KWAZULU-NATAL COASTAL METROPOLITAN AREA WATER SUPPLY SYSTEM

Strategy Steering Committee (SSC) for the Implementation and Maintenance of the Reconciliation Strategy

MEETING 3: PROGRESS REPORT

September 2011

1. INTRODUCTION

The third meeting of the Strategy Steering Committee (SCC) was held on Tuesday, 27 September 2011 to discuss the further progress made with regard to the implementation of the Water Reconciliation Strategy for the KwaZulu-Natal Coastal Metropolitan Areas and the potential supply challenges that exist in the area with regard to implementation.

A summary of the progress to date with the implementation of the main strategies between the previous SSC meeting of March 2011 and this meeting is presented in this report. The progress with the various aspects of the strategy was supplied by the responsible authorities as follows:-

- The Department of Water Affairs (DWA) supplied information on the water balances with input from Umgeni Water.
- DWA provided input on the progress with the Mooi Mgeni Transfer Scheme, Hazelmere Dam Raising, Mkomazi Scheme and the Mvoti Scheme, and on the System Operation Management Forum.
- eThekwini supplied information on the progress with the re-use of treated sewage effluent.
- Umgeni Water progress with the Lower Thukela transfer scheme, upgrade of the North Coast water infrastructure and the desalination of seawater option.

2. PROBLEMS WITH WATER SUPPLY

The water situation in the KwaZulu-Natal Coastal Metropolitan Area is such that the water use already exceeds the assured supply of water. This poses a challenge in water security for this metropolitan area over the short to medium term. The above average rainfall over the last few years has kept the major supply dams full which has led to a false sense of security regarding the water supply situation.

This area is experiencing rapid growth in water requirements attributed to the migration of people from the rural areas, economic growth and development initiatives. The late rainfall over the last summer season has kept the major supply dams full and has removed the threat of water restrictions being imposed in the short term. However, a below average rainfall period in the area will result in the need for water restrictions which will have impacts on the local economy.

The Reconciliation Strategy for the KwaZulu-Natal Coastal Metropolitan Area Water Supply System (Figure 1) identifies, prioritises and confirms the essential interventions necessary to meet the water requirements of the area for the next twenty five years (Department of Water Affairs, 2009). The strategy was developed by DWA in close collaboration with the eThekwini Municipality, Umgeni Water, other municipalities and stakeholders.

