water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

WC WSS Reconciliation Strategy

Status Report October 2013

Draft Report to the Strategy Steering Committee

October 2013

Department of Water Affairs
Directorate National Water Resource Planning

SUPPORT TO THE CONTINUATION OF THE WATER RECONCILIATION STRATEGY FOR THE WESTERN CAPE WATER SUPPLY SYSTEM

STATUS REPORT OCTOBER 2013

APPROVAL

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WC WSS Reconciliation Strategy – Status Report October 2013

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 WS WSS Reconciliation Strategy

In early 2005, the then Department of Water Affairs and Forestry (DWAF), as the custodian of the country's water resources, in partnership with the City of Cape Town (CCT), commissioned the Western Cape Reconciliation Strategy Study to facilitate the reconciliation of predicted future water requirements with supply available from the Western Cape Water Supply System (WCWSS) for a 25-year planning horizon. The Strategy is used as a decision-support framework for making timeous and informed recommendations on those interventions that should be implemented to meet the future water requirements. The extent of the WCWSS is shown in Appendix A.

The WCWSS comprises several dams, mostly located in the upper regions of the Berg River and Breede River catchments. The system supplies raw water to the CCT, the West Coast District Municipality (DM) for domestic supply to Swartland Local Municipality (LM), Saldanha Bay LM and Bergrivier LM, the Stellenbosch LM to augment the supply to Stellenbosch, and to agricultural users downstream of the Berg River Dam, Voëlvlei Dam and Theewaterskloof Dam. Treated water from the CCT's treatment works is provided to several towns close to the treatment works and bulk transfer pipelines.

The Strategy was completed in 2007 and since then it has been reviewed and regularly updated by the Strategy Steering Committee.

1.2 Strategy Steering Committee

One of the recommendations of the Reconciliation Strategy Study was that a Strategy Steering Committee (SSC) be formed with a clearly defined mandate and scope of work.

The objectives of the SSC are:

- To ensure and monitor implementation of the recommendations of the WC Reconciliation Strategy;
- To ensure that the necessary studies by the responsible institutions identified in the Strategy, are started timeously to ensure continued reconciliation of water supply and requirements;
- To update the Strategy to ensure that it remains relevant; and
- To ensure that the Strategy, its recommendations and progress with the implementation are appropriately communicated to all stakeholders.

The SSC has met ten times since the Strategy was completed in May 2007, with a hiatus between November 2011 and August 2013. The Committee is functioning as it was intended and the stakeholders and water users of the WCWSS actively partake and provide feedback in the meetings. The current list of SSC members is contained in Appendix B.

An Administrative and Technical Support Group (Support Group) was formed to support the SSC. The Support Group consists of *inter alia* representatives from the Department of Water Affairs' National Office (Directorates of National Water Resource Planning, Water Resources Planning Systems and Options Analysis), the DWA National Water Resource Infrastructure Branch, the DWA Western Cape Regional Office and the CCT (Water and Sanitation Department: Bulk Water and WDM & Strategy Branches). The Support Group meets between the SSC meetings to ensure that the recommendations following from the strategy and committee meetings are implemented.

This Status Report provides an overview of the 2013 update to the Strategy. Due to the hiatus since the last status report and required update of relevant input data to the reconciliation scenarios, it was decided to prepare a comprehensive report.

2 Progress with Implementation of the Strategy

2.1 Water Conservation / Water Demand Management (WC/WDM)

2.1.1 City of Cape Town (CCT)

WC/WDM Strategy (2007)

The WC/WDM Strategy (2007) identified and stated 5 goals that the strategy will endeavour to achieve over the ensuing ten years (up until 2016/17). These five goals consist of both quantitative and qualitative techniques which both have a direct and indirect impact on the water demand.

Table 1: Strategy Goals (after WCWDM Strategy, 2007)

Quantitative	**Goal A**	CCT must reduce and maintain NRW to below 15% of the total average demand and within accepted international benchmarks.
	Goal B	Water wastage by consumers to be reduced and maintained below 2% of the total demand by 2012 and most consumers must achieve water efficiency benchmarks by 2016.
	Goal E	Reduce projected potable water demand to an average growth rate of no more than 1% p.a. for the next 10 years and conserve CCT water resources
Qualitative	**Goal C**	Ensure by 2009 and maintain on-going effective management systems and implement IWRP in all decisions regarding augmentation, bulk infrastructure development and water efficiency projects.
	Goal D	CCT must adopt WC/WDM as one of the key delivery strategies and must give priority to its implementation and ensure an on-going enabling environment.

Success of implementation

Significant savings have been reported through the strategy's implementation for the period 2007-2011. Most of these savings were achieved through pressure management and treated effluent re-use. The projected estimated maximum potential savings will potentially be achieved provided WC/WDM have full resource co-operation. The table below gives an overview of the historic non-revenue water trend for the CCT.

Table 2: Historic non-revenue water trend for the CCT (as taken from the CCT's Long Term WC/WDM Strategy)

Description	07/08	08/09	09/10	10/11	11/12	12/13 *
Total System Input (Kl)	315 555 297	325 691 626	331 895 445	336 271 703	330 040 938	217 922 373
Non-Revenue Water (Kl)	63 809 479	75 901 218	84 107 521	78 159 401	67 541 133	47 278 113
Non-Revenue Water (%)	**20.20%**	**23.30%**	**25.30%**	**23.20%**	**20.50%**	**19.80%**
Non-Revenue Water (R)	R151 228 465	R196 584 155	R217 838 479	R222 754 293	R203 974 222	R152 235 524
Number of metered connections	Not available	Not available	Not available	617 323	623 191	627 589
Water Loss (Kl)	63 809 479	73 595 268	78 496 376	69 549 908	50 543 518	36 035 425
Water Loss (%)	**20.20%**	**22.60%**	**23.70%**	**20.70%**	**15.30%**	**14.30%**
Water Loss (R)	R151 228 465	R190 611 744	R203 305 614	R198 217 238	R152 641 424	R116 034 069
Material Financial Losses (Kl)	Not available	Not available	Not available	Not available	25 485 001	16 485 824
Material Financial Losses (R)	Not available	Not available	Not available	Not available	R76 964 703	R53 084 353

Note: * As at April 2013 – water requirements and losses up to June 2013 are used in Section 3

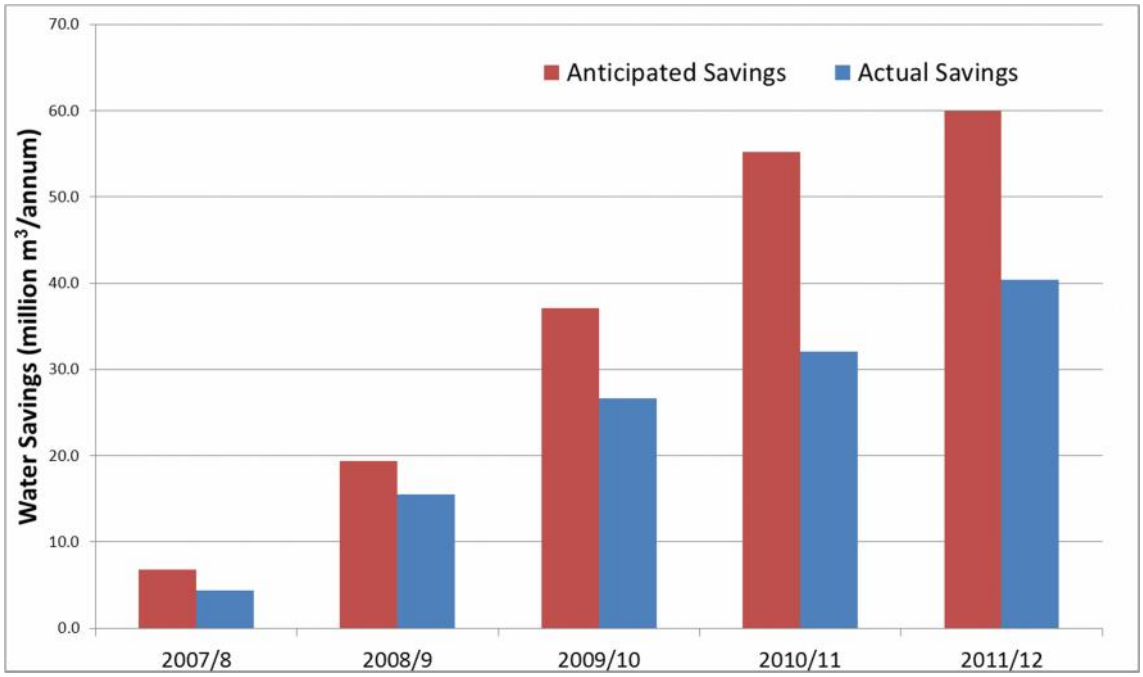
The CCT has focussed on a number of WC/WDM interventions in the last couple of years. The following statistics from the 2010/2011 and 2011/2012 financial years summarise some of the achievements with the implementation of the Strategy and give an indication of the extensive WC/WDM measures which have already been implemented:

- Pressure Management was successfully implemented in Crossroads / Plumstead / Retreat / Marina Da Gama / Lavender Hill / Goodwood / Monte Vista / Bishop Lavis / Bonteheuwel / Thornton / Kalkfontein – Estimated savings = 4.56 Ml/day;

- More than 36 000 non-functional consumer water meters were replaced;
- 95 users were supplied with treated effluent which accounts for 30 Mℓ/day of re-use (Potable Water replacement – 12.66 Mℓ/day);
- WDM flow limiting devices installed in about 26 000 households;
- Integrated Leaks Repair project at numerous schools and households;
- Awareness and Education workshops.

The cumulative savings since implementation of the WC/WDM Strategy in 2007 were 40 million m^3 in the 2011/2012 financial year, out of 60 million m^3 anticipated savings (see Figure 1b). This is also reflected in the reduction of water losses from 80 million m^3 in 2009/2010 to below 50 million m^3 in 2012/2013 (see Figure 1a).

a)



b)

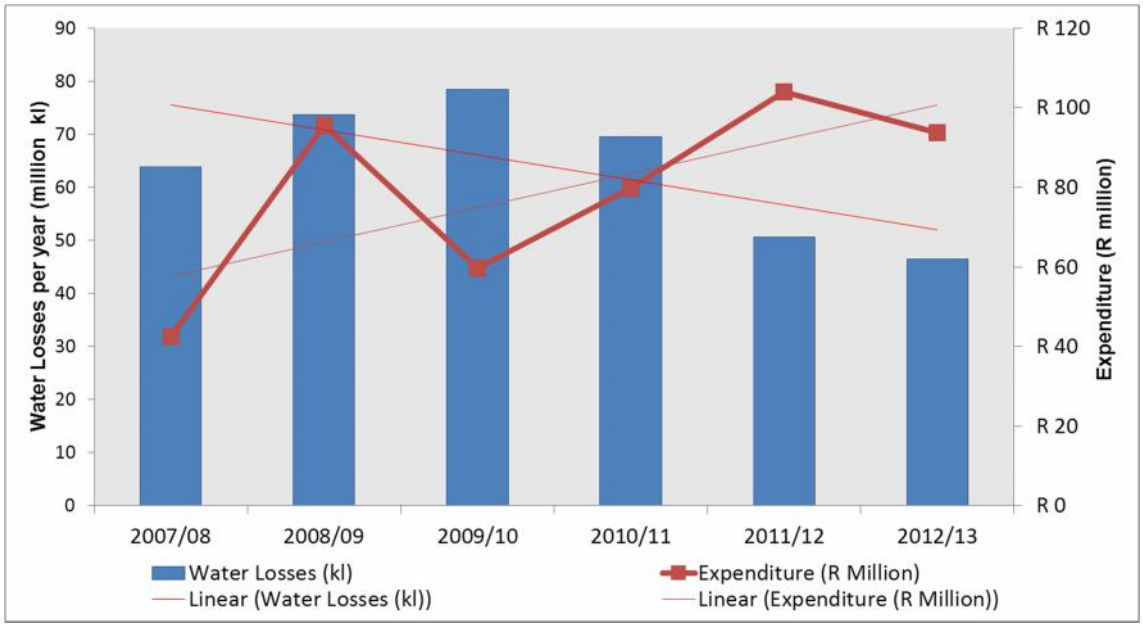


Figure 1: WC/WDM Expenditure and Savings; a) Expenditure vs. reduction in water losses, b) Actual and anticipated savings achieved through WC WDM measures

Updated WC/WDM Strategy

The CCT updated their Long-Term WC/WDM Strategy during June 2013. The purpose of the WC/WDM Strategy is to ensure the long-term balance between available water resources and water requirements, to postpone the need for expensive capital infrastructure projects for as long as it is economically viable and to minimise water wastage.

The five strategic goals, as initially developed in the 2007 WC/WDM Strategy, were improved to include additional and revised strategic goals. Some of the targets were also altered in order to re-align with current and forecasted CCT growth trends. The updated WC/WDM Strategy include the following five goals:

- A: CCT must by 2015/16 reduce and maintain the water losses to below 15% of the total average annual water requirement and within accepted international benchmarks.
- B: Ensure an on-going effective management system and implementation of IWRP.
- C: Mobilise resources according to the WC/WDM Strategy.
- D: CCT must by 2020 reduce and maintain the Non-Revenue water to below 20% of the total average annual water requirement and within accepted international benchmarks.
- E: Reduce the projected potable water requirement to an average growth rate of no more than 2% p.a. for the next 10 years and conserve Cape Town's available water resources.

The quantitative goals A and D were achieved in the 2012/2013 financial year. The non-revenue water (NRW) was cut down to 19.8%, while the water losses were contained below the target of 15% (see Table 2). In addition, the CCT was able to sustain the growth in water requirements below the target of 2%, despite the increase in population.

