NELSON MANDELA METROPOLITAN MUNICIPALITY

WATER MASTER PLAN: 2005 – 2020

EXECUTIVE SUMMARY

1. INTRODUCTION

NMMM acts in terms of the Water Services Act (Act No 108 of 1997) as a Water Services Authority (WSA) for its area of jurisdiction, an area which was vastly increased over recent years when metropolitan status was awarded terms of the Local Government Demarcation Act (Act 27 of 1998) to Port Elizabeth, Uitenhage, Despatch and surrounding areas in.

Act 108/1997 states inter alia that a WSA has a duty to all its consumers or potential consumers in its area of jurisdiction to progressively ensure efficient, affordable, economical and sustainable access to water services.

The need for a Water Master Plan with a longer term planning horizon than the 5-year horizon of the Water Services Development Plan (as prescribed by Act 108/1997) was identified and financed by NMMM.

2. PURPOSE OF WATER MASTER PLAN

To analyse and evaluate historical, present and estimated future water usage by the NMMM for the period 2005 to 2020, taking into account the water needs and the impacts on water supply that may follow from –

- The NMMM 10 year Housing Development Plan
- The NMMM SDF (Draft-2006) with proposed Urban Fence Line
- IDP projects as prioritised for implementation
- NMMM Vision 2020 projects
- NMMM WSDPlan 2005 – proposed projects for a 5 years horizon

The Water Master Plan was compiled for the complete water service operating system with the following key outcomes:

(a) Supply Side Analysis:

A detailed evaluation of water supply system long term yield and peak supply capacities versus future demand. This included the treatment, transfer and pump station boosting capacities.

(b) Demand Side Analysis:

An evaluation at a planning level of present and future reservoir supply zones based on economic growth points and housing demands identified by NMMM

10-Year Housing Plan. New reservoir zones and proposed infra-structure were identified, sized and located to economize on present infra-structure capacities.

This was performed with additional input from a team of 9 other consulting firms, appointed for the planning and design of specific supply zones identified by NMMM as immediate growth points within its area of supply.

(c) Supply Side Implementation Programme

An implementation programme complete with estimated costs was compiled to meet the average daily demand required from supply sources as well as peak week demands within the supply system.

(d) Demand Side Implementation Programme

An implementation programme complete with estimated costs was compiled to meet the peak week and daily water demands of new supply zones and growth points within existing reservoir supply zones.

3. SUPPLY SIDE ANALYSIS

The Algoa Water Resources Stochastic Analysis study which was completed for Port Elizabeth Municipality and DWAF in 1995/96, confirmed that the individual sub water supply systems can yield a total water supply (without system constraints) as summarised in the table below.

Table 1: Water Sources for Port Elizabeth Metropolitan Area (1995)

SOURCE (LONG TERM YIELDS BASED ON HYDROLOGICAL SUB-SYSTEMS)	Supply for Urban demand (Ml/d)	
	Risk = 1 in 20 Year Recurrence Interval	Risk = 1 in 50 Year Recurrence Interval
Older Dams (Port Elizabeth)	10.4	9.0
Groendal Dam (Uitenhage)	12.7	11.1
Springs (Uitenhage)	4.5	4.5
Churchill /Impofu Dam	140.8	121.6
Kouga Scheme (DWAF *allocation*)	62.5 *	62.5 *
Sundays River Scheme (DWAF *allocation*)	70.0 *	70.0 *
Total Yield of Individual Resources	300.9	**278.7**

** Values are DWAF allocation to PEM and are not based on long term yields.*

The study pointed out that due to transfer/treatment capacity constraints within some of the bulk supply systems, the 1 in 50 year yield from all resources is reduced to **250** Ml/day.

Capacity constraints exist within the following sub-systems:

(a) Sundays River Supply Scheme – In order to fully utilise the allocation of 70 Ml/day, the sub system peak treatment and transfer capacity of some 74 Ml/day should be increased to some 100Ml/day.

(b) Churchill / Elandsjagt Supply Scheme – In order to fully utilise the 1:50 year yield of 121.6 Ml/day, the maximum transfer capacity should be increased from the present maximum of some 140 Ml/day to at least 176 Ml/day (Peak week = 1.45 x 121.6 Ml/day).