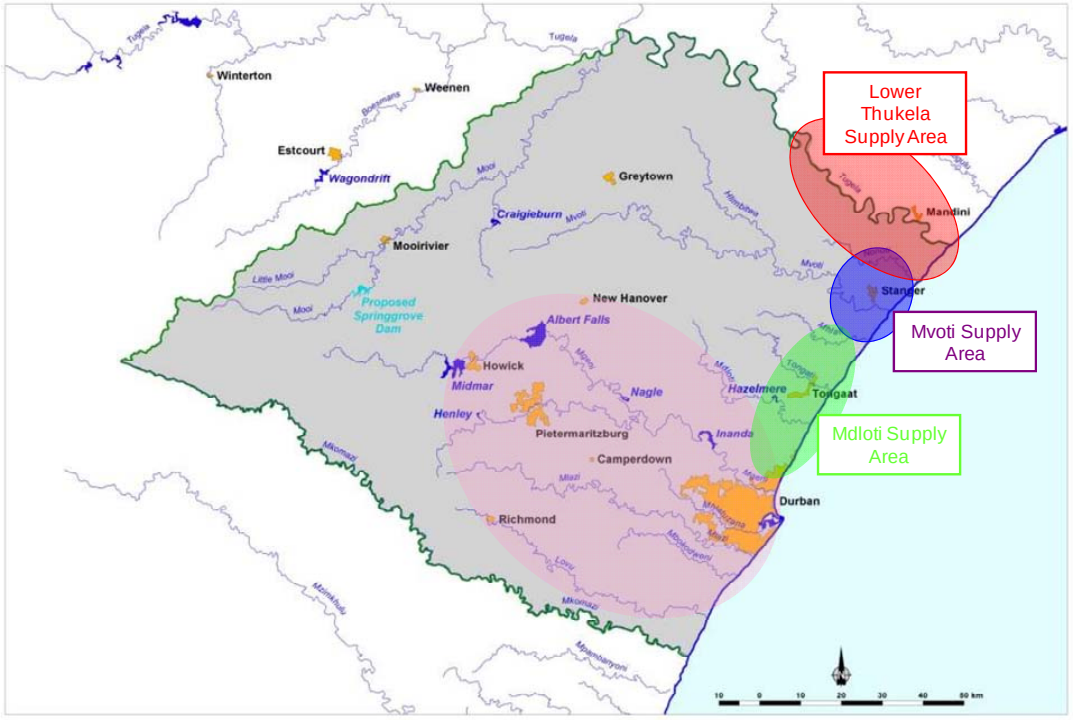

Figure 1: **KwaZulu-Natal Coastal Metropolitan area (Pietermaritzburg to Durban from the west to east and from KwaDukuza in the north to Amanzimtoti in the south)**

3. WATER BALANCES

The water balances depicting the water reconciliation situation in the Mgeni and Mdloti River Systems were updated with recent water requirement projections and the latest implementation schedule (September 2011) of the interventions as shown in the subsequent figures. The graphs indicate how the water requirements compare with the available resources and show that the Mgeni system will experience deficits, which is depicted by red shaded area where the water requirements exceed the available water.

3.1 Mgeni River System

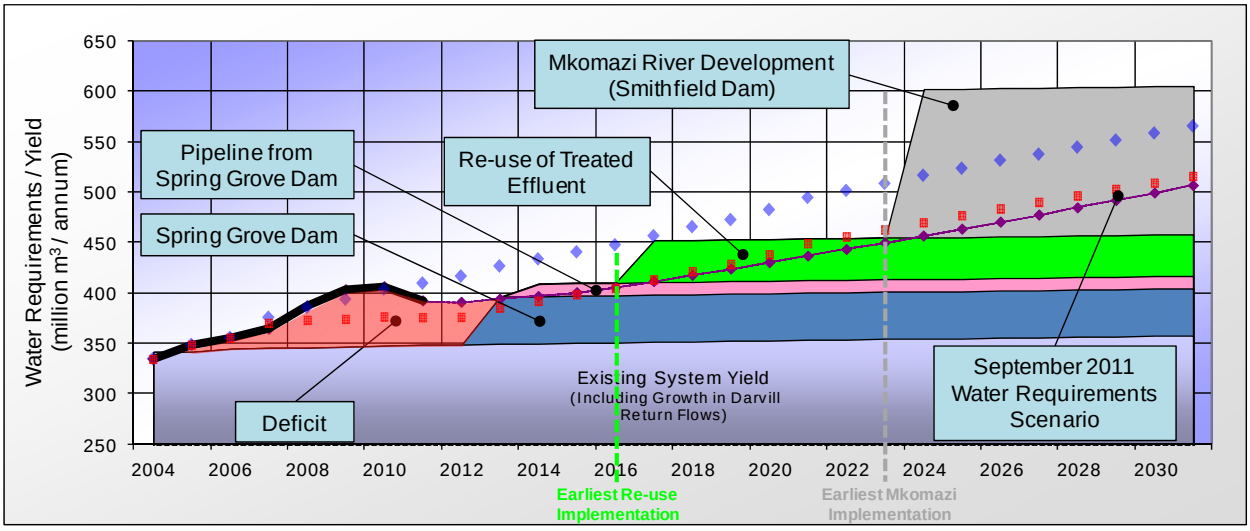

Figure 2: Water reconciliation situation in the Mgeni River System (September 2011)

Figure 2 shows the following:-

- The solid black line up to the year 2011 represents the actual water use.
- The dotted blue curve represents the high water requirement projection scenario without further Water Conservation and Water Demand Management (WC/WDM) as applied in the reconciliation strategy of August 2009.
- The dotted red curve represents the high water requirement projection scenario with further WC/WDM applied in the reconciliation strategy of August 2009.
- The purple line represents the revised water requirement projection scenario provided by Umgeni Water after consultation with the municipalities dated August 2011. This scenario incorporated the planned WC/WDM interventions of eThekwini Municipality.
- The red shaded areas indicate where the water requirement exceeds the yield of the system and deficits in supply and high risk of water restrictions will be experienced.
- The blue and pink areas represent the yield of the two phases of Spring Grove Dam added onto the existing yield of the Mgeni River System.
- The green area represents the planned re-use volume of treated sewage effluent.
- The increase in yield of the proposed Mkomazi River development and water transfer scheme (Smithfield Dam) is indicated by the grey area, showing sufficient water can be made available to the system to supply the projected water requirements beyond the year 2030.

