



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD



WATER REUSE FOR CAPE TOWN

HELPING SECURE CAPE TOWN'S WATER FUTURE

Making progress possible. Together.

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Why is water reuse being implemented in Cape Town?

Cape Town is a growing city facing uncertainty about when and how much climate change will influence our rainfall and available water supply.

In 2018, during the worst drought on record, Capetonians narrowly avoided 'Day Zero', the day when the piped water supply would have had to be shut off in most areas and everyone would have had to queue for water. This was only about three years after the dams were full.

We are not alone – water stress currently affects as many as 1,5 billion people living in cities all over the world.^a

Climate experts warn us that droughts are going to happen more often and will last longer and be more severe. Rainfall is unpredictable, evaporation is set to increase (with higher temperatures), and there are limited options for further surface water schemes. We can no longer rely on surface water stored in dams to meet our anticipated growing demands. The recent drought showed us that we need a new relationship with water, so we need to find alternative sources of water.

Water reuse is one of the most cost-effective new sources. It is estimated to cost about 60% of what desalination and groundwater from the Cape Flats aquifer cost, and set to cost slightly more than the cost of groundwater from the Table Mountain Group aquifer. It also has less environmental impact than desalination and other surface water options.

Because of these significant benefits, the City of Cape Town (the City) wants to pursue water reuse as an important part of the diversified mix of new water sources to take us into a more secure shared water future. A demonstration plant has tested this process and shown to produce water of a very high quality. A permanent reuse scheme called the Faure New Water Scheme is being planned and designed.

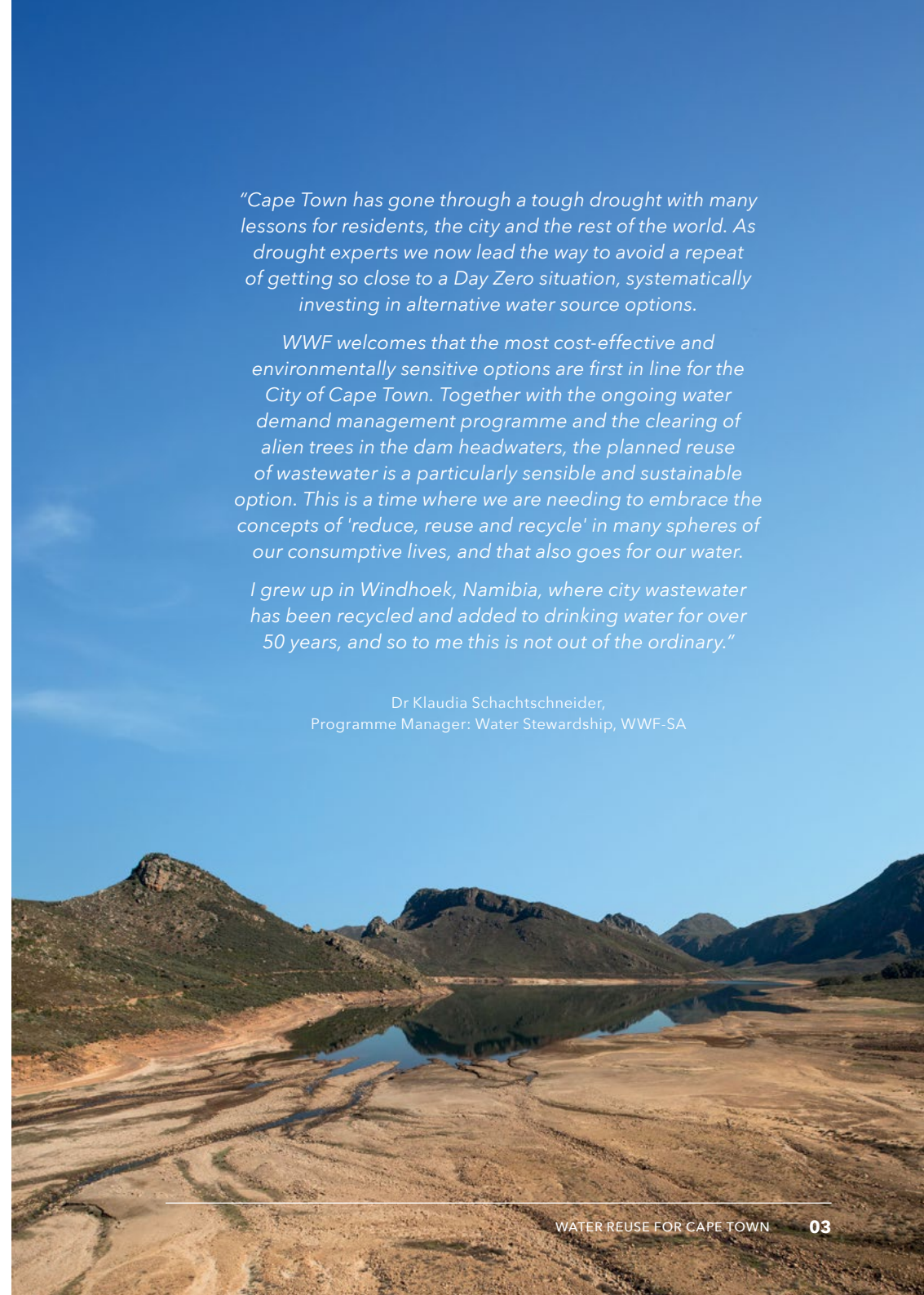
^a World Resources Institute, 2019. Aqueduct Project, Water Risk Atlas

