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CITY OF CAPE TOWN
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Building the City of Cape Town's water supply system resilience

through the permanent Paarden Eiland Desalination Plant

Acronyms

AOP	Advanced Oxidation Process
CCT	City of Cape Town
CIP	Cleaning-in-Place
HVAC	Heating, ventilation and air conditioning
Kl/day	Kilolitres per day
MENA	Middle East and North Africa
Mℓ/day	Megalitres per day
MPPP	Municipal Public Private Partnership
MSA	Municipal Systems Act
NWP	New Water Programme
OSEC	On-Site Electro Chlorination
RO	Reverse Osmosis
SA	South Africa
UV	Ultraviolet radiation

Main insights

The City of Cape Town (CCT) is investing in resilient capital infrastructure projects to ensure energy, water and food security for industry and residents and accelerate the transition to a carbon neutral economy whilst simultaneously creating jobs.

The CCT's ambitious R120 billion 10-year project pipeline investment includes major climate action projects to build water and energy security, with approximately 40% of the pipeline aiming to contribute to strengthening Cape Town's ability to respond to climatic shock events in the future. As part of this project pipeline, the CCT aims to add 300 million litres of water per day from new, diversified sources.

The 2015-2020 Western Cape drought highlighted that a new relationship with water is needed, including finding alternative sources of water. This has resulted in the formation of Cape Town's Water Strategy (Our Shared Water Future) and the New Water Programme (NWP).

Commitment 3 of Cape Town's Water Strategy calls for sufficient, reliable water from diverse sources. The NWP includes augmentation from surface water, groundwater, water reuse and desalination.

From a desalination perspective, the NWP includes a permanent desalination plant to be located at Paarden Eiland. The pre-feasibility design of this plant has been completed, and the project is currently in the feasibility design phase, which includes Municipal Public-Private-Partnership considerations. The feasibility phase explores the optimal service delivery option in accordance with Section 78 of the Municipal Systems Act (MSA), Act 32 of 2000.

The planned permanent Paarden Eiland plant will be a 70 Mℓ/day seawater desalination plant with a multi-barrier process that will include pre-screening, dissolved air flotation, rapid gravity sand filtration, reverse osmosis, a potential advanced oxidation process, a disinfection step, stabilisation of the water, and safe brine disposal.

This project presents opportunities for interested companies to provide technologies, products and services linked to the planned desalination scheme. In addition, ~30 direct jobs will be created at the plant, as well as approximately 100-150 indirect jobs, requiring a range of skills and qualifications.

The CCT has undertaken a series of initiatives to ensure that the public is aware of the desalination plant and the benefits that it will offer.

This brief is written for:

- Companies interested in the opportunity to provide technologies, products and services linked to the CCT planned Paarden Eiland Desalination Plant

This brief discusses:

- Background description of desalination in the CCT.
- Planned purification process and technologies.
- Skills and staff requirements.
- Desalination trends and case studies
- CCT's community engagement initiative.
- Overview of CCT's procurement processes.

