CITY OF CAPE TOWN
ISIXEKO SASEKAPA
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CAPE TOWN WATER OUTLOOK

Edition 10

March 2023

Water and Sanitation Directorate

City of Cape Town

Making progress possible. Together.

Previous editions of the Water Outlook

Edition 1: January 2018

Edition 2: March 2018

Edition 3: April 2018

Edition 4: May 2018

Edition 5: July 2018

Edition 6: September 2018

Edition 7: December 2018

Edition 8: October 2020

Edition 9: March 2022

Referencing

This document should be referenced as follows: *City of Cape Town, (2023); Cape Town Water Outlook – March 2023 – Edition 10; Bulk Water Branch, Bulk Services Department, Water & Sanitation Directorate.*

Queries and updates

Technical queries on the content of this document may be addressed to Water.Stakeholders@capetown.gov.za. Future updates of this publication will be published at the City's website, see: www.capetown.gov.za/thinkwater.

Contents

1 Introduction

Cape Town's Water Strategy (2019)[1] commits to building a new relationship with water that increases resilience and integrated management of the various water streams. Accordingly, the Cape Town Water Outlook is published to make information available, in an accessible way, to stakeholders on the current status of Cape Town's water supply, progress that is being made to build resilience and to provide an outlook on future water security.

This edition of the Cape Town Water Outlook focuses on the following topics:

- Current status of the water supply system
- Anticipated future water demand
- Climate change planning and adaptation
- Water augmentation programme
    - Groundwater and managed aquifer recharge
    - Water reuse and desalination
    - Catchment management and alien vegetation clearing
- Operational and power supply risk management
- Water security considerations

Figure 1 Wemmershoek Dam

[1] The 2019 Water Strategy is available online: Click here

2 The current status of Cape Town's water supply system

The Western Cape Water Supply System (WCWSS) is currently the primary source of Cape Town's water supply. This will remain the case until the New Water Programme diversifies Cape Town's water sources. During the 2021/2022 hydrological year (ending 30 October 2022), the WCWSS experienced below-average rainfall, resulting in the dams not filling and ending up being ~19% lower than the year before. This raised serious concerns as to whether drought conditions were persisting.

Cumulative rainfall at Wemmershoek (Figure 2), a station that has historically been a good predictor, was ominously close to that experienced during 2017 at the height of the drought. In addition, total system storage also tracked below the lower 10th percentile of the forecasts for the end of the year, and forecasts for 2022/23 indicated that depending on demand dams would fall to approximately 45% at the end of summer and that without good winter rains there may possibly be a need to impose restrictions in 2023/24. However, given that water usage was expected to increase, the City adopted a precautionary approach and voluntarily agreed with other urban users to target a 10% saving on water use for 2023 without imposing formal restrictions.

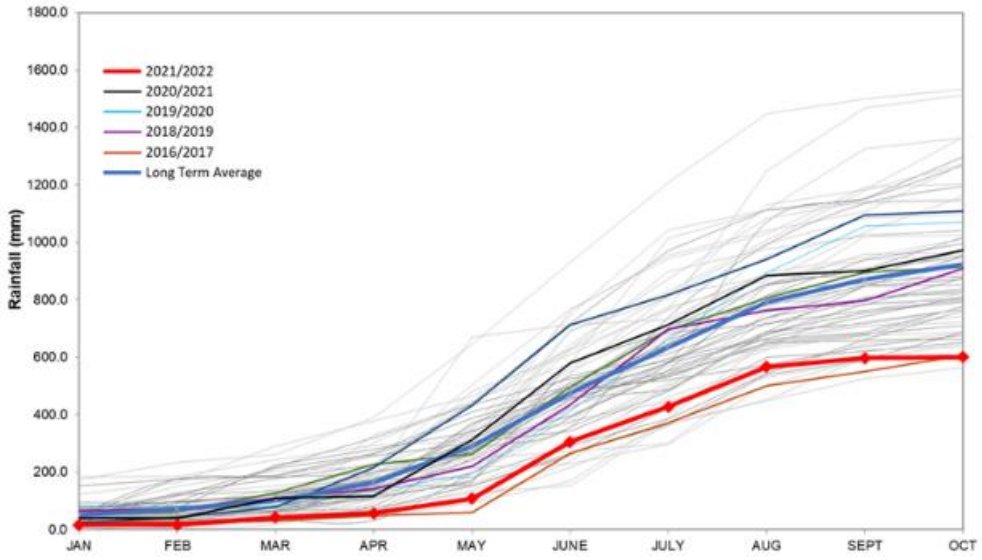

Figure 2 Rainfall at Wemmershoek dam

A 'Drought Monitoring and Response Framework' was developed to improve the transparency of water resource decision-making. It utilised statistical storage modelling combined with anticipated rainfall trends, seasonal weather forecasts, catchment soil, and moisture conditions to help define an alert level. For each alert level, an appropriate response was defined as illustrated in Figure 4 below.

Alert Level	Meaning	Projected Storage 1 Nov	Recommended response to Alert Level	Possible Restrictions	Current Level
Water-Wise	There is no indication of significant risk of a drought cycle beginning	>95%	**Monitor Water Resources** • Maintain management plans • Maintain infrastructure • Maintain public awareness of the importance of water conservation • Develop and upgrade infrastructure	**Water-wise** No restrictions	
Drought Alert	There is clear evidence of a possible, but not confirmed, drought cycle developing	80% - 95%	**Keep updated and begin preliminary planning** • Initiate Water Restrictions Steering Committee • Prioritise repairs and maintenance • Ensure WCWSS is in balance • Engage with DWS around the operation of the WCWSS • Review drought mitigation and management planning • Maintain public awareness of the importance of water conservation	**Water-wise** No restrictions but with special measures as decided by the City's Water Restriction Steering Committee	X
Drought Response	There is confirmation that a drought has begun, or is in progress, and appropriate actions are required	70% - 80%	**Conserve available surface water resources** • Conserve available surface water resources • Maximise yield from alternative water resources • Consider bringing forward augmentation projects where possible • Implement drought response measures • Prioritise repairs and maintenance of infrastructure which ensured CCT's ability to optimise its use of water from the WCWSS • Continue implementing measures implemented under "Drought Watch"	**Level 1 Restrictions** Consultation with Water Restriction Steering Committee required	
Accelerated Drought Response	A drought is impacting the WCWSS requiring significant (20-30%) restrictions.	<70%	**Reduce Water Demand** • Implement drought management plans with a focus on reducing demand in alignment with restrictions imposed by DWS • Continue implementing measures implemented under "Drought Watch" and Drought Warning	**Level 2 & 3 Restrictions** Consultation with Water Restriction Steering Committee required	
Emergency Drought Response	A drought is impacting the WCWSS requiring significant (20-30%) restrictions and an emergency response	<50%			

Figure 3 Drought Monitoring and Response Framework

Application of the framework indicated that a "Drought Alert" would be applicable until there was certainty on the quantum of winter rainfall in 2023. This has since been incorporated into the Weekly Water Dashboard[2]. Figure 4 indicates how the framework was incorporated into the dashboard.

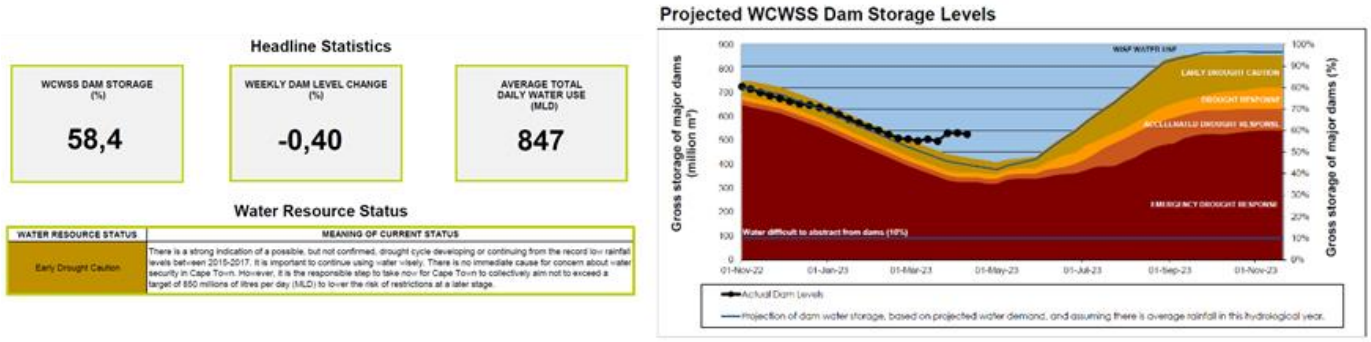

Figure 4 Incorporation of the Drought Monitoring and response framework into the Weekly Water Dashboard

[2] The Weekly Water Dashboard is available online. Click here to access the latest Weekly Water Dashboard

In addition, the City launched a publicity campaign to target a total water usage of 950 MLD to conserve resources. This target was subsequently reduced to 850 MLD due to operational constraints brought on by load shedding (see Section 4.2).