"Cape Town has gone through a tough drought with many lessons for residents, the city and the rest of the world. As drought experts we now lead the way to avoid a repeat of getting so close to a Day Zero situation, systematically investing in alternative water source options.

WWF welcomes that the most cost-effective and environmentally sensitive options are first in line for the City of Cape Town. Together with the ongoing water demand management programme and the clearing of alien trees in the dam headwaters, the planned reuse of wastewater is a particularly sensible and sustainable option. This is a time where we are needing to embrace the concepts of 'reduce, reuse and recycle' in many spheres of our consumptive lives, and that also goes for our water.

I grew up in Windhoek, Namibia, where city wastewater has been recycled and added to drinking water for over 50 years, and so to me this is not out of the ordinary."

Dr Klaudia Schachtschneider,
Programme Manager: Water Stewardship, WWF-SA





USING THE WATER AVAILABLE ON EARTH

The amount of water on our Earth is finite and does not change over time. It's the same water that is continuously recycled year after year on our planet by the natural water cycle. We're drinking the same water that dinosaurs drank millions of years ago. While about 70% of our planet is covered by water, most of that is salty sea water, or in polar ice far away. Only 2,5% is fresh water and only about 1% is readily accessible^b for our growing needs. This precious water is being steadily polluted by our human activity. Water is a unique substance which can't be manufactured, but we can clean it and reuse it like nature does.

^b American WaterReuse Association, 'Profiles in Reuse: Potable Reuse', www.watereuse.org.

Cape Town's Water Strategy

The City of Cape Town, together with the national Department of Water and Sanitation, has undertaken numerous studies over decades and consulted with external experts to prepare advanced plans for the development of alternative water sources, including water reuse.

After public comment, Cape Town's Water Strategy was adopted in 2019. This is to ensure that water can continue to support the life of the city – even if climate change does affect our rainfall.

We are now working towards providing water from diverse sources, including groundwater, more surface water, sea water desalination, and water reuse. The strategy also prioritises water conservation and demand management, pressure regulation, and removal of 'thirsty' alien invasive vegetation in our catchment areas as important ways to help secure our supply. For more information about the new water programme, see the latest Water Outlook document at www.capetown.gov.za/thinkwater.



THE COMMITMENTS OF THE WATER STRATEGY

1

Safe access to water and sanitation for all

2

Wise water use through pricing, regulation, active citizenship, network management

3

Sufficient, reliable water from diverse sources (groundwater, surface water, desalination and reuse)

4

Shared benefits and managed risks from regional water resources

5

Water sensitive city by 2040

What is water reuse?

