CITY OF CAPE TOWN
ISIXEKO SASEKAPA
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Cape Town Water Outlook 2018

Updated 20 July 2018

Department of Water and Sanitation

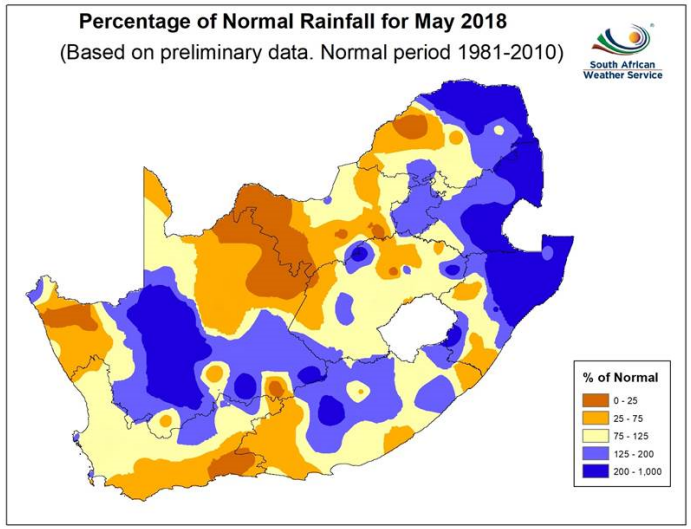
City of Cape Town

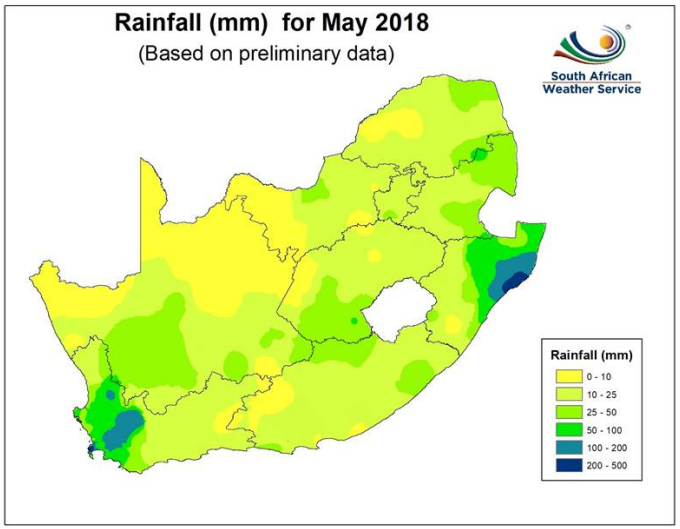
Making progress possible. Together.

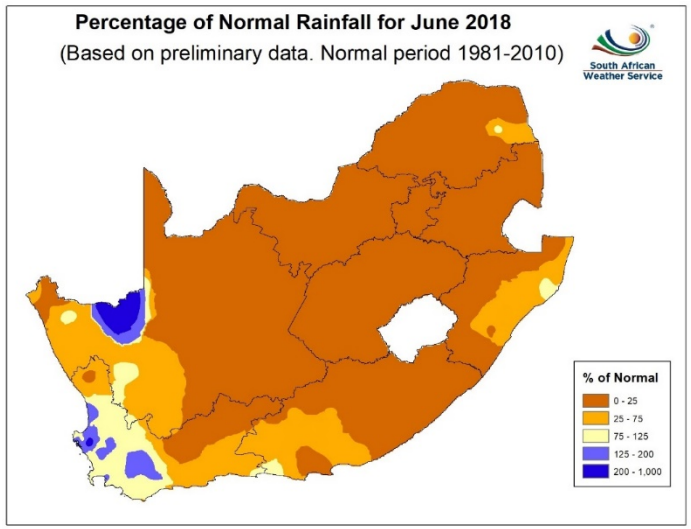
Overview

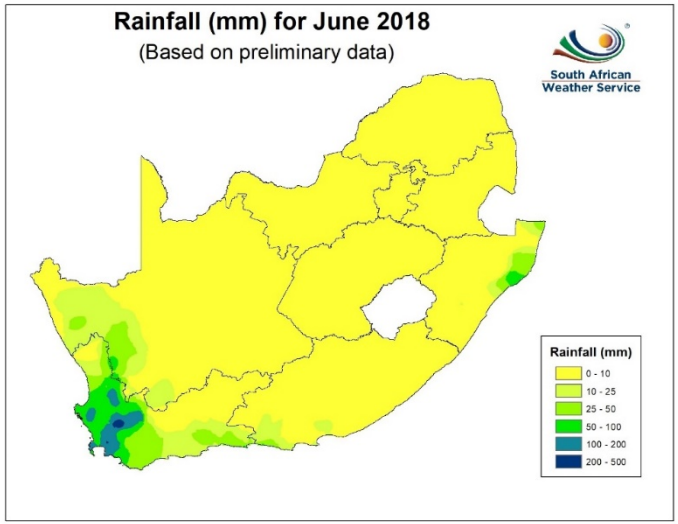
- 2018 rainfall to date and balance of season forecast
- Impact on dams and rainfall scenarios
- What has changed in managing demand & supply?
- Too early to relax – implement recovery plan to provide relief without compromising water security
- Restrictions, demand management initiatives, reduced demand & diminishing returns
- WCWSS rules and reconciliation strategy approach
- Providing assurance of water supply
- Augmentation considerations - determining optimal augmentation volumes, timing, source, cost, responsibility
- Existing, committed and future augmentation options
- Summary of current water outlook