While unseasonal rainfall during March 2023 has resulted in a welcome increase in dam storage, this does not necessarily imply a wet winter ahead. Seasonal forecasts still indicate dryer than normal conditions, and there are furthermore anticipated shifts in the El Nina cycle.

Given the rebound in water demand post-drought (Chapter 3), over-allocation of the surface water supply system and apparent climatic uncertainty, the City will remain constrained in terms of water availability in the short to medium terms. Therefore, it is important that Cape Town continues to use water wisely.

3 Cape Town's current and future water demand

Cape Town's total water use (water demand) has increased steadily from a low point of 500 million litres per day in June 2018 (Figure 5). Peak summer demand (December – January) increased by more than 10% from ~950 million litres per day in 2021/22 to ~1090 million litres per day in 2022/23. Peak demand is expected to reach ~1200 million litres per day next summer (2023/24). Water demand at this level was last recorded in December 2015. Figure 5 shows that winter demand – indicative of indoor water use, has recovered to ~800 million litres per day. While this implies a change in the water demand pattern, with less water being used outdoors for garden irrigation and the filling of pools, both of which are predominantly summer activities, the pre-drought habits are beginning to return – particularly during spells of hot weather. During December 2022 - February 2023, it is interesting to note how quickly demand responded to temperature and rainfall, confirming that 150-200 million litres per day (~20% of demand) was being used to meet outdoor demand.

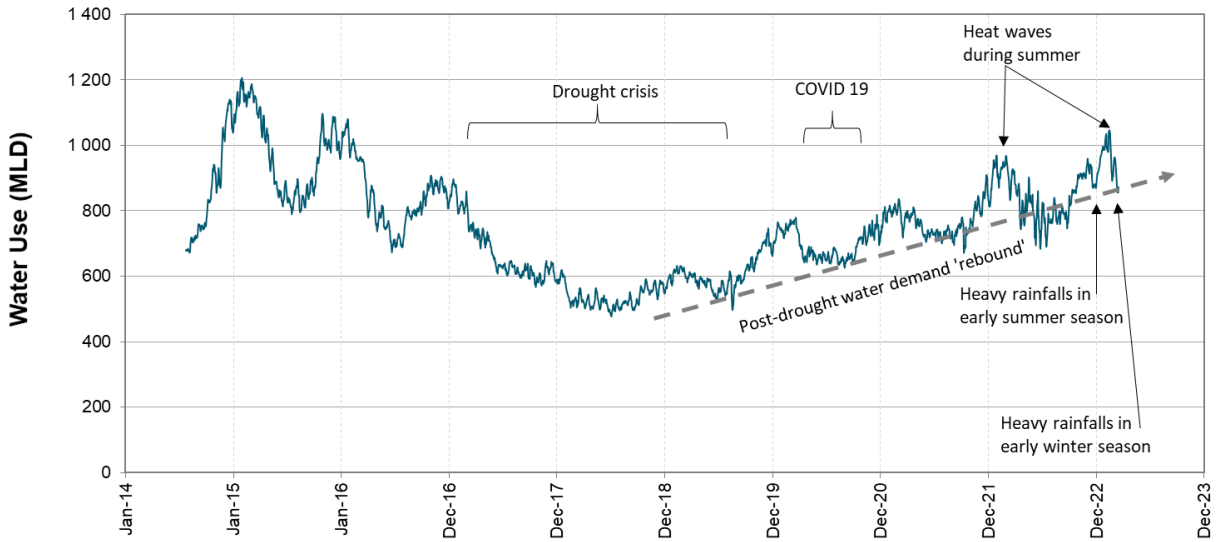

Figure 5 Overall Water Use by the City of Cape Town (Million litres per day)

The City began intensifying water conservation awareness and water demand efforts in November 2022. This was in response to several factors, including load shedding and its impact on water infrastructure; the increase in water demand; and the dam storage levels of the Western Cape Water Supply System (from where Cape Town receives most of its water supply). These efforts will continue and be increasingly important as demand continues to grow and will contribute to helping protect critical infrastructure and reduce the risk of restrictions by ensuring the dams – of the Western Cape Water Supply System stay fuller for longer.

3.1 Spatial distribution of future demand

Although water demand is the primary driver of the timing of the New Water Programme (NWP), it is crucial that the location and timing of different new water sources and associated infrastructure (reservoirs, pipelines etc.) are timeously planned. This planning is essential to ensure the robustness and resilience of the bulk water supply system.

Figure 6, based on the latest spatial plans, highlights the current (Figure 6A) and future 2040 (Figure 6B) distribution of water demand across the City – indicated by the size of circles in each figure. It is important to note that the latest spatial planning, and consequently Figure 6, predicts increased levels of densification and a decrease in the rate at which water demand increases in the northern areas of the City – which was previously expected in 2015.

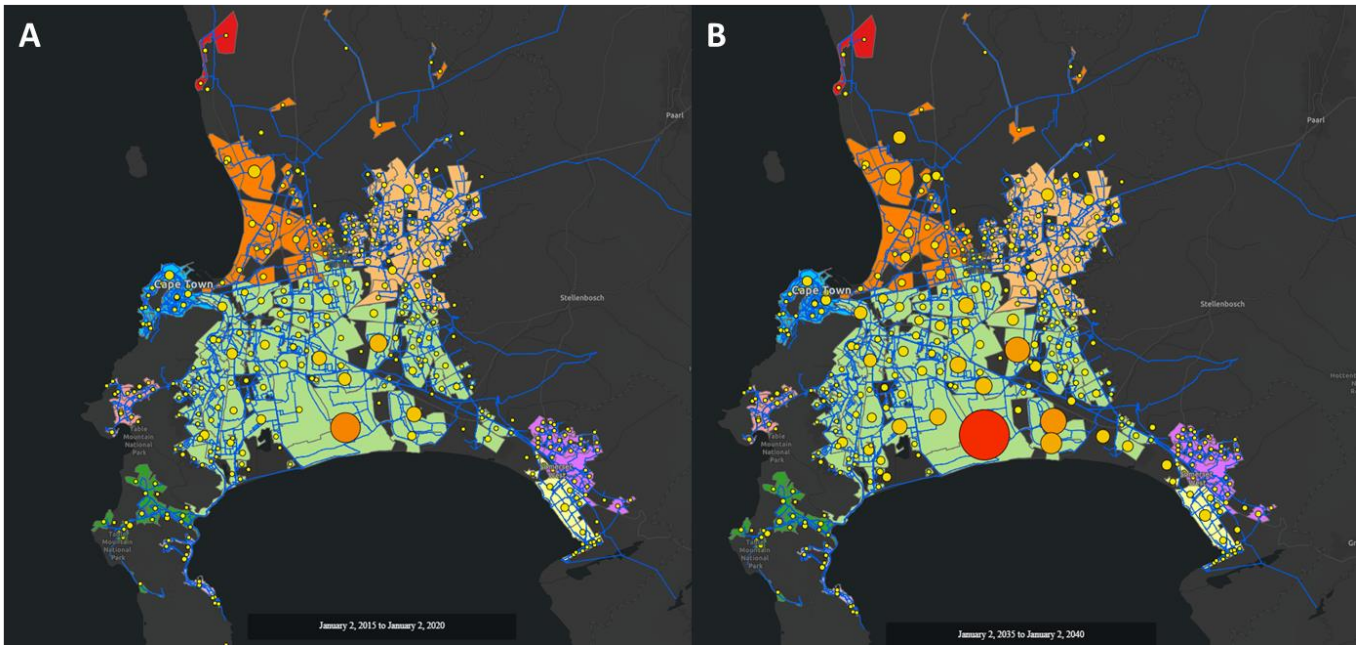

Figure 6 Spatial Distribution of water demand 2020 [A] and 2040 [B]

The change in water demand forecasts and spatial planning has the potential to have a significant 'knock-on' impact on bulk water infrastructure planning. However, it is important to emphasise that the Bulk Water Resilience planning recognises that demand could grow in a planned or unplanned manner. Therefore, infrastructure development needs to respond timeously. To this end, water demand growth is being monitored to help inform ongoing revisions of the bulk water supply infrastructure masterplan.