Figure 2 highlights the following:-

- The revised water projections (August 2011) indicate a lower water requirement than previous projections indicating that a supply deficit only exists until late 2013 (and not until 2016 as previously projected). This decrease in water requirements is attributed to the implementation of WC/WDM measures and a lower projected growth in development than previously envisaged.
- There is a high risk of water restrictions until Spring Grove Dam (Mooi-Mgeni Transfer Scheme) is scheduled to deliver water to the Mgeni River System.
- The system balance remains in deficit until late 2013 until both phases of the Mooi-Mgeni Transfer Scheme are implemented
- The importance of WC/WDM measures to reduce the deficits and risk of restrictions are illustrated by the difference in the blue dotted graph and purple line;
- The desalination of seawater is being investigated as a possible alternative to the Mkomazi River Development. The re-use of effluent, the desalination of seawater and Mkomazi River Development as water supply options need to be reviewed once the results of the feasibility studies become available.

3.2 Mdloti River System

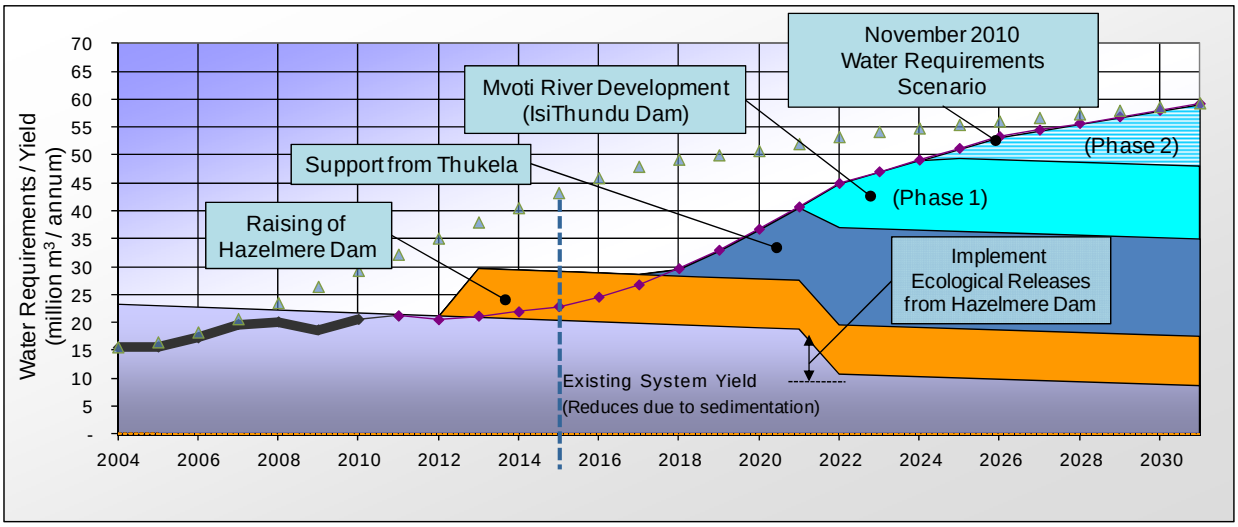

Figure 3: Water reconciliation situation in the Mdloti/Mvoti River System (September 2011))

Figure 3 shows the following:-

- The solid black line up to the year 2010 represents the actual water use. The drop in water use in the year 2009 is due to some of the water requirements normally supplied from Hazelmere Dam being supplied from the Mgeni River System.
- The grey dotted curve represents the water requirement projection scenario from the reconciliation strategy (August 2009).
- The purple line represents the revised scenario compiled by Umgeni Water – August 2011.
- The supply capability (yield) of the interventions (augmentation options) identified in the strategy are indicated in shaded area graphs stacked on top of the existing system yield.

Figure 3 highlights the following:

- The current revised water projections indicate a lower water requirement than previous projections. Based on this current projection no supply deficits are experienced in the system to year 2030. The lower than original projected growth is due to the Hazelmere treatment works capacity constraint and lower than expected growth. Some successes in the implementation of WC/WDM is also a contributing factor.
- Due to the lower water requirements projected, some of the schemes are required later than the dates specified in the latest implementation schedule.