Rainfall in May & June in WCWSS approximately average









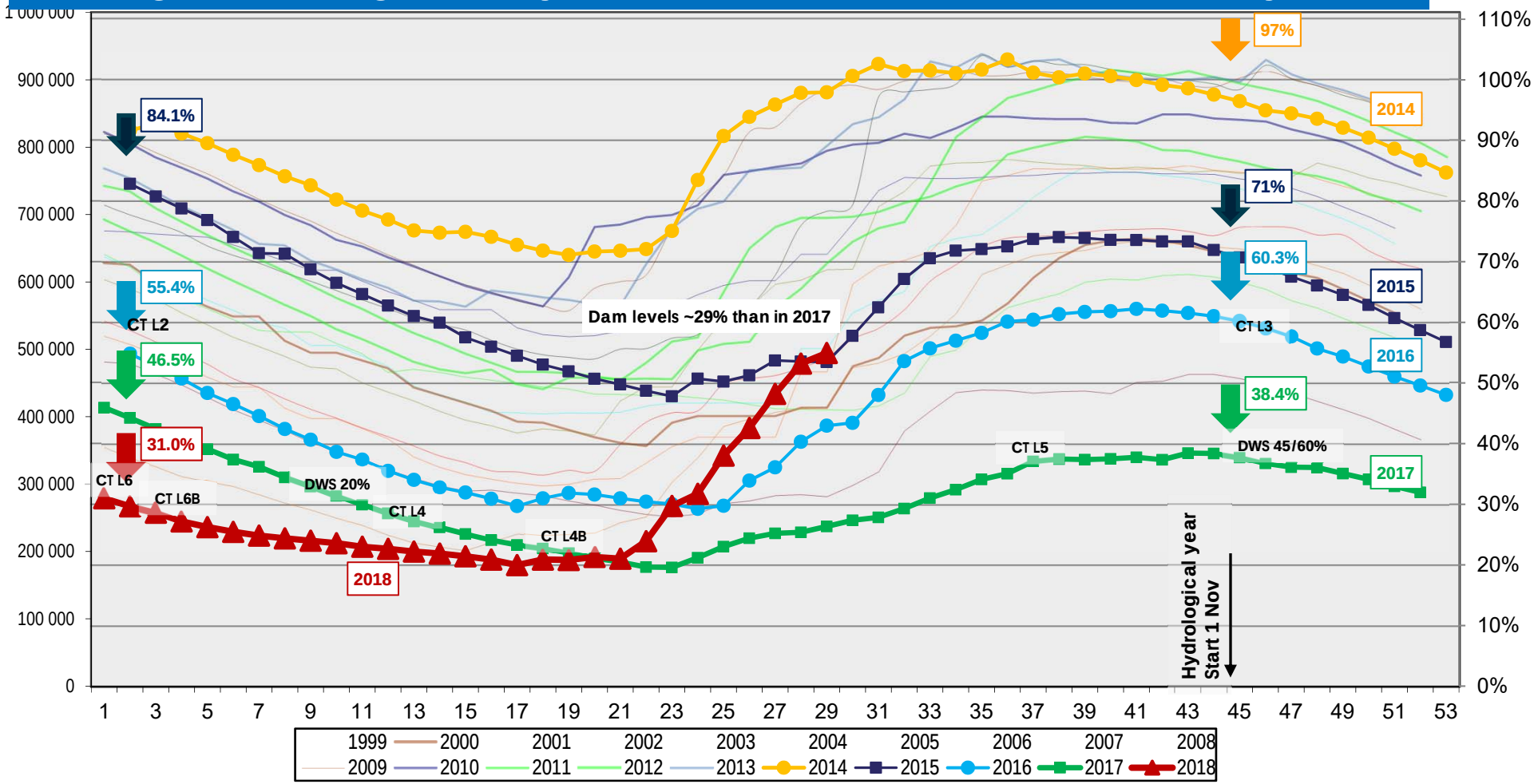
SAWS Rainfall outlook Q3 2018

1. El Nino / Southern Oscillation (ENSO) is in a neutral phase.
2. Latest forecasts indicate a high likelihood (almost a 50% probability) of the development of an El Nino event during spring and summer.
3. It is still too early to predict its exact outcome during summer.
4. It is advised that this system be monitored in the next few months to determine its impact on the summer-rainfall areas.
5. During Jul-Aug-Sep there are sustained, almost countrywide indications for above-normal rainfall, but there is still no confidence for this period.
6. There is however indications of drier conditions along parts of the south coast, with confidence, during Aug-Sep-Oct and Sep-Oct-Nov.
7. Overall, higher than normal temperatures are expected towards Spring and beyond. There is a particularly high confidence forecast for above-normal temperatures over the northern parts of the country.

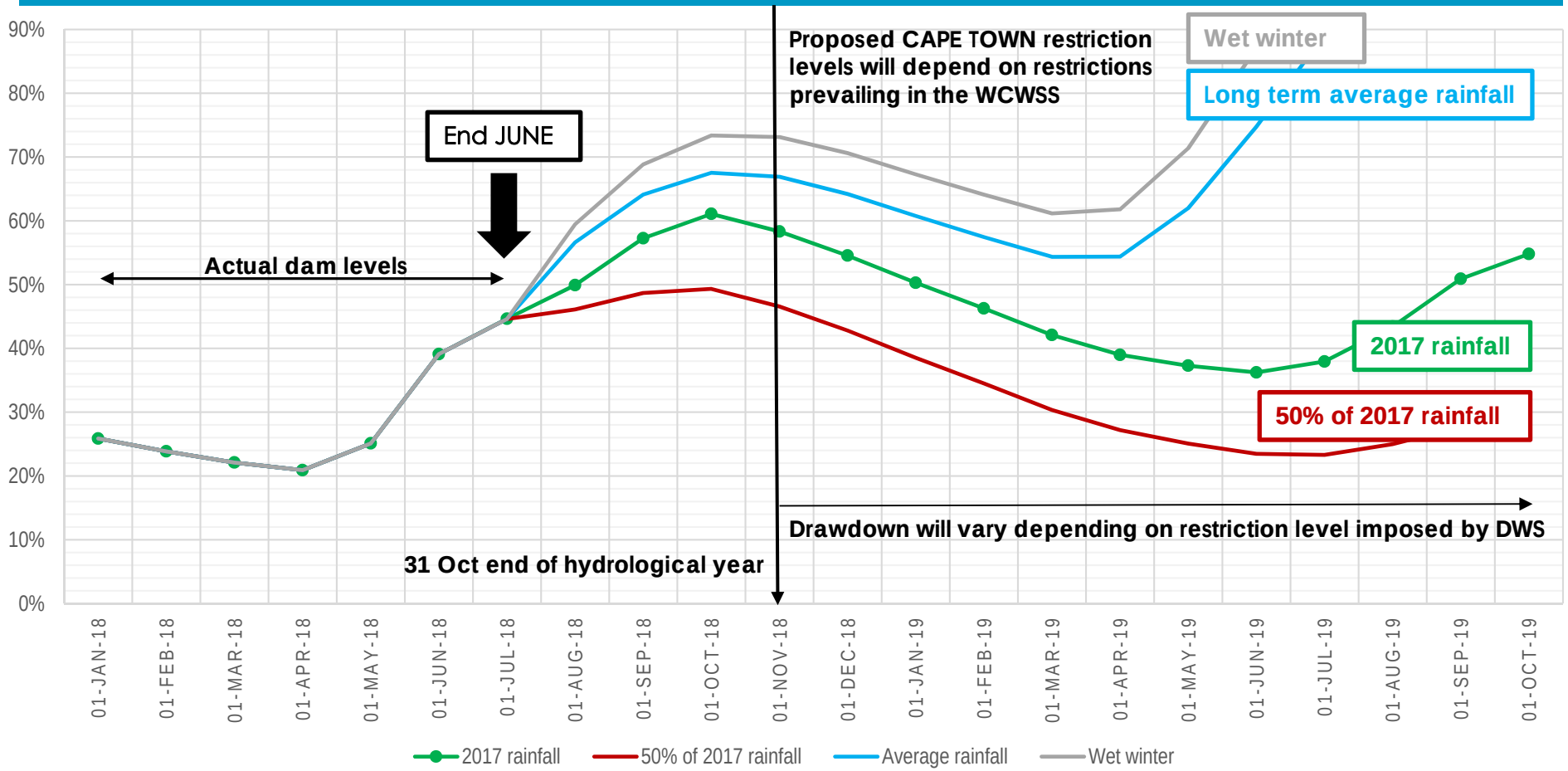
(as at 10 July 2018)

South African Weather Service

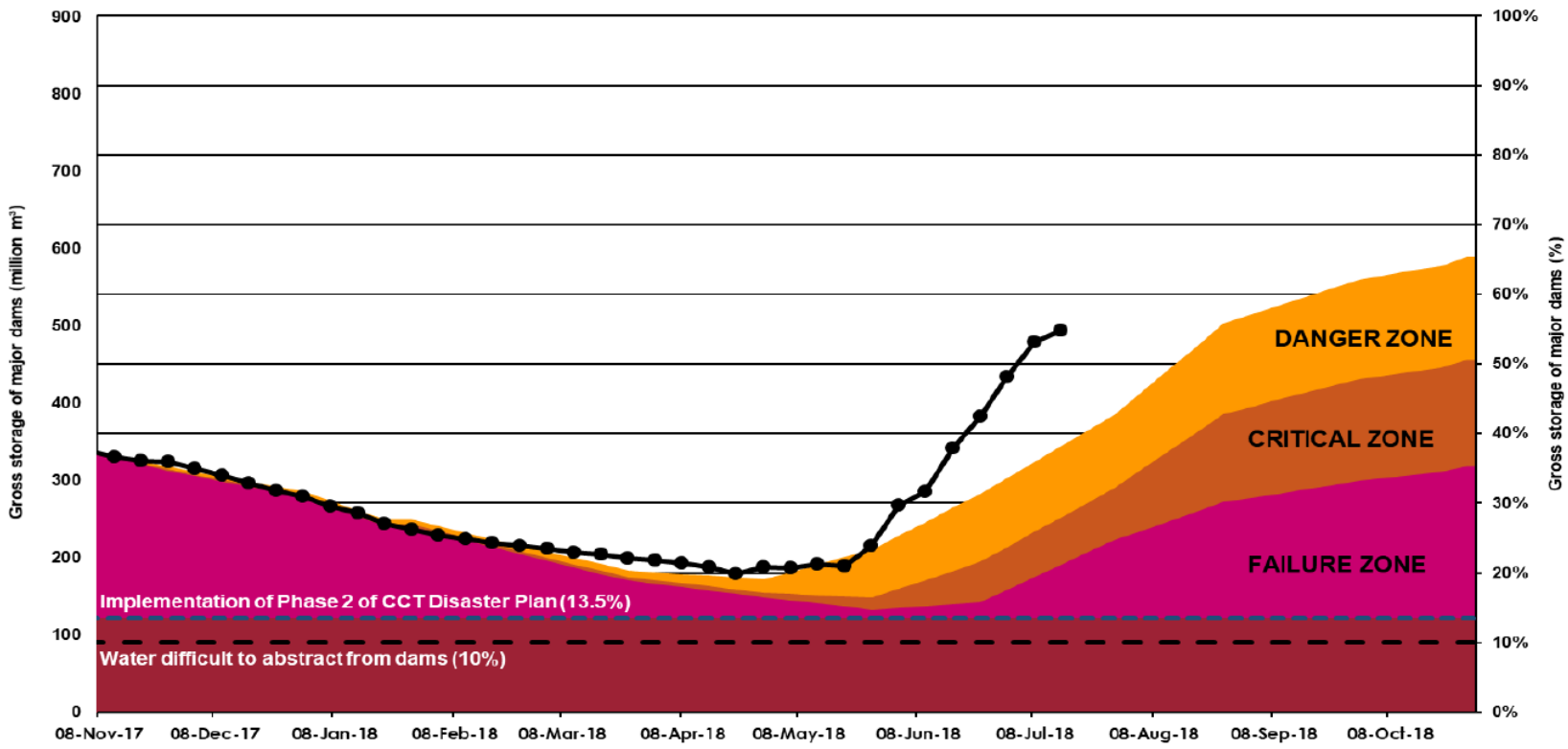
Average rainfall significantly raised dam levels – 55.8% as at 19 July 2018