1 Context

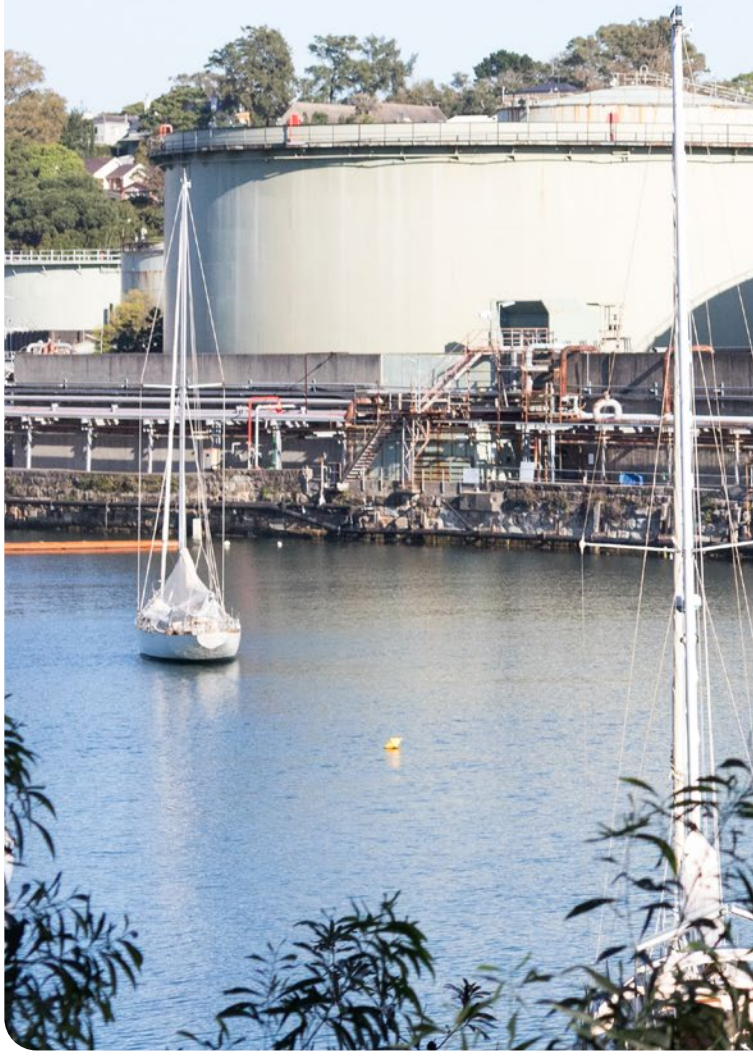
Securing a reliable supply of water in the future, and providing quality sanitation services, are essential to enable a life of hope and dignity for communities, as well as to support Cape Town's businesses and industries. As committed in the Cape Town Water Strategy, the CCT is actively facilitating the transition of Cape Town over time into a water-sensitive city with diverse water resources, diversified infrastructure and one that makes optimal use of stormwater and urban waterways for the purposes of flood control, aquifer recharge, and water reuse and recreation, all of which are based on sound ecological principles.

This objective will be undertaken through new incentives and regulatory mechanisms as well as through the way the CCT invests in new infrastructure. As detailed in the Infrastructure Report, the CCT's NWP aims to add 300 million litres of water per day from new sources. By 2040, around 25% of Cape Town's water is expected to be sourced from desalination, groundwater, and reuse through the NWP. The committed programme is designed to balance risk and cost. If less capacity is built, the risk of severe water restrictions will increase. If more capacity is built, the risk is further reduced, but the cost increases. The proposed programme reduces risk at an affordable price.

Seawater desalination is an important part of the planned programme to diversify Cape Town's water sources. Temporary desalination facilities at Monwabisi and Strandfontein have added safe drinking water to the CCT's supply network during the 2015 – 2018 drought, followed by a decommissioning period as planned.

These allowed the CCT to gain experience in operating advanced water purification processes in a South African and Cape Town context. Leading on from this, a permanent desalination plant is being developed at Paarden Eiland. At the time of writing[1], the pre-feasibility design phase of this plant has been completed and the project is currently in the feasibility phase, where it is exploring the optimal service delivery option in accordance with Section 78 of the MSA. The next stage would be to submit the comprehensive feasibility stage report to the CCT's Council, which is planned for the latter half of 2025. The Paarden Eiland desalination project presents an opportunity for businesses to provide technologies, products and services in support of the plant. High level timeline forecasts project that the procurement opportunities are expected to reach the market in 2027.

In the Cape Town context, desalination is the process of removing salt and minerals from seawater from the Atlantic Ocean to produce clean, usable and drinkable water. This will supplement the bulk water supply. Permanent desalination is planned as a reliable water source since seawater is always available, regardless of rainfall patterns.



1 March 2025

2 Paarden Eiland Desalination Plant: Planned purification process and technologies

The planned permanent Paarden Eiland Desalination Plant is a 70 Mℓ/day seawater desalination project initiated by the CCT to serve as a sustainable water resource, complementing surface water, groundwater, and potable water reuse sources.