3.2 Future water demand study

The 'Future Water Demand Study', described in the Water Outlook – March 2022, is taking a scenario approach based on 'possible, plausible, probable and preferable' demand scenarios to inform operational planning and long-term water resource planning. A draft version of the tool and analysis is currently under review, following which it is anticipated the tool will be utilised more broadly. In the development of the tool, various additional uses have been identified – including the potential to help with understanding Non-Revenue Water. Progress on this initiative, and its application will be presented in the next Water Outlook

4 Risks to Water Supply

4.1 Climate Change

Climate change poses a significant risk to Cape Town's long-term water security, and the City continues to plan for a 25% reduction in yield (available water) by 2045. In addition, independent studies have suggested that climate change could further increase the likelihood of severe droughts, as was experienced during the 2015-2017 period for the City of Cape Town by a factor of three (Otto et al., 2018[3]). The severity of the recent drought in the Western Cape and the associated impact on the City of Cape Town has intensified the various concerns relating to the long-term effects of climate change on the WCWSS.

It is currently unclear whether any future regional climate change will be gradual (Figure 7A) or sudden change / 'step change' (Figure 7B) as has been experienced in Perth and Melbourne in Australia. This may lead to questions of whether or not the WCWSS is possibly already experiencing the effects of a sudden change or 'step change' in climate (Figure 7B), or if the 2012/22 below-average rainfall is part of a long-term cycle which has also been noted in various studies.

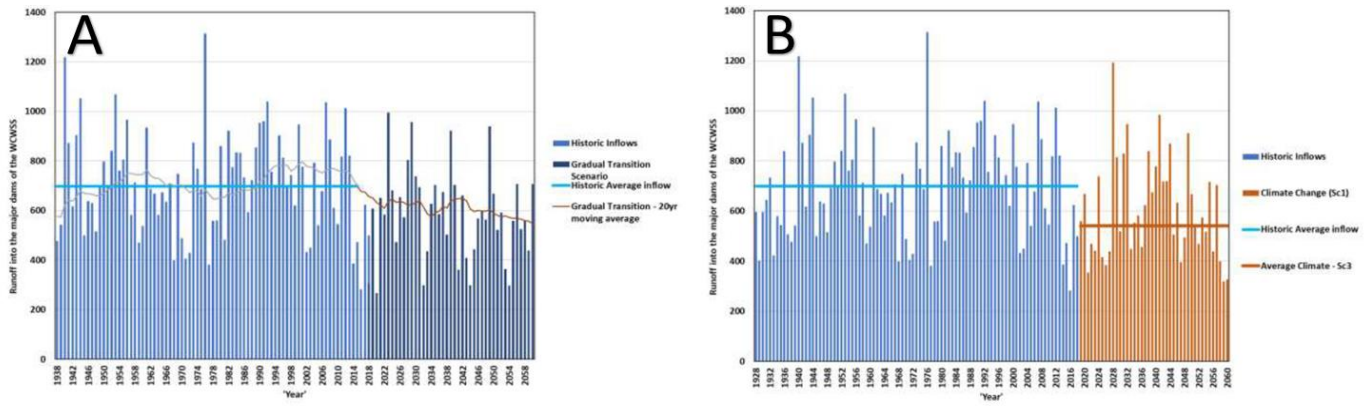

Figure 7 [A] Gradual Vs [B] Sudden / "Step change" climate change

Following five years of below-average runoff (2014 to 2018), Cape Town experienced two years of slightly above-average runoff (2019/2020 and 2020/2021 rainfall seasons), and then, in the 2021/2022 rainfall season, runoff was well below average – Figure 8. The above-average runoff, coupled with depressed water demand up to the 2020/21 hydrological year, resulted in the lifting of water use restrictions. The lower rainfall and resulting runoff in 2021/2022 may indicate a possible continuation of a multi-year drought cycle, similar to what was experienced in the 1920-1930s and 1960-1970's – Figure 8.

[3] https://www.preventionweb.net/files/62726_otto2018environ.res.lett.13124010.pdf

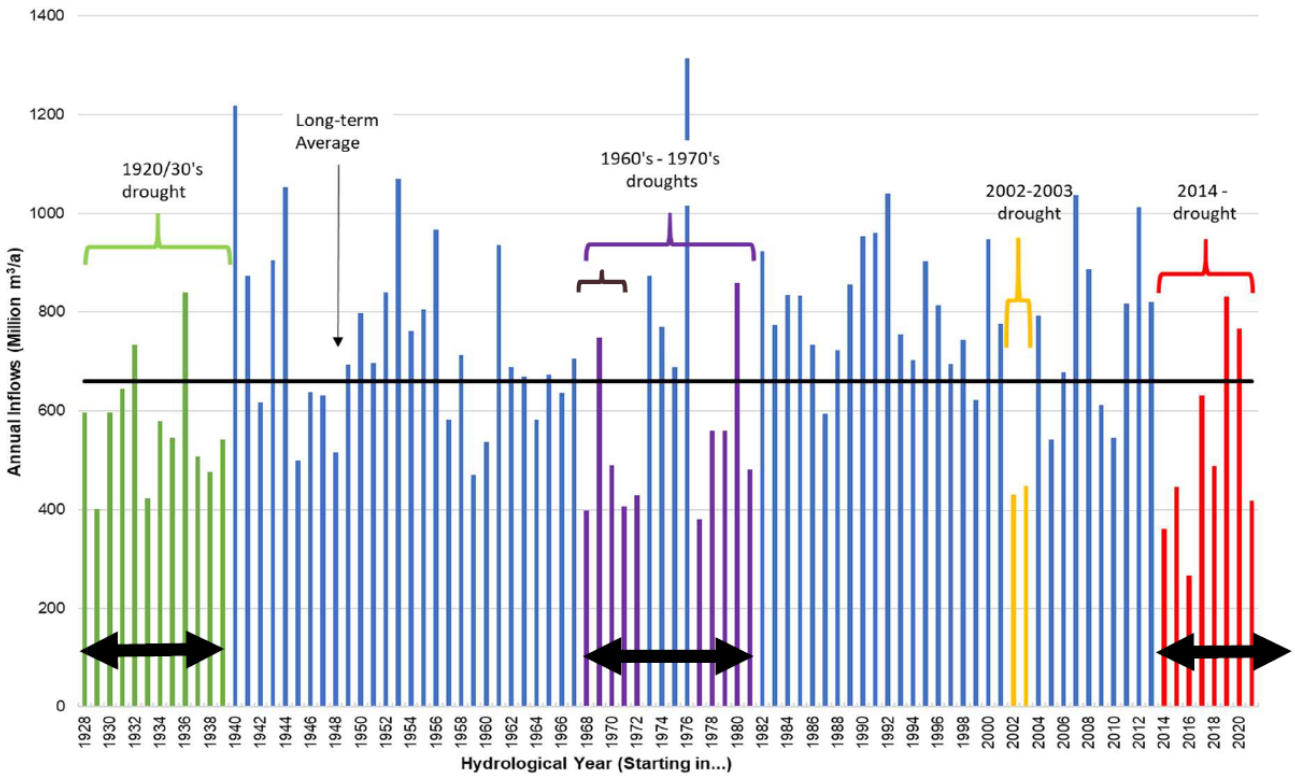

Figure 8: Annual Inflows into the large water supply dams (Black arrows indicating decade-long drought periods).

The City's view remains that we are in a possible 10-year drought, compounded by gradual climate change. However, should it be evident that the WCWSS is experiencing a step change in climate, it is essential to recognise that implementation will lag the low demand curve, which means:

- The City will not be able to supply water at a 1: 200-year level of supply assurance.
- In the case of a severe drought, restrictions in the order of 30% initially will be required, which will get progressively less as NWP Schemes come online.
- Achieving 30% restrictions will prove challenging due to the current low household consumption.
- TMG 2 and 3 from the committed programme must be brought forward.

Should Cape Town be experiencing a step-change in climate, planned water schemes will need to be accelerated to ensure a secure water supply to Cape Town. Further, due to the long timelines for implementation, intensive water conservation and demand management remains vital to ensuring water security.

4.2 Load shedding

Load shedding, especially extended higher stages, poses direct and indirect risks to Cape Town's water supply. Currently, bulk water supply is directly impacted as only four (these account for 80% of total treatment capacity) of the twelve water treatment plants generate their own hydro power. The remaining plants rely on grid power. While all the City's plants have installed generators, these only have the capacity to run critical equipment and processes for limited periods. Electrical equipment and control systems are also adversely impacted by power fluctuations often associated with load shedding. This results in increased breakdowns, the impacts of which prove difficult to manage during the summer peak demands periods. Despite this, Cape Town is fortunate that the majority of the City is supplied by gravity, limiting the need for pumping. Chemical supply chains have also been impacted by load shedding, due to manufacturing downtime that has reduced available stocks on hand at the water treatment plants.