The historic water demand growth for the metropolitan area as a whole was determined as 2.3% per annum, based on a 33 year record (1972 – 2005). A high confidence growth envelope was developed for the 33 year period with historic water demand only falling outside the envelope during periods of severe drought and restrictions to water users.

In addition to the normal growth of some 2.3% per annum for NMMM, it is estimated that by 2020 the additional water demand imposed by the Coega IDZ will amount to some 72Ml/day. The impact of this additional demand on the overall growth of the NMMM is demonstrated in the graphical display below.

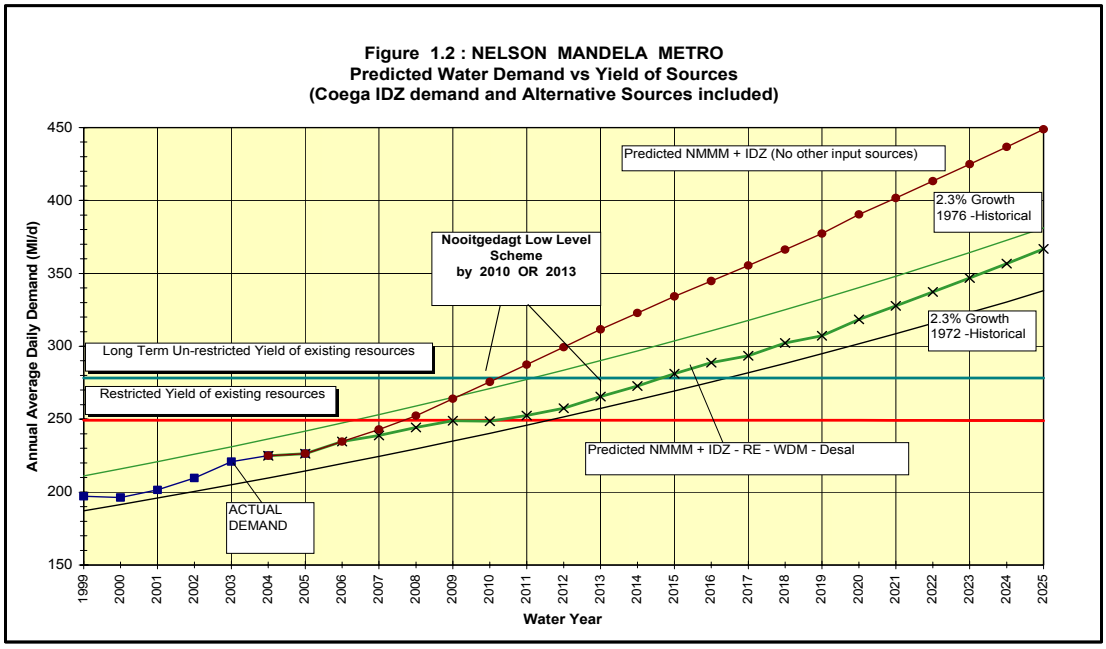

Figure 1.2 demonstrates the immediate need for removing the increasing risk of supply to consumers by resolving the capacity constraints which will increase the system supply yield from 250 Ml/day to 278 Ml/day.

The following capital works should be implemented by 2008/09:

(a) Sundays River Scheme – Install a 4th pump in the final water pump station and construct an additional pulsator tank (clarifier) with 35 Ml/day capacity.
Cost : R 9,700,000

The Grassridge high level supply transfer capacity from Motherwell to Chelsea should be increased to transfer the increased peak supply from the Sundays River Supply to the reservoir zones located within the Swartkops River Valley. An additional 4.6 Km x 700mm diameter pipeline is required from Motherwell reservoir to the right bank of the Swartkops River.
Cost : R 17,900,000

(b) Churchill/Elandsjagt Scheme – Construct a 25 Ml/day pump station at Gamtoos Booster Pump Station to pump water into Summit reservoir from where spare capacity exists within the Summit /Chelsea pipeline.
Cost : R 20,200,000

In the longer term, additional capacity will be created in the system by increased upstream water demand from Jeffreys Bay and surrounding areas. These areas are at present experiencing an abnormally high rate of property development.

For a system yield of 278 Ml/day, Figure 1.2 confirms that due to the Coega IDZ water demand, the NMBMM supply sources will require augmentation by 2010/11, which leaves too little time to plan, design and implement, given the complexities and environmental impacts to be finalised for a scheme of this magnitude. Furthermore, DWAF will be reluctant to approve an augmentation scheme if available “alternative” sources are not been utilised.