The plant's treatment process will be installed across two erven as indicated in **Figure 1**. Pre-screening will take place at the intake works at the landfall site, while pre-treatment, filtration, reverse osmosis (RO), and advanced purification will be undertaken at the treatment site.

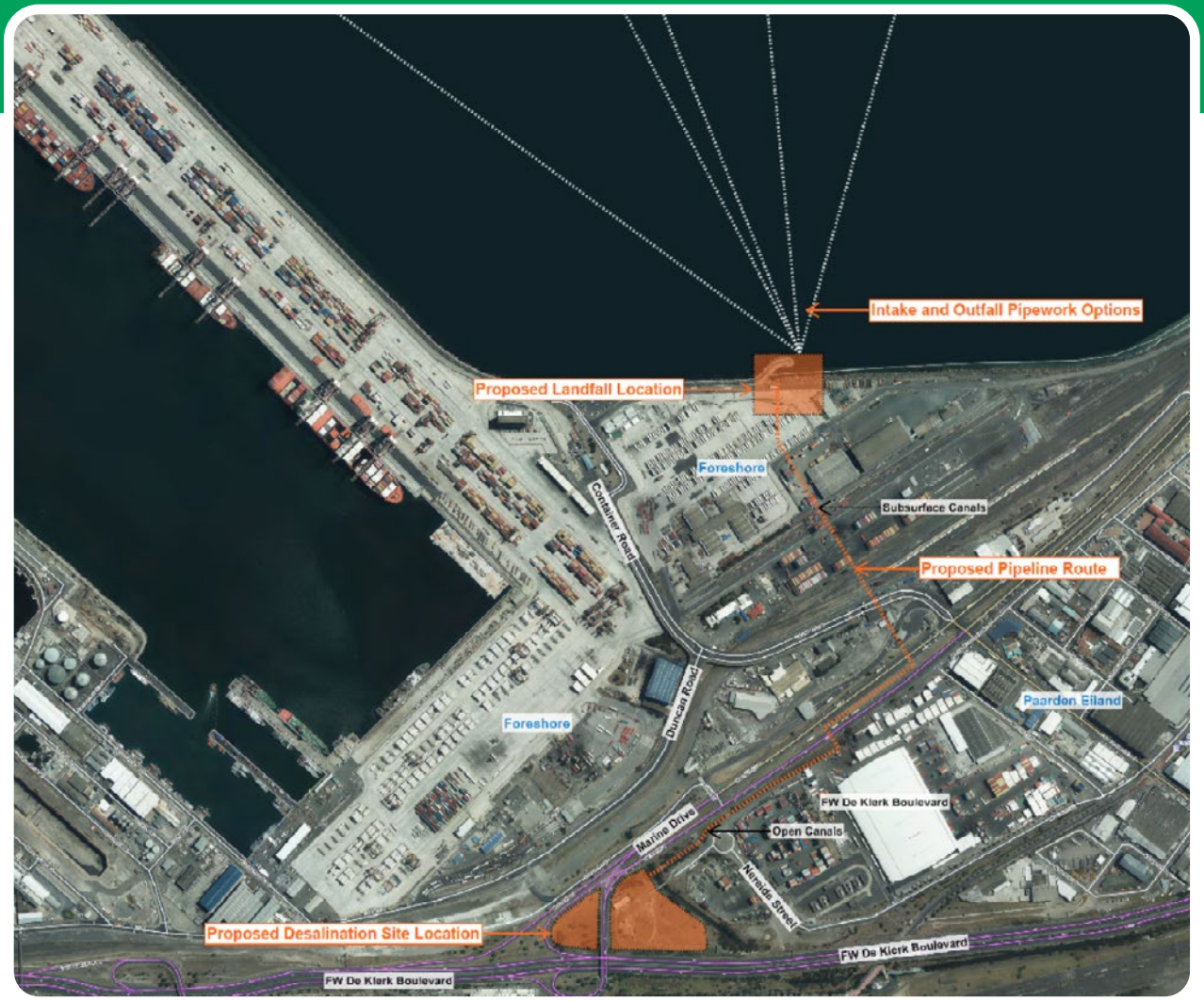


Figure 1: Paarden Eiland desalination plant locality plan (Source: CCT)

Figure 2 shows a high-level process flow of the treatment processes at the plant. The process begins with screening and pre-treatment to remove the majority of total suspended solids and any present algae. Following pre-treatment, the water is then filtered using rapid gravity sand filters in preparation for the desalination process. The desalination process makes use of RO, where high-pressure pumps force the water through membranes to separate fresh water from brine, with energy recovery to improve the efficiency of the process.