The impact of rainfall on dam levels if current restrictions remain



What happened to Day Zero? / Drought Monitoring - 2018 Hydrological Year



- The Day Zero monitor provided for dam levels below 40%, based on rainfall similar to 2017.
- In light of improved dam levels, the City is exploring **incremental reduction of restrictions** to provide relief to consumers while not compromising water security.

Dam levels > in 2015: How has this changed what we do?

- Still too early to relax
- Drought management moving to a recovery phase
- Focus on long-term resilience
- Ensure lessons from the drought are used to ensure water security going forward
- Formalise water strategy as it relates to water supply & demand, resilience & adaptation, governance, financial sustainability

Demand

- Rolling out of pressure management zones will continue until all possible zones are completed. Pressures are linked to restriction levels;
- Water management devices will still be installed in alignment with restriction levels but at a reduced pace;
- Tariffs will remain in place until restriction levels are reduced and need to compensate for bounce-back uncertainties;
- Communication campaigns will continue, to ensure responsible water use.

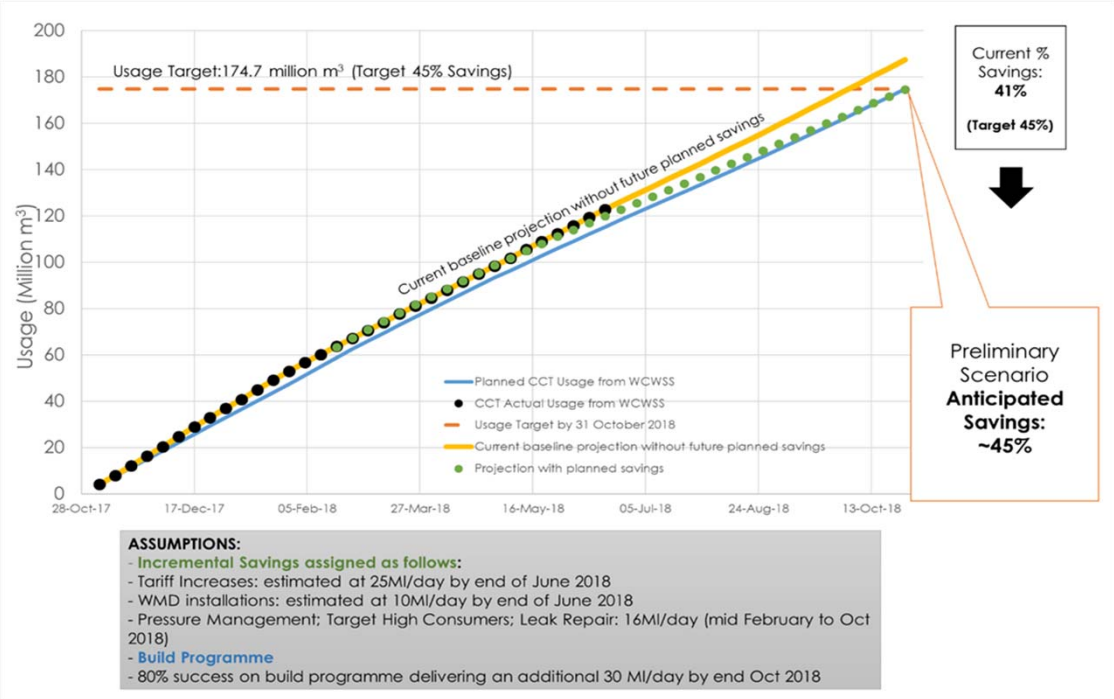
Supply

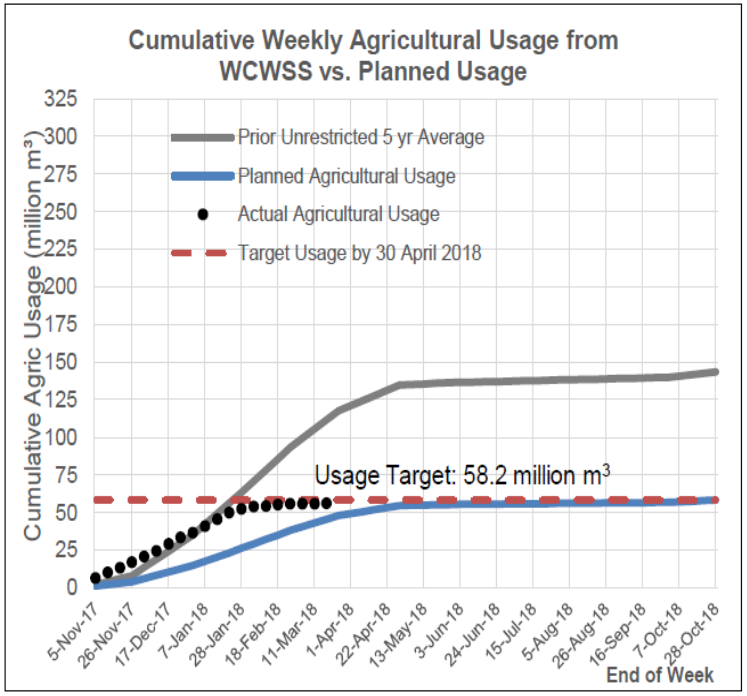
- Managing dam system optimally according to system **rules**;
- Managing catchments including **clearing alien vegetation**;
- Reviewing level of **desired supply assurance** for the City (currently 1:50);
- Determine **optimal augmentation volumes** and **timing** aligned with reconciliation strategy;
- Continue existing augmentation projects.

APPROACH HAS MOVED FROM DISASTER TO LONG-TERM RESILIENCE

DEMAND SIDE

But DWS restrictions are in place and need to be met. Agricultural releases were limited to ensure 60% saving. Urban requires 45% saving; the city has achieved 41% to date and can thus not reduce water restrictions despite recovering dam levels.