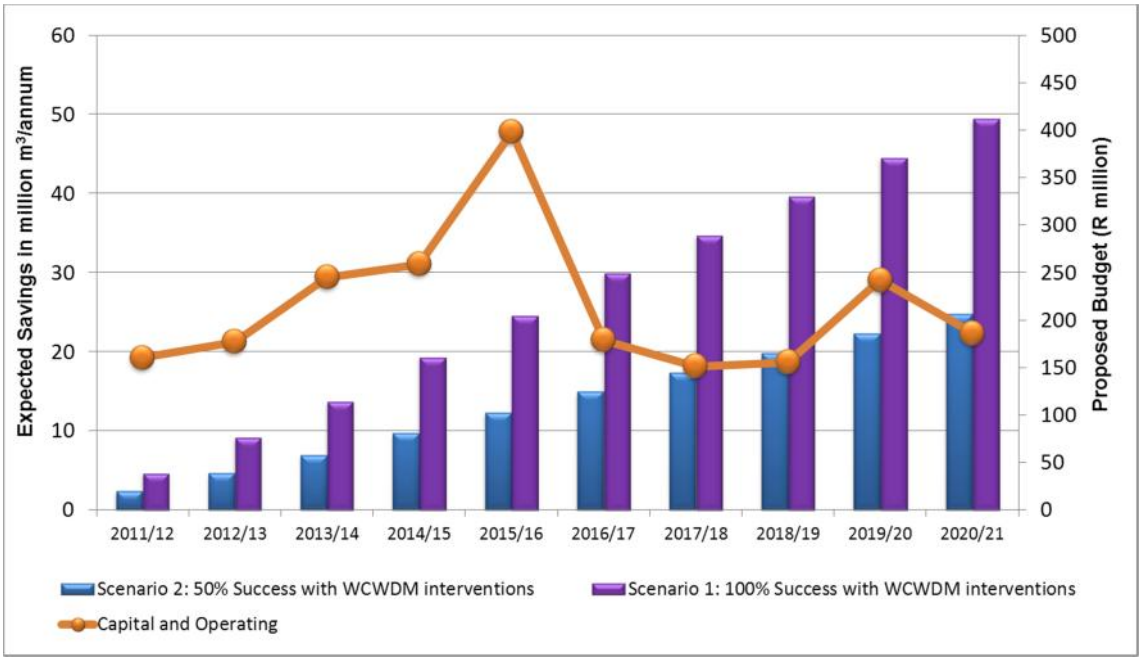


Figure 2: Proposed budget for WC/WDM measures and potential savings

2.1.2 Other Municipalities

West Coast District Municipality

The West Coast District Municipality and the Local Municipalities supplied with potable water through their bulk systems are very effective with the implementation of their WDM Strategies. The treatment and bulk distribution losses of the West Coast District Municipality's bulk systems are summarised in the table below.

Table 3: Bulk water requirements and losses for the West Coast District Municipality (Kℓ)

Description	07/08	08/09	09/10	10/11	11/12	12/13
Raw Water	23 766 881	24 585 837	24 315 601	24 314 294	25 205 808	26 220 257
Treated Water	22 213 488	23 083 499	22 769 765	22 777 941	23 692 176	24 550 591
Treatment Losses	1 553 393	1 502 338	1 545 836	1 536 353	1 513 632	1 669 666
Treatment Losses (%)	**6.54%**	**6.11%**	**6.36%**	**6.32%**	**6.01%**	**6.37%**
Water Sales	21 162 772	21 790 185	22 076 522	21 496 174	22 490 474	23 328 832
Bulk Distribution Losses	1 050 716	1 293 314	693 243	1 281 767	1 201 702	1 221 759
Bulk Distribution Losses (%)	**4.73%**	**5.60%**	**3.04%**	**5.63%**	**5.07%**	**4.98%**

The total annual volume of water losses and the percentage water losses for the internal distribution systems of Saldanha Bay, Swartland and Bergrivier municipalities, which are supplied with bulk potable water by the West Coast District Municipality, are summarised in the table below.

Table 4: Internal distribution losses of the Local Municipalities supplied by the West Coast District Municipality

Description	07/08	08/09	09/10	10/11	11/12	12/13
Saldanha Bay	1 765 842	2 139 400	1 749 147	1 447 311	1 698 381	1 262 633
	13.82%	**16.50%**	**13.89%**	**11.57%**	**12.61%**	**9.40%**
Swartland	782 722	797 850	694 931	898 877	844 816	978 215
	15.57%	**15.08%**	**13.44%**	**16.26%**	**15.27%**	**17.73%**
Berg Rivier (Velddrif and Dwarskersbos)			171 395	170 128	70 224	84 311
			16.30%	**15.60%**	**6.90%**	**8.30%**

Drakenstein Municipality

The implementation of a WDM Strategy by Drakenstein Municipality has been extremely successful and has reduced the water requirements of the towns significantly. The overall percentage of non-revenue water for Drakenstein Municipality was calculated as 12.11% for the 2012/2013 financial year.

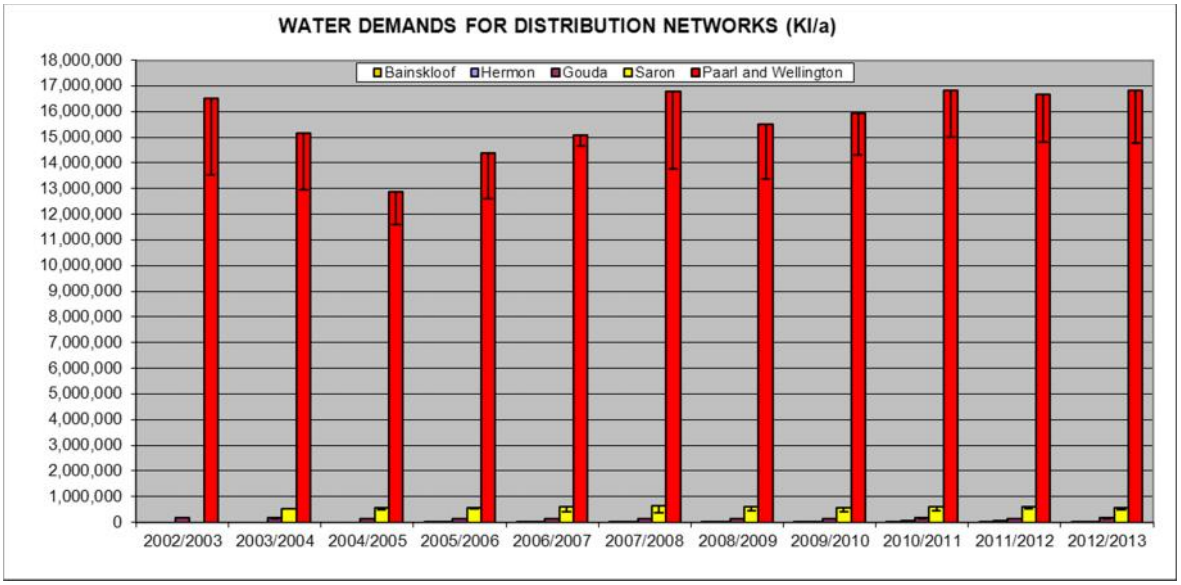


Figure 3: Trend of water requirement and non-revenue water in Drakenstein Municipality (black lines indicate non-revenue water)

The table below gives a summary of the non-revenue water for the various distribution systems in the Drakenstein Municipality's Management Area.

Table 5: Water Losses for the various distribution systems in Drakenstein Municipality's Management Area (Kℓ and %)

System	07/08	08/09	09/10	10/11	11/12	12/13
Paarl and Wellington	3 041 551	2 129 013	1 624 675	1 818 452	1 839 764	2 031 439
	18.12%	13.75%	10.20%	10.81%	11.05%	12.08%
Saron	287 798	136 935	163 005	148 941	63 060	60 456
	44.46%	22.94%	28.50%	25.06%	10.72%	10.87%
Gouda	21 022	17 222	22 791	26 965	30 885	34 809
	14.25%	11.64%	15.65%	16.86%	19.95%	19.98%
Hermon	6 533	19 953	13 562	18 365	16 885	1 958
	19.94%	59.10%	39.97%	43.80%	35.20%	5.24%
Bainskloof			452	579	1 649	0 671
			11.93%	12.30%	40.65%	17.41%
Total for Drakenstein LM	**3 356 904**	**2 303 123**	**1 824 485**	**2 013 302**	**1 952 243**	**2 129 333**
	19.05%	**14.15%**	**10.94%**	**11.43%**	**11.19%**	**12.11%**

Stellenbosch Municipality

The DWA supported Stellenbosch Municipality during 2011/2012 with the development of a detailed WC/WDM Strategy. Adequate human and financial resources now need to be allocated towards the implementation of the WC/WDM Strategy. The Municipality failed to submit their quarterly water balance data to the DWA during the last round of submissions. The table below however gives an overview of the water losses for Stellenbosch Municipality for the various systems, as submitted during the previous rounds to the DWA.

Table 6: Water losses for the various distribution systems in Stellenbosch Municipality's Management Area (Kℓ and %)

System	07/08	08/09	09/10	10/11	11/12	12/13 *
Franschhoek	590 872	452 604	400 599	431 859	591 016	323 211
	39.0%	30.1%	27.5%	29.3%	41.0%	26.9%
Dwarsrivier	211 250	404 897	253 063	156 446	250 973	151 728
	33.7%	46.9%	35.2%	23.5%	32.7%	22.2%
Klapmuts	151 460	169 024	170 846	151 227	102 490	77 615
	44.6%	47.1%	44.7%	40.1%	32.0%	21.7%
Stellenbosch	2 590 266	2 337 760	1 649 709	1 582 938	1 305 617	844 121
	25.1%	22.2%	17.0%	15.4%	16.5%	11.3%
Total for Stellenbosch LM	**3 543 848**	**3 364 284**	**2 474 217**	**2 322 470**	**2 250 095**	**1 396 674**
	27.6%	**25.4%**	**20.2%**	**18.2%**	**21.5%**	**14.3%**

Note: * Data for period April 2012 – March 2013

2.1.3 Agriculture

Water use efficiency in agricultural sector can be measured by crop yield per unit amount of water; i.e. either same crop yield by using less water or produce more crops using the same amount of water. The Fruitlook project was established by the Department of Agriculture to support the farmers with decisions to improve their water use efficiency. The web-based system provides information on 9 growth parameters per registered plot, using satellite imagery: evapotranspiration deficit, crop factor, biomass developed, biomass-water-use efficiency, nitrogen content etc.

2.2 Feasibility Studies

This section of the status report details the progress the DWA and the CCT have made in the investigation and or implementation of the supply-side interventions. Investigations into possible supply-side interventions by the other municipalities that would impact on their requirement from the WCWSS are discussed as well.

2.2.1 Department of Water Affairs Studies

Berg River-Voëlvlei Augmentation Scheme / Berg-Breede (Michell's Pass) Water Transfer Scheme

The DWA, through the Directorate: Options Analysis has undertaken a full feasibility study to further investigate two potential surface water development options to augment the WCWSS. Each of these options is based on the diversion of surplus winter water into existing or new bulk storage facilities (dams). The schemes which were studied are the Berg River-Voëlvlei Augmentation Scheme (BRVAS) and the Berg-Breede (Michell's Pass) Water Transfer Scheme. The implementation of the latter augmentation option will be subject to confirmation of water availability in the Breede River Basin.

Based on the feasibility investigations, the First Phase Augmentation of the Voëlvlei Dam was selected as the best surface water option which now needs to be compared with the non-surface water options being investigated by the CCT. The incremental yield of the scheme was found to be 23 million m^3 at a level of assurance of supply of 98% (1 in 50 years failure). The unit reference value of the water was estimated to be R1.52/m^3 at a social discount rate of 8% per annum. A decision has been made to go ahead with the EIA for the Berg River-Voëlvlei Augmentation (Phase 1) Scheme. It is anticipated to make the PSP appointment for the EIA in October 2013.

Langebaan Road Aquifer Artificial Recharge

The first pilot study did not provide the expected results; hence, it was decided to undertake a second feasibility study to relook at different methods and different sites. The project did not start yet due to procurement issues. Appointment will probably happen around February 2014 and the project will then start in April 2014. This delay impacts on the lead times for implementation of the scheme, as detailed in Section 3.3.2.

2.2.2 CCT Studies

Water re-use

The tender for the water re-use feasibility study was published earlier in 2013 and several tenders have been received, which are currently being evaluated. It is expected to appoint the PSP and start the work by November/ December this year. The required lead time for implementation of water re-use for water supply augmentation depends on the selected option, but it can be expected to be about eight (8) years from start of the feasibility study – this includes the EIA process, construction and linking up to the current water distribution network.

Seawater desalinisation feasibility study

WorleyParsons were appointed in July 2012 to conduct the large-scale seawater desalination feasibility study. The contract period is twelve (12) months but will take six (6) months longer than anticipated, until December 2013. Two possible sites were identified, one of which is at the Koeberg Power Station (ESKOM). The design capacity of the plant will be 150 Mℓ per day, with the possibility of upgrading it with a further two phases up to 450 Mℓ per day. Phasing will require that some of the infrastructure will need to be sized for the final capacity e.g. the marine intake and outlet works. The use of the ESKOM site and marine infrastructure could result in possible savings of about R1 billion for the CCT. The lead time for implementation is about eight (8) years, including the feasibility study, EIA, construction and linking up to the current water distribution network.

TMG Aquifer

The exploratory phase of this study was completed in 2012, but there has been a delay in appointment of the consultant for the Pilot Phase due to legal complications of how to proceed. The CCT is still committed to continue with the project and to proceed with the Pilot Phase. The pilot well field was designed for 5 million m^3/a and the pilot phase will take about five (5) years. Depending on the EIA

requirements, it would take at least two (2) to three (3) years after the CCT's decision before abstraction will start and one or two years of well field operation and abstraction to conclude the feasibility and yield assessments. The CCT currently runs a baseline monitoring programme, which continues until the go-ahead for the pilot phase is received, at which point the monitoring programme requirements will be updated and put out for tender again.

Lourens River Diversion

The proposed scheme is a weir with an earth off-channel dam. Water quality in the river has long been a problem due to the impacts of an urban catchment and this is difficult to control. The area that was identified previously for the earth dam has since become part of a housing development. Hence, it is becoming more unlikely that the CCT will be able to develop the scheme as a feasible augmentation option. However, the tender for the Lourens River Feasibility Study is still expected to go out before the end of the year.

