked in the amended schedule. Where this is inadequate for the settlement the necessary steps to obtain an adequate proven supply must be taken. This process will include as necessary any of the following:

- Water quality testing.
- Identification of the type of water source previously tested.
- Yield testing.
- Location of additional sources of water (including where necessary drilling of additional boreholes).

7.8 Once the sources of water for each Settlement have been confirmed a suitable reservoir site must be identified, the availability of Eskom power ascertained and the extent of reticulation decided on.

7.9 Cost estimates for construction of the proposed infrastructure for each settlement in Emadlangeni can then be made and based on these estimates additional funds sourced if necessary.

7.10 Construction of infrastructure can then proceed as funding becomes available.

7.11 Negotiations with relevant parties concerned with the Proposed Regional Scheme discussed in paragraph 5.1.3 should be initiated.

Yours faithfully

A Strauss
Principal

AO/ds

ANNEXURE A

REFERENCES

REFERENCES

Title	Date	Prepared by
1. Emadlangeni Bulk Rural Water Supply – Feasibility Report – Draft 1	November 2009	Actus Integrated Management (AIM) P O Box 11989 Dorpspruit Pietermaritzburg 3206 Telephone N°: 033 342 3941
2. Integrated Development Plan Review 2010/11	May 2010	Amajuba District Municipality
3. Register Water Sources Emadlangeni		uThukela Water
4. Special Municipal Infrastructure Grant (SMIG) – Phase 1 of Buffalo River Catchment Regional Water System	July 2005	uThukela Water

ANNEXURE B

BACKLOGS PER SETTLEMENT

ANNEXURE C

EMADLANGENI
DEMAND VERSUS WATER SOURCES
PER SETTLEMENT

ANNEXURE D

DRAWINGS