IVRS Strategy Steering Committee

WCWDM Project 15% Progress Report

Johannesburg Water

13 April 2011

Introduction

- City of Johannesburg is the biggest consumer out of the Vaal River catchment (510,000 Ml over the last 12th month period)
- The entity supplies some 650 000 domestic, commercial and industrial customers and serves an estimated consumer base of 3.8 million people. At least 2 400 people are employed by the entity.
- Johannesburg Water developed a comprehensive Water Conservation and Demand Management Strategy. (07/08 F/Y)
- JW strategy which is aligned to national strategy aims at reducing the future water demand for the City of Johannesburg by at least 90,000 Ml over a period of 10 years.

WCWDM Strategy

- The WCWDM strategy aims to address the ff:
  - Reduction in water usage
  - Reduction in water losses
  - Optimisation of infrastructure
  - Reduced operational costs of water provision and water resource management
  - Optimal use of available water resources including surface, groundwater and rainfall
  - Increased awareness of financial and environmental value of water resources

Supply Area Overview

- **City of Johannesburg**
- 65 km North to South
- 35 km East to West
- 1,625 km2
- **Johannesburg Water**
- 6 Operational Regions
- 10 Regional Depots
- 4 Electro-mechanical depots

Key Statistics - Infrastructure

Water Networks	11 300 km's
Reservoirs	86
Towers	33
Bulk Supply Meters	108
Average Daily Demand	1 366 Ml

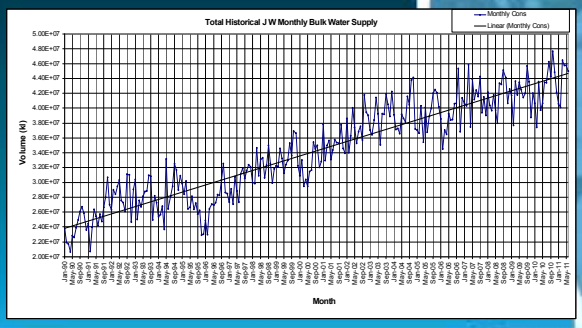
Status Quo

- The City of Johannesburg started with various projects and pilot studies since the late 90's.
- The importance of continuing with similar projects and the sustainability thereof is highlighted in the WDM plan.
- The City acknowledge that paying customers cross subsidise non paying customers, thus the plan is aimed to reduce non-revenue water and not to envisage on consumer demand management.

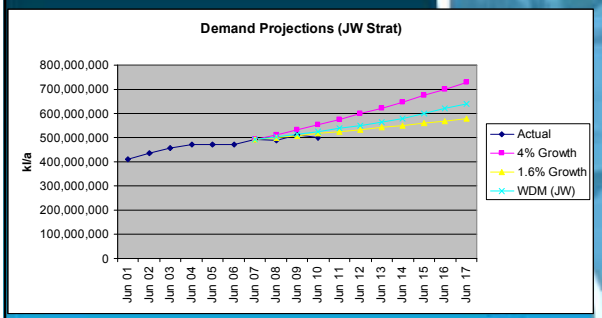
Status Quo: Water Balance – past 5 years

			Year ending	Jun-05	Jun-06	Jun-07	Jun-08	Jun-09	Jun-10
Water Balance Calculations	Revenue water	kl/annum		304,877,898	313,552,207	324,949,204	321,039,751	313,823,724	308,748,999
	Non-Revenue water	kl/annum		168,507,059	155,478,489	164,204,433	171,999,736	191,526,520	188,398,916
	% Non-revenue water			35.6%	33.2%	33.6%	34.9%	37.9%	37.9%