Cape Flats and Newlands aquifers

The feasibility for utilizing the Cape Flats Aquifer for storage of treated effluent is part of the water re-use feasibility study. A situation assessment of the Cape Flats Aquifer is currently underway that takes into account land use planning issues, water quality, flooding issues, different possible uses of the aquifer and management options. The City will take a decision about undertaking a feasibility study to investigate the potential of the Cape Flats based on the situation assessment.

The CCT is currently busy with a study on the springs around Table Mountain as part of the WDM Strategy.

2.2.3 Other Municipalities

West Coast District Municipality

Desalination

The West Coast District Municipality started with a comprehensive study in 2007 to identify a sustainable long-term alternative water source for the region, in order to ensure sustainable economic development. Various alternative sources and combinations thereof were evaluated and eventually a 25.5 Ml/day sea water desalination plant in the Saldanha Bay area was identified as the most cost beneficial alternative.

The West Coast District Municipality is therefore proposing to construct and operate a sea water desalination plant in the Saldahna Bay area using sea water reverse osmosis (SWRO) technology. The intake capacity of the plant will be approximately 60 Mℓ/d (21.9 million m^3/a) producing 25.5 Mℓ/d (9.3 million m^3/a) at final capacity. Approximately 36 Mℓ/d (13 million m^3/a) brine will be discharged into the sea. It will have a lifespan of 25 years with the potential of an extended lifespan.

The environmental screening and technical evaluation reduced the ten possible sites, which were originally identified, to two proposed sites to be evaluated, i.e. the site at ArcelorMittal in the Industrial Development Zone (IDZ) of Saldanha Bay and a site in Danger Bay. The Danger Bay site was identified as the most suitable site and the EIA approval was obtained during August 2013 for this site and the bulk infrastructure.

The proposed desalination plant and bulk infrastructure will cost an estimated R500 million, R300 million more than the original cost estimate. The first phase will include the construction of the desalination plant with a capacity of 8.5 Mℓ per day and the bulk infrastructure, with a capacity of 25.5 Mℓ per day. The desalination plant will be upgraded in three phases up to the final capacity of 25.5 Mℓ per day. Funding of this plant is currently a major challenge, as the DM is not in a position to co-fund a project of this extent.

Increased storage capacity at Withoogte

Although the modelling results from the "Analysis of Management Options at Misverstand Weir" to mitigate the potential impact on salinity of the Berg Water Project and Voëlvlei Augmentation Scheme (DWA, 2006) indicated that the incremental impact of the Berg Water Project and Voëlvlei Augmentation Scheme could be mitigated through the provision of an additional 0.25 million m³ of off-channel storage capacity, the re-analysis showed that the desired 98% level of assurance would not

be achievable. To obtain a 98% level of assurance an additional 0.7 million m³ of storage would be required over and above the readily available 0.5 million m³ storage at Withoogte.

Drakenstein Local Municipality

Drakenstein Municipality completed a Bulk Water Supply Study during May 2009. One of the recommendations from the study was that the Municipality must proceed with the construction of the new Meulwater WTW on Paarl Mountain. The construction of the new WTW was identified as the most cost effective way to utilise more yield from the Bethel and Nantes Dams and from Drakenstein Municipality's allocation from the Berg River. In addition to this, the Paarl Mountain WTW was also required to address potential water quality concerns.

The new 8 Mℓ/d Meulwater WTW was put into operation during January 2012. One of the recommendations from the Drakenstein Bulk Water Supply Study was that all future source interventions of the Drakenstein Municipality should be benchmarked against the current and proposed bulk water supply tariff of the CCT. Another recommendation was that the proposed CCT / Drakenstein Agreement should also be updated to include Drakenstein Municipality's "entitlement" from the Berg Water Project, future water resource development principles and the operation procedures for an integrated system.

Stellenbosch Municipality

Stellenbosch Municipality completed a "Bulk Water Supply Improvements for Stellenbosch Municipality" study during June 2012. The study included several source augmentation options for the four water distribution systems in Stellenbosch Municipality's Management Area (see Table 7).

An updated water supply agreement between Stellenbosch Municipality and the CCT for the provision of bulk potable water also needs to be finalised.

Table 7: Augmentation options for the water distribution systems, Stellenbosch Municipality

System	Augmentation options investigated
Stellenbosch	• Upgrade of existing Ida's Valley water supply scheme to Stellenbosch with increased Jonkershoek Weir abstraction allocations. • Upgrade of existing Ida's Valley water supply scheme to Stellenbosch with increased allocation from Kleinplaas Dam. • Upgrade of existing Paradyskloof water supply scheme with increased DWA allocations. • Raising of existing Ida's Valley Dam. • New bulk water supply scheme from the Berg River Dam to Stellenbosch. • New bulk water supply scheme from the new Jonkershoek Dam to Stellenbosch. • Re-use of treated sewage water from the existing WWTWs for irrigation of sport fields and parks. • Conduct water pressure demand management, by implementation of pressure reducing valves. • Conduct water meter audits and water loss investigations. • Rainwater harvesting. • Groundwater development.
Dwars River	• New water supply scheme via Boschendal Estate (New bulk supply scheme from Berg River or Theewaterskloof Tunnel) • Re-use of treated sewage water • Pressure demand management. • Water meter audits and water loss investigations. • Rainwater harvesting. • Groundwater development.
Franschhoek	• Upgrade of existing Wemmershoek water supply scheme to Franschhoek with increased CCT allocations. • New additional parallel Wemmershoek water supply scheme with increased CCT allocations. • New bulk water supply scheme from the Berg River Dam or Theewaterskloof Tunnel to Franschhoek. • Replacement of existing Perdekloof water supply scheme's non-pressurized gravity mains and relocation of Franschhoek WTW. • Re-use of treated sewage water from the existing WWTW for irrigation of sports fields and parks. • Conduct water pressure demand management, by implementation of pressure reducing valves. • Conduct water meter audits and water loss investigations. • Rainwater harvesting. • Groundwater development
Klapmuts	• Increased CCT allocations. • Re-use of treated sewage water from the future upgraded WWTW for irrigation of sports fields and parks. • Conduct water pressure demand management, by implementation of pressure reducing valves. • Conduct water meter audits and water loss investigations. • Groundwater development. • Rainwater harvesting.

3. Current Situation

3.1 Current Water Requirements

3.1.1 City of Cape Town (CCT)

Historical Water Requirements

The historical water requirements of the CCT's bulk system is summarised in the table below (information as submitted to the DWA on a quarterly basis):

Table 8: Historical bulk water use of the City of Cape Town (kℓ/a)

Description	07/08	08/09	09/10	10/11	11/12	12/13
Total treated water after WTW	315 555 297	325 691 626	331 895 445	336 271 703	330 040 938	320 921 722
Bulk water sales to External WSAs	30 503 933	30 256 583	29 325 817	32 879 785	33 808 187	33 034 548
Bulk system losses after WTWs	23 929 315	22 425 217	27 248 382	18 286 584	19 329 188	16 553 288
Treated water supplied to CCT Ret.	261 122 049	273 009 826	275 321 246	285 217 698	276 903 563	271 333 886
Total from WCWSS	301 555 297	311 691 626	317 890 000	322 270 000	316 040 000	306 370 000

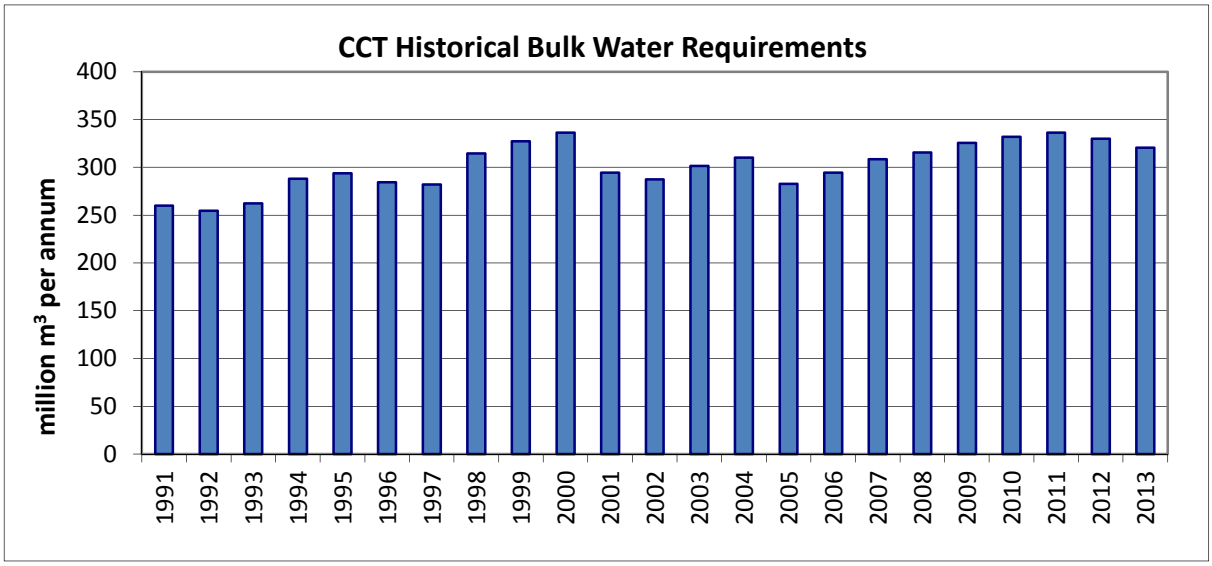


Figure 4: Historical bulk water use of the City of Cape Town

Water Use per Sector

The table and figure below gives an overview of the water usage per sector for the CCT for the last four years:

Table 9: Water requirement per sector for the CCT (kℓ/a)

Year	Government	Industrial	Municipal	Other	Commercial	Domestic	Total
Volume							
09/10	4 457 276	8 532 560	12 312 820	14 089 361	25 541 890	153 556 030	**218 489 936**
10/11	6 681 757	9 118 368	13 460 566	12 880 405	27 554 094	159 383 764	**229 078 954**
11/12	7 182 106	9 799 381	12 688 747	13 981 879	27 174 713	168 741 537	**239 568 364**
12/13	5 287 687	8 655 943	12 694 275	14 972 605	27 241 516	165 506 625	**234 358 650**
Percentage Annual Increase / Decrease							
09/10 – 10/11	49.91%	6.87%	9.32%	-8.58%	7.88%	3.80%	4.85%
10/11 – 11/12	7.49%	7.47%	-5.73%	8.55%	-1.38%	5.87%	4.58%
11/12 – 12/13	-26.38%	-11.67%	0.04%	7.09%	0.25%	-1.92%	-2.17%

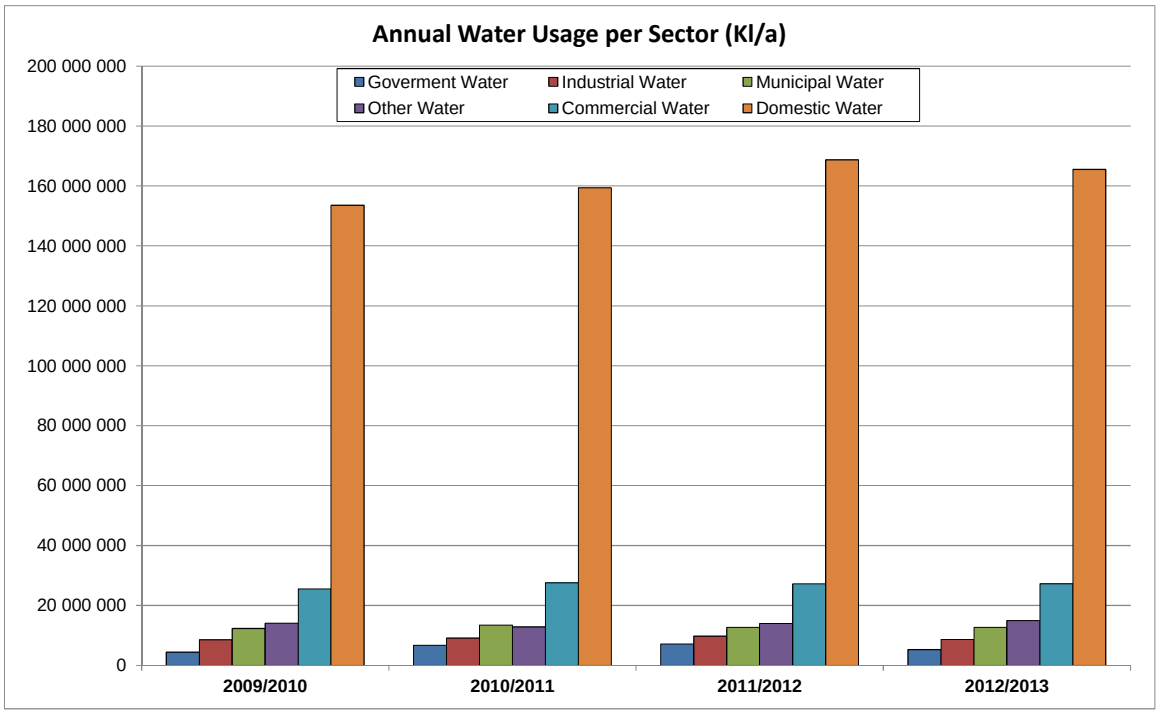


Figure 5: Water use per sector in the City of Cape Town

3.1.2 Other Municipalities

West Coast District Municipality

The West Coast District Municipality supply potable water to Saldanha Bay, Swartland, Bergrivier and Drakenstein local municipalities (only Gouda) through their Withoogte and Swartland bulk distribution systems. The table below gives an overview of the towns supplied with potable water.