The desalinated water can then be further treated with ultraviolet radiation (UV) advanced oxidation and disinfection, followed by remineralisation to restore essential minerals. The final treated water is distributed, while the concentrated brine is safely disposed of. This process ensures a reliable supply of potable water while optimising energy use and minimising environmental impact.

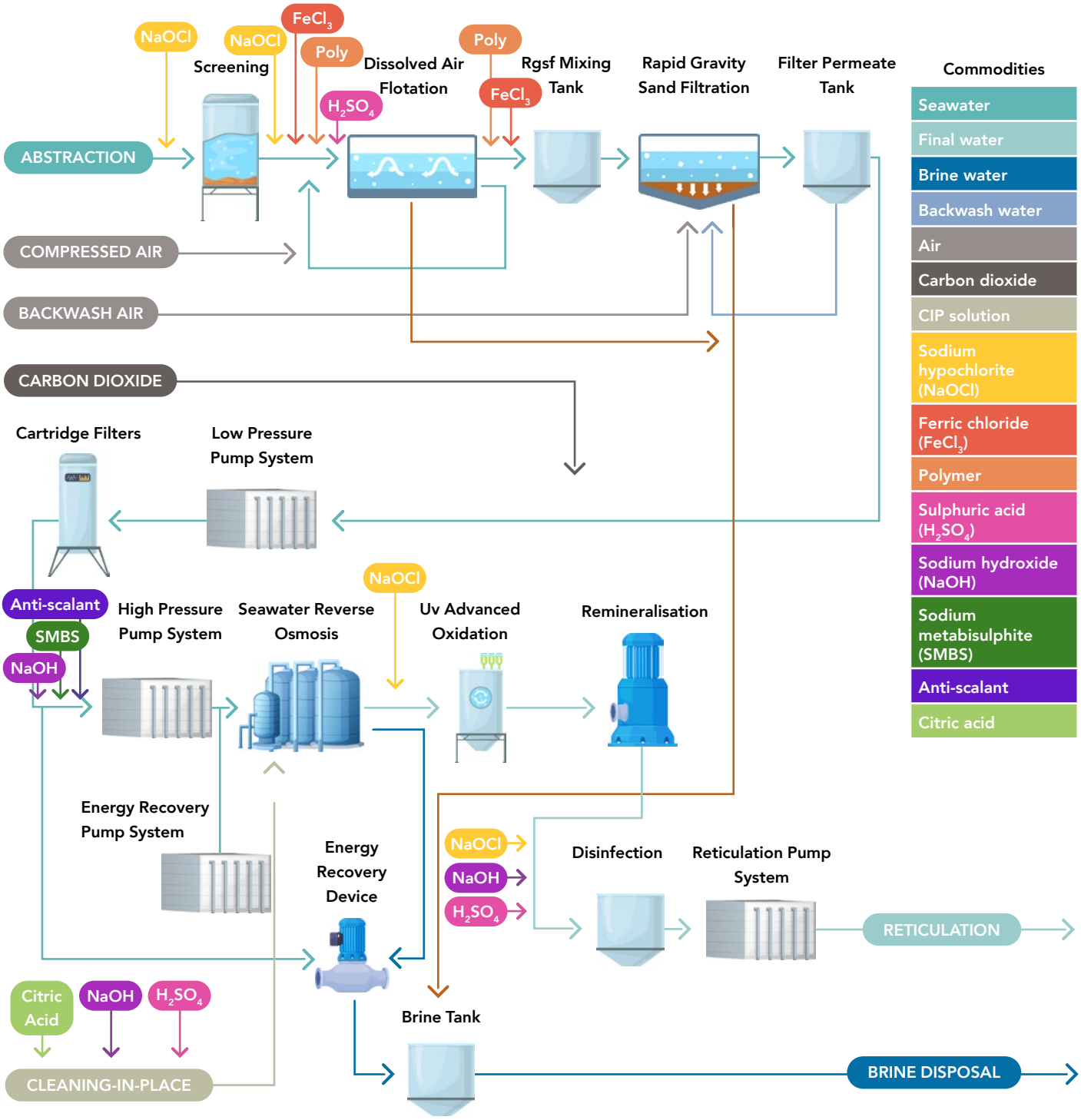


Figure 2: High-Level process at the Paarden Eiland Desalination plant
(Source: CCT)

The full list of components and consumables envisaged at each stage of the process, and which supports this opportunity are summarised below:

Construction opportunities

The project scope includes the construction and installation of:

- Water Treatment Systems: Screening plants, Dissolved air flotation plants, filtration systems.
- Desalination units, advanced oxidation systems, water stabilization systems, disinfection systems and cleaning-in-place (CIP) systems.
- Chemical and Dosing Systems: Facilities for chemical preparation and dosing.
- Support Infrastructure: Storage reservoirs, pump stations, and multi storey buildings.
- Utility Systems: Heating, ventilation, and air conditioning (HVAC) systems; fire protection systems; and disinfection systems.
- Control Systems: Advanced electrical, control, and instrumentation systems for seamless plant operations.

Opportunities for contractors: the project requires contractors with expertise in:

- Civil Engineering: Construction of reservoirs, buildings, and structural works.
- Mechanical Systems: Installation and maintenance of treatment and utility systems.
- Electrical, Control & Instrumentation: Integration of advanced control systems to optimize plant performance.

Opportunities for consumables and chemicals

The key consumables and chemicals required for plant operations, are:

- Coagulation: Ferric chloride
- Rapid Gravity Sand Filtration: Filter media
- Micro-screening: 5-micron cartridge filters
- RO:
  - 8" high boron rejection RO membrane modules and pressure vessels;
  - sodium metabisulphite (SMBS);
  - anti-scalant;
  - RO CIP chemical sodium hydroxide (48%);
  - RO CIP chemical sulphuric acid (98%); and
  - RO CIP chemical citric acid powder.
- Advanced Oxidation Process (AOP): UV lamps
- Liquid CO_2: For water stabilisation
- Limestone: For water stabilisation