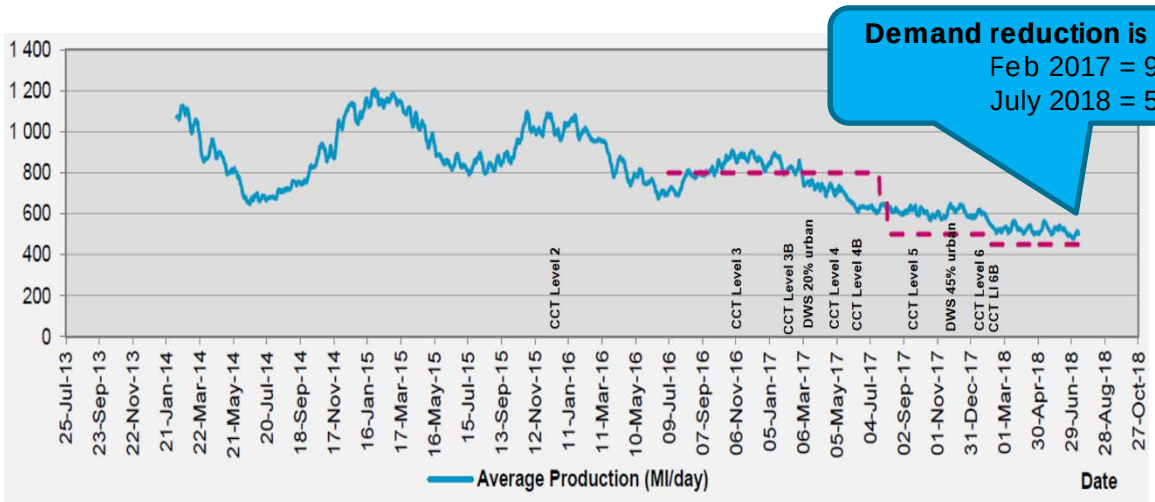


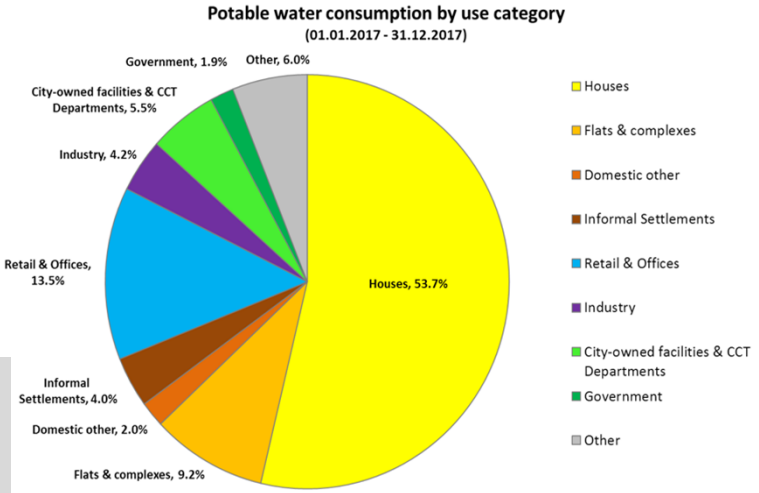


For Cape Town, this means that demand must still be managed to get below 450 Ml/day

DEMAND SIDE

While Cape Town has significantly reduced its demand (measured here as production from the treatment works), from a peak of 1200 Ml/day in 2015 down to nearly 500 Ml/day, a further reduction in demand is needed to below 450 Ml/day to meet the 45% saving required by DWS restrictions.



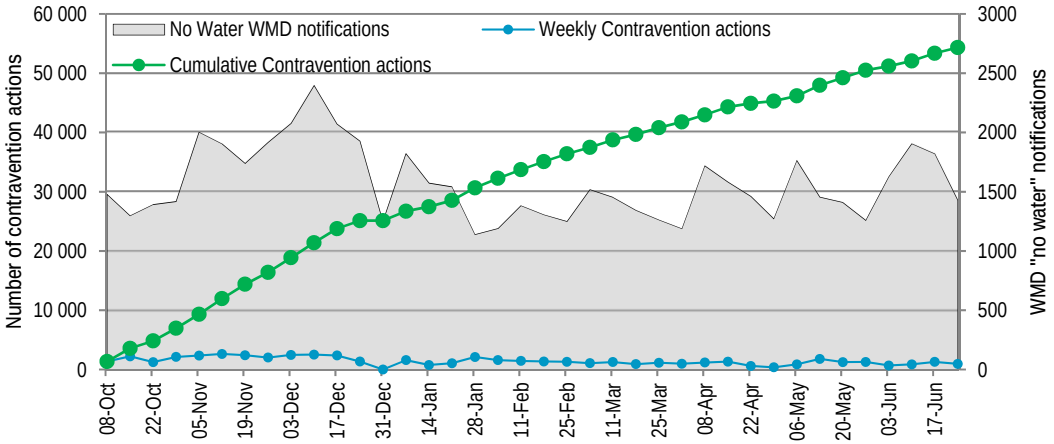


Main demand reduction interventions include:

- punitive drought tariffs
- water management devices & flow restrictors
- aggressive pressure management

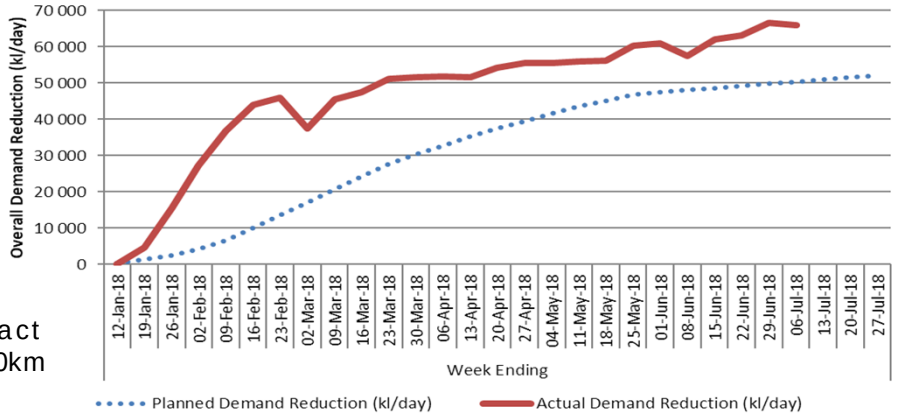
Demand management actions

DEMAND SIDE



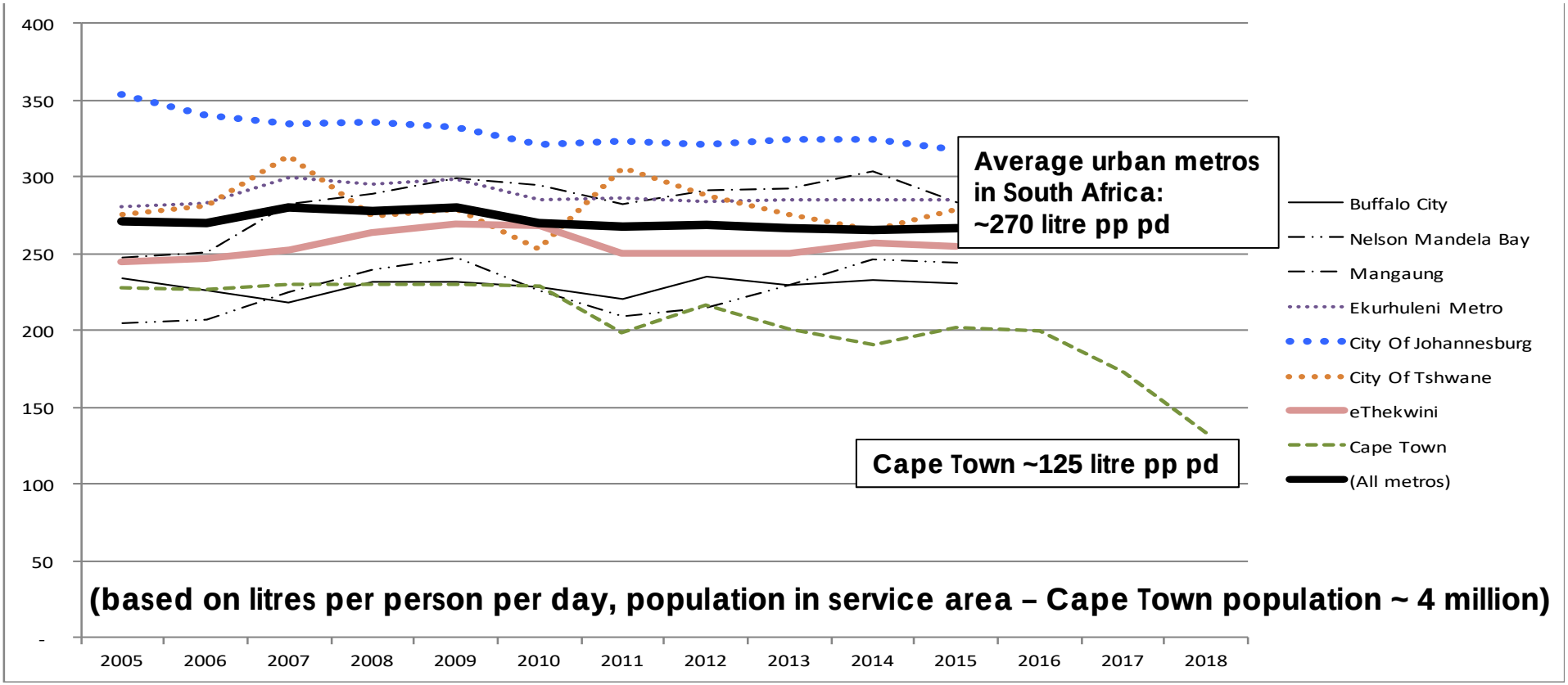
- Contraventions introduced in Oct 2017 – WMDs installed where use >20kl/mth per household;
- From 1 Jan 2018, this changed to installations at households using >10.5kl/mth;
- Average household size in Cape Town is 3.2, at 50lcd => 4.8kl/mth per household
- Spike in WMD "no-water" notifications;
- Approximately 15% of notifications result in orders – that means that the majority of calls logged are due to undetected leaks and households depleting the daily allocation and are not due to installation or meter issues;