Table 10: Towns supplied with potable water by the West Coast District Municipality

Bulk System	Local Municipality	Towns
Withoogte (from Misverstand on Berg River)	Saldanha Bay	Hopefield, Langebaan, Vredenburg, Saldanha, St Helena Bay
	Swartland	Koringberg, Moorreesburg
	Bergrivier	Velddrif, Dwarskersbos
Swartland (from Voëlvlei)	Swartland	Malmesbury (Abbotsdale, Kalbaskraal, Chatsworth, Riverlands), Darling, PPC, Riebeek West, Riebeek Kasteel, Yzerfontein
	Drakenstein	Gouda

The current allocations for the West Coast District Municipality's bulk distribution systems are as follows:

Table 11: Allocations for the West Coast District Municipality's bulk distribution systems (kℓ/a)

Name	Resource Name	Permit Reg. Certificate	Current Allocations
Withoogte Misverstand	Berg River	No. 22062820	17 440 000
Swartland Voëlvlei	Berg River (Voëlvlei Dam)	No. 22062777	4 200 000
Langebaan Road boreholes	Saldanha Underground	No. 22062688	1 500 000
Minus 10% of Langebaan Road (as recommended by Monitoring Committee)			-150 000
Total Allocation for West Coast DM			**22 990 000**
Total Allocation for West Coast DM from WCWSS			**21 640 000**

The historical water requirements of the West Coast District Municipality are summarised in the table below.

Table 12: Raw water abstracted by the West Coast DM for the various financial years (kℓ/a)

Source	07/08	08/09	09/10	10/11	11/12	12/13
Withoogte Misverstand	16 179 454	17 487 890	16 932 258	16 705 674	17 525 046	18 692 770
Langebaan Road Aquifer	1 014 826	436 312	621 476	972 433	1 088 030	931 778
Swartland Voëlvlei	6 572 601	6 661 635	6 761 867	6 636 187	6 592 732	6 595 709
Total for West Coast DM	**23 766 881**	**24 585 837**	**24 315 601**	**24 314 294**	**25 205 808**	**26 220 257**
Total from WC WSS	**22 752 055**	**24 149 525**	**23 694 125**	**23 341 861**	**24 117 778**	**25 288 479**

The West Coast District Municipality exceeded their allocation from the WCWSS at least for the last six (6) years, including by 3.6 million m^3 in the last financial year.

In addition to the direct supply from the WCWSS, the Bergrivier LM abstracts water from the Berg River for domestic supply to Piketberg.

Drakenstein Local Municipality

The Paarl and Wellington distribution system is an integrated system, with potable water supply from the WCWSS and raw water supply from the Municipality's own sources, which include the Berg River, Bethel and Nantes dams and the Antoniesvlei / Withoogte scheme. Saron and Bainskloof are also supplied with bulk raw water from the Municipality's own sources. Gouda is supplied with potable water from the West Coast District Municipality from their Swartland WTW and Hermon is supplied with potable water from the WCWSS. The current allocations for the towns in Drakenstein Municipality's Management Area are as follows:

Table 13: Allocations for the towns in Drakenstein Municipality's Management Area (kℓ/a)

Town	Resource Name	Permit Reg. Certificate	Current Allocations
Paarl	Wemmershoek	CCT Agreement	17 300 000
Wellington	Wemmershoek	CCT Agreement	8 500 000
Paarl	Nantes and Bethel Dams	No. 22058657	200 00
Paarl	Berg River	No. 22087162	2 109 000
Wellington	Antoniesvlei / Withoogte	No. 22058675	403 000
Saron	Leeu River (Klein Berg River)		465 415

The historical water requirements and the bulk water supply to the towns in Drakenstein Municipality's Management Area are summarised in the table below:

Table 14: Bulk water supply to the towns in the Drakenstein Municipality's Management Area (kℓ/a)

Towns	Source	07/08	08/09	09/10	10/11	11/12	12/13
Paarl and Wellington	Berg River, Bethel and Nantes Dams	378 120	322 375	393 488	1 036 156	632 409	916 163
	Antoniesvlei	274 191	305 527	314 970	392 103	249 286	157 594
	WCWSS	16 133 468	14 859 770	15 216 342	15 392 072	15 771 466	15 739 475
Saron	Leeu River	647 298	596 876	571 893	594 291	588 423	556 050
Gouda	Swartland (WC DM)	147 568	147 998	145 658	159 918	154 788	174 238
Hermon	WCWSS	32 770	33 763	33 927	41 925	47 962	37 346
Bainskloof	Wit River	4 727	5 322	3 789	4 708	4 057	3 855
Total Drakenstein LM.		**17 618 142**	**16 271 631**	**16 680 067**	**17 621 173**	**17 448 391**	**17 584 721**

Note: Water supply from WCWSS to Drakenstein covered under CCT bulk water and Swartland bulk water

Stellenbosch Local Municipality

The Stellenbosch area is supplied with raw water from mainly two sources, namely the Eerste River and the WCWSS. Water from the Eerste River in the Jonkershoek Valley is diverted by means of a weir and a gravity pipeline to two off-channel storage dams in Ida's Valley. The registered abstraction from this source is 7.224 million m³/a. During the summer water is being drawn from the WCWSS. This is obtained via a pipeline leading from the Stellenboschberg Tunnel outlet to the Paradyskloof WTW. A volume of 3 million m³/a is available from this source.

Franschhoek, which includes the smaller settlements of Groendal, La Motte, Wemmershoek and Robertsvlei is currently supplied with water from local sources in the catchments of the Mount Rochelle Nature Reserve and Perdekloof and with potable water from the WCWSS (Wemmershoek Dam). The licensed abstraction from the perennial streams in the Mount Rochelle Nature Reserve is 0.221 million m³/a, from the Perdekloof Weir 0.577 million m³/a and from the Du Toits River 0.104 million m³/a.

The Dwarsrivier system includes Pniel, Kylemore, Lanquedoc, Johannesdal and Groot Drakenstein. These areas are supplied with potable water from the WCWSS (Wemmershoek Dam). The local sources, which are currently not in use, include the Pniel Mountain Stream (0.053 million m³/a), Pniel Spring (0.025 million m³/a) and the Pniel Kloof Street Borehole (0.079 million m³/a)

The historical water requirements and the bulk water supply to the towns in Stellenbosch Municipality's Management Area are summarised in the table below (Treated Water):

Table 15: Bulk water supply to the towns in the Stellenbosch Municipality's Management Area (kℓ/a)

Towns	Source	07/08	08/09	09/10	10/11	11/12	12/13 [1]
Franschhoek	WCWSS, Mount Rochelle, Perdekloof, Du Toits River	1 516 520	1 501 213	1 454 406	1 472 275	1 441 052	885 378
Dwarsrivier	WCWSS	626 490	862 570	718 970	666 729	767 947	528 840
Klapmuts	WCWSS	339 886	359 033	382 617	376 656	320 030	289 955
Stellenbosch	WCWSS, Eerste River	10 335 042	10 509 918	9 678 316	10 273 397	7 927 739	5 659 578
Total Stellenbosch Mun.		**12 817 938**	**13 232 734**	**12 234 309**	**12 789 057**	**10 456 768**	**7 363 751**
Treated water from WCWSS (CCT) [2]		1 904 917	1 960 907	1 367 920	2 303 000	2 051 000	1 400 000
Raw water from WCWSS [2]		1 978 545	2 944 896	2 681 935	3 290 000	2 930 000	2 000 000

Note: 1) Period July 2012 – March 2013 (9 Months); 2) estimated for 2010/11, 2011/12 and 2012/13

Summary

The total urban supply from the WCWSS is indicated in the table below and shown in Figure 6.

Table 16: Raw water abstracted by the different municipalities for the various financial years (kℓ/a)

Source	07/08	08/09	09/10	10/11	11/12	12/13
Bulk water CCT	315 555 297	325 691 626	331 895 445	336 271 703	330 040 938	320 921 722
Bulk water CCT, own sources	14 000 000	14 000 000	14 000 000	14 000 000	14 000 000	14 000 000
Bulk water CCT, WCWSS	301 555 297	311 691 626	317 890 000	322 270 000	316 040 000	306 370 000
Bulk water Withoogte	16 179 454	17 487 890	16 932 258	16 705 674	17 525 046	18 692 770
Bulk water Swartland	6 572 601	6 661 635	6 761 867	6 636 187	6 592 732	6 595 709
Bulk water Stellenbosch	1 978 545	2 944 896	2 681 935	3 290 000	2 930 000	2 000 000
Urban total from WCWSS	**326 285 897**	**338 786 047**	**344 266 060**	**348 901 861**	**343 087 778**	**333 658 479**

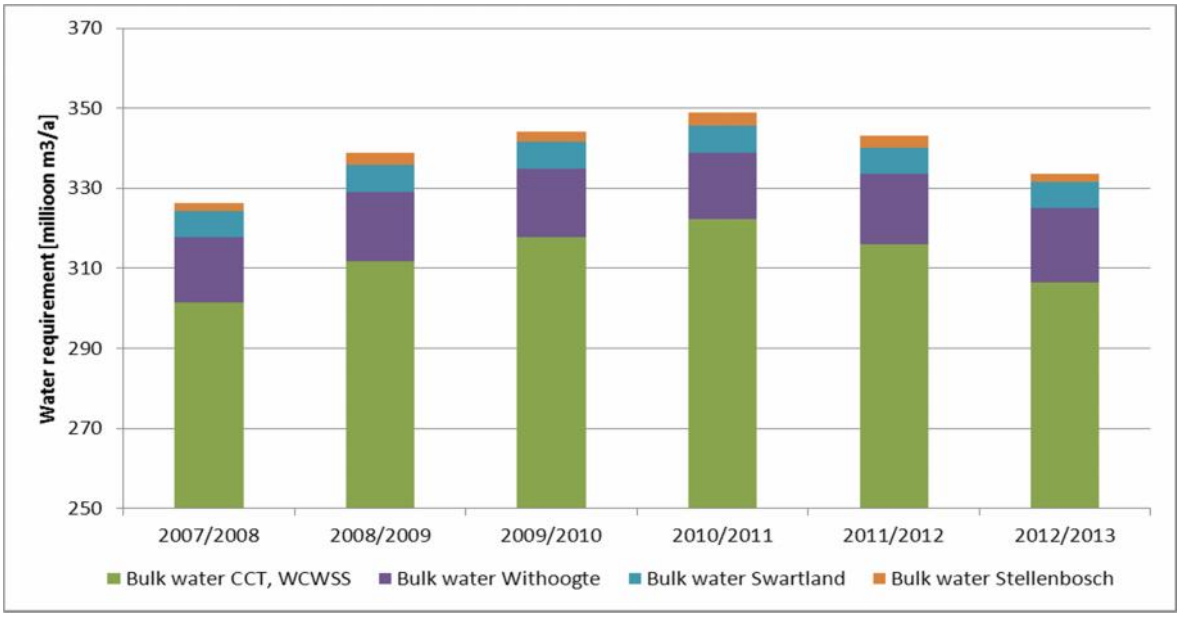


Figure 6: Historical urban bulk water requirements from the WCWSS

3.1.3 Agriculture

The agricultural use from the WCWSS is measured by the releases from the dams and or the abstraction from canals and pipelines. The volume provided between July 2012 and June 2013 is currently not available, but will be updated in the final version of this report. It must be noted that the agriculture sector did most probably not use the full volume and it is anticipated that a significant quantity of water released from the Berg River Dam and from the Voëlvlei Dam was not abstracted by agriculture and ended up flowing into the Berg River estuary.

For planning purposes the actual water requirement for agriculture was “adjusted” to take into account the variability of rainfall, possible additional releases and the fact the agricultural sector can still grow into their capped allocation. It is important to use the “adjusted” total water requirement for planning purposes as it is in times of drought when the agricultural sector will maximise their water use from the WCWSS, as their farm dams may not be full.

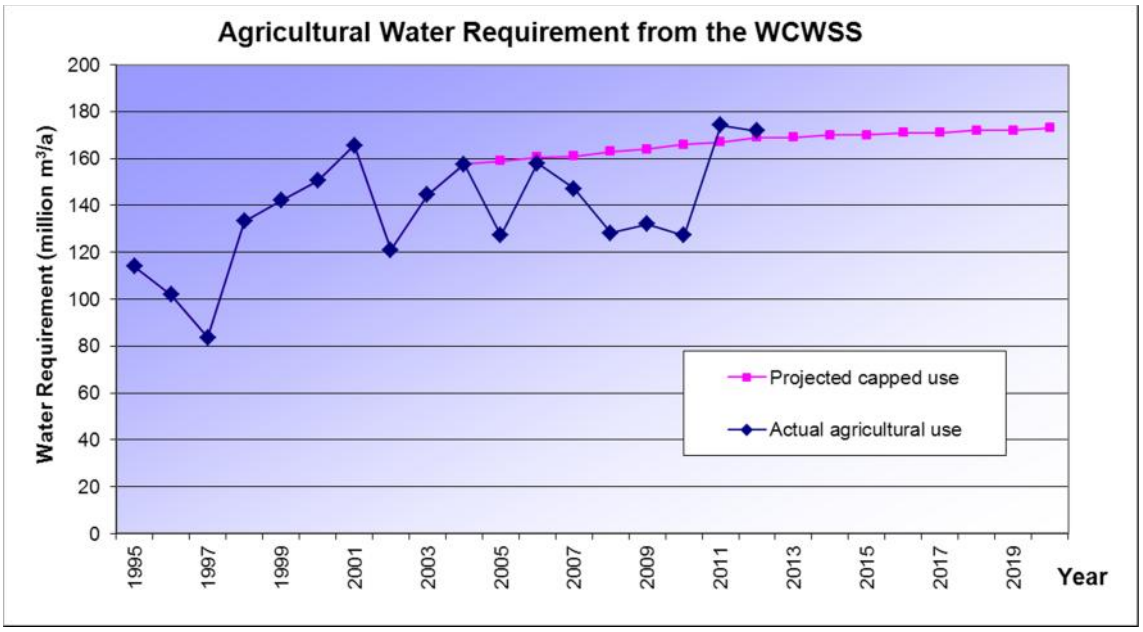


Figure 7: Historic agricultural use and adjusted use (to be updated)

3.1.4 Summary

The actual sectoral water use pattern (based on releases from the dams) in the WCWSS for 2012/13 was as follows:

- Urban: 333.7 million m^3/a
- Irrigation releases: not available
- TOTAL (estimated): ~ 500 million m^3/a

The "adjusted" total water use from the WCWSS is given below.