- Disinfection: Salt for on-site electro chlorination (OSEC)
- Diesel: For generators

These materials require regular replenishment, presenting ongoing supply opportunities.

Opportunities for maintenance services

Comprehensive maintenance services across all plant systems will be critical to ensuring smooth operations, extending equipment lifespan, and maintaining compliance with performance standards, creating opportunities for service providers to deliver these essential activities.

3 Skills and staff requirements for the operation of the plant

The project is expected to create approximately 30 new direct jobs at the facility. Additional indirect jobs are expected to be created along the value chain of technology, product and service providers that service the scheme. Based on similar projects, the construction phase is expected to last around two years, generating approximately 100 to 150 job opportunities in the construction sector.

It is anticipated that around 55% of the jobs will be suited for low-skilled workers, 30% for semi-skilled individuals, and 15% for highly skilled professionals

4 Seawater desalination trends and case studies

The global capacity for desalinated water production has grown significantly in recent years, increasing at an average annual rate of approximately 7% since 2010, equivalent to around 4.6 million cubic meters per day each year (Jones et al., 2019; Eke et al., 2020). By 2018, nearly 16 000 desalination plants were in operation worldwide, with a combined production capacity of about 95.37 million m^3/d. More recent estimates from 2022 indicate that over 21 000 seawater desalination plants were operating globally, producing 100-104 million m^3/d of desalinated water daily, along with more than 150 million cubic meters of brine as a by-product.

The Middle East and North Africa (MENA) region dominates desalination, accounting for 70% of global capacity, followed by the United States approximately 10-15%, while Europe contributes only around 10% of the total capacity (European Commission). Australia contributes a small but notable share of global desalination capacity at approximately 2%. However, Australia's contribution is worth highlighting due to its operation of several large-scale desalination plants, which play a significant role in their water security.