In our Cape Town context, water reuse refers to the purification of treated wastewater through an advanced purification process to produce drinking-quality water. This can supplement our bulk water supply.

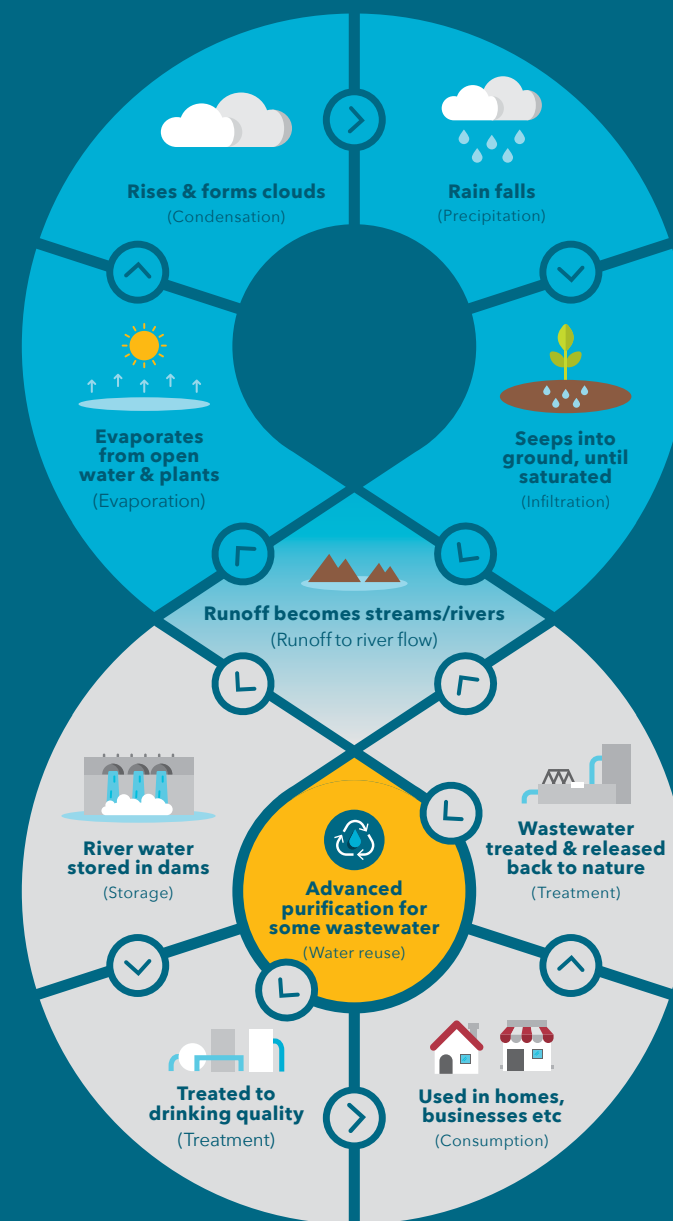
Water reuse is reliable, cost effective and sustainable.

Recycling of water happens continuously in nature. Rain falls from clouds and seeps into the ground, collects in rivers and is captured in dams, treated, and piped to our homes, schools and businesses for us to use.

Once we're done with it, our water is treated at a wastewater treatment works and released into our rivers and oceans where it evaporates to form clouds that rain – and the cycle starts all over again. The same water is going around and around, just as it's always done. This is called the urban water cycle.

Water reuse enhances this cycle by redirecting treated wastewater and purifying it so that it can be used again, rather than releasing it all back to the rivers and the ocean and waiting for it to return as rain. This supports the urban cycle with our own engineered loop, so that we can make more use of our water.

THE NATURAL WATER CYCLE



THE URBAN WATER CYCLE

This is a simplified graphic of the natural and urban water cycle, which doesn't include all possible aspects.

Where else is water reuse taking place?

Joining other leading cities

Cape Town is not the first city to explore or implement reuse. Water reuse projects for drinking have already been successfully implemented in many major cities across the world, including in America, Australia and Singapore. African cities have also pioneered water reuse, including Beaufort West, Ballito and Windhoek (Namibia) where it's been done for more than 50 years.