- Urban: 333.7 million m^3/a
- Irrigation estimated: 169.0 million m^3/a
- TOTAL 502.7 million m^3/a

3.2 Water Balance

The Berg Water Availability Assessment Study by the DWA showed that the integrated historical firm yield of the system remained at 556 million m^3/a. However the 1:50 year stochastic yield, determined with DWA's Water Resource Planning Model (WRPM) showed that the sum of the increases of the standalone 1:50 year yields of the individual dams could result in a combined increase in yield of 26 million m^3/a. This is however not the full yield of the system and an additional approximately 14 million m^3/a is available if all the dams are managed and operated as a system so as to maximise the water resource situation at the end of winter each year. The updated total integrated system yield at a 98% level of supply assurance is therefore 596 million m^3/a.

A comparison between the estimated total water requirement from the WCWSS and the high water requirement curve developed during the Reconciliation Strategy Study (refer to Figure 8) shows that the adjusted total water requirement falls below the high water requirement curve. The "adjusted" total water usage from the WCWSS for 2013 is approximately 503 million m^3/a, compared to the existing WCWSS available yield of 596 million m^3/a.

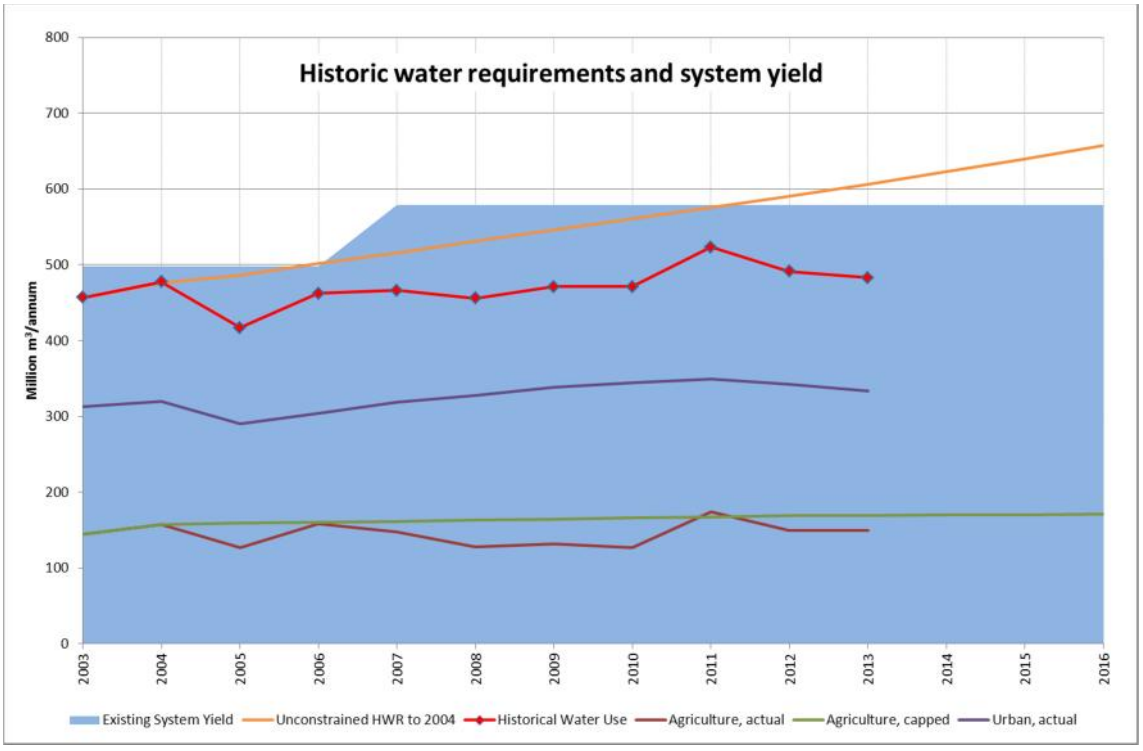


Figure 8: Total water requirement from and total yield of the WCWSS (to be updated)

3.3 Intervention Implementation Programme

3.3.1. Available interventions

Based on the current status of the feasibility studies (see Section 2.2), the following interventions are considered available for possible implementation, when a new supply-side intervention is required:

- Berg River-Voëlvlei (Phase 1) Augmentation Scheme
- Desalination
- Water re-use
- TMG Aquifer

3.3.2. Leadtimes and programme

The updated implementation programmes for the Berg River-Voëlvlei (Phase 1) Augmentation Scheme, desalination, water re-use, and the TMG Aquifer scheme are shown in Appendix C of this Report. The comparative fast-tracked programmes for these schemes are also shown in Appendix C. Fast-tracking an intervention could be achieved through either minimising the time taken by the approval processes, and/or running the environmental approval process and scheme design as parallel processes.

There are two options for the TMG Aquifer scheme;

a) either to proceed with a pilot well field to conclude the Feasibility Study and Pilot Project, as originally envisaged by the City (the City's currently approved approach),
b) or to commence the incremental development of a well field based on the current results of the feasibility study, without completion of the Pilot Phase (this changed approach would require approval within the City and consultation with stakeholders).

Both options are shown with their respective lead times in the table below and in Appendix C.

Table 17: Lead time programme for the different steps of implementation for the relevant interventions

INTERVENTION PROGRAMMES	Feasibility (years)			Construction/Implementation (years)					Implementation lead time
Scheme	Lag time (budget delay)	TOR / Appoint Consultant	Feasibility Study / EIA / Reserve	Lag time (budget delay)	TOR / Appoint Consultant	DWA / DEA&DP Approval	Design / tender prepar. & award	Construct / Implement / Council Bylaw	
Michell's Pass Diversion			1.5	1	1	1.5	2	2	**9**
Voëlvlei Phase 1			1	1	0.5	0.5	2	2.5	**7.5**
Cape Flats Aquifer	0.5	0.5	2.5	1	1	1.5	1.5	2	**10.5**
Artificial Recharge: West Coast		0.5	2.5	1	1	1.5	2	1.5	**10**
TMG Scheme (with Pilot Phase)		0.5	4	1	0.5	1	1	2	**10**
TMG Scheme (without Pilot Phase)				1	0.5	1.5	1	2	**6**
Water Re-use			2	1	0.5	0.5	1.5	2.5	**8**
Seawater Desalination			2	1	0.5	0.5	1.5	2.5	**8**
Lourens River		1	2	1	1	1.5	2	1.5	**10**
Raise Lower Steenbras	1	1	2	1	1	1.5	2.5	3	**13**
Voëlvlei Phases 2 & 3	1	1	2	2	1	2	2.5	2.5	**14**

The construction programme for any of these interventions would be quite tight and is based on a number of construction activities being implemented in parallel.

3.4. Other considerations

3.4.1 Berg River Water Quality

Pollution in the Berg River catchment of the Western Cape is a cause of concern especially to communities, farmers and industries in the various municipalities of the West Coast and Cape Winelands regions. Various stakeholders have implemented initiatives to address the pollution concerns raised. The Western Cape Government recently developed and endorsed the implementation of a Berg River Improvement Plan (BRIP) to address water security concerns (i.e. quality and quantity) in the Berg River catchment. The plan identifies short (≤ 5 years) and long-term (5 – 30 years) interventions, and their financial implications. The objectives of the plan are to:

- reduce the negative impact from Municipal urban areas, particularly informal settlements and wastewater treatment works;
- reduce the negative impact of agriculture on the Berg River's water quality to acceptable levels;
- ensure sustainable resource use efficiency and ecological integrity.

A Steering Committee, comprising of various Departments and agencies from the National (Water Affairs; Working for Water - WfW), Provincial (Environmental Affairs and Development Planning – DEADP; Local Government – DLG; Human Settlements – DHS; Agriculture – DoA; Economic Development and Tourism – DEDAT; CapeNature; GreenCape) and Local Government (Municipalities), has identified the six (6) tasks to achieve the objectives. The Steering Committee meets every fortnight to monitor and ensure the successful implementation of these tasks:

Task 1: Implement a Berg River Water Quality Monitoring Regime

Task 2: Upgrade Wastewater Treatment Works and Train Process Controllers

Task 3: Upgrade Informal Settlements

Task 4: Advocate Best Practice in Agricultural and Agro-Industrial Processes

Task 5: Riparian Zone Rehabilitation and Bio-remediation

Task 6: Pricing Water Management in the Berg River Catchment

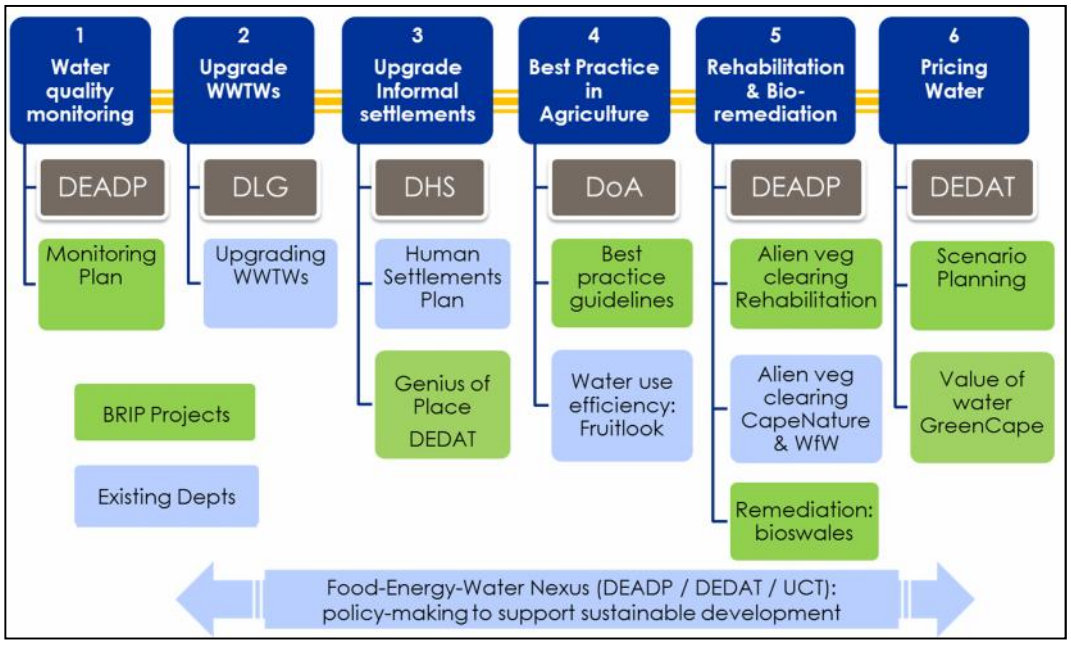


Figure 9: Alignment of BRIP projects (green) and existing Departmental projects (blue) to Tasks 1 – 6.

4. Strategy Update 2013

4.1. Water Requirement Scenarios

Two basic water requirement scenarios have been developed for use in the reconciliation scenarios. The possible impact of WC/WDM measures is not included in the water requirement scenarios, but considered under the reconciliation scenarios (see Section 4.2).

4.1.1. Start year

It was decided to project the water requirements forward from the adjusted water use of the 2012/2013 financial year, ending July 2013. The reasoning for this decision is given below and shown in Figure 10.

- The WCWSS Water Reconciliation Strategy (2007) used a 3% growth scenario, starting in 2004, due to the drought measures and restrictions in 2005.
- The last Status Report (2011) used a 3.01% growth scenario, starting in 2007, following the trend in growth between 2005 and 2009.
- The slowdown and subsequent reduction in growth of water requirement in the years 2011 to 2013 is mainly due to the effect of implementing WDM measures, and it can be expected that these reductions are maintained.

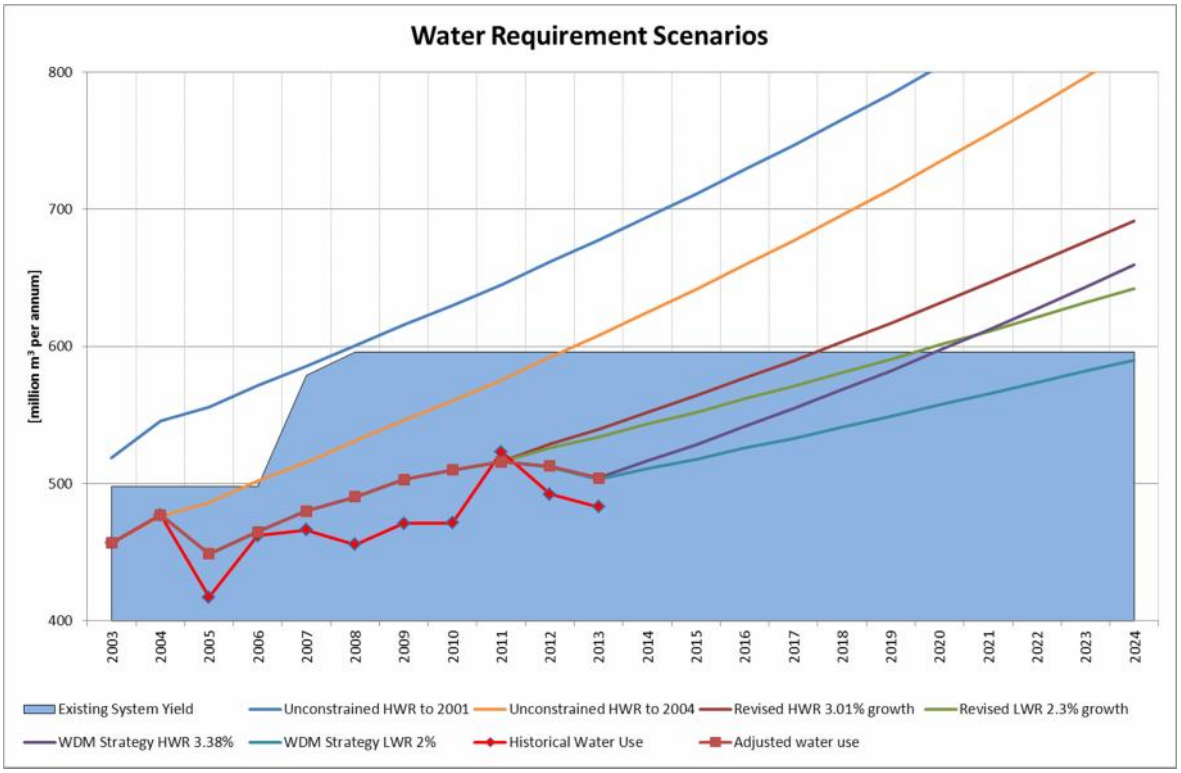


Figure 10: Water requirement scenarios with different start year of projection

4.1.2. Low-growth scenario

The low-growth scenario applies the average annual growth rate of the urban sector between 2007 and 2011 of 2.3%, plus the capped agricultural use. The growth rate prior to 2007 was about 5% due to the recovery from the drought restrictions in 2004/2005, while the growth rate in 2012 and 2013 was negative due to the successful implementation of WDM measures. Hence, the selected range can be considered a realistic growth in water requirement.