Whilst we have contingency plans in place, emergency water restrictions may be required to reduce power consumption and protect the water supply system should the national power situation become critical.

5 Update on Committed Water Augmentation Programme

The City continues with planning and implementation of the various water augmentation projects identified in the Water Strategy and remains committed to developing an additional 300 million litres of water supply from diversified sources by 2030. This Chapter provides an update on the groundwater, reuse, desalination and alien vegetation clearing programmes. These collectively represent a significant portion of our investment in future water security.

5.1 Sustainable Groundwater Utilisation

In keeping with our commitment to sustainable groundwater use, the City is working on various initiatives, including recruiting hydro-geological professionals as members of staff, establishing monitoring committees and developing groundwater protection systems to protect this vital drinking water resource.

5.1.1 Monitoring Committees

Following water use licence approval conditions, monitoring committees have been successfully established for the Cape Flats Managed Aquifer Recharge and Steenbras TMG Schemes. A third monitoring committee will also be established to aid in the management of the decades-old Atlantis Water Resource Management Scheme[4]. The functions of the monitoring committees, comprising multiple stakeholders from civil society, regulatory authorities and interested community organisations, are as follows:

a. Ensuring compliance with water use licence conditions and applicable environmental legislation in developing and operating groundwater schemes, including making recommendations on required changes to licence conditions or scheme operations.

b. Making recommendations on mitigation measures to reduce impacts on connected water and terrestrial ecosystems as well as other water users.

c. Providing a forum for discussing issues relating to the wellfield operations and management, and for raising, addressing and where possible, resolving any concerns.

d. Promote awareness on the importance and value of groundwater as an important component of the City's water future.

[4] https://www.artificialrecharge.co.za/casestudies/Atlantis_final_10August2010_reduced%20dpi.pdf

5.1.2 Monitoring and numeric modelling of aquifer storage and water quality

The City is investing and implementing extensive monitoring programmes to detect and manage the potential impacts of groundwater abstraction on subterranean storage, the natural environment and other users. An extensive network of near and far-field monitoring boreholes and surface water monitoring stations in groundwater-dependent streams and wetlands has already been established. This will also assist in managing the Managed Aquifer Recharge of the Atlantis and Cape Flats aquifers. Types of monitoring being undertaken include:

- Extensive Groundwater quality and level monitoring conducted over the years to aid in determining baseline conditions
- Groundwater levels and yield assessments to determine aquifer storage and maximum permissible drawdown and abstraction from the various wellfields
- Water quality to detect transient changes and suitability for drinking water production and source water protection.
- Streamflow and wetland inundation to detect changes to groundwater-dependent ecosystems

Data obtained during monitoring and aquifer testing are used to calibrate the groundwater model, which aids in better management of the resources and provides forecasts of water level trends.

This monitoring and implementation of mitigation measures in the event of adverse impacts on the environment is subject to oversight and scrutiny from the various Monitoring Committees.

5.1.3 Groundwater Protection Plan

A groundwater protection plan has been developed to protect the bulk water supply wellfields from pollution and other anthropogenic activities. In essence, this requires the application of numerical modelling to determine water and pollutant pathways from the geographic areas surrounding the existing and proposed abstraction wellfields. This analysis results in the delineation of various groundwater protection zones (GPZ's), which require management of development and land use activities within each zone. An example of these zones developed for the Cape Flats is provided in Figure 9.

The groundwater protection plans aim to protect the drinking water abstraction boreholes and catchment areas from direct contamination at the boreholes or microbial and/or chemical

contamination from near or further afield. Figure 9 illustrates protection zones for the Cape Flats Aquifer. The outer zone in each area were included in the Municipal Development Framework and is currently being used to inform City development applications with the intention to publish an official guideline and dedicated bylaw within the next 18 months.

5.1.4 Managed Aquifer Recharge

Managed Aquifer Recharge (MAR), is a process of purposefully injecting or recharging water into an aquifer. This process has seen significant benefits world-wide and City of Cape Town intends on utilising highly treated wastewater, which has undergone advanced treatment through a reclamation plant, and stormwater for managed aquifer recharge. In the City of Cape Town's context, MAR is conducted to:

- Improve the water quality of the underlying aquifer by injecting high quality treated effluent the has undergone treatment in an advanced water reclamation plant;
- Protect and restore the aquifer by preventing salt water intrusion (in the form of salt water intrusion barriers) and reducing further declines in groundwater levels;
- Improve the environment by maintain and restoring groundwater dependant ecosystems
- Maintain groundwater sustainability by improve water storage. This is done by storing surplus water to maintain sufficient groundwater for our needs without compromising the availability of groundwater to other registered users and the environment

5.1.5 Community Outreach Initiatives

The City of Cape Town is a key partner in the newly established Table Mountain Water Source Partnership. The partnership focuses on groundwater protection, management and awareness within the strategic water source area. A fundamental output of the partnership is the groundwater dashboard (https://tablemountain.groundwaterinfo.africa/) which allows you to navigate through the map menu to get information and data on groundwater. The City's groundwater data obtained through the New Water Programme is included in this dashboard.

The City is also actively pursuing an aquifer park and groundwater education centre planned to assist in promoting the importance of aquifers for drinking water supply and maintenance of our unique aquatic ecosystems.

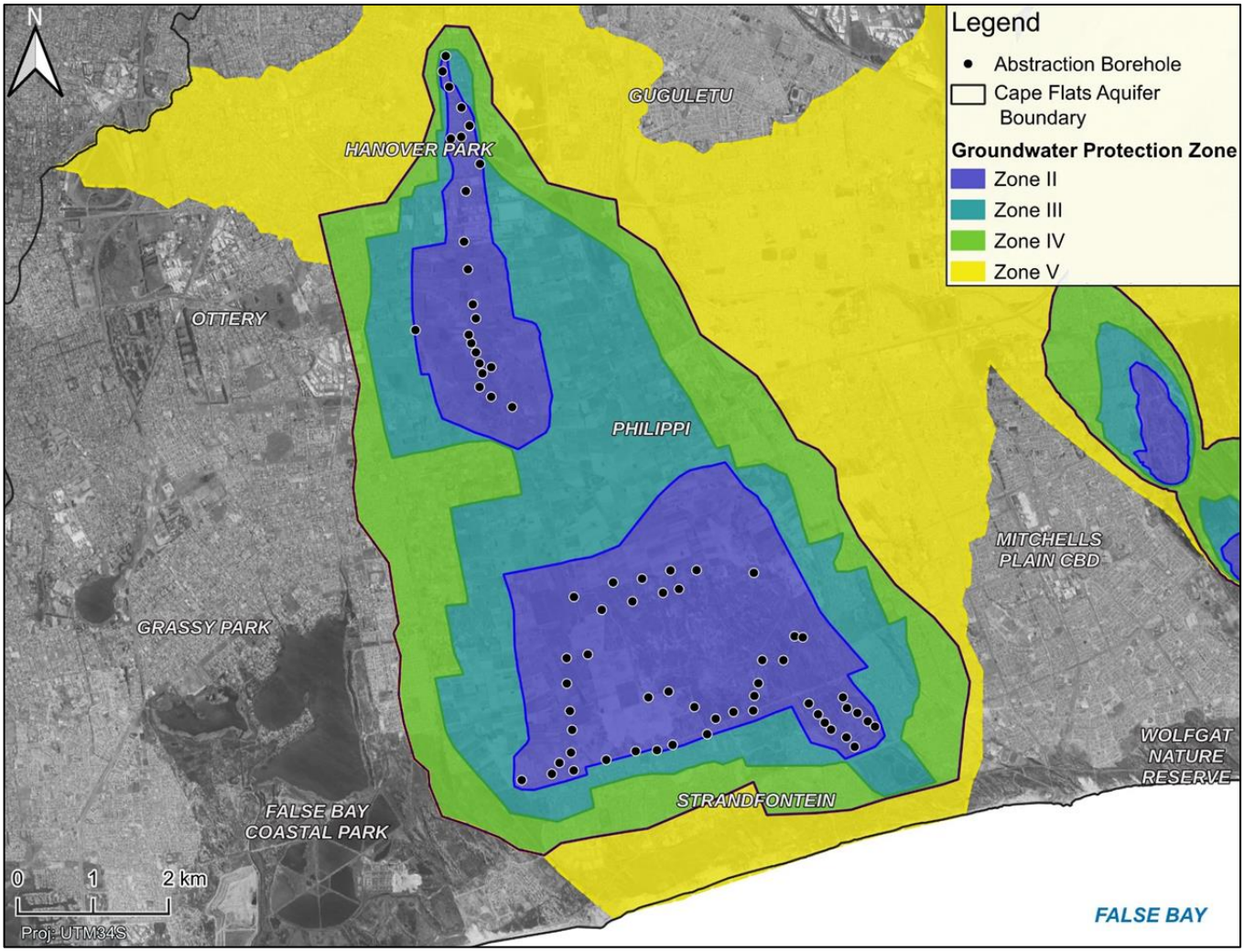

Figure 9 Cape Flats Managed Aquifer Recharge Scheme Groundwater Protection Zones

5.2 Groundwater Schemes

This section provides updates on the individual groundwater schemes being developed by the City.