- Saving as at 10 July **66 MLD** as at 6 July 2018.
  - pressure reduction 61 MLD
  - leak repair from reticulation repairs 3.5 MLD
  - leak repair from internal household leaks 0.3 MLD
- Leak repair
- Pressure reduction on **163 zones** across the City.
- The breakdown of pressure management is as follows:
  - Total length of reticulation across the 10 600km
  - Total length of current pressure managed reticulation: 4 800km (45,3%)
  - Total length of reticulation that will be managed on completion of contract (includes all new zones currently being designed and constructed): 6 200km (58,6%)



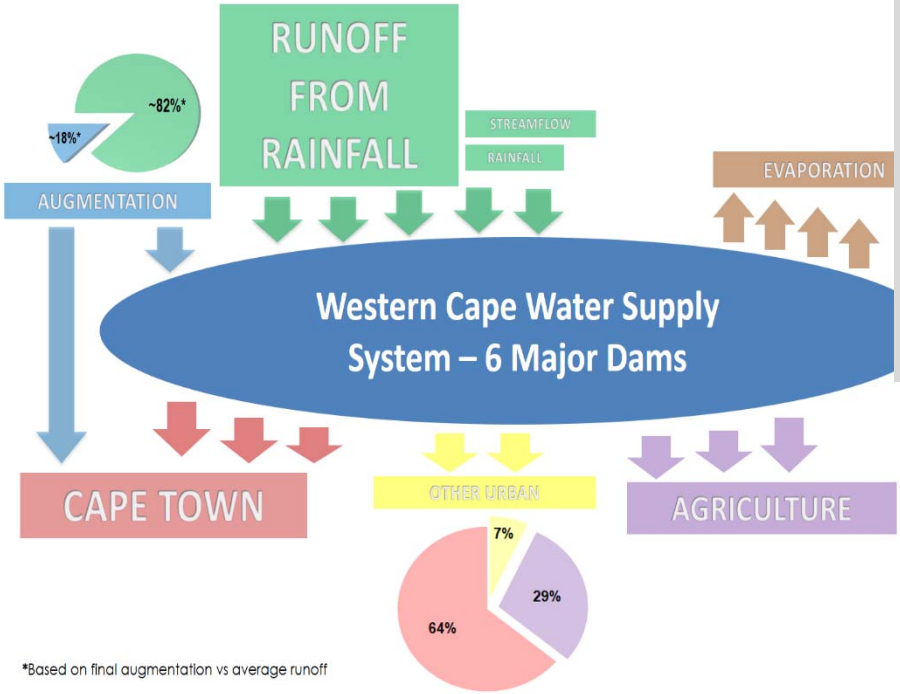
Cape Town has done really well, but further reduction is unlikely (diminishing returns)

DEMAND SIDE



Cape Town's water is part of an integrated system

SUPPLY SIDE

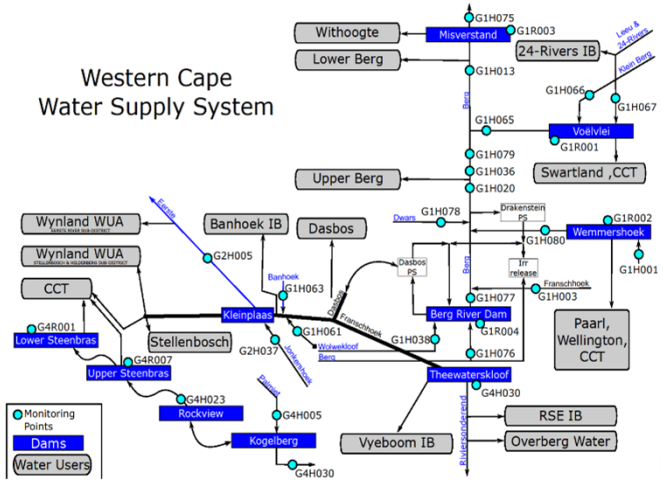


Cape Town gets its water from a system of dams heavily dependent on rainfall that supply agriculture and other urban areas. This complex system is managed by the national Department of Water and Sanitation in cooperation with the City, based on rules that:

Minimize spillage : COCT demand can be shifted to dams most likely to spill to maximize system yield

Minimize Wastage : WC/WDM Strategies to be implemented by all users

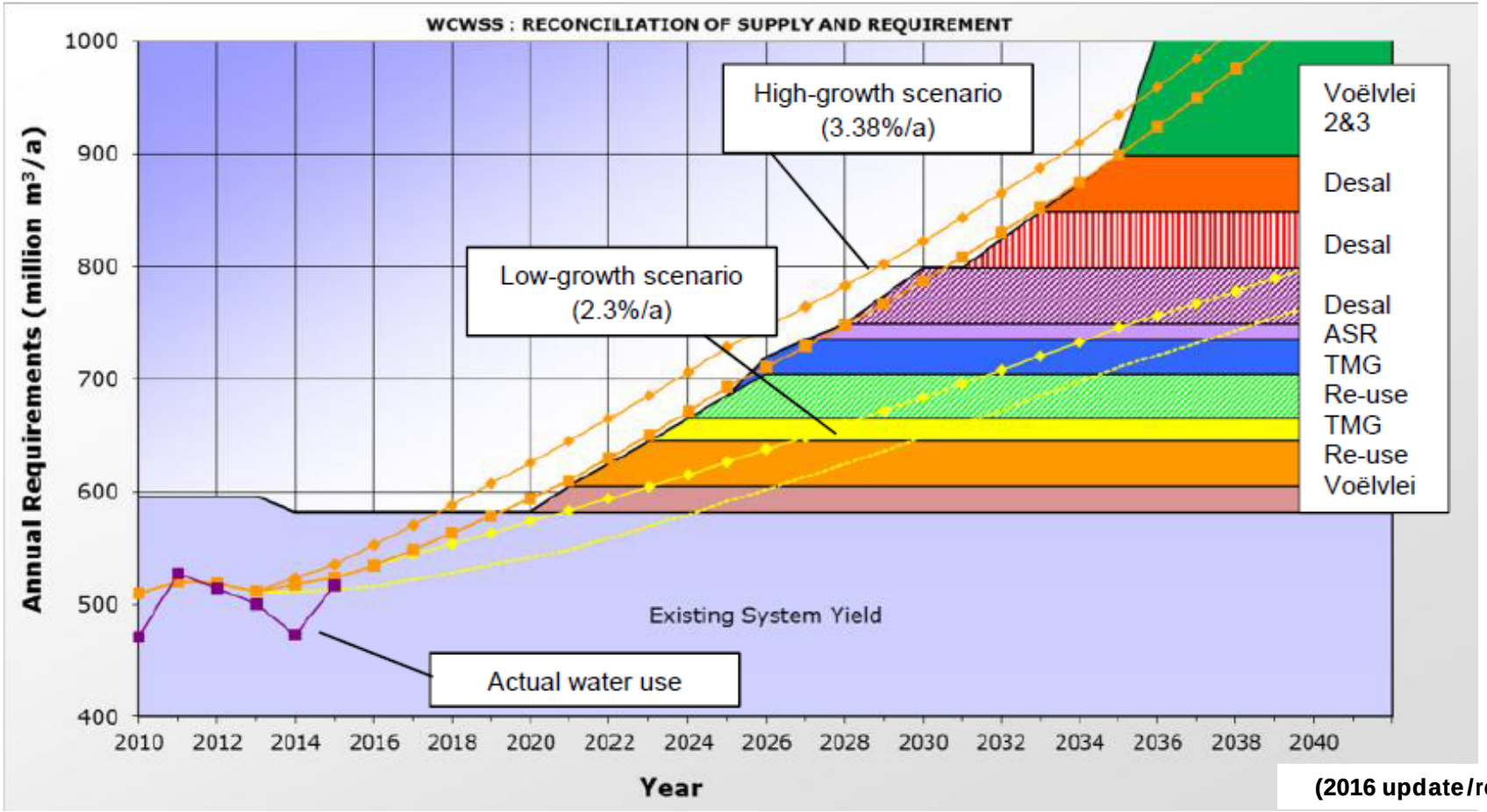
Water Restrictions : DWS are responsible for determining and managing water restrictions



About a third of the water in this system is used by agriculture and 7% by other urban areas (smaller towns), with the City using 64% (unrestricted).