4.1.3. High-growth scenario

The high growth scenario adopts the high growth scenario from the City's WDM Strategy (3.38%) for CCT and 4% for the West Coast DM and Stellenbosch supply areas, plus the capped agricultural use.

4.2. Reconciliation Scenarios

In order to obtain a good understanding of the range of possible implementation dates of the next required supply-side intervention, three scenarios were developed taking account of updated water requirements, the potential effectiveness of implementing WC/WDM measures and achieving the targeted savings, potential climate change impacts, the current *status quo* of the feasibility studies, and implementation progress with interventions.

The following three scenarios were investigated:

1. Scenario 1: 2013 Base Scenario: Revised Integrated System Yield, "High water requirement", CCT WC/WDM strategy 100% successful (2014 to 2020), no climate change impact

2. Scenario 2: 2013 Planning Scenario: Revised Integrated System Yield, "High water requirement", CCT WC/WDM strategy 50% successful (2014 to 2020), no climate change impact

3. Scenario 3: "Worst-Case" Scenario: Revised Integrated System Yield, "High water requirement", CCT WC/WDM strategy 50% successful (2014 to 2020) with possible effects of climate change.

Many more scenarios exist between the 2013 Planning Scenario and the "Worst-Case" Scenario, but if solutions could be found for these two scenarios, all other eventualities should be covered. Should the adjusted total water requirement follow a lower trajectory than the High Water Requirement Curve, then the required implementation date of interventions could be delayed and more options for implementation would become available to select from.

4.2.1. Base Scenario – High Growth with 100% successful WC/WDM

The 2013 Base Scenario assumes that the CCT is able to achieve 100% of their WC/WDM targets and anticipated savings for the period 2014 to 2020, based on the updated WC/WDM Strategy and programme.

Under this scenario the requirement for water would exceed the available supply in 2024.

The following interventions would be available for implementation by 2024:

- Berg River-Voëlvlei (Phase 1)
- TMG Aquifer
- Water re-use
- Desalination of seawater.

The following interventions will not be available for implementation by 2024:

- Michell's Pass Diversion – subject to a Water Availability Assessment Study in the Breede River to determine the available yield
- Raising of Steenbras Upper Dam – Feasibility Study not commenced and much longer lead time required to implement
- Development of the Lourens River Diversion, Cape Flats or Newlands Aquifer – not available for implementation by 2024 as the CCT, with its current limited human and financial resources, has decided to focus its attention on initiating water re-use and desalination feasibility studies as their first priority.

After the implementation of one of the four options by 2024, a whole range of options then become available to be implemented over time. A possible reconciliation of supply and requirement based on lowest Unit Reference Value (URV) is shown in Figure 11 below, taking into account those interventions that could potentially be implemented in time. This represents only one potential development sequence. Other potential development sequences could include other surface water or groundwater interventions. In Table 18 the interventions which have been used in Figure 11 are listed in sequence of implementation as shown.

Table 18: Possible intervention implementation programme for Reference Scenario

INTERVENTION SELECTION		YEAR	YIELD (million m^3/a)	Total Lead Time	Required Study Start Date	Time to full yield / saving	Study Status Completed
1	Berg River-Voëlvlei Phase 1	2024	23	7.5	2016	1	F
2	TMG Scheme 1 (after Pilot Phase)	2025	20	10	2016	1	PF
3	Re-use Generic 1	2026	40	8	2018	2	PF
4	TMG Scheme 2	2028	50	10	2018	2	PF
5	Re-use Generic 2	2031	40	8	2023	2	PF
6	Desalination	2033	80	8	2025	3	PF

Note: It is important to note that the implementation dates almost follow year-on-year, due to the relative small yields of the different schemes.

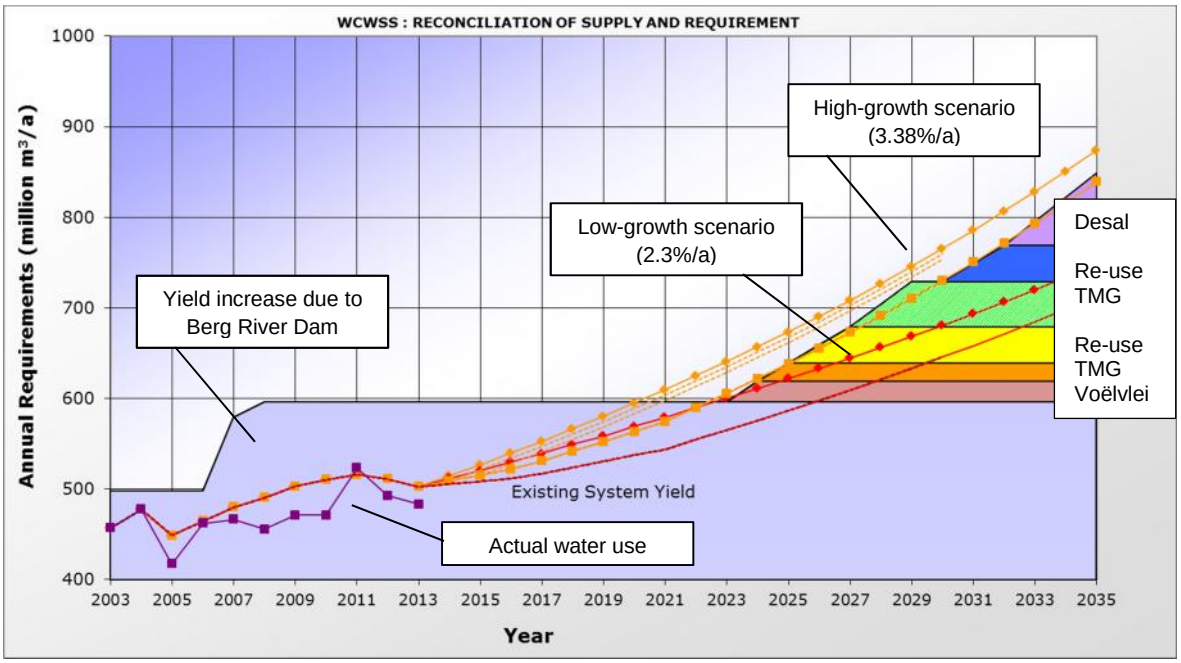


Figure 11: Reconciliation of water supply and requirement for the Reference Scenario

4.2.2. Planning Scenario – High Growth with 50% successful WC/WDM

This Scenario assumes that the CCT is only able to achieve 50% of its year-on-year WC/WDM targets for the period 2014 to 2020, based on the updated WC/WDM Strategy and programme.

Under this scenario the requirement for water would exceed the available supply in 2022.

All four possible interventions listed in Section 4.2.1 above would be available for implementation in 2022. However, the TMG Aquifer Scheme would need to be fast tracked or implemented without waiting for the Pilot Phase.

A possible reconciliation of supply and requirement for the WC/WDM 50% successful Scenario is shown in Figure 12. This represents only one potential development sequence. Table 19 lists the supply-side interventions which have to be implemented in order to ensure the reconciliation of supply and requirement up to 2035 under this scenario.

Table 19: Possible intervention implementation programme for Planning Scenario

INTERVENTION SELECTION		YEAR	YIELD (million m^3/a)	Total Lead Time	Required Study Start Date	Time to full yield / saving	Study Status Completed
1	Berg River-Voëlvlei Phase 1	2022	23	7.5	2014	1	F
2	TMG Scheme 1 (after Pilot Phase)	2024	20	10	2014	1	PF
3	Re-use Generic 1	2025	40	8	2017	2	PF
4	TMG Scheme 2	2028	50	10	2018	2	PF
5	Re-use Generic 2	2030	40	8	2022	2	PF
6	Desalination	2032	80	8	2024	3	PF

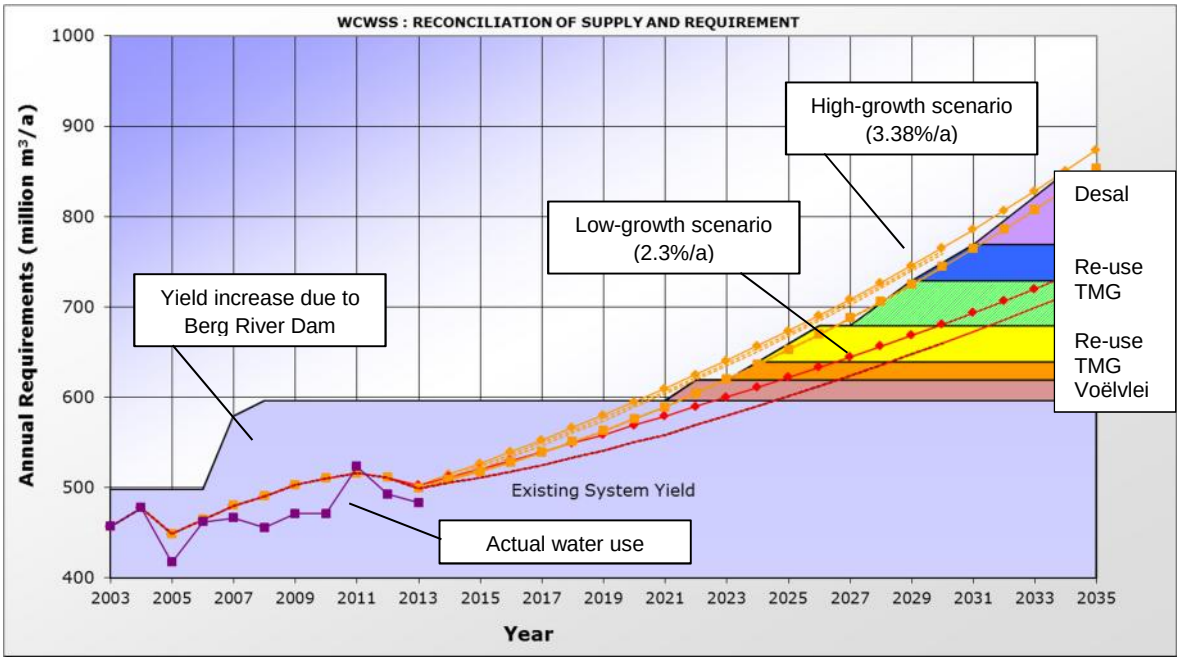


Figure 12: Reconciliation of water supply and requirement for the Planning Scenario

4.2.3. Worst Case Scenario – High Growth and climate change

The Worst-Case Scenario assumes that the CCT is only able to achieve 50% of the WC/WDM targets proposed in the updated WC/WDM Strategy and Programme, and that climate change will impact on the available yield of the WCWSS.

Under this scenario the requirement for water would exceed the available supply in 2021.

It would be very costly to implement additional interventions to offset the potential decrease in yield as a result of climate change. Interventions should therefore only be implemented if proof of a long-term decrease in rainfall were to be found. It is therefore important to monitor for any trend changes in rainfall and run off and to understand the possible impacts of climate change on water requirements. A possible reconciliation of supply and requirement for the Worst-Case Scenario is shown in Figure 13. This represents only one potential development sequence. However, it is noted that additional schemes would need to be implemented, not considered in the previous scenarios; e.g. DWA Artificial Recharge Scheme at Langebaan Road Aquifer and extension of water re-use and or desalination.

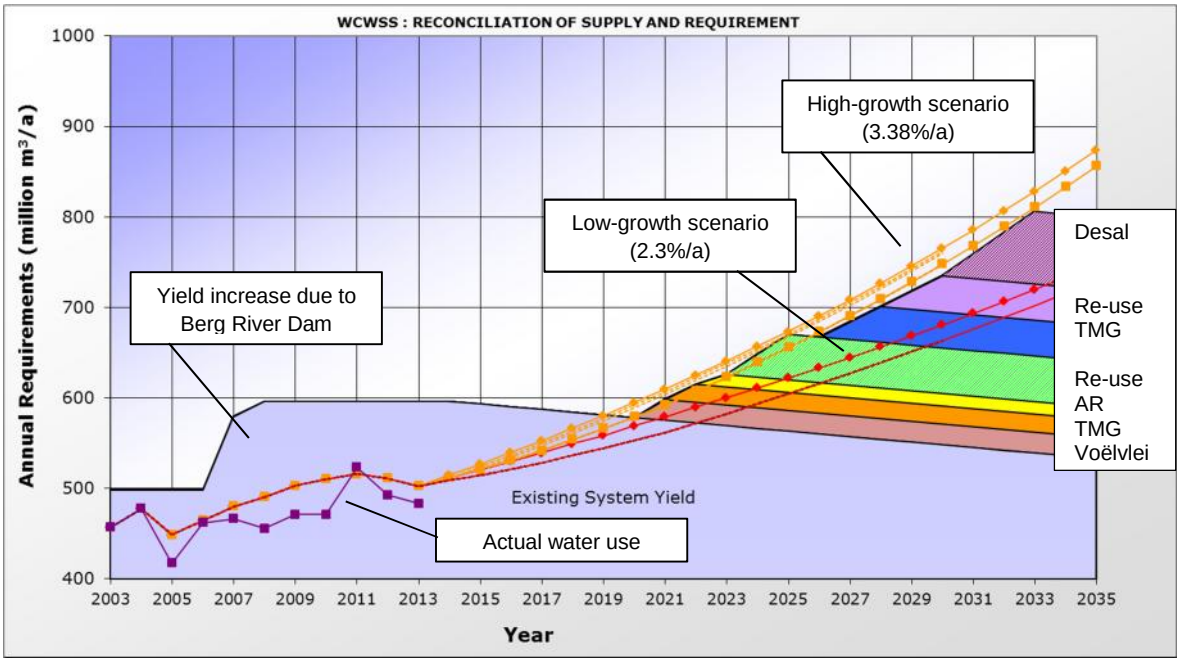


Figure 13: Reconciliation of water supply and requirement for the "Worst Case" Scenario (impact of climate change)

4.3. Implementation of the Ecological Reserve

The ecological Reserve requirement of the Berg River downstream of the Berg River Dam was built into the design and operational rules for the scheme. Dams constructed prior to the Berg River Dam are not yet releasing the ecological Reserve requirements. Based on the 2013 Planning Scenario, it is proposed that the ecological Reserve on "old dams" should only be phased in after 2022 or when a new augmentation intervention has been put in place. Should the Reserve be implemented within the next few years (see Figure 14), it might not be possible to implement interventions in time to offset the loss in yield due to the required environmental flow releases. The implementation of the Reserve should be phased in, in a planned manner, based on the implementation dates of future water augmentation schemes. Figure 15 illustrates a possible scenario for the implementation of the ecological Reserve after 2022.