5.2.1 Table Mountain Group Aquifer (TMGA) Development

Deep fractured rock zones within the Table Mountain Group Aquifer have been identified for water abstraction adjacent to the Steenbras Dams, in the mountains above Grabouw, and near Theewaterskloof Dam. While exploration drilling has taken place at all three locations, the Steenbras wellfield (Figure 10) was identified for initial development given the proximity to City owned water infrastructure. On completion, this wellfield will be able to supply 25 million litres of water from two compartments of the main aquifer.

Borehole depths very from 300m to 1000m below ground level. Due to high concentrations of iron and manganese it will in the long-term require pre-treatment before the discharge of the abstracted water into the Steenbras Upper Dam, from where the water can be processed at either the Steenbras or Faure water treatment plants.

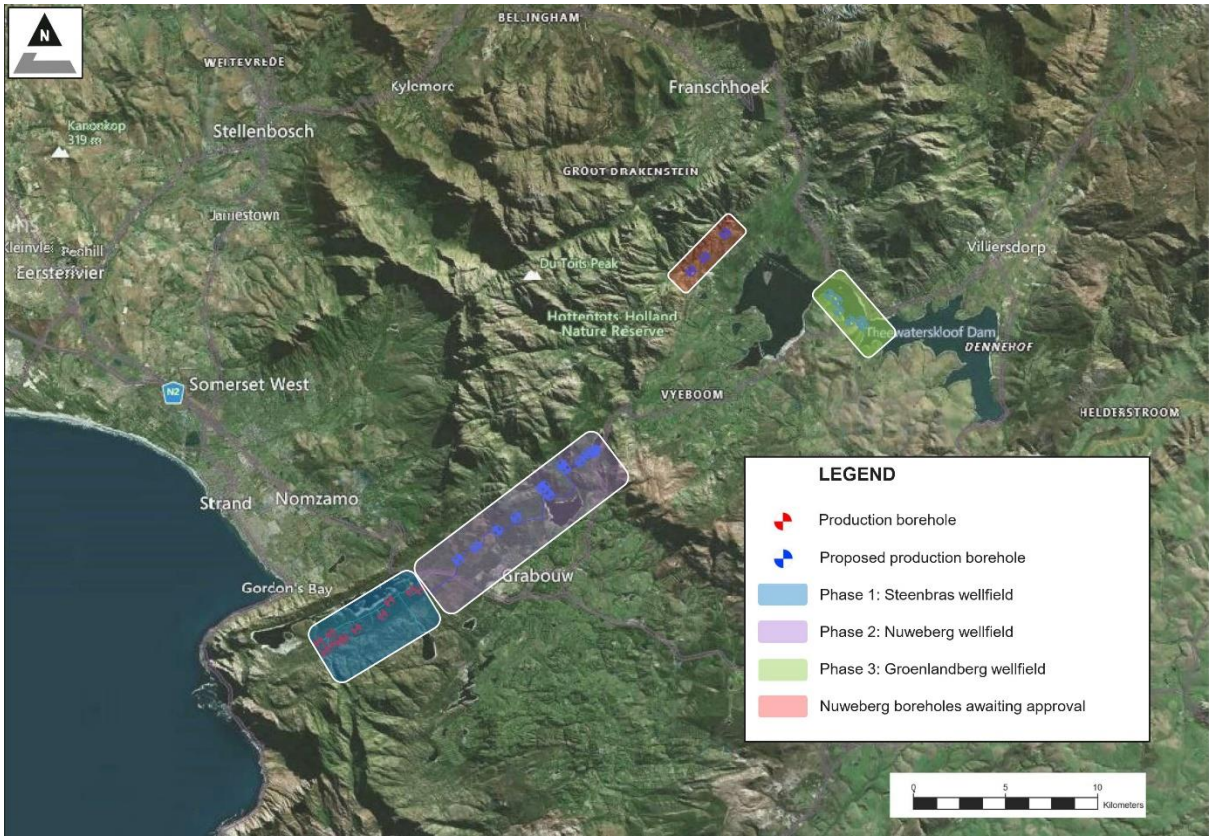

Figure 10 Overview of the existing and proposed TMG Aquifer Wellfields

Figure 11 Example of pumping infrastructure in the TMGA

The existing and planned wellfields are located in environmentally sensitive areas, which have been considered in the wellfield infrastructure's planning, design, and construction. To date, 8 of the 12 planned abstraction boreholes with associated pump house structures have been completed at Steenbras. In addition, 14.5 km of conveyance pipelines and 14.4 km of electrical cables required to power the pumps have been completed. A total of 17 monitoring boreholes have also been drilled to assist in the management of aquifer abstraction rates.

Drilling to completion of the remaining planned boreholes and their associated equipping will commence shortly and signal completion of the Steenbras wellfield. Construction of the founding platform for the future pre-treatment plant and the installation of enhanced security measures to protect installed infrastructure will also be undertaken in parallel. Additional vegetation rehabilitation work will also be performed along 3 km of pipe trenches. It is worth noting that this work has been very successful, and areas disturbed during construction are recovering very well.

A tender for the establishment and maintenance of instrumentation at the 17 monitoring boreholes has been awarded. It will permit the transmission of data to the Bulk Water Decision Support System (profiled in the Water Outlook – March 2022) to inform the long-term wellfield management. A secondary electrical supply line is also scheduled for installation over the next few months to increase power availability to the water scheme. Work has also continued with the design of the Grabouw (Nuweberg) wellfield and the pre-treatment plant.

Over the past year, replacement contracts have also been put in place for civil, mechanical and electrical services as well as maintenance services necessary for the development and operation of the scheme.

5.2.2 Cape Flats Managed Aquifer Recharge Scheme (CFA) Development

This environmentally sensitive water scheme targets water in the shallow sandy aquifer underlying much of the Cape Flats. It comprises a combination of abstraction and recharge wellfields located in the heart of the urban area – Figure 12. It will store water during wetter years, remediate and improve water quality in the aquifer over time and enable integrated urban water management. The scheme comprises the following elements:

- Managed injection of 40 MLD advanced treated water sourced from the Cape Flats Wastewater Treatment Works into the Cape Flats Aquifer through a total of 64 injection boreholes to store water and create barriers to prevent ingress of sea water or pollutants from potential point sources.
- Abstraction of groundwater from 6 wellfield clusters via 89 production boreholes.
- Treatment of the abstracted groundwater to potable standards at Hanover Park and Phillipi (10MLD), Strandfontein West (5MLD), Strandfontein North/East (15MLD) and Mitchells Plain (15MLD) before injection into the water distribution water network.
- The development of the Mitchells Plain WTP and the implementation of Managed aquifer Recharge and additional 24MLD will be available.

The development of the CFA scheme is progressing with the Strandfontein West 6 million litres of water per day modular treatment plant having been completed. The water treatment plant will be operated on a trial basis from July 2023 onwards once the equiping of some supply boreholes have been equipped. Equipping of the 11 boreholes at the Mitchells Plain cluster, required for the containment of polluted groundwater plumes emanating from old sludge ponds, will commence thereafter.