4. IMPLEMENTATION OF THE STRATEGY

4.1 Water Conservation and Water Demand Management

WC/WDM has been identified as an immediate action to deal with water shortages in the area. Even if completely successful, WC/WDM measures will not be sufficient to ensure sufficient future water availability in the area and further significant interventions are required.

eThekwini Metro, iLembe, Ugu and Msunduzi municipalities have initiated a number of WC/WDM measures to reduce water losses and a number of successes were reported on at the meeting. WC/WDM measures being implemented in the municipalities are showing promising results in terms of non revenue water reduction and reduction of water leaks. Water requirement projections are showing a downward

trend despite an increase in water connections. Illegal water connections remain a major problem for the municipalities and are impacting on WC/WDM efforts. The lack of funding to continue with the implementation of further WCWDM measures was again raised as a challenge preventing additional decreases in water requirements and posing a threat to the sustainability of WC/WDM in the municipalities.

4.2 Spring Grove Dam and transfer system

Background

- Mooi Mgeni Transfer Scheme 2 (MMTS-2) will augment the water supply of the Mgeni System.
- The full scheme will increase the current system yield by 60 million m^3/a.
- The scheme consists of the Spring Grove Dam (MMTS-2A) and conveyance infrastructure (MMTS-2B)
- The Trans Caledon Transfer Authority (TCTA) has been instructed to implement the scheme on behalf of the Department of Water Affairs (DWA).

Progress

- Construction on the dam has started.
- Projected water delivery: March 2013
- The Mearns pump station and pipeline upgrade is to begin in October 2011.
- The funding issues related to scheme have been resolved. All agreements have been signed.

Environmental Compliance:

- The environmental impact assessment for the revised pipeline route has been initiated.

4.3 Raising of Hazelmere Dam

Background

- The project will augment the water supply to the KwaZulu-Natal North Coast (Mdloti to Thukela) and sustain irrigation downstream of the dam.
- The project entails the raising of Hazelmere Dam by installing radial gates to increase the gross storage capacity from 23.9 million m^3 to 43.7 million m^3.
- The storage capacity of the dam has been greatly reduced by sedimentation (2010: 11.4 million m^3) with the corresponding reduction of the yield.

Progress

- The civil consultant is in the process of being appointed.
- The tender for the gates and the manufacturer's appointment is scheduled for October 2011.
- Installation of gates and commissioning is scheduled for June 2012 to October 2013.
- Water delivery: October 2013.

4.4 North Coast pipeline and Hazelmere Supply Infrastructure

Background

Extensive current and proposed future developments within the North Coast region have necessitated the augmentation of the entire North Coast Supply System. The following projects are being planned or implemented as part of this augmentation. These include:

- A pipeline has been constructed from Avondale Reservoir to Honolulu reservoir,

- A pipeline is currently being constructed to augment the North Coast Supply System from Honolulu Reservoir to Mvoti Balancing Reservoirs,
- A pipeline is planned to augment the line from Hazelmere WTP to La Mercy bifurcation,
- A new raw water pipeline is planned from the Hazelmere Dam to the Hazelmere WTP, and
- The Hazelmere WTP will be upgraded from 45Ml/d to 75Ml/d.

Progress

- Avondale to Honolulu Pipeline was completed in November 2009
- Honolulu to Mvoti Balancing Reservoir Pipeline
    - Pipeline contract was completed in October 2010
    - The construction of the pipe bridge is approximately 25% complete
    - The programme for the booster pump station is still to be determined once the land issue is resolved
- Hazelmere Raw water Pipeline
    - Detailed design of pipeline is currently in progress
- Hazelmere WTP Upgrade
    - Overall detailed design of the WTP upgrade is at 69% complete. (Civil Design 86%, Process 60%, Mechanical 95%, Electrical 5%)
- Hazelmere to Bifurcation Pipeline & Pump Station
    - Design of pipeline is complete
    - Detailed design of pump station is about to commence. PSP has been appointed

Way forward

- Honolulu to Mvoti Balancing Reservoir Pipeline
    - Construction of the pipe bridge is scheduled to be completed by November 2011.
    - Resolve land issues and completed pump station (by ?)
- Hazelmere supply infrastructure
    - Obtain Environmental Authorisation
    - Complete the upgrade of:
        - Raw water pipeline from dam to waterworks (2013)
        - Upgrade of Hazelmere WTP to 75Ml/day (2013/14)
        - Upgrade Hazelmere to Bifurcation Pipeline and Pump Station (2013).