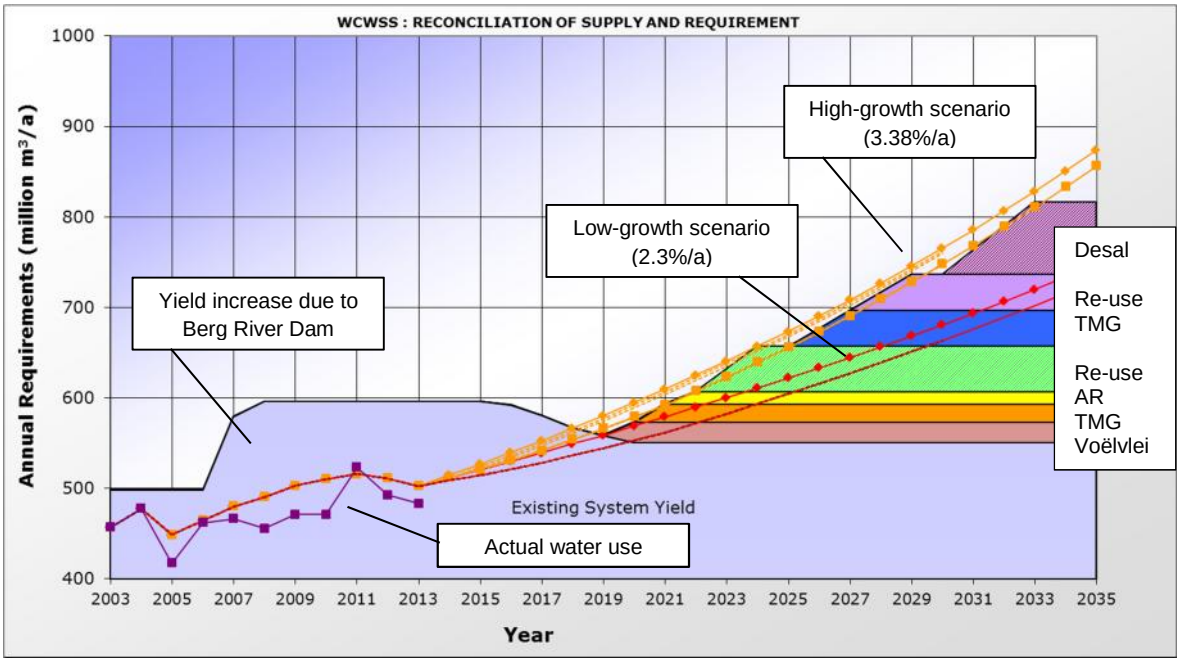


Figure 14: Impact of implementing the Ecological Reserve from 2016 onwards on the reconciliation of water supply and requirement

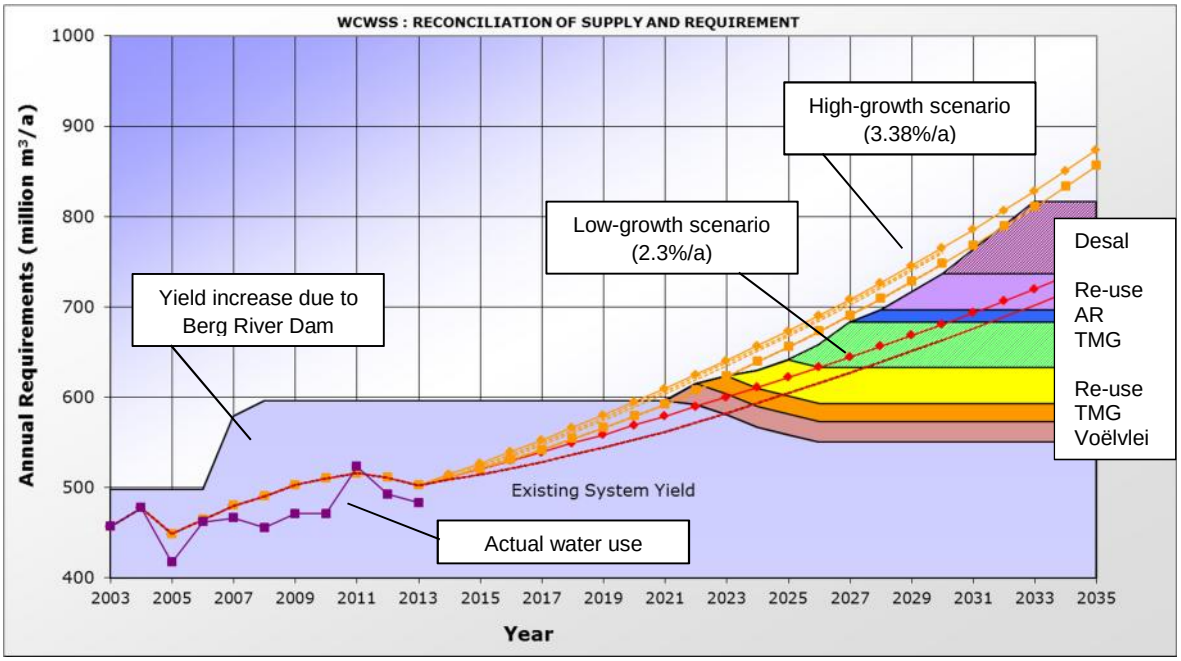


Figure 15: Impact of implementing the Ecological Reserve from 2022 onwards on the reconciliation of water supply and requirement

5. Conclusions and Recommendations

5.1. Conclusions

The following conclusions can be drawn from the 2013 scenario planning and strategy update:

- The WC/WDM Strategy and its implementation by the CCT show positive results, in that water losses and actual water consumption were reduced significantly over the last two years.
- The successful implementation of WC/WDM by all users in the System remains absolutely critical to ensure the on-going reconciliation of supply and requirements.
- The planning scenario (high water requirement growth, 50% success of WC/WDM measures) indicates that the water requirement would exceed the current system yield in 2022, by which time a new supply-side intervention need to be ready for augmenting the water supply.
- The WC/WDM savings and reduction in water requirements mean that the implementation of the next intervention could be delayed by approximately three (3) years.
- It should not be necessary to fast-track a supply-side intervention, unless the ecological Reserve of the old dams is implemented within the next few years.
- Feasibility studies are being undertaken by both the DWA and the CCT to determine which of the four potential augmentation interventions that are on the table should be implemented by 2022, and the possible sequence of the interventions. A decision on which of these interventions to implement first will have to be made at the latest at the October 2015 meeting of the SSC.
- The choice of which intervention to implement will be dependent on the growth in water requirements. If the growth in water requirements is lower than the high water requirement curve, then it may be possible to implement the intervention with the lowest URV. If the water requirements grow at the projected high growth rate, it is important to continue with the feasibility studies for other interventions as well.
- The Decision Support System (DSS) which is currently being developed for the WCWSS includes a real-time monitoring system which helps to improve the management of releases from the major dams and to also reduce potential losses incurred under current operating rules.
- It is important to implement a system to monitor potential indicators of climate change and to monitor the CCT's success in implementing their WC/WDM Strategy measures.
- There is uncertainty surrounding the actual extent of invasive alien plant infestation in the catchment areas of the dams of the WCWSS and this need to be addressed by Working for Water. Clearing of the riparian zones of invasive plants is also seen as a potential way of making some water available to meet ecological water requirements.

5.2. Recommendations

The following recommendations follow from the assessment of the current water requirements and updated scenario planning:

1. The CCT must actively continue with the implementation of its approved and updated WC/WDM Strategy.

2. Regular reviews of the WC/WDM Strategy should be undertaken in order to ensure the objectives and targets set by the Strategy are achieved.

3. The assumptions made in the 2007 Reconciliation Strategy and in the updated WC/WDM Strategy in terms of population growth projections, economic growth projections and anticipated service delivery programmes should be reviewed and updated in order to ascertain whether the assumptions surrounding the development of the High Water Requirement curves are still valid.

4. The Feasibility Studies identified in the 2007 Reconciliation Strategy Study and the 2013 Scenario Planning update need to continue or start, namely:

    a. Berg River-Voëlvlei (Phase 1) Augmentation – commence EIA process in 2013

    b. Michell's Pass Diversion Scheme – DWA to commence Breede WAAS in 2014 to confirm water availability

    c. Raising of Steenbras Lower Dam – DWA/CCT to commence with feasibility study

    d. Langebaan Road Aquifer Artificial Recharge Scheme – DWA to commence with second feasibility study and pilot project in 2013

    e. Table Mountain Group Aquifer (TMG) development – CCT to take decision on how to proceed with the Pilot Phase of the project before end of 2013 and commence work early in 2014,

    f. Cape Flats and Newlands Aquifer development – CCT to start feasibility study in 2014, depending upon the findings of the situation assessment

    g. Lourens River Diversion – CCT to start tender process for appointing a PSP in 2013; study to commence in 2014.

    h. Water Re-use – CCT to award tender and appoint consultants for feasibility study before end of 2013

    i. Desalination of seawater – CCT to conclude feasibility study early in 2014

    j. Clearing of invasive alien vegetation - on-going and extent could be increased.

5. A monitoring system must be put in place to serve as an early warning that climate change has started to impact on water availability and/or water requirements.

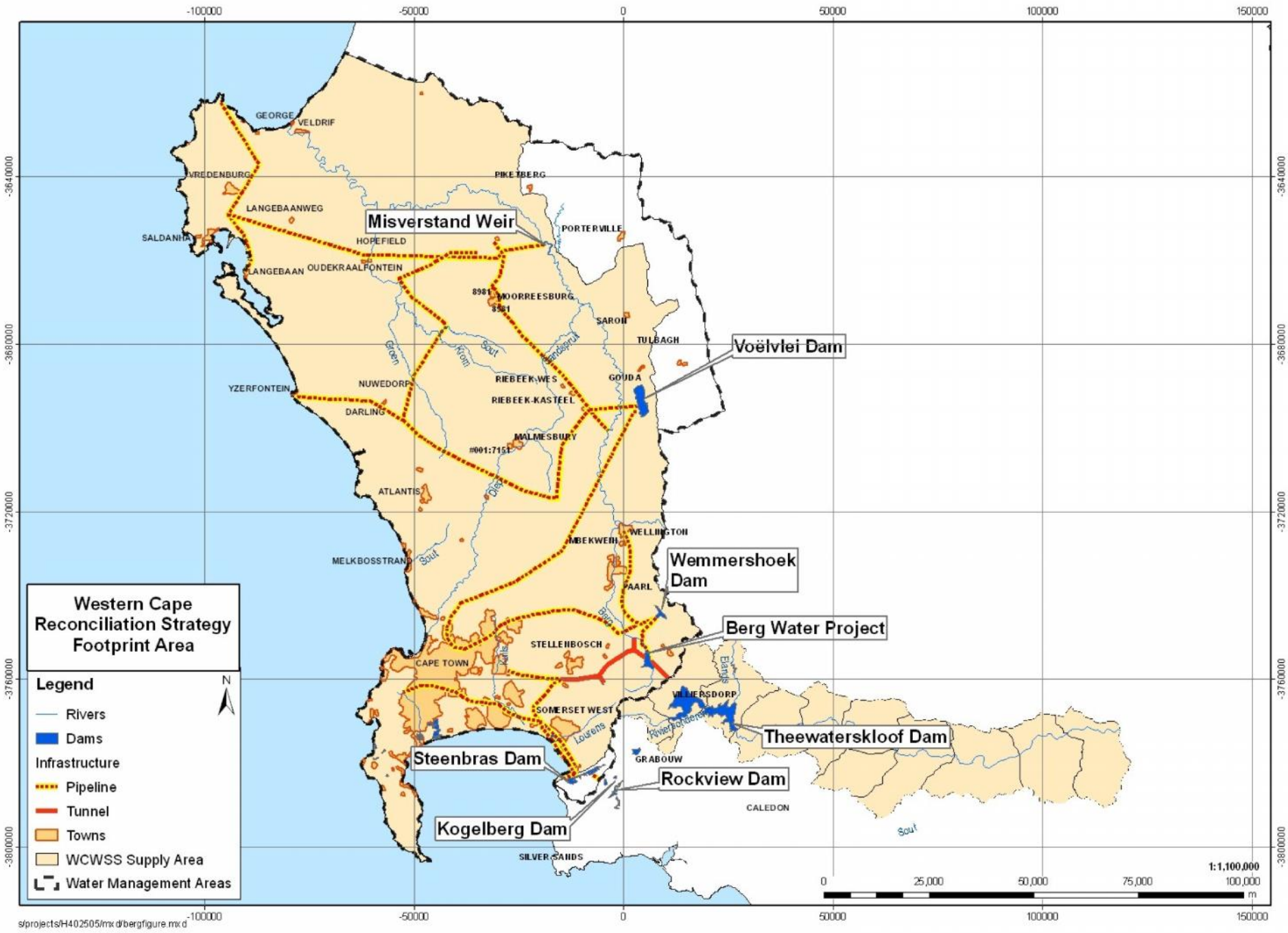
6. The Reconciliation Strategy for the WCWSS should be re-assessed in September 2014 and adjusted if required.