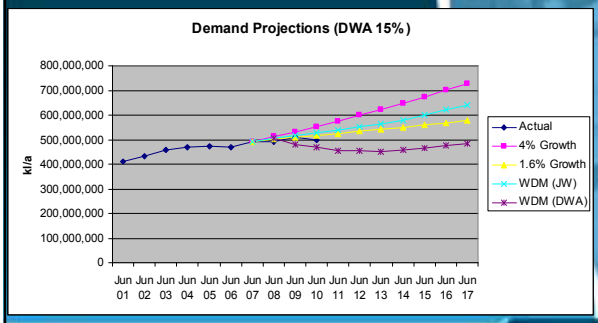
Status Quo: Demand Projections



Status Quo: Demand Projections JW



Status Quo: Demand Projections DWA



Demand Projections - comments

- Due to limitations on the volume of water that can be supplied from the Vaal system, WDM and the need to contain demand has become increasingly important.
- Johannesburg Water developed and implemented a Water Demand Management Strategy from 07/08 financial year. This strategy is based on a 90 000Ml reduction on a 4% growth over 10 years. (Current actual demand is well below this target)
- The Gauteng region will potentially suffer from water shortages during the period 2013 -2018 if no effort is made to reduce the current growth demand.
- This then implied that the JW strategy should be implemented over a 5 year period from the 08/09 financial year. The reductions should also be measured against a growth of 1.6%. (Current actual demand is well above this target)
- Currently demand will exceed supply capacity of the current system by 2014, implying that no growth in demand can be accommodated between 2013 and 2018.

WCWDM Plan: Key interventions

Direct Measurable Interventions	Indirect Measurable Interventions
Distribution Management - Pressure Management - Mains Replacement - Active and passive leakage control	**Distribution Management** - Sectorisation - Management Meters - Consumer Meters - Management/Monitoring performance targets
Consumer Demand Management - Retrofitting & removal of wasteful devices	**Consumer Demand Management** - Tariff Structures - Accurate meter reading, billing & cost recovery - Legislation - Water Audits - General Education and public involvement (School Education)

WCWDM Plan: Budget requirements

The table indicates the budget required to implement the WDM interventions and the actual budget allocated from both Capex and Opex.

Budget	09/10	10/11	11/12
Allocation	R195.5 m	R287.3 m	?
Implementation Requirements	R307.6 m	R302.9 m	R368.0 m

Required vs Available budget

- Based on the budget available for water demand management for the 10/11 financial year only the following interventions are implemented or existing ones maintained:
- Water Mains Replacement
- Pressure Management
- Active and passive leakage control
- Reservoir and Tower Monitoring
- Soweto Infrastructure Upgrade project

Risks and mitigation measures

- (Risk) Failure to Implement WDM Strategy – The threat of inadequate water resource management on JW's operations in part or total, negatively impacting on access to water goal, core business, national water use and saving targets.
- (Mitigation) Implementation of a fast tracked WDM strategy. This was developed and approved in the 09/10 financial year.
- (Risk) Budget allocation shortfall – The threat to implement the WDM strategy as a result of the City capital budget allocation process.
- (Mitigation) – Investigating alternative funding options including the ring fencing of WDM related funding separately from other funding.

Contingency Plans if water restrictions imposed

- Implement Consumer water restrictions
- Tariff settings
- Alternative water sources i.e. Effluent reuse
- Continuation of WDM strategy
- Eradication of deemed areas

Progress on WCWDM Plans

The following interventions are implemented by the City of Johannesburg to reduce or limit real losses:

- Water Mains Replacement
- Pressure Management
- Hostels Retrofitting
- Active and passive leakage control
- Reservoir and Tower Monitoring
- Soweto Infrastructure Upgrade Project

(1) Water Mains Replacement

- The City of Johannesburg has approximately 11 300 km of water reticulation mains with great variability in the condition of the pipes.
- Pipe bursts can be influenced by:
  - Type of material
  - Operating Pressure of the pipe
  - Age of the pipe
- In the past Johannesburg Water replaced pipes on an ad hoc basis.

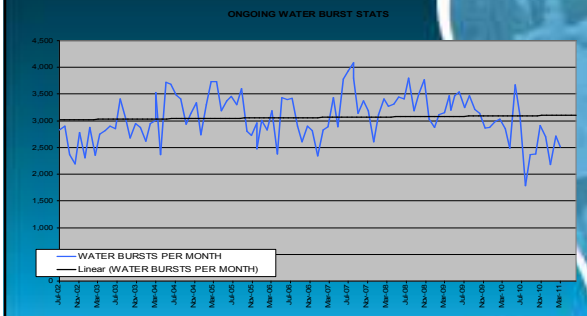
Water Mains Replacement

- Pipes for replacement are currently identified by prioritizing them according to burst frequencies.
- The Geographic Information System (GIS) is used to highlight pipes with a high burst rate.
- A total of thirty three (33) suburbs were prioritized for block mains replacement as a starting point.