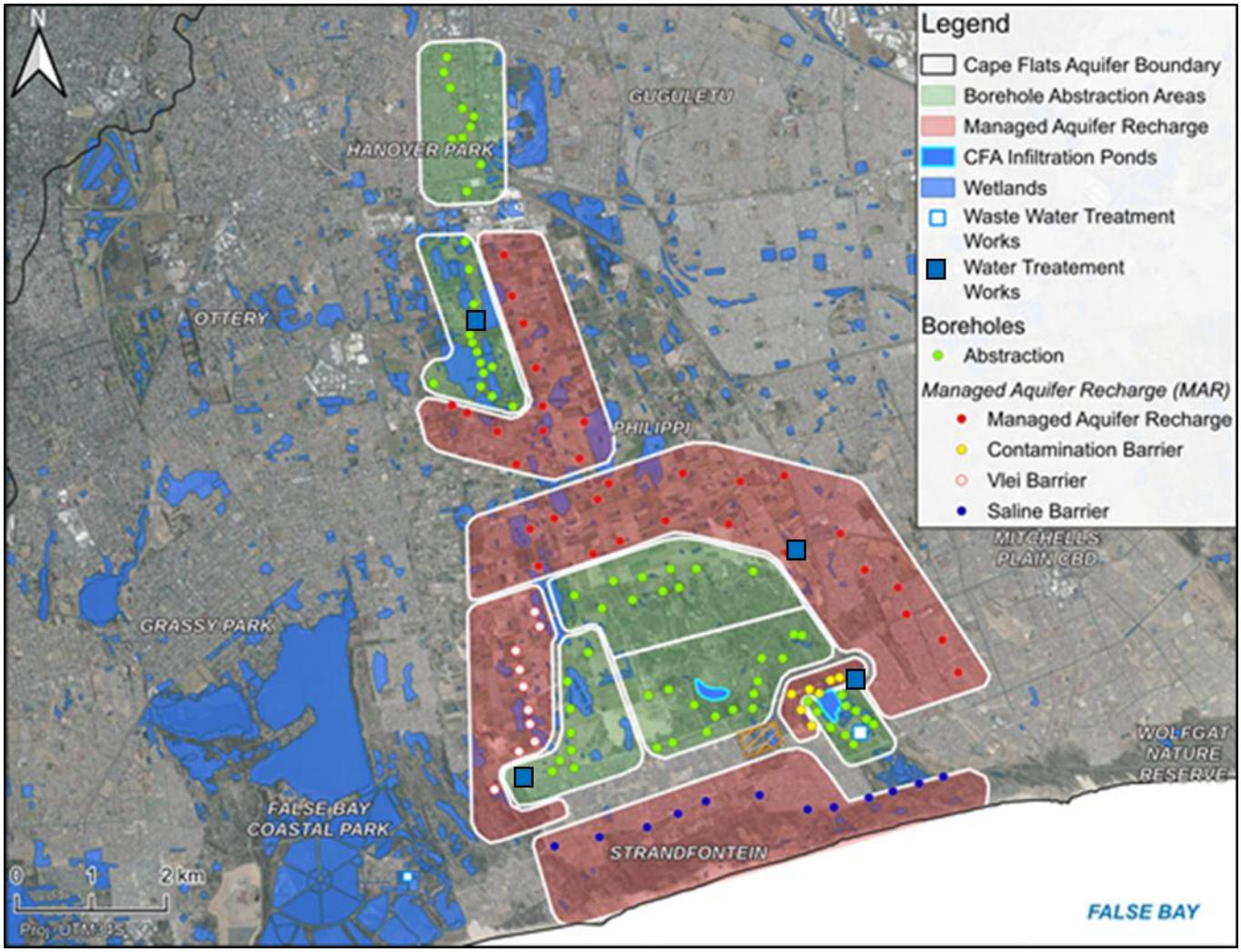

Figure 12 Overview of the Cape Flats Aquifer scheme

Civil construction work at the advanced treatment plant located at the Cape Flats Waste Water Treatment Works is progressing well, and the detailed design of the Hanover Park / Phillipi water treatment plant has been completed. Tender documentation is now in preparation for the construction of this package water treatment plant which will incorporate reverse osmosis technology due to the salinity present in the groundwater. Equipping of boreholes comprising the Hanover Park wellfield will commence in July 2023.

Contracts for borehole drilling, pipeline installation, equipping boreholes, and mechanical/chemical cleaning of boreholes have also been finalised.

Figure 13 Strandfontein West Water Treatment Plant

5.2.3 Atlantis Managed Aquifer Recharge Scheme Refurbishment

The Atlantis Water Resource Management Scheme (Figure 14) was developed in the 1970s to supply water to Atlantis, Pella, and Mamre. Water is abstracted from two wellfield clusters and treated to potable standards at Witzands and Silwerstroom. Natural rain-fed recharge of the shallow sandy aquifer is augmented by means of stormwater infiltration ponds and reclamation water sourced from the Wesfleur Wastewater Treatment works, as indicated graphically below. This project focuses on refurbishing the existing groundwater scheme, which has lost significant water production capacity due to the biofouling of boreholes and ageing process equipment. Capacity will be increased from the current approximate 10 MLD to 38 MLD.

To date, the re-drilling of 32 boreholes has been completed, along with upgrading the Silverstroom pumping system to Pella Reservoirs. Upgrading the electrical control and acid handling systems at the Witzands softening plant and the brine disposal system have also recently been completed.

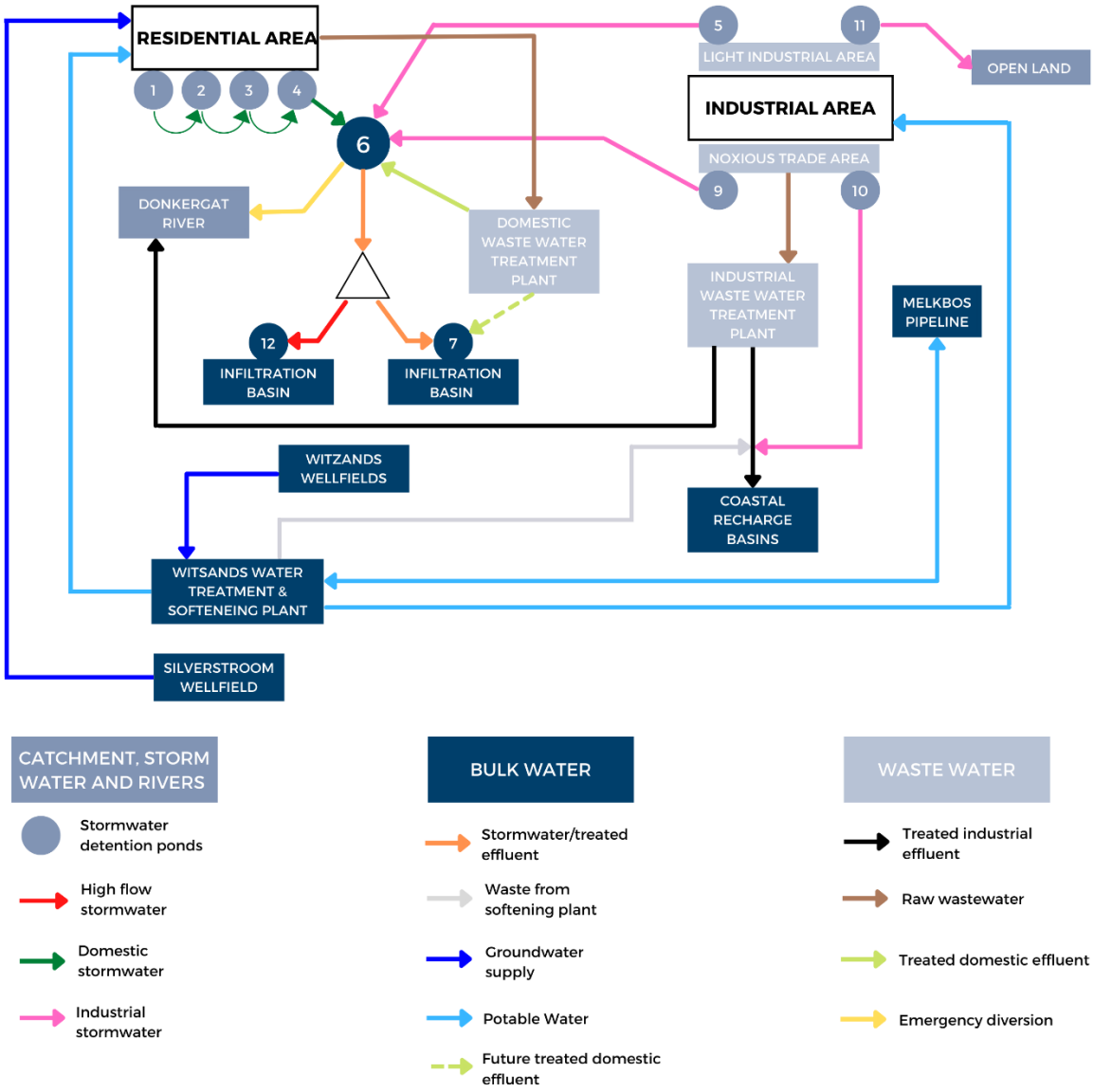

Figure 14 Scheme General Arrangement Plan

Equipping of the boreholes will commence in May 2023, and upgrading the two main stormwater recharge basins has already started, with completion due by the end of 2026. In addition, the installation of raw water reservoirs totalling 10 million litres in capacity is also underway. These reservoirs will assist in the improved management of wellfield abstractions and the softening plant processes.