RECONCILIATION STRATEGY APPROACH

SUPPLY SIDE

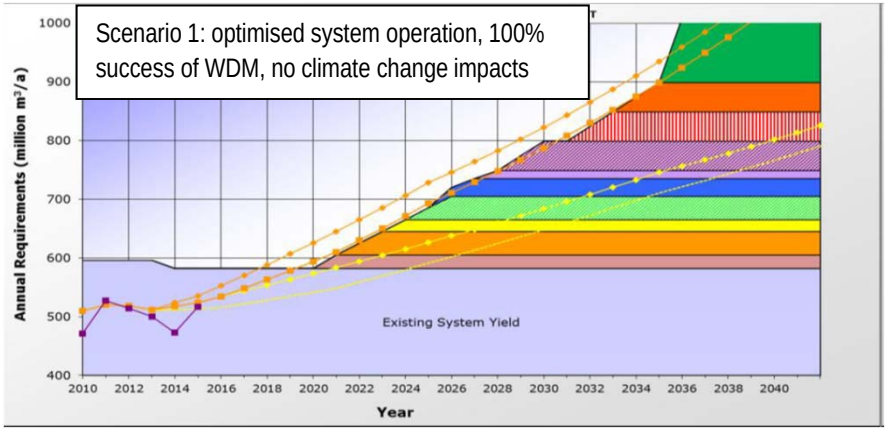


(2016 update/review)

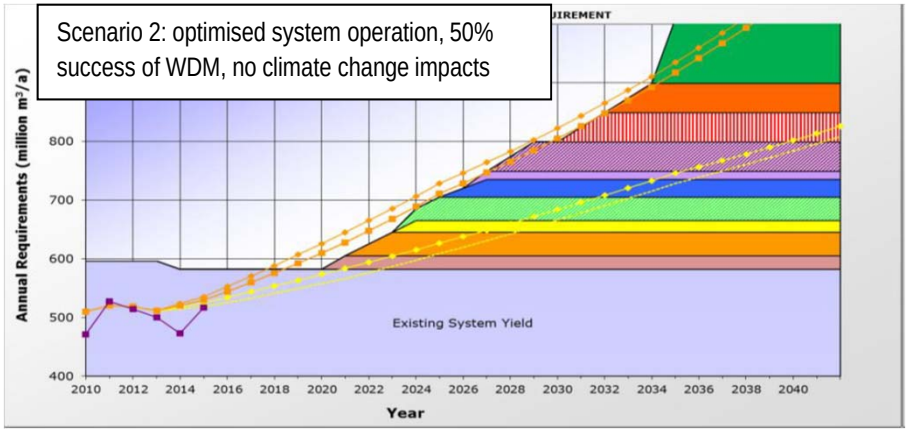
WCWSS RECONCILIATION STRATEGY - SCENARIO PLANNING

SUPPLY SIDE

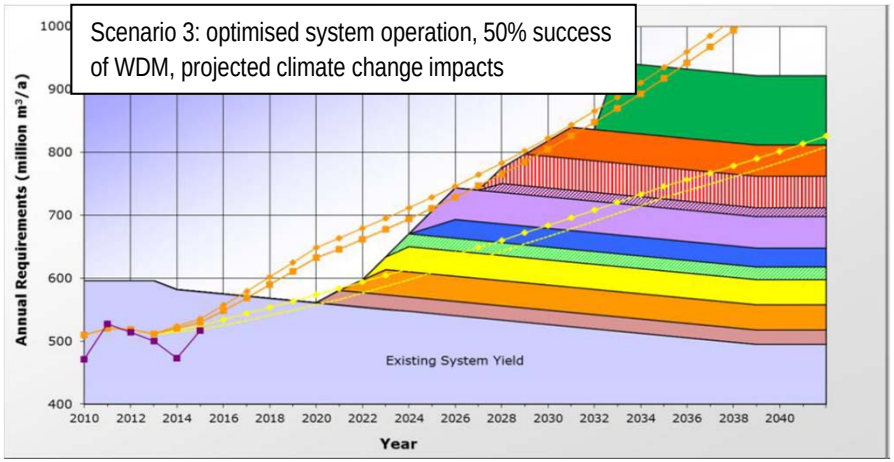
Scenario 1: optimised system operation, 100% success of WDM, no climate change impacts



Scenario 2: optimised system operation, 50% success of WDM, no climate change impacts



Scenario 3: optimised system operation, 50% success of WDM, projected climate change impacts



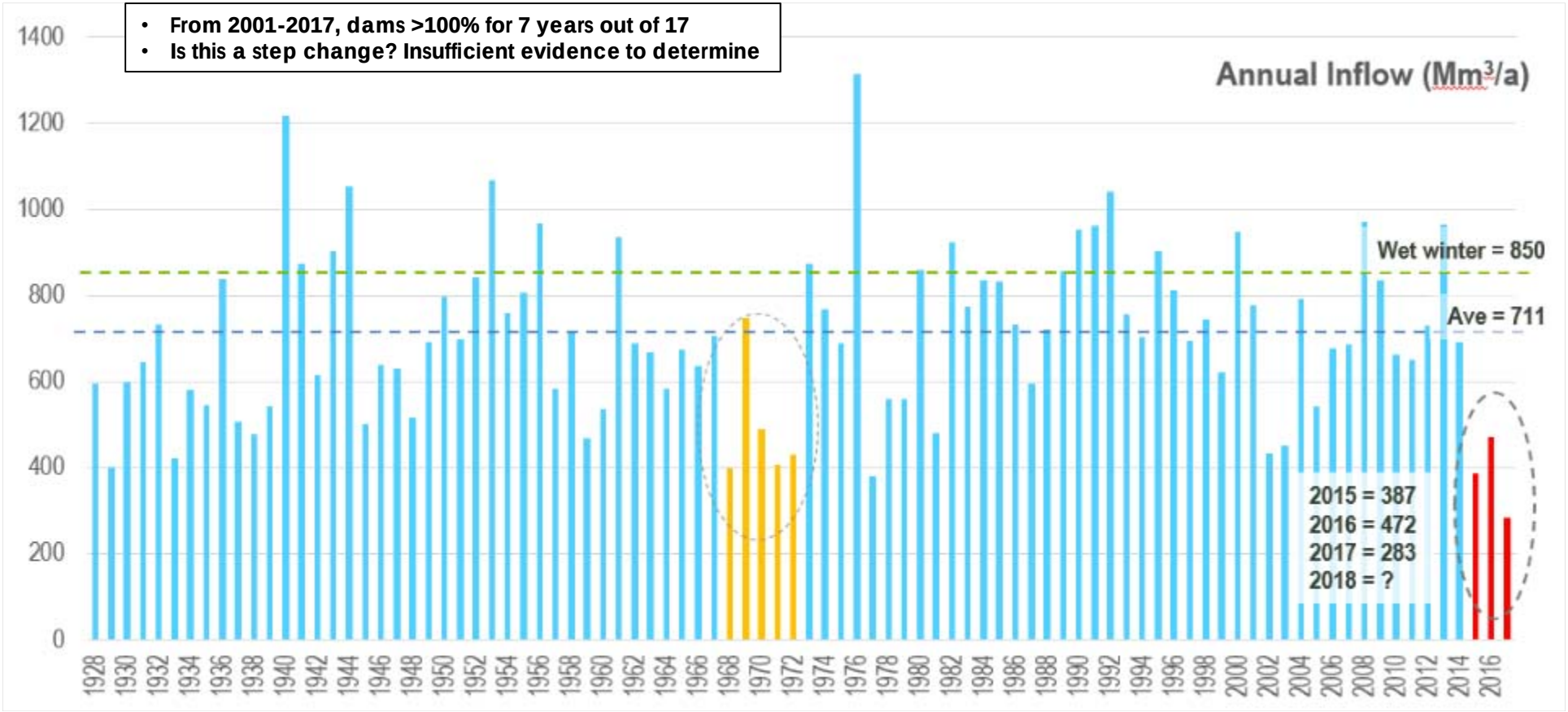
	INTERVENTION SELECTION	YEAR	YIELD (million m³/a)	Total Lead Time	Required Study Start Date	Time to full yield / saving	Study Status Completed
1	Voëlvlei Phase 1	2021	23	6	2015	1	F
2	Re-use Option 1	2022	40	7	2015	2	PF
3	TMG Scheme 1	2024	20	8	2016	1	PF
4	Re-use Option 2	2024	40	7	2016	2	PF
5	TMG Scheme 2	2026	30	10	2016	2	PF
6	DWAF:ASR: West Coast	2027	14	10	2017	1	PF
7	Desalination 1 Generic	2028	50	8	2020	2	PF
8	Desalination 2 Generic	2031	50	8	2023	2	PF
9	Desalination 3 Generic	2033	50	8	2025	2	PF
10	Voëlvlei Phases 2 & 3	2035	110	15	2020	1	R