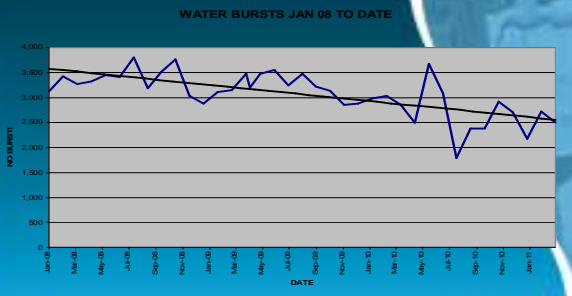
Water Mains Replacement

- The project was rolled out in a phased approach and 58% of the originally identified suburbs have been completed.
- The success of this project is based on the reduction of burst frequencies before and after implementation, including the impact it should make on the water demand of the identified area.
- Minimum of 12 months worth of data was used and to date there is a 90% reduction in the number of pipe bursts.

Water Mains Replacement



Water Mains Replacement



(2) Pressure Management

This programme is aimed to reduce:

- High-night time pressures and limit pipe bursts caused by high pressures.
- Water losses through back ground leaks.
- Consumer water demand in areas experiencing high on-property leakage.

Pressure Management

- Pressure management is achieved through pressure control devices. (Pressure Reducing Valves or Booster pump station)
- Three types of pressure management. (Fixed outlet, Time modulated and Flow modulated)
- There are currently 457 PRV's controlling pressure to 318 pressure reducing zones in the CoJ.

Smart PRV Controllers



Smart Pressure Reducing Installations

Smart PRV controllers


Pressure Management

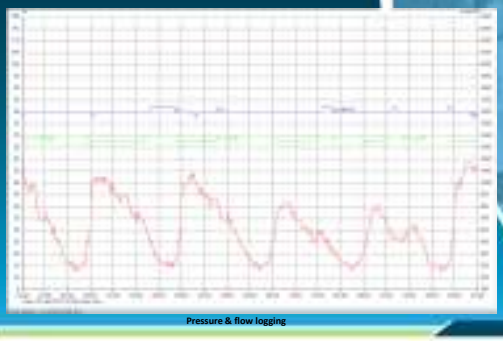
- Identification of areas where pressure management can be implemented is continuing.
- Possibility of upgrading existing fixed-based PRV's with the latest technology in advanced pressure management is investigated.
- Areas with high static pressures (excess of 90m) are being identified through hydraulic modelling of the existing water distribution system. (*as they contribute to water losses through frequent pipe burst*)

Case study – Houghton Drive

- To investigate the benefits of installing pressure management equipment onto existing pressure reducing valves in a water network.
- To measure if a reduction in night time pressures resulted in a net savings of night time flow.
- Equipment used:
  - 1 x 600mm Cla-Val 690G-01ABE pressure reducing valve with specialist equipment retrofitted onto the existing valve
  - 1 x 600mm Cla-Val 690G-35ABE/X101 dual stage pressure reducing valve auxiliary pipe work only

Valve installation

Process variables
P1 max = 82meters
P1 min = 78meters
Qmin = 270 m³/hr
P2 = 70meters
Qmax = 1170 m³/hr



Pressure & flow logging

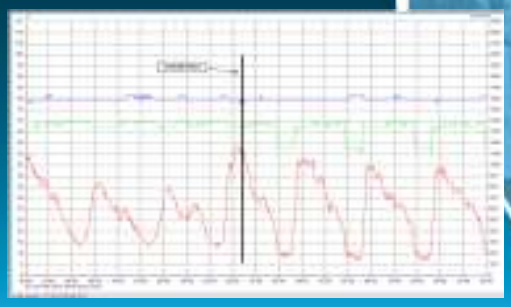
Case Study - Houghton Drive

- The pressure management equipment was installed onto the existing valve after a five day logging period, after which the valve was re-set to the following settings:

  P2 high = 70meters P2 low* = 58meters

- After seven days, the loggers were downloaded and the results were reviewed to see if any savings had been achieved.