Water reuse is supported and actively encouraged by national government in South Africa (Department of Human Settlements, Water and Sanitation), and is supported by other institutions such as the Water Research Commission and expert water academics, e.g. the University of Cape Town's Future Water Institute.

In Cape Town, water reuse has been an important part of the new water system at Old Mutual's large office campus in Pinelands (MutualPark). Since 2018, the treatment facility there ensures that water from many different sources is purified for about 10 000 people who work and visit that complex every weekday. It's used widely, including for drinking purposes.



"Climate change is a real threat, and at Old Mutual we realised we had to adapt the way we use our precious water resources so we can continue to operate and thrive. Our pioneering water treatment facility purified water from multiple sources, and has been supplying about 10 000 people at that campus there every working day since 2018.

So I support water reuse for Cape Town. The technology is tried and tested, and many thousands of Capetonians at MutualPark have been using and drinking it for a few years already now. We need this as part of our bulk water supply for the future as a city too."

Khiyam Fredericks, previously National Technical Director at Old Mutual, where he helped pioneer the new water system at MutualPark in 2017-2018.



WINDHOEK - WATER REUSE VETERANS JUST NEXT DOOR

In 1968, faced with a growing demand for drinking water, Windhoek began operating the world's first drinking water reuse plant. Namibia is one of the driest countries in Africa, and when their existing water resources became critically low, they began to consider wastewater as a potential drinking water resource. A treatment plant was developed and has been operating successfully ever since.^c

The Old Goreangab drinking water reclamation plant initially treated 4,3 million litres of water per day, making up 10% of the water demand at the time. In 2002, the New Goreangab reuse plant was completed with an upgraded advanced purification process producing 21 million litres of drinking water per day (25% of the total water consumed in Windhoek).^d

Today, the Windhoek Goreangab Operating Company is recognised globally as one of the leading experts in water reuse and advanced water purification technology.

The new facility provides clean drinking water to more than 300 000 residents of Windhoek, and to date there have been no detected negative health effects as a result of the use of reused water.^e

^c Du Pisani, P. & Menge, J.G. 2013. Direct potable reclamation in Windhoek: a critical review of the design philosophy of new Goreangab drinking water reclamation plant. *Water Science & Technology: Water Supply*.

^d Veolia, 2018. *Namibia: Windhoek has been producing drinking water from its wastewater for 50 years*.

^e Wingoc, 2020. Key facts & figures.

How can we ensure reuse water is safe to drink?

Recycled treated water from wastewater treatment works is already being used for irrigation, industrial and construction use, but the biggest demand in Cape Town is for drinking-quality water.

The water is therefore thoroughly, carefully and repeatedly processed to remove particles, pathogens and pollutants at an advanced water purification plant with proven multi-barrier treatment processes and advanced monitoring. (Pathogens are bacteria, viruses or other microorganisms that can cause disease. More commonly called germs.)

Strict protocols are in place to make sure that the process operates correctly. Each step in the process is validated and verified with online monitoring systems and an onsite laboratory. Samples are also regularly sent to independent laboratories to be tested against strict global drinking water standards. Water quality results will be published regularly at: www.capetown.gov.za/thinkwater.

Residents / stakeholders are welcome to approach the City about conducting collaborative research related to water reuse. To make an arrangement, please email water@capetown.gov.za.



What expertise does the City of Cape Town have in water reuse?

The City of Cape Town has been developing critical technical and institutional capacity in water reuse by engaging other water utilities around the world and learning from their experience, as well as partnering with local and international experts in water reuse. A peer review panel including local and international experts is being set up through the national Water Research Commission.

The operation of a demonstration-scale advanced purification plant for over two years has also helped the City gain valuable experience in water reuse. Initially commissioned as an emergency drought-relief measure, the Zandvliet demonstration facility has been effectively repurposed to enable us to analyse the water quality over time at different points in the purification process, put in place the correct design, operating, monitoring and management protocols, and engage with key stakeholders. This has helped us to develop the expertise and capacity required to implement larger production-scale reuse schemes.