Various coastal towns in SA have installed small or medium-sized RO plants to desalinate water for bulk water supply. Table 1 summarises the desalination plants that have been installed in the Western Cape and are currently operational.

Table 1: Operational desalination plants in the Western Cape
Source: Patel, 2018; Fitzgerald et al., 2020

DESALINATION PLANT	LOCATION	CAPACITY (M3/DAY)	TECHNOLOGY	USERS
Witsand Solar Desalination Plant	Witsand, Western Cape	100 m^3 of fresh water per day powered by the solar energy only and up to 300m^3 through a blend of solar and municipal power	RO powered by solar energy	First solar-powered desalination plant in SA (2018). Primarily serves the local community in the Witsand area. The plant is operated periodically to meet demand
Mossel Bay Desalination Plant	Mossel Bay, Western Cape	15 000	RO	Supplies municipal and industrial water to PetroSA; Not always in operation, they use the plant to cover the peak in water demand during the holiday periods.

The CCT considered these plants when designing and constructing their own temporary plants (Monwabisi and Strandfontein) from which key lessons learnt were extracted. These lessons are supplemented by the knowledge from a committee of experts locally and internationally (Independent Advisory Panel through WRC) for which the CCT is pursuing a long term, phase 2 agreement to bring the expertise along the development process, with the intent to take it into the operational phases.

5 Public participation and community awareness initiatives

The CCT has undertaken a series of initiatives to ensure that the public is aware of the Paarden Eiland desalination plant and the benefits that it can offer residents.

These initiatives and interventions include:

- Published the desalination booklet to breakdown complex and technical processes into understandable information.
- Public participation to obtain views of the local community on the exploration of the possibility of providing a municipal service through an external mechanism: MSA s78(3)(b)(iii).
- Series of events planned throughout the duration of the project are summarised in Table 2 below

Table 2: Planned public participation events for the Paarden Eiland Desalination plant project

EVENT	DATES
EIA Pre-application Draft Scoping Report	13 Nov to 13 Dec 2024
Section 78(3) of the MSA: Public Engagement – 1	12 Feb 2025
Section 78(3) of the MSA: Public Engagement – 2	19 Feb 2025
City of Cape Town TNPA Lease Agreement Section 33: Receive the public comments and representations	Sep - Oct 2025
EIA report + CWDP	Sep - Oct 2025
Section 120(6) of the MFMA: Public Engagement	Oct – Nov 2025
Town planning statutory Public Engagement	Nov 2025 – Jan 2026
Appointment of PPP SPV Section 33: Receive the public comments and representations	TBC

Residents / stakeholders are also welcome to approach the CCT about understanding more about the desalination project.

6 CCT's procurement processes

GreenCape has published an industry brief on entering the South African water market, which guides readers through general water sector procurement requirements and recommendations. In addition, the following sources can be consulted for assistance when bidding on CCT tenders:

- The CCT's Supply Chain Management Policy.
- Relevant webpages on the CCT's website, such as the Tender Portal, guiding articles in City Connect, and the CCT's supplier database.
- Water tariffs can be accessed from the CCT's latest budget annexure.

Next steps

For further information and support on any of the content provided here, please contact GreenCape's Water sector desk: water@green-cape.co.za

The City of Cape Town has a New Technology Platform to give the City a better understanding of innovative water sector technologies in the market. It gives companies the opportunity to present their products and services to government in a fair manner. For details on how to submit information to the committee, please contact: Water.NewTechnology@capetown.gov.za

References and useful resources

- City of Cape Town (2021). Our Shared Water Future: Cape Town's Water Strategy, available online: https://www.capetown.gov.za/general/cape-town-water-strategy – accessed March 2021.
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- Patel, M. (2018). Desalination in South Africa: Panacea or peril for industrial development? Trade & Industrial Policy Strategies (TIPS). Retrieved from https://www.tips.org.za/research-archive/

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For more information and support contact:

GreenCape: info@greencape.co.za | (021) 811 0250

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