- Hereafter the logging result:



- After the installation, it is noted that during periods of low flow, the valves reduced the pressure to the "pressure management" setting, and that the overall minimum night flow had reduced substantially.

Houghton: Metered volumetric flow rates

After installation
23rd February 2011

Time Range			Flow m³/hr	Total flow - m³
23:00	to	23:20	240	80
23:20	to	23:40	210	70
23:40	to	0:00	180	60
0:00	to	0:20	210	70
0:20	to	1:20	180	180
1:20	to	1:40	150	50
1:40	to	2:20	180	120
2:20	to	3:20	150	150
3:20	to	3:40	180	60
3:40	to	4:00	150	50
4:00	to	4:20	180	60
4:20	to	4:40	210	70
4:40	to	5:00	240	80
				1100

Before installation
20th February 2011

Time Range			Flow m³/hr	Total flow - m³
23:00	to	0:00	310	310
0:00	to	2:00	300	600
2:00	to	2:40	270	178.2
2:40	to	3:00	300	100
3:00	to	3:20	270	124
3:20	to	4:40	300	400
4:40	to	5:00	360	120
				1832.2

- The pressure setting of the dual stage control valve is set to operate from 23:00 and then switch off at 05:00 (6 hours) - i.e. at 23:00 the valve will change its outlet pressure from 70meters to 58meters.

- At 05:00 the valve will then change this setting from 58meters to the original setting of 70meters. This operation will continue, until the set points have been changed.

  20/02/2011 – total volume = 1832.2m³
  07/07/2010 – total volume = 1100m³

Houghton case study - Savings

- A total net savings of 732.2m³ of water was realized during the MNF period, which equates into a savings of 22 698.20m³ water per calendar month.

- This equates into a savings of:
  22 698.20m³ x R4-03 per m³ = R91 473-74

- Thus the pay back period would be as follows:
  Initial capital investment / total water savings = pay back period (in months)
  = R1 600 000
  R91 473-74 = 17 months
- Payback period = +/- 1.4 years

Pressure Management – Lessons learnt

- Large areas are difficult to manage but more cost effective.
- Single point of supply into an area is preferred, but if not possible at least not more that three.
- Zone must be discrete
- Bulk Supply meter and pressure reducing valve should be correctly sized, operational and maintained.
- Pressure Management Controllers should be time or flow modulation, battery operated, be able to log pressure and flow and should function under water.

(3) Hostels Retrofitting

- Opportunities to reduce losses have been identified in public (government) buildings, schools and hostels.
- The plumbing in hostels is in a poor condition. Leaks are experienced on the majority of the water fittings and sewer blockages are experienced.
- Maintenance is almost non-existent therefore water losses due to unattended leaks are great.
- The Retrofitting project on Hostels is at the implementation stage (85 % completed) for 3 hostels in Alexandra and one hostel in Soweto (28%).
- The overall impact on the water demand through retrofitting is estimated at 1000Ml per annum.

(4) Leakage Management

- This programme is carried out in an effort to identify all unreported leaks as well as invisible leaks.
- The leaks detected are reported and repaired by the relevant depots at a rate depending on the response times as discussed below.
- 24/7 call centre for consumers to report complaints: The following response times are applicable:

Burst Pipes:	48 hours
Leaking Valves:	48 hours
Leaking Hydrants:	48 hours
Leaking Meters:	4 days

Leakage Management

- Areas are identified with minimum night flow (MNF) loggings on a monthly basis to prioritise leak detection activities.
- JW has 15 dedicated leak detection teams that survey the water mains, which cover approximately 89% of the total water reticulation per year.
- Leak detection is done in two phases: visual and acoustic equipment like listening sticks, ground microphones and correlators are used.