See a short video describing the water reuse demonstration facility at: www.capetown.gov.za/thinkwater.

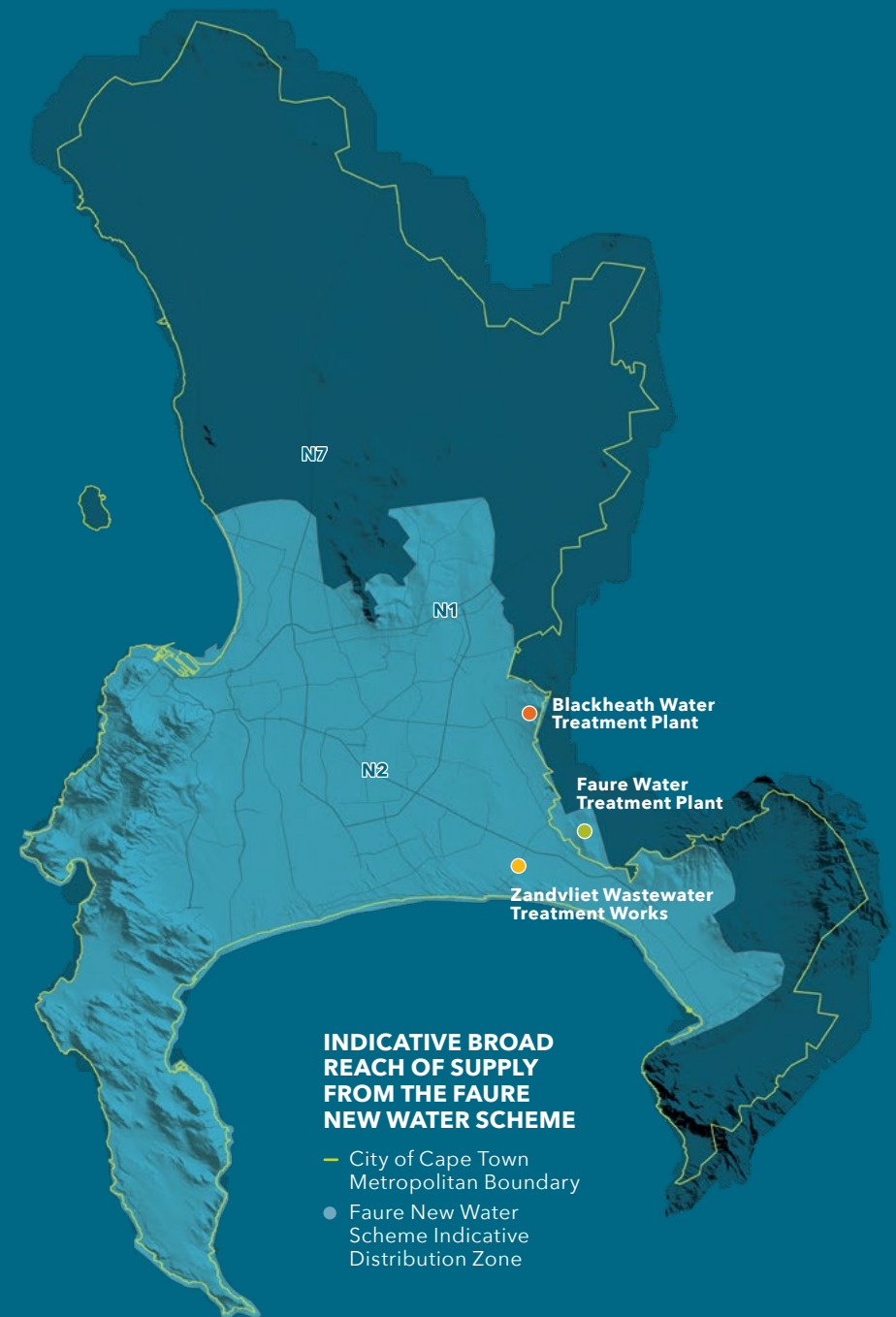


The Faure New Water Scheme

After 25 years of rigorous economic and environmental studies, technical research and planning, the Faure New Water Scheme (FNWS) was identified as the best opportunity for water reuse in Cape Town.