Similarly, as for the Cape Flats scheme, contracts for borehole drilling, pipeline installation, equipping boreholes, and mechanical/chemical cleaning of boreholes have also been finalised.

5.3 Desalination

Desalination is set to become an important part of our water future water resource mix due to it being climate independent and scalable. Power requirements need careful consideration given the current instability of the national power supply, and therefore alternative power sources are being considered in the planning.

The feasibility study for the proposed Cape Town Harbour location has been completed and confirmed that a 70 million litre per day plant can be established on the proposed site. The plant layout has also been configured to allow for planned major elevated roadways abutting the site. In addition to the harbour site, the City has considered a site near Atlantis and will now commission a study to consider another alternative at Melkbos. The latter study will be concluded by March 2024.

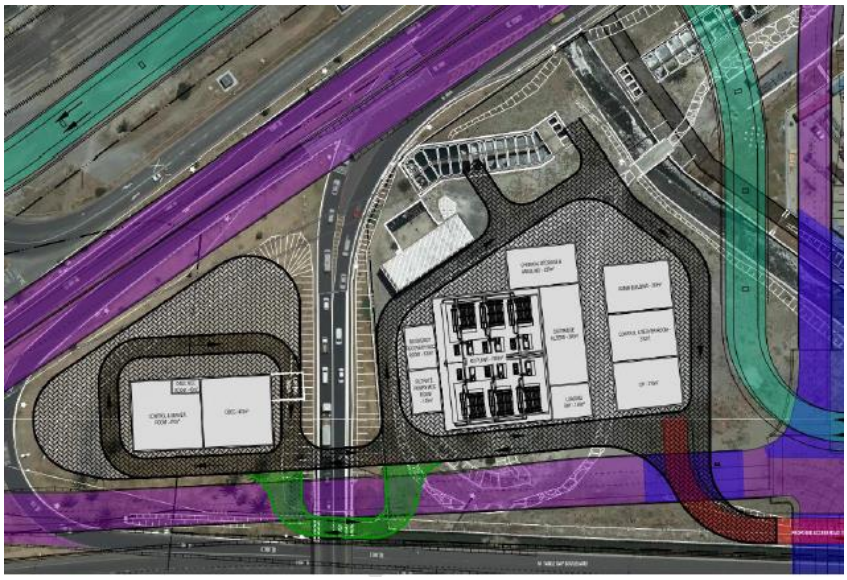

Figure 15 Overview of the PIP Desalination Site

Following the conclusion of an agreement with National Treasury, they have undertaken to provide transaction and specialist advisory services to the City on developing and financing the desalination plant. Consulting appointments are currently in the process of being finalised. The environmental impact assessment process to be undertaken by the City is scheduled to commence in May 2023.

Early in March 2023, an independent advisory panel (IAP) was established to review and advise on the City's desalination plans. The panel comprises well-recognised professionals, including scientists, engineers, and public health and social science practitioners with extensive experience implementing seawater desalination plants and associated processes nationally and internationally.

5.4 Faure New Water Scheme

The Faure New Water Scheme (FNWS) will have a maximum capacity of 70 Ml/d, and utilise feed water from the upgraded Zandvliet wastewater treatment works treated to drinking water standards through an advanced water treatment process. The treated water will then be blended and distributed to Cape Town.

The Faure New Water Scheme is currently in the Detailed Design Phase of the project. The City has implemented a rigorous process to review the design through the Independent Advisory Panel and internal workshops. The Independent Advisory Panel was discussed in the Water Outlook – March 2022).

5.4.1 Operation of the Faure New Water Scheme

The FNWS will incorporate advanced water treatment technologies that are new to the City. Operating this type of plant to produce purified recycled drinking water meeting international standards will require operational rigour at a level significantly higher than needed for the conventional water treatment plants operated by the City. It is, therefore, essential to establish whether the scheme's operation should be undertaken internally by the City or be outsourced via a management contract, where the latter will be required to ensure suitable technical and operational expertise is in place. The City has received the go-ahead to commence the Section 78 process to determine whether the Faure New Water Scheme should be operated internally by the City of Cape Town or by an external party.

5.4.2 Stakeholder Engagement

The City has undertaken a stakeholder engagement program to build stakeholder understanding of and trust in its water reuse plans. Consultations have occurred with, amongst others, key government, institutional, academic, environmental, religious, and industry stakeholders.

Over the next nine (9) months, the City will undergo an extensive public engagement process on the benefits and risks of the Faure New Water Scheme, which will entail engagements with the broader public and a process to address the comments and feedback received from the public.

For more information on the Faure New Water Scheme, communication materials relating to water reuse have been developed and are available on the City's website (www.capetown.gov.za/water-reuse). These include a brochure, leaflet and video - available in English, Afrikaans, and isiXhosa – as well as a frequently asked questions sheet and a presentation.

5.4.3 Independent Advisory Panels (IAP)

The City appointed the Water Research Commission (WRC) to establish an independent advisory panel of international and local experts to review the City's work and provide advice and recommendations on various aspects relating to the implementation of the Faure New Water Scheme.

Figure 16 The Independent Advisory Panel and City officials visiting the new Zandvliet MBR plant

The Independent Advisory Panel (IAP) held its inaugural workshop from 7 - 9 November 2022. The objectives of the workshop were to provide expert advice and independently review, among other things, the following aspects of the project:

- Stakeholder and public engagement
- Approach and design, with a specific focus on public health
- Water quality criteria for source, intermediate, and treated water, and the related water treatment objectives during design and operational phases
- The water quality sampling and testing programme, from planning through to the operational phase

The outcome of the three (3) day workshop highlighted the soundness of the technical design of the FNWS and confirmation of alignment with international best practices. The IAP proposed that a roadmap be developed that identifies all critical aspects that need to be addressed before implementation as well as during the operation of the scheme. The development of this roadmap is currently in progress.

5.5 Alien Invasive Plants

The clearing of invasive alien plants in the catchments of the Western Cape Water Supply System is to be implemented in two phases via a 6-year high impact phase between 2020 and 2026, followed by a 24-year maintenance phase. During the 'high-impact Period', resources are concentrated on initial and follow-up clearing of the seven priority sub-catchments feeding Theewaterskloof, Berg River, Wemmershoek and Steenbras dams as well as the Atlantis aquifer primary recharge zone, with ongoing follow-up and then maintenance clearing treatments building in over time.

In July 2021, the City of Cape Town and The Nature Conservancy (TNC) signed a Memorandum of Agreement (MOA) for undertaking high angle slopes clearing in the upper reaches of the identified catchments. In terms of this MOA the City of Cape Town committed R50 million over a 2 year period.

The City of Cape Town and TNC intend to continue clearing alien invasive plants (AIPs) in remote mountainous areas and priority sub-catchments through a new MOA (subject to Council approval), which will run from July 2023 to June 2026. Under the new proposed MOA a further R75 million will be committed to the clearing of invasive alien plants over the next 3 year period. The clearing of invasive alien plants is the cheapest source of all of the schemes making up part of the New Water Programme.

Figure 17 Extent of clearing of AIPs

Total of 40,320 hectares cleared since April 2019. This comprises 29,025 hectares of catchment subjected to initial clearing and further 11,295 hectares of follow up clearing as indicated in Figure ___ above. The programme has generated 571 employment opportunities of which 44% are women. In addition, 120 specially trained high-angle technicians working in remote mountainous terrain have been trained and deployed. An estimated avoided water loss of 13.1 Mm^3/year (35MLD) to the regional water system has been achieved to date.

6 Cape Town Water Outlook

6.1 Update of Water Strategy

The City of Cape Town annually reviews the long-term water balance between available supply and projected water demand. Figure 18 contains the water balance as of the end of June 2022. The actual demand has fairly closely followed the projected "bounce-back" curve post the low demands during the recent drought. It is anticipated that the growth in water demand will still increase in 2023 and will then follow the Low Water Demand Curve. The gradual decrease in available supply is attributable to the gradual climate change projections described in Chapter 4.