In order to minimize the impact of the Coega IDZ demand on the present water resources of NMBMM, alternative short and medium term resources should be developed/ implemented as follows:

a) Return Effluent Scheme from Fishwater Flats WWTW: The implementation of a 45 Ml/day x R430 million (present day value) RE Scheme in phases of 15 Ml/day each, from about 2010/11 when the industrial demand volume for RE within the Coega IDZ is expected to exceed 5 Ml/day. The use of return sewage effluent from Fishwater Flats WWTW as a source for industrial water use, was a condition of the EIA approval and ROD issued by DEAET for the development of the Coega IDZ. This project is considered to be a suitable high-tech project for a Public Private Partnership and several companies have already indicated their interest.

b) Water Demand Management: The full implementation of the WDM Strategy recommended in previous studies for NMBMM from 2006/07 to ensure that saving of at least some 22 Ml/day from water wasted and un-accounted for within the water distribution system, is achieved. Project cost is estimated R7,0 million with some R1,0 million required per annum.

c) De-salination By-product water: A water supply/purchase agreement with a large chlorine manufacturing company to be located within the Coega IDZ should be pursued. Chlorine will be manufactured from salt (NaCl) generated from the de-salination of sea water. Surplus potable water will be a by-product for sale. Some 16-24 Ml/day could become available for redistribution from about 2008/09.

Figure 1.2 illustrates the predicted future water demand for NMBMM inclusive of the Coega IDZ demand both with and without the effect of "alternative sources" as discussed above. The "alternative sources" will result in the net water demand from present water resources in the longer term, to remain within the 2.3% historical demand growth envelope and augmentation of water source will then be required by 20013/14.

The Algoa Water Supply Pre-feasibility Study (1999/2000) confirmed that the two most cost sustainable long term augmentation schemes were the Guerna Dam Option (upstream of Kouga Dam) and an increased supply from the Orange River Development Project (ORDP) from the Scheepersvlakte Dam on the left bank of the Sundays River to the Nooitgedagt WTW.

In all scenarios investigated, first increasing the capacity of the Nooitgedagt WTW resulted in a lower unit reference value than if the Guerna Dam would be constructed as the first option.

The Guerna Dam option will yield some 41-60 Ml/day for NMBMM. This additional supply would only postpone the need for additional water from the ORDP by some 8-10 years. It is however in the interest of NMBMM to develop the Sundays River Supply first for the following reasons:

(a) The Coega IDZ and surrounding areas will over the next few years become a node of high growth with an associated high increased water demand. The Sundays River Scheme is closest to this node with direct and indirect economic and infrastructure benefits.

(b) The present drought has reaffirmed the importance of having access to a remote water source which is located in a hydrologic different catchment area than the local dams.

This report and proposed infrastructure programme has been based on the ORDP being utilised as the next source of supply to NMBMM. If DWAF is not in agreement, then a re-planning of proposed infrastructure will be required with drastic amendments to the NMBMM Capital Programme.

Agreement from DWAF regarding an increased water supply from the ORDP has become high priority for NMBMM.

The proposed ORDP water supply upgrade will include the following infrastructure:

- A complete 2nd 70 Ml/day water treatment module at Nooitgedagt WTW, complete with clarifier and filters (No post treatment to improve dissolved solid contents).
- A low lift pump station and rising pipeline (1.2m diameter x 19.1 km) sized for 140 Ml/day transfer capacity.
- Balancing storage sited on farm Olifantskop with TWL 156m MSL. First reservoir to be constructed with 25 Ml balancing capacity.
- Gravity pipeline (1.4m diameter x 5.6Km) to follow the Coega IDZ boundary up to the main future off-take point into the IDZ reticulation. From here the gravity pipeline will supply existing Coega Kop and Motherwell reservoirs.

Estimated cost : R 261,000,000 for completion by 2012/13.

The raw water to be treated at Nooitgedagt WTW is high in Total Dissolved Solids which gives rise to high chlorine dosages to disinfect and short chlorine residual time for treated water. The final water quality falls within the SABS guidelines for potable water but gives rise to –

- Public complaints (mostly taste)
- Corrosion to mechanical equipment (All impellors to 3 final water pumps at Nooitgedagt presently in process of refurbishment after 14 years)
- Corrosion formation to inside of steel pipelines used for transfer of Nooitgedagt treated water. This situation will result in increased maintenance costs and ultimate loss of pipelines which is estimated at more than R 300 million in present day replacement value.