4.5 Mkomazi River Transfer Scheme

- The Mvoti to Mzimkulu WMA Reserve Determination and Classification study is to be initiated soon. DWA is currently in the process of appointing a PSP. The Mkomazi Reserve will be determined as part of this study. The Reserve will be available by October 2014.
- Feasibility Study to start October 2011 (end September 2016)
- EIA (including estuary): Start December 2011 (end September 2016)
- Detailed design: Start October 2016 (end September 2018)
- Construction: October 2018 (end October 2022)
- Water delivery: January 2023.

4.6 Lower Thukela Bulk Water Supply Scheme

Background

This scheme is planned to abstract water from the lower reaches of the Thukela River near the SAPPI Mill, for treatment at a regional water treatment plant situated in close proximity. Potable water will be delivered southwards to local developments and rural communities and will link into the existing North Coast Supply System. Potable water will also be delivered northwards to the Mandini Municipality area for developments.

Progress

- The detailed Feasibility Study was completed in June 2011. Final reports are awaited.
- A meeting was held on 17 June 2011 between DWA, Department of Co-operative Governance and Traditional Affairs (CoGTA), iLembe DM, and Umgeni Water:
    - DWA / CoGTA committed to funding 40% of the capital cost of the scheme
    - iLembe DM committed to purchase bulk potable water from the scheme
    - Umgeni Water committed to 'fast-track' the implementation of Phase 1 of the scheme to meet specific iLembe DM milestones
    - To meet its commitment Umgeni Water also needs to complete the Hazelmere upgrades and augmentations timeously
- The Environmental Impact Assessment report is to be submitted to the authorities within the next few months
- A Professional Service Provider for design and site supervision was appointed July 2011
- Design of Phase 1 commenced in August 2011
- Mechanisms are being explored to expedite the appointment of Contractors.

Way Forward

- An environmental authorisation needs to be obtained before the construction phase can commence
- All necessary DWA licenses and approvals need to be obtained before construction and abstractions can commence
- All scheme components will move directly from detail design to construction
- The gravity pipeline (Mvoti Balancing Reservoir to Darnall) and access roads are prioritised for implementation
- Weir must be constructed over at least two dry seasons
- Target deadlines for final completion:
    - Gravity Pipeline (Mvoti Reservoir to Darnall) – November 2013
    - LTBWSS Phase 1 - December 2014

4.7 Mvoti River Development

- Feasibility Study to start October 2011 (end October 2015)
- EIA (including estuary): Start January 2012 (end January 2016)
- Detailed design: Start April 2016 (end March 2018)
- Construction: June 2018 (end June 2021)
- Water delivery: January 2022

4.8 Re-use of treated sewage effluent

- The Reserve determination on uMngeni estuary has recently been completed. Two flow scenarios were assessed in terms of their potential significance to the estuary. These scenarios may result from the removal of the bulk (80%) of the waste water discharge. The scenarios provided an indication that changes proposed as a result of the recycling of the present day waste water return flows do not significantly change the present health status of the uMngeni estuary. (See Appendix 1 for the Summary of Major Conclusions Report).
- With the completion of the Reserve determination study the water use licence application (WULA) for the re-use project has been submitted to DWA. Comments on the WULA have been received and eThekwini is in the process of addressing this with the DWA Regional Office. With the Reserve and WULA processes being addressed the EIA process is to be initiated in November 2011.

Way Forward

- DWA WUL decision: October 2011
- EIA process and approval: November 2011 to November 2012
- Tender / adjudication: January to July 2013
- Tender award, financing and site establishment: July 2013 to June 2014
- Construction and Commissioning: July 2014 to June 2016
- Water Delivery: July 2016

4.9 Desalination of seawater option

The projected demand of the Mgeni Inland and Central systems is greater than the assured yield that the system can generate. Umgeni Water is currently investigating the possibility of augmenting the supply to the Mgeni System through one or more large scale desalination plants. These plants would serve water to the coastal areas of KwaZulu-Natal thus feeding up water currently allocated by the Mgeni System.

Project Progress

- Australian consultants GHD have been appointed as ‘expert advisors’ in March 2011.
- Consultations have been held with numerous relevant organisations and authorities toward consensus in the site selection process.
- The site selection report was finalised in May 201.1
- Detailed Feasibility Study tender (for 2 sites):
    - Advertised in the media on 7 August 2011
    - Compulsory briefing meeting held on 12 August 2011
    - Closing date for tenders on 15 September 2011 -13 have been received.