(2016 update/review)

HISTORICAL INFLOW – informs volume of augmentation

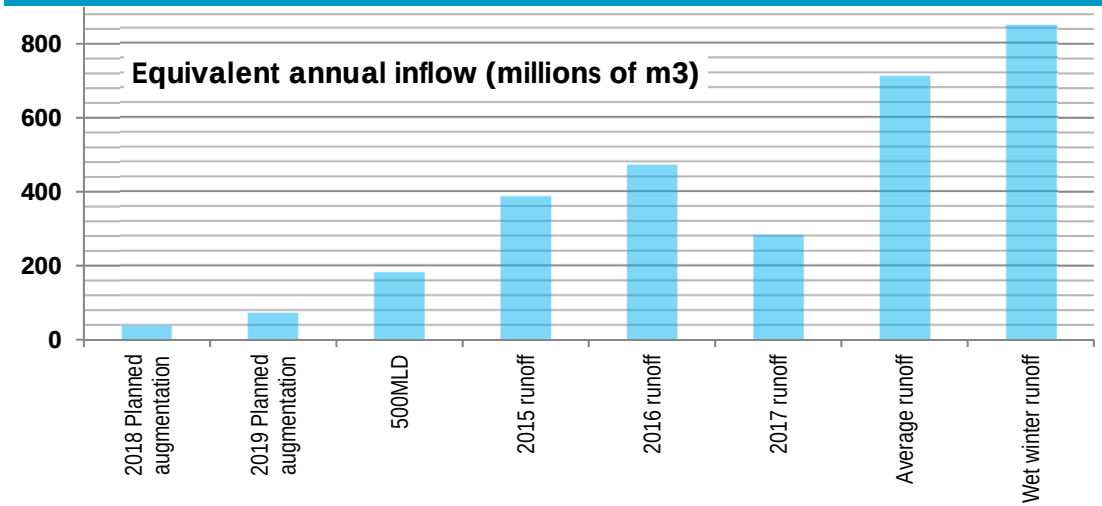
SUPPLY SIDE

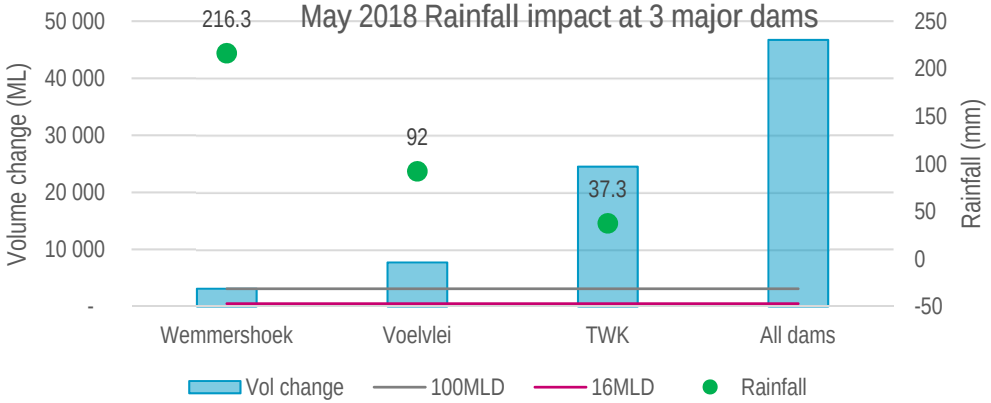
- From 2001-2017, dams >100% for 7 years out of 17
- Is this a step change? Insufficient evidence to determine



Augmentation - considerations

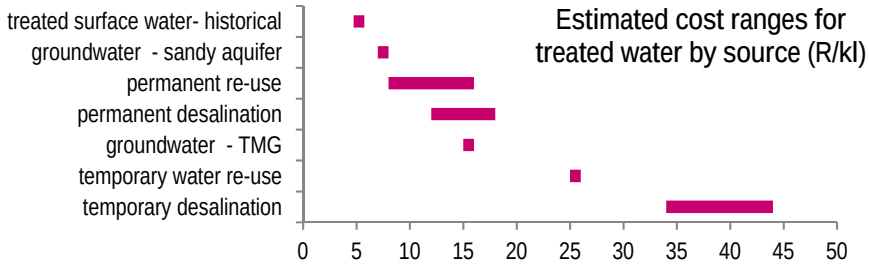
SUPPLY SIDE





Augmentation schemes are a far more expensive source of water than runoff from rainfall. The equivalent volume of runoff cannot be augmented in short time periods and is dependent on rainfall patterns. Even under poor rainfall conditions like 2017 we would require augmentation of ~770 MLD to match the volume of runoff. Despite all augmentation efforts, the supply scheme is vulnerable to poor rainfall. This is clear from the impact of May rainfall on dam volume change compared to 100MLD water plant operating for a month: such plant would need to operate for 3 months to add 1% to dam levels.

As can be seen the cost per kl of water from other sources vary considerably. The cost of bulk water, waste water and reticulation is common so the costs can be compared to the cost of runoff which is ~**R5.20/kl** vs temporary desalination at >R40/kl.



Reviewing Augmentation programme – learnings from drought

SUPPLY SIDE

Original program features:

- Temporary desalination prioritised (104 MLD) 16 small plants (desal and reuse) logistically complex & poor economy of scale
- Ships and barges hugely expensive (200 MLD)
- Groundwater (90 MLD) not part of immediate response
- Focussed only on the city (not the wider system)
- Lack of sufficient attention to water *demand* management

Expert review

1. Assuming it will ***not*** rain again is not realistic
2. **Prioritise ground water** (Cape Flats Aquifer and Table Mountain Group Aquifer)
3. **Do not** pursue temporary desalination and reuse
4. Plan and execute **permanent desalination & re-use** at an **optimum scale**

PROVIDING ASSURANCE FOR WATER SECURITY IN THE WCWSS:

- Embed WCWSS rules for restriction levels linked to dam levels;
- Continue WC&WDM efforts both urban and in agriculture through adaptation for resilience;
- Define governance responsibilities in the WCWSS reconciliation strategy;
- Confirm system yield in light of updated hydrology and formalise allocations to system users to provide certainty;
- Update WCWSS reconciliation strategy.

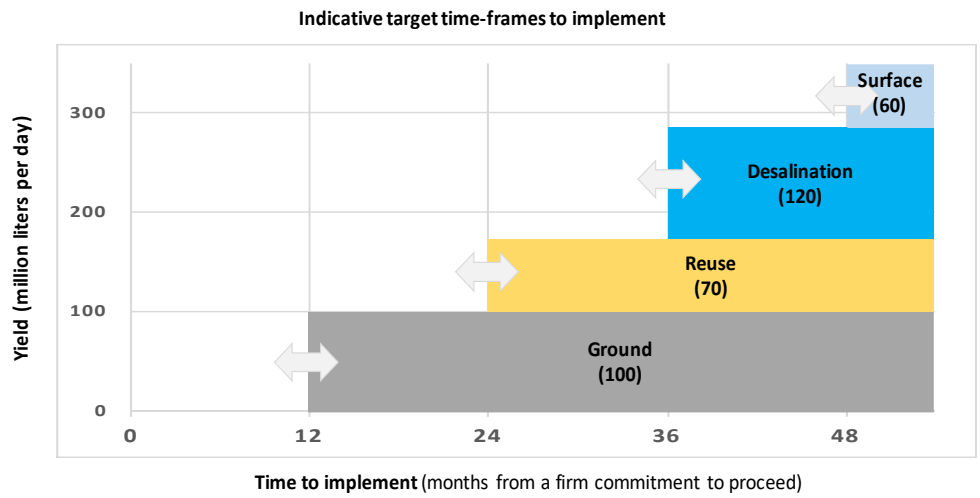
Specifically in pursuit of Cape Town as a Water Sensitive City:

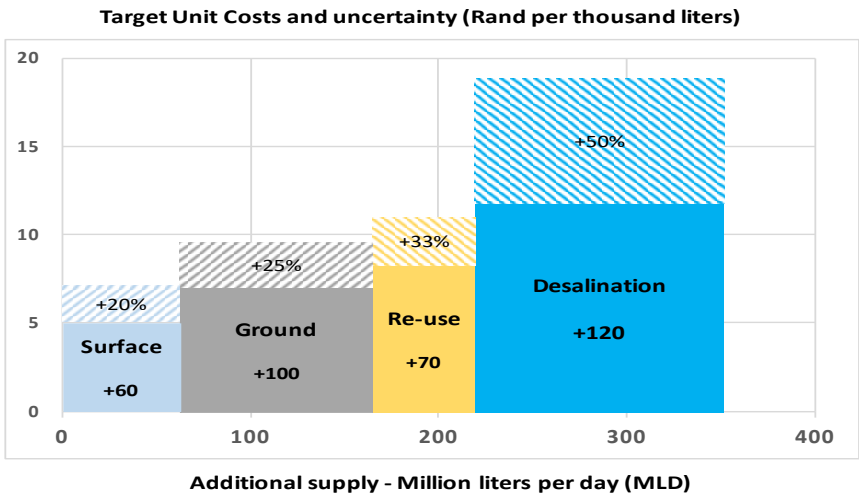
- Develop an **integrated water strategy** for Cape Town;
- Ensure the development of **enabling** water management solutions pursuant to progressive realization of;
- **Value water** and appreciate the importance of **water availability** to the regional economy and City growth;
- Ensure a **flexible and adaptive** management approach to deal with an uncertain water future brought about by emerging climatic variability and regulatory uncertainty. Plan for **excess and scarcity**;
- **Reduce vulnerability** associated with present over reliance on surface water sources comprising the WCWSS by seeking to **diversify and integrate** water sources at multiple scales;
- Manage entire **urban water cycle** and maximize **reuse of wastewater**.

Reviewing Augmentation - Yield, cost, timing inform priorities

SUPPLY SIDE

- **Surface water** is least costly, but not resilient to drought;
- **Groundwater** can provide relatively quick additional water into the system. Groundwater extraction can also be matched to requirement – over-extracting in times of drought while reducing volumes when augmentation is not required;
- Permanent **Desalination** is very costly and cannot be implemented quickly **BUT** it is the only unlimited new source of water into the system completely independent of rainfall;
- **Re-used water** is less costly than desalination, and is necessary to maximize value from the diversified supply mix which is considerably more expensive than single source surface water.





Reviewing Augmentation – focus on long-term resilience

SUPPLY SIDE

DWS is responsible for implementing surface water schemes which form part of the reconciliation strategy. Responsibility for non-surface water schemes has not been conclusively defined. Where groundwater enters the municipal reticulation system, it appears logical to be a municipal responsibility. Similarly, treating municipal wastewater to potable standard would be a municipal responsibility.

Cape Town has committed to augmentation to improve the City's water security:

- **Groundwater**: the combined yield in the first phase provides ~100MLD. The cost of operating schemes will determine the speed of roll-out, and once the Phase 1 schemes are operational, the development of further phases and schemes will be easier;
- **Re-use:** Water re-use schemes include both recharge of CFA as well as treating wastewater to drinking water standard at Faure treatment plant to provide 70MLD. Depending on the growth required, this could be extended to other wastewater treatment works around the metro;
- **Desalination:** Given the cost and complexity of desalination projects, the city is considering initiating a project at the right time providing for expansion, probably in increments of ~50MLD.

AUGMENTATION DELIVERING WATER IN THE **CURRENT** HYDROLOGICAL YEAR INCLUDES:

- Springs & rivers – consistent yield of **7.5MLD** increasing during rainy season;
- Atlantis aquifer – sustained yield of **12 MLD**;
- Temporary desalination – maximum yield of **16MLD**. To date this has peaked at ~8MLD with Monwabisi 7MLD to come into system in July;
- Temporary transfers – Groenland transfer provided **7MCM** (million cubic meters) in the first quarter of 2018.

Reviewing Augmentation – focus on long-term resilience

SUPPLY SIDE

AUGMENTATION PROJECTS **COMMITTED** TO AND IN PROGRESS:

- **Cape Flats Aquifer**: License conditions provide for extraction of 20MCM/year in Phase 1, 25MCM/yr in Phase 2 and 30MCM in Phase 3. this translates to a sustainable yield of 55 – 83MLD and a peak yield of between 83 – 124MLD. Conditions have been such that progress has been slower than planned, but the yields specified within the license conditions are the ultimate target for permanent augmentation. The license conditions further require artificial recharge of between 12 – 25MCM for the three phases, for which the projects are in design;
- **Table Mountain Group aquifer:** License conditions cover three phases at a number of locations providing for a yields of between 42 & 130 MCM/yr translating to 115 – 355MLD sustainable yield. As with CFA, it may take considerably longer than originally planned to realise the yield but work will continue until the licensed yields are achieved. Due to environmental sensitivities, initial work will be confined to Steenbras which license provides for 12-35MCM translating to 33-96MLD over the three phases;
- **Atlantis & Silwerstroom aquifer**: potential for an additional 20MLD – injection into the system in design;
- **Berg River Voelvlei augmentation scheme** (BRVAS) in progress by DWS to yield 60MLD by 2021;
- **Zandvliet temporary re-use** scheme was part of the section 29 projects funded in Dec 2017, and will be complete towards the end of 2018;
- **Faure permanent re-use:** This project is in design to provide 70MLD (expandable to 90MLD) of re-use water from Zandvliet & potentially Macassar into the water supply from Steenbras at Faure water treatment plant;
- **Alien vegetation clearing:** The impact of unmanaged aliens on the system yield has been calculated to be in the region of 20MCM. The city has accelerated programs in its own catchment areas and will work with other spheres of government and stakeholders to cover all relevant catchments.

AUGMENTATION **STILL TO BE TRIGGERED**:

- **Permanent desalination:** procurement of a permanent desalination plant has not commenced. a project is in progress to enable water quality sampling over an extended period to feed into the site selection process for permanent desal. While the immediate requirement to augment supply has not been agreed, undertaking an updated feasibility study is seen as a no-regret endeavor.
- **Further augmentation through WCWSS reconciliation strategy:** The reconciliation strategy is currently being updated by the WCWSS, incorporating the updated hydrology and the impact of the three-year drought. For Cape Town alone, accounting for anticipated growth will require an additional 30MLD every year. Additional water schemes will thus be a requirement into the future.

Summary

DEMAND & SUPPLY

1. Collaborate with DWS to lower restrictions responsibly before end of hydrological year (31 October) to provide relief to customers, while continuing to manage and monitor **dam behaviour** and **rainfall;**
2. Develop an integrated **Cape Town Water Strategy** which will crystallise the financial impact and governance issues surrounding the of level of assurance, optimal augmentation volume, timing and water sources;
3. Continue **demand management** initiatives (in line with NDWS restriction of 45% saving required);
4. Continue work on **augmentation projects, focus shifted to sustainability and cost efficiency**:
    - **Decisions** under consideration by the City on **optimal augmentation** types, volumes, methods;
    - **Groundwater** projects (Atlantis, Cape Flats and TMG Aquifers) have been prioritised including **Aquifer recharge** projects from treated wastewater;
    - **Long-term Permanent Re-use** project under development;
    - **Long-term Permanent Desalination** under evaluation in terms of siting, optimum yield & procurement method;
4. Continue managing financial impacts through appropriate adjustments to the **tariff structure** and level. Monitor tariff revenues as a result of significant shifts in demand patterns and a steeply inclining block tariff;
5. Continue efforts to improve **coordination** and leadership within and between spheres of government;
6. Continue to improve information flows and consistency of messaging; actively **engage citizens** and stakeholders to encourage active citizenry and stakeholder partnerships to jointly solve problems.

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Thank You

http://www.capetown.gov.za/thinkwater

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