Minimum post treatment of final water recommended is for a low pressure desalination plant at an estimated cost of R 86,000,000 for two 35 Ml/day modules as a side stream treatment for two 70 Ml/day standard treatment modules.

4. DEMAND SIDE ANALYSIS

All the present reservoir supply zones were evaluated against the 2004 total water demand as supplied from all water treatment works.

Based on the planned housing provision areas and the SDF proposed urban fence lines, those areas where additional reservoir storage and supply zones will be required, were identified and the limits of supply zones for each of the present and future reservoirs were fixed to optimize infra-structure use.

This 2004 supply/demand model was then extended and balanced for the 2020 predicted water demand from all water treatment works.

The table below summarises the new reservoirs zones which must be provided over the next 15 years to meet the needs of the demand side.

Proposed New Reservoirs for NMBMM Water Supply System		
Reservoir Name	**Capacity (Ml)**	**Year for Completion**
Port Elizabeth		
Amanzi	20.0	2011
Amanzi Tower	0.5	2015
Bethelsdorp High (Replace small BPT)	1.0	2010
Chatty	20.0	2008
Coega Kop (1st of two)	17.0	2008
Colchester (2nd of two)	1.5	2009
Olifantskop (1st of two)	25.0	2012
Schoenies (Replace existing small)	2.5	2008
Seaview Low Level (Replace existing small)	2.5	2008
Seaview High Level	2.0	2008
St Albans	12.0	2012
Theescombe	6.0	2010
Van der Kemp	12.0	2010
Witteklip	5.0	2011
Uitenhage & KwaNobuhle		
Balmoral	9.0	2015
Kwanobuhle No4 (Replace existing floating roof)	12.0	2011

The present day value of the proposed infra-structure listed above, together with the associated approach pipelines and related pump stations where required, is estimated at some R 242 million.

A more detailed zone implementation programme was compiled in the main report.

5. RECOMMENDED STRATEGIES

In the evaluation process of present system operational capacities and future infra-structure needs, several strategies have been identified which should be implemented or put into place by NMBMM to ensure timeous decisions and availability of sufficient water supplies in the short and medium term. These strategies are scheduled in the table below.

Strategy No.	Strategy Description : Supply Side
S1	Detailed planning and financial provision for infrastructure capacity upgrade is required over the period 2007-09 to increase the treatment and transfer capacities of the bulk supply system from the "restricted" yield of 250 Ml/day supplied from all sources to the "unrestricted" yield of some 278 Ml/day.
S3	The detailed planning of a Return Effluent Scheme to treat and supply RE water from Fishwater Flats WWTW to the Coega IDZ and the identification of a financing and implementing partner for a Public Private Partnership for such a scheme should receive priority.
S4	The decision on the next bulk water augmentation scheme for NMMM will directly effect the planning and capital budget of NMMM. A final decision and agreement must be reached between NMMM and DWAF on future allocations from the Orange River Development Project as a matter of urgency.
S5	The Agreement made between DWAF and PEM in 1990/01 regarding the exchange of Loerie water for ORDP water, stated that PEM "shall be not worse off". The additional treatment cost of 37 Ml/day to improve quality should therefore be for DWAF account. This matter should form part of the NMMM /DWAF negotiations for increased supply from ORDP

Strategy No.	Strategy Description : Demand Side
S2	The present implementation of a Water Demand Management Programme shall receive priority by management to accelerate and materialise an overall saving in water use of >20 Ml/day.
S6	The accuracy of flow measurement at Schoenies pump station must be verified
S7	The supply system to the Emerald Hill /Heatherbank / Lovemore Heights zones will require upgrading. More in depth research to resolve discrepancies and detailed planning is required into the future transfer upgrading.
S8	NMBMM should formalise and implement policies for the following: (a) A policy for 'Water Services Levies' for all new sub-divisions to ensure that capital is available for ad-hoc service extensions in order that development is not slowed due to insufficient services at development nodes. (b) A policy for provision of water service infra-structure outside the SDF "Urban Fence".