Way Forward

- Appointment of Professional Service Provider to undertake the Detailed Feasibility Study will be done by end October 2011
- The tender document for the Environmental Impact Assessment will be finalized by October 2011
- Appointment of Environmental Assessment Practitioner to undertake the EIA will done in January 2012
- Detailed Feasibility Study duration will be approximately 18 months.

4.10 Management of System Operation

Further to the above interventions, a Systems Operations Committee has been established that is focused on improving system management and managing water restrictions in the area in the event of a drought. The committee includes members from DWA, Umgeni Water and all municipalities. The committee's most recent meeting was held on 22 September 2011.

The assessment of the system indicates that it presently has higher volumes of water than predicted. The dams are full due to good rains. Water restrictions will therefore not be implemented over next dry season. The situation will be evaluated again in May 2012. The model simulations however show that the dams in the area are drawn down very rapidly if below than average rainfall occurs. The risk of restrictions is therefore still unacceptably high.

UPDATE OF STRATEGY

The augmentation schemes and measures identified in the 2009 Reconciliation Strategy have not changed. No new supply options have been identified. The key to the successful implementation of the strategy is meeting the target dates for the various phases of the augmentation schemes. The revised set of implementation dates is given in Table 1.

Table 1: Target dates of activities for augmentation schemes identified

MAIN SCHEME	Start Date	End Date
Mooi Mgeni Transfer Scheme Phase 2 A		
Spring Grove Dam		
Construction	Feb 2011	May 2013
Impounding	Nov 2012	March 2013
Water Delivery via MMTS-1	March 2013	March 2013
Upgrade Mearns Pump Station and pipeline (3,2 m^3/s)	Oct 2011	Nov 2012
Mooi Mgeni Transfer Scheme Phase 2 B		
Pipeline & Pump station		
EIA (Transfer pipeline & measuring weir on Little Mooi River)	Oct 2011	Nov 2012
Detailed Design	Jan 2012	Nov 2012
Construction	Jan 2013	Dec 2014
Delivery via MMTS-2B (5,0 m^3/s)		Dec 2014
Hazelmere Dam Raising (DWA)		
Appointment civil consultant	Sept 2011	Sept 2011
Tender for gates and manufacturers appointment	Oct 2011	Jan 2012
Construction	June 2012	Oct 2013
Delivery		Oct 2013
Mkomazi Scheme (DWA)		
Feasibility Study	Oct 2011	Sept 2016
EIA (including estuary)	Dec 2011	Sept 2016
Detailed Design	Oct 2016	Sept 2018
Construction	Oct 2018	Oct 2022
Delivery		Jan 2023
Mvoti River Scheme (DWA)		
Feasibility Study	Feb 2012	Feb 2016
EIA (including estuary)	Jan 2012	Jan 2016
Detailed Design	April 2016	Mar 2018
Construction	June 2018	June 2021
Delivery		Jan 2022
Lower Thukela Transfer (Umgeni Water)		
Feasibility Study		31 July 2011
Detailed Design	1 Aug 2011	31 May 2012
Construction	1 Jul 2012	31 Mar 2015
Delivery		31 Dec 2014
North Coast pipeline and Hazelmere Dam infrastructure upgrades (Umgeni Water)		
Construction North Coast Pipeline to Honolulu reservoir		31 Dec 2010

	Construction North Coast pipeline Honolulu to Mvoti Balancing Reservoir		31 Dec 2011
	Raw water pipeline from Hazelmere Dam to Hazelmere WTW		31 Dec 2013
	Upgrade Hazelmere Dam		31 Dec 2013
Desalination (Umgeni Water)			
	Site Selection	1 Sep 2010	31 Jul 2011
	Feasibility Study	1 Oct 2011	31 May 2013
Re-use treated sewage effluent (eThekwini Metro)			
	PSP for Mgeni Estuary reserve appointed		March 2011
	Results of Mgeni Estuary workshop		Sept 2011
	DWA decision		Oct 2011
	EIA process and approval	Nov 2011	Nov 2012
	Tender preparation and adjudication	Jan 2013	July 2013
	Tender award, financing and site establishment	July 2013	June 2014
	Construction and commissioning	July 2014	June 2016
	Water delivery		July 2016

5. GENERAL INFORMATION

Detailed progress reports on the water resource management strategies can be found at the following link: http://www.dwa.gov.za/Projects/KZNWRMS/documents/aspx.