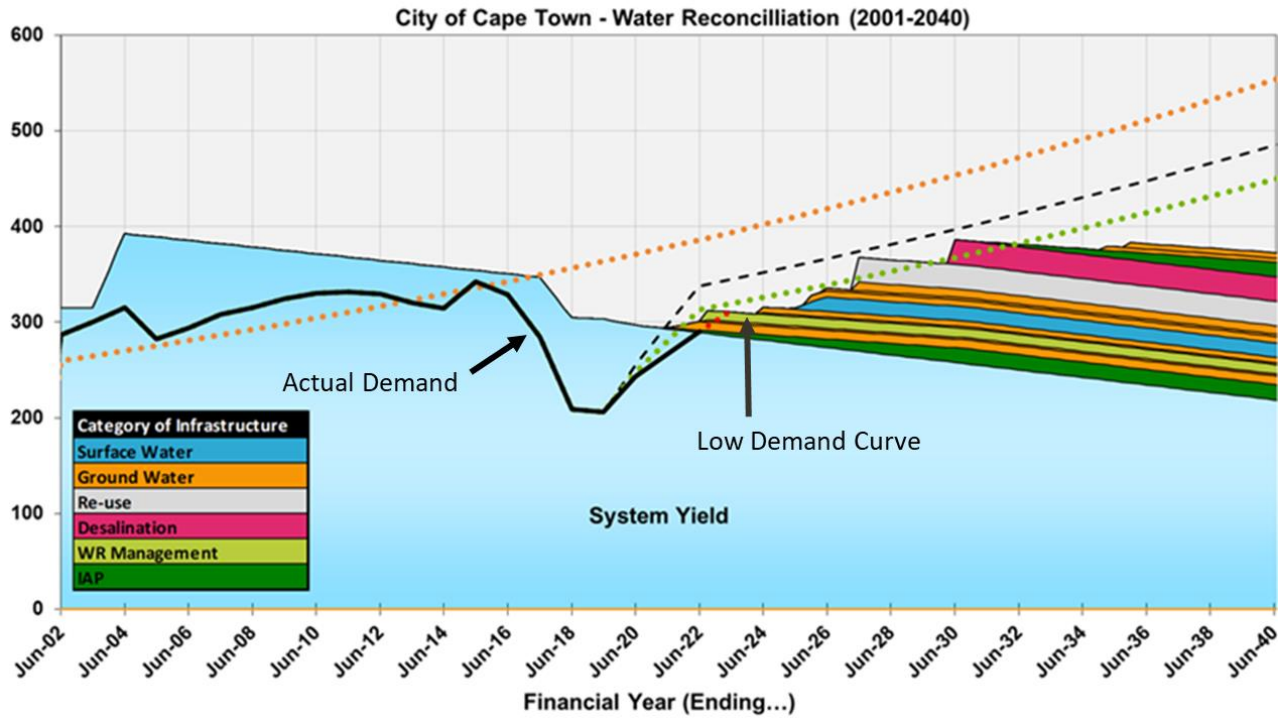

Figure 18 City of Cape Town water balance, including the New Water Programme

An updated schedule showing the latest timing and capacity of the schemes forming part of the City of Cape Town New Water Programme is contained in Table 1. The City of Cape Town remains on track to increase the supply by 300 Ml/d by 2030.

Table 1 City of Cape Town New Water Programme

Description	Revised First Water Date	Capacity (Ml/d)
Table Mountain Steenbras Phase 1	21 to 24	25
Table Mountain Nuweberg Phase 2	Jun-35	15
Table Mountain Groenlandberg Phase 3	Jul-35	12
CFA Strandfontein West	Jun-23	6
Cape Flats Aquifer: Hanover Park	Jun-25	4.8
Cape Flats Aquifer: Strandfontein North & East	Jun-26	18
Cape Flats Aquifer: Philippi	Dec-26	7.2
CFA Mitchells Plain WTP	Jun-27	24
Atlantis Aquifer	Jun-24	13
Berg Voelvlei River Augmentation Scheme	Jun-25	41
Faure New Water Scheme Phase 1	May to Sept-28	70
Desalination Phase 1	Feb 30	50 to 70
Clearing Invasive Alien Plants	July 22 to July 26	~ 30
Optimal management of the WCWSS	Ongoing	~ 25
		~ 341 to 361

6.2 Adaptable Programme

The water strategy states that by 2040 the City will strive to diversify its water sources away from surface water schemes by 25%. Therefore, future water augmentation schemes will primarily consist of water reuse, desalination, and groundwater schemes. The purpose of the adaptable program is to plan schemes that will be needed in the future, but for which an immediate decision to implement is not required.

Preparatory work for the schemes under the adaptable program has already commenced and the following initiatives are underway:

1) **Strategic Water Reuse Study** – this study considers the potential for the further development of direct and/or indirect water reuse schemes following the implementation of the Faure New Water Scheme. This study is anticipated to be completed by the end of 2023.

2) **Further Phases of Desalination** – the City has considered two sites at the feasibility level: the PIP site and a site at Atlantis. In addition, the City has now commissioned a study also to consider a desalination site close to Melkbos. It is anticipated that this study will be completed by the end of 2024

3) **Mitchells Pass Diversion Scheme** is a surface water intervention currently being studied at the Feasibility Level by the National Department of Water and Sanitation. The scheme entails investigating and confirming the proposed scheme's feasibility to divert surplus winter water from the upper Breede River to the Voelvlei Dam. The scheme comprises a new diversion

weir near the current Artois Canal diversion and a new pipeline to the upper reaches of the Klein Berg River, from where the water will be conveyed via the existing Klein Berg Canal into Voëlvlei Dam. The study has already commenced and it is anticipated that it will be completed by Mid-2024.

4) **Lourens River Pre-feasibility study** – the City has commissioned a study to consider the potential of pumping surplus winter water (run of river) from the Lourens River to the existing Faure Water Treatment Plant. It is anticipated that this study will be completed by the end of 2023

5) **Raising Steenbras Lower Dam** – the City has commenced discussions with the National Department of Water and Sanitation to determine the best way forward regarding the initiation of a pre-feasibility study on the raising of Steenbras Lower Dam

6) **The Faure New Water Scheme and Atlantis Aquifer** were developed as part of the committed water programme. Both of these schemes will be expanded under the adaptable programme by 30 Ml/d and 13 Ml/d, respectively.

The current status and possible capacity of the schemes currently envisaged under the adaptable programme – Table 2.

Table 2 Current status and possible capacity of schemes being investigated

Description	Capacity (MLD)	Status
Lourens River Diversion	54	Prefeasibility study underway
Mitchells Pass	65	Feasibility Bridging Study underway (DWS study)
Raising of Steenbras Lower	63	Scoping phase
Faure New Water Scheme Ph2 (70 - 100ML/day)	30	Part of FNWS Feasibility Study
New Water Schemes (Reuse)	>100	Potential conceptual yields and costs to be finalised as part of Strategic Water Reuse Study
Atlantis Aquifer Expansion	13	Prefeasibility study underway
Desalination Phase 2 (West Coast)	>150	Prefeasibility study underway

6.3 Risk of Imposing Water Restrictions

Even with the development of the New Water Programme, most of Cape Town's water will continue to come from rain-fed dams over the next twenty years and more. This will mean that Cape Town would still need to implement water restrictions during drought periods when rainfall is low. The frequency and severity of restrictions should however not exceed a 30% required saving. The rainfall, which was experienced in 2022 was well below average. Should this level of rainfall be experienced during the winter of 2023, low-level water restrictions would likely need to be implemented during the summer of 2023/2024.

Table 3 illustrates the likelihood of any level of water restrictions being imposed within the next ten years as well as the maximum indicative restriction that could be experienced within any given year. Under a stepped climate change scenario (Section 4.1), the probability of having to impose water restrictions and the severity of the restrictions increases significantly.

Table 3 Risk of the likelihood and severity of restrictions under gradual and 'step change' scenarios

Scenario	Likelihood of any level of restrictions in next 10 years	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
		Indicative maximum restriction that could be experienced in any given year								
Gradual Climate Change	30 - 70%	25% to 30%					20	20	15	20
Stepped Climate Change	75%	35% to 45%					25	25	25	30

6.4 Conclusions

Based on the forgoing, the following conclusions are drawn:

- Any delay in implementing the New Water Programme will increase the probability of having to impose water restrictions.
- The growth in water demand needs to be carefully monitored, and the implementation of the Adaptable Programme adjusted accordingly.
- Water Reuse and Desalination are critical to ensure long term water security and the City will continue with the necessary feasibility and planning studies to ensure implementation readiness in accordance with anticipated future water demand.