Leakage Management

Leak detecting using acoustic equipment

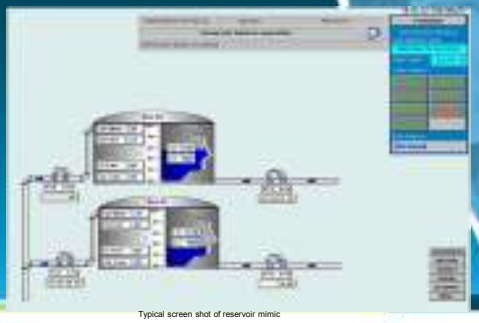
Leakage Management: Projects

- Active leak detection initiatives are also being implemented by outsourced contractors in the Parktown 1/Linksfield district and Yeoville district.
- The project involves the collection and analysis of water data; visual and intrusive leak surveys; boundary valve assessment and leak repairs.
- Part of this project is to verify the discreetness of the water district.
- The contractor is currently busy with the installation of the insertion tappings on the bulk mains. Once all tappings are complete, Rand Water and SSIS Sahara will be used for intrusive surveys on the bulk mains using the Smart Ball and Sahara Methods respectively.

(5) Monitoring Of Reservoirs And Towers

- 24 hour manned control room
- Continuously Monitoring levels and flows of 86 Reservoirs and 33 Towers
- "Early Bird" warning system (Detect possible overflows)
- Notification of possible overflow to field staff to react
- Limit physical loss because of reservoir and tower overflows to almost zero

Monitoring Of Reservoirs And Towers



Typical screen shot of reservoir mimic

(6) Soweto Infrastructure Upgrade

- **Soweto Infrastructure Project (Operation Gcin'A Manzi)**
  - Rehabilitation of water network
  - Improve level of service (Increase pipe diameter)
  - Reduction of consumer demand (Retrofitting)
  - Educate consumers and create awareness

Soweto Infrastructure Upgrade

- The Soweto Infrastructure Upgrade and Renewal (SIUR) programme was on hold since 7 May 2008 following the Mazibuko Court Judgement.
- The suspension has impacted negatively on the achieved reduction in water loses due to most of the households by-passing the meters.
- The Project resumed in October 2010, preceded by an intensive public participation campaign.
- The technical roll-out plan will be completed around the 31 January 2012.

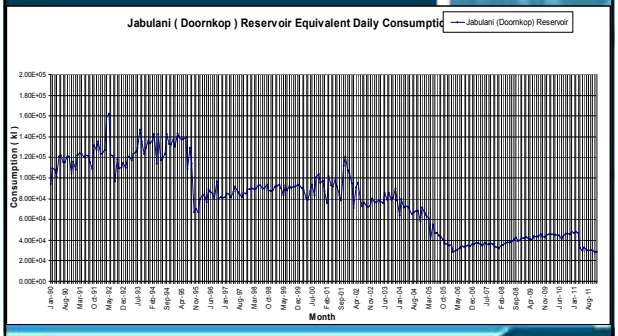
Soweto Infrastructure Upgrade: Progress

- The project started by going back to all previously metered stands.
- Pre-intervention surveys are carried out followed by retrofitting.
- The old pre-payment meter is upgraded to comply with new specifications or replaced it can't be upgraded.

	Pre-intervention Survey	Retrofitting	New Meter Installation	Meter Upgrade
Target	40,466	26,276	2,678	12,272
Actual TD	43,179	23,435	2,021	7,117
% Achieved	107%	89%	75%	58%

Soweto Infrastructure Upgrade

Soweto Infrastructure Upgrade



Way Forward – Short Term Actions

- Extended active leakage control
- Extend water networks replacement programme
- Install pressure reducing valves (PRV's) in zones with high pressure
- Implement a routine PRV maintenance programme
- Investigate alternative water resources i.e. Effluent Reuse

Way Forward – Long Term Actions

- Meter un-metered fire connections
- Undertake reservoir storage optimization study
- Maintain and repair inlet valves to eliminate overflows
- Promote grey water reuse and rain water harvesting
- Extend educational programmes in schools through out the CoJ
- Design and implement innovation programmes to enhance behavioral change
- Provide ongoing technical training for officials at all levels in WC/WDM

Conclusion

- The programmes and interventions put in place to limit or reduce real losses with in the water reticulation system is contributing to the reduction in the water demand of the City in an effort to contribute to the overall 15% reduction.
- Budget allocation is still a problem and the required money for WDM is not available. Alternative funding opportunities is being investigated.
- If funding is not available it will be difficult to achieve the required savings to contribute to the 15% reduction that's required in the upper Vaal System
- Efforts to reduced deemed areas in Johannesburg should be priority incase water restrictions are enforced. This will then enable the CoJ to implement the restrictions equally to all customers.