The Study Manager for the project is Mr. Niel Van Wyk, Chief Engineer at the Directorate: National Water Resource Planning (East).

The next meeting of the SSC is on 14 March 2012.

APPENDIX 1

Reserve Determination for the uMngeni Estuary
Summary of the Major Conclusions

Reserve Determination for the uMngeni Estuary
Summary of the Major Conclusions

Introduction

A workshop to investigate freshwater flow changes on the uMngeni estuary as part of an ongoing programme aimed at reconciling water demand, waste water treatment and proposals for recycling of waste water to a potable standard was held on the 7th and 8th September 2011. The workshop was convened by Marine & Estuarine Research and included hydrologists, water chemists, botanists and estuarine ecologists all versed in the techniques of and protocol of the reserve determination process.

Results

The initial phase of an environmental water requirement study involves an assessment of the present health or ecological status of the estuary (PES). This is done on the basis of a comparison of conditions under a non-impacted situation – the reference condition - with present conditions. This can generally be done on the basis of, *i.e.* an interpretation and synthesis of contour lines, which give an indication of the historical extent of the estuary, historical photographs and data, the presence of mangroves, which are indicative of an historically open mouth, a knowledge of natural levels of nutrients in the region and expert opinion.

In combination, the above factors and available recent data, particularly on water chemistry and the fauna, indicated a massive habitat loss through infilling and land use transformation, a long history of reduced riverine input and degraded water quality in terms of nutrient and bacterial levels and dissolved oxygen. The estuary is presently receiving 38% of the reference MAR and low flow periods have been significantly extended. It was accordingly rated as highly degraded and scored 33 putting it in a category of **E** on a scale of A – F. Present environmental conditions in the estuary, as far as the aquatic biota is concerned, are determined largely by the dissolved oxygen levels which, *on average,* are biologically acceptable but, based on available data, periodically dip below tolerable thresholds. There was no indication that typical estuarine variables such as salinity and temperature were problematic. Unfortunately there were no data available on potentially toxic pollutants.

Proposals which were evaluated as part of the flow scenarios for the system involved the treatment and re-cycling of the waste stream presently flowing into the estuary via the Nhlangane stream from the KwaMashu works and directly into the uMngeni from the Northern treatment works. After treatment the non-recycled component (approximately 20% of the original discharge volume), now obviously more concentrated, would be discharged into the estuary.

Two flow scenarios that were assessed in terms of their potential significance to the estuary were scenarios which may result from the removal of the bulk of the (80%) waste water discharge. These are detailed in the table below with the MAR and percentage MAR indicated

Scenario name	MAR (million ^{3})	Percentage remaining
Natural	671.30	100
Present	262.68	39.13
Scenario 1 represents the situation in 2016 when the re-use project is planned for implementation. At this stage it is assumed that 0.6 m^3/s will be released from Inanda Dam and the 18ML/d from Phoenix WWTW will be transferred to the uMngeni River. The effluent returned to the river system will be 20% of the inflow to the re-use plants.	235.46	35.08
Scenario 2 represents the situation in 2031. It is assumed that 1.5 m^3/s will be discharged from Inanda Dam, 68 ML/d will be transferred from the Phoenix WWTW and the effluent volume returned to the river will be 20% of the 2031 inflow to the re-use plant.	281.44	41.92

Both scenarios involved a small deviation either side of present day in terms of MAR. Scenario 1 indicated that there were changes to the estuary which negatively affected the low flows and mouth behaviour and very small improvements in some water quality parameters. Scenario 2 however resulted in positive changes to mouth behaviour, base flows and some water quality parameters. Both scenarios did not however cause any changes to the habitat scores which resulted in major changes in the biotic components. The major findings were that scenario 1 resulted in the health score of the estuary remaining more or less the same as present day (changed from present day 33 to 34). Scenario 2 results in a slightly higher degree of change moving the estuarine health score from 33 to 40. This was a result of positive improvements in low flows, mouth behaviour and some water quality parameters. The scenarios provided an indication that changes proposed as a result of the recycling of the present day waste water return flows do not significantly change the present health status of the uMngeni estuary.

Possibilities for improvement to the estuarine environment exist in terms of rehabilitation of areas on the south bank between the Ellis Brown viaduct and the Connaught interchange and also above the Connaught interchange and the N2 bridge. Further significant improvements could also be possible through an improvement in run-off and discharge quality.