6. References

- Conward Consulting, April 2007. COCT Long-Term Water Conservation and Water Demand Management Strategy, Water & Sanitation.
- CCT (2013). Update and Additions to Initial Long-Term Water Conservation and Water Demand Management Strategy
- DWA, 2011. Western Cape Water Supply System, Reconciliation Strategy, Status Report, November 2011.

Appendices

Appendix A: Extent of WCWSS



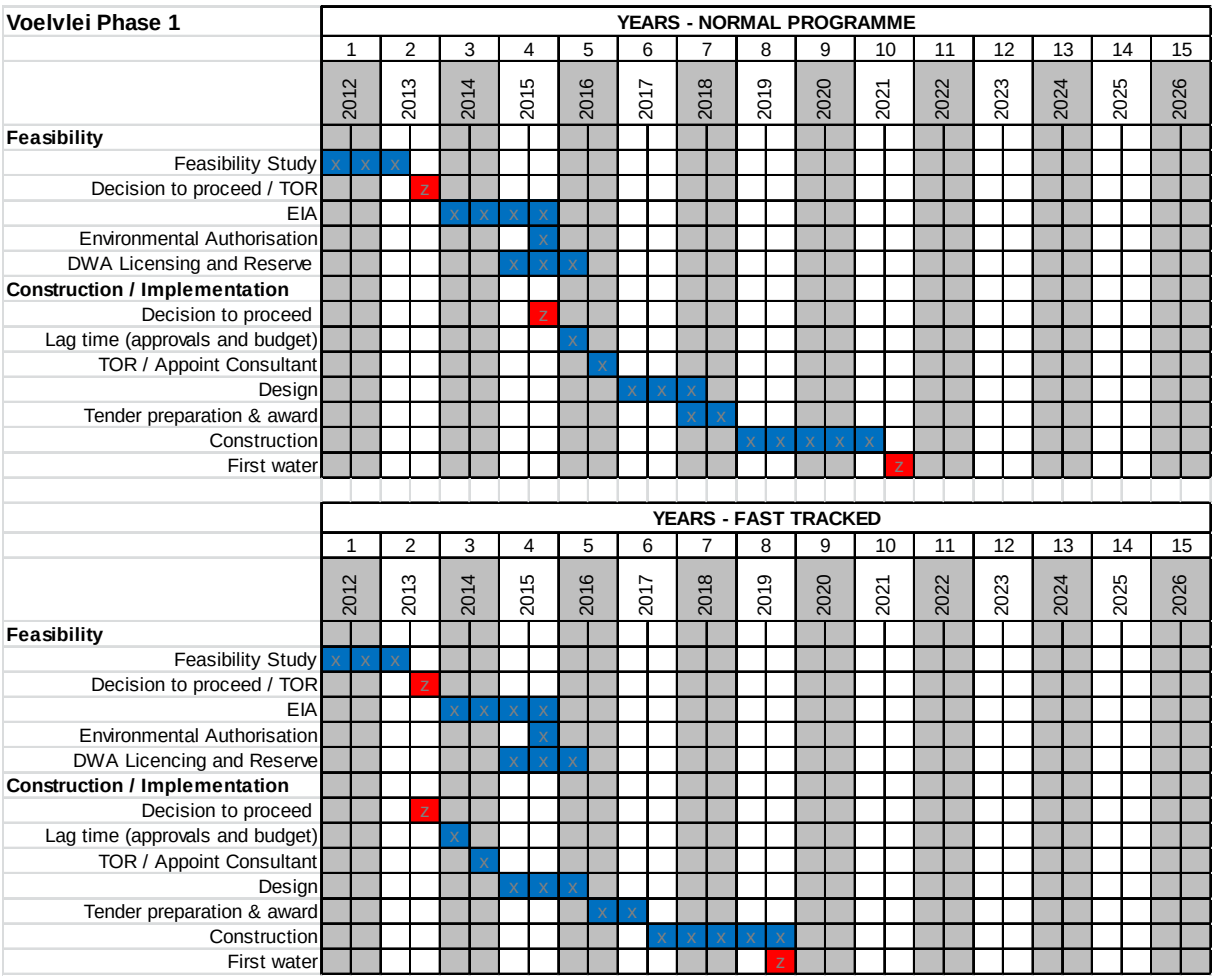
s/projects/H402505/mxd/bergfigure.mxd

Appendix B: List of SSC members

ORGANISATION	MEMBER	POSITION
Western Cape Provincial Government		
Department Agriculture	André Roux	Chief Director
	Peter Keuck (alternative)	Chief Engineer
Human Settlement	Niel Muller	
	Emmanuel Muanza (alt.)	
Cape Nature	Pierre de Villiers	
DEA&DP	Chris Rabie	- Planning Branch
	Joy Leaner	
	Catherine Bill (alt.)	
	Zaahir Toefy	- Environmental Branch
Local Government	Dr Hildegarde Fast	
	Izak Toerien (alt.)	
	G Paulse (alt.)	
Local Authorities		
City of Cape Town	Peter Flower	Director Bulk Water
	Paul Rhode (alt.)	- Bulk Water
	Kevin Samson	- Waste Water
	Zolile Basholo	Director WDM & Strategy
	Collin Mubadiro (alt.)	
	Jaco de Bruyn	- WC/WDM
West Coast DM	Nic Faasen	
	Henk Matthee	
Cape Winelands DM	Francois van Eck	
Drakenstein	Andre Kowalewski	
Stellenbosch	Dries van Taak	
	Esias de Jager (alt.)	
	Brett Keyser (alt.)	
Witzenberg	Nathan Jacobs	
Bergrivier	Jaco Breunissen	
Department of Water Affairs		
Regional Office	Rashid Khan	Chief Director
	Ashia Petersen	Director Institutional Establishment
	Anneke Schreuder	
	Boniswa Hene	Director Regulatory Support
	Wilna Kloppers (alt)	
	Simpiwe Mashicila	Manager Water Sector Support
	Zenzile Bayanda (alt)	- Groundwater
Chief Directorate: Integrated Water Resource Planning (Head Office)		
- Chief Director	Livhuwani Mabuda	Chairperson
- National Water Resource Planning	Tendani Nditwani	Acting Director
	Isa Thompson	CE: South

ORGANISATION	MEMBER	POSITION
- Options Analysis	Menard Mugumo	CE: South
- Water Resource Planning Systems	Dr Beason Mwaka	Director
	Elias Nel (alt.)	- Int Hydrological Planning
	Fanus Fourie (alt.)	- Groundwater Planning
	Jenny Pashkin (alt.)	- Systems operation
- Water Use Efficiency	Paul Herbst	Director
	Nosipho Sombane (alt.)	
- Climate Change	Dr Smangele Mgquba	Director
Water Resources Infrastructure: Southern Operations (EC & WC)		
- Operations	Dewald Coetzee	Director
	Bertrand van Zyl (alt.)	Chief Engineer
CMAs		
Berg Olifants Doorn	Derril Daniels	
Breede-Gouritz	Phakamani Buthelezi	
	Jannie van Staden (alt.)	
WUAs / IBs		
Berg WUA	Willie Enright	
	WD Bourbon-Leftley	
Sentraal-Breede WUA	Louis Bruwer	
Winelands WUA		

Appendix C: Implementation Programmes

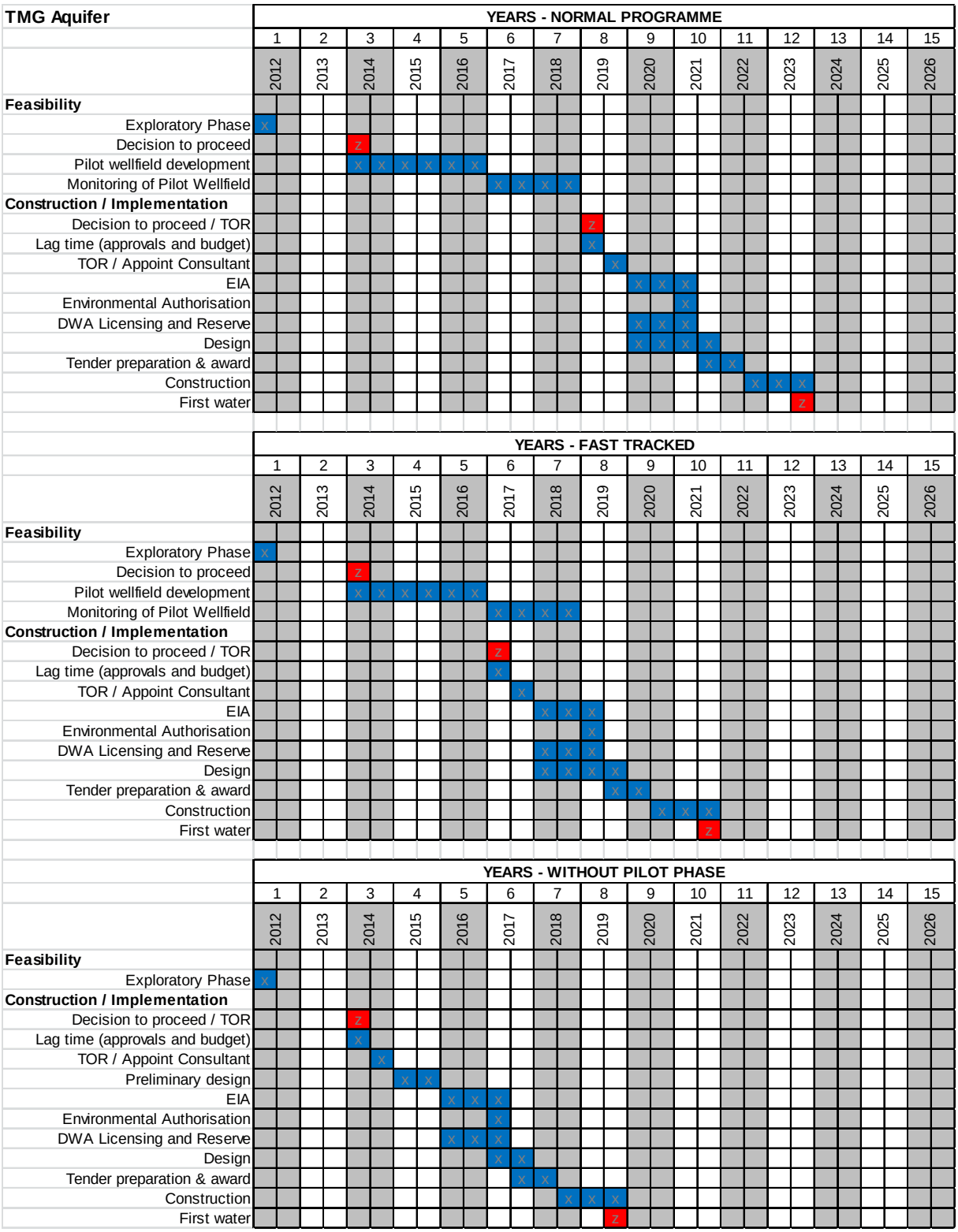


Water re-use	YEARS - NORMAL PROGRAMME														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
TOR / Appoint Consultant		X													
Pre-feasibility			X												
Feasibility															
Feasibility Study			X	X	X										
Decision to proceed / TOR					Z										
EIA						X	X								
Environmental Authorisation							X								
Construction / Implementation															
Decision to proceed							Z								
Lag time (approvals and budget)							X								
TOR / Appoint Consultant						X									
Design							X	X	X						
Tender preparation & award								X	X	X					
Construction									X	X	X	X	X		
First water										Z					

	YEARS - FAST TRACKED														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
TOR / Appoint Consultant		X													
Pre-feasibility			X												
Feasibility															
Feasibility Study			X	X	X										
Decision to proceed / TOR					Z										
EIA						X	X								
Environmental Authorisation							X								
Construction / Implementation															
Decision to proceed					Z										
Lag time (approvals and budget)						X									
TOR / Appoint Consultant						X									
Design							X	X	X						
Tender preparation & award								X	X	X					
Construction									X	X	X	X	X		
First water										Z					

Desalination	YEARS - NORMAL PROGRAMME														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
TOR / Appoint Consultant	X														
Pre-feasibility		X													
Feasibility															
Feasibility Study		X	X												
Water Quality Monitoring		X	X	X											
Decision to proceed / TOR			Z												
EIA				X	X										
Environmental Authorisation					X										
Construction / Implementation															
Decision to proceed					Z										
Lag time (approvals and budget)					X										
TOR / Appoint Consultant						X									
Design						X	X	X							
Tender preparation & award							X	X							
Construction								X	X	X	X	X			
First water									Z						

	YEARS - FAST TRACKED														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
TOR / Appoint Consultant	X														
Pre-feasibility		X													
Feasibility															
Feasibility Study		X	X												
Water Quality Monitoring		X	X	X											
Decision to proceed / TOR			Z												
EIA				X	X										
Environmental Authorisation					X										
Construction / Implementation															
Decision to proceed			Z												
Lag time (approvals and budget)				X											
TOR / Appoint Consultant					X										
Design					X	X	X								
Tender preparation & award						X	X								
Construction								X	X	X	X	X			
First water									Z						


TMG Aquifer
YEARS - NORMAL PROGRAMME
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026
Feasibility
Exploratory Phase
Decision to proceed
Pilot wellfield development
Monitoring of Pilot Wellfield
Construction / Implementation
Decision to proceed / TOR
Lag time (approvals and budget)
TOR / Appoint Consultant
EIA
Environmental Authorisation
DWA Licensing and Reserve
Design
Tender preparation & award
Construction
First water
YEARS - FAST TRACKED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026
Feasibility
Exploratory Phase
Decision to proceed
Pilot wellfield development
Monitoring of Pilot Wellfield
Construction / Implementation
Decision to proceed / TOR
Lag time (approvals and budget)
TOR / Appoint Consultant
EIA
Environmental Authorisation
DWA Licensing and Reserve
Design
Tender preparation & award
Construction
First water
YEARS - WITHOUT PILOT PHASE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026
Feasibility
Exploratory Phase
Construction / Implementation
Decision to proceed / TOR
Lag time (approvals and budget)
TOR / Appoint Consultant
Preliminary design
EIA
Environmental Authorisation
DWA Licensing and Reserve
Design
Tender preparation & award
Construction
First water