The Faure New Water Scheme will receive source water (treated wastewater effluent) from the Zandvliet Wastewater Treatment Plant. The Zandvliet plant is a cost-effective location, with sufficient volumes of wastewater which doesn't come from heavy industry which would be more challenging to treat. It is being upgraded to include enhanced treatment processes that will ensure a high quality of source water for the reuse scheme. The source water from Zandvliet will be piped to a new advanced purification plant located at to the existing Faure Water Treatment Plant, 5 km away.

The advanced purification plant will produce up to 100 million litres of clean drinking water per day. This water will initially be blended with raw water from dams, with a maximum ratio of 20% reuse water and 80% dam water. Then the blended water is treated once more by the conventional processes of the existing Faure Water Treatment Plant, before being stored in the Faure reservoir. From there, the distribution network will have the flexibility to supply this water widely across most of Cape Town.



This Faure New Water Scheme brings together the newest purification technologies, sophisticated online monitoring and control systems and best-practice operating protocols. The design has been peer reviewed by international water reuse experts and followed the Validation and Hazard Analysis and Critical Control Points (HACCP) approach used by the food and beverage industry.

Detailed plans are also being put in place to ensure the lowest possible environmental impact and long-term protection protocols.



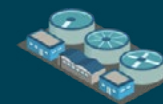
The purification process at the Faure New Water Scheme

Prior to the advanced purification process, trace nutrients in the source water are reduced through biological nitrate removal and membrane bioreactor processes.

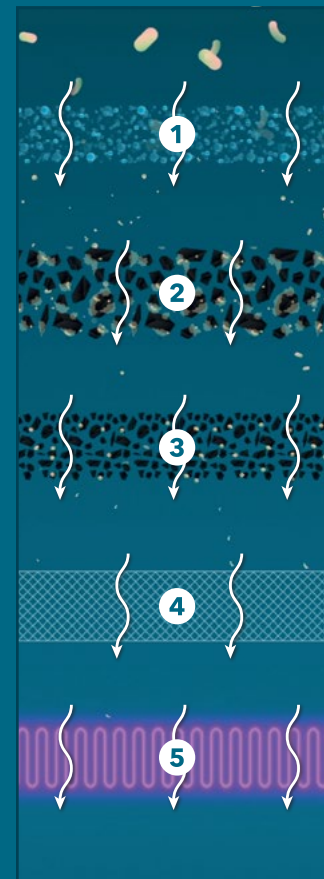
The advanced water purification process relies on a proven multi-barrier purification process for removing contaminants to safe levels, as measured against the strictest global standards. For more information about the advanced purification process and performance standards, see www.capetown.gov.za/water-reuse.



THE ADVANCED WATER PURIFICATION PROCESS



Treated wastewater enters the new advanced purification plant and is subjected to the following proven multi-barrier treatment steps:



STEP 1: Ozonation uses strong oxidising properties to destroy any disease-causing pathogens/germs and break down complex organic substances into simple biodegradable organic substances which are consumed in the BAC filtration process.

STEP 2: Biologically Activated Carbon (BAC) Filtration removes particles and biodegradable organic substances.

STEP 3: Granular Activated Carbon (GAC) Filtration removes non-biodegradable micro-organic substances through adsorption.

STEP 4: Ultrafiltration removes particles, pollutants and pathogens/germs that are 1 000 times smaller than the width of a single human hair (<10 microns).

STEP 5: Advanced Oxidation Process with ultraviolet lamps combines light and chemical energy to break down any remaining organic chains right down to their molecular building blocks of carbon dioxide and water.



The resulting water has been purified to quality levels that are 100% safe to drink/consume.

How can you join us in our shared water future?

Stay informed. The City of Cape Town has committed to share information with interested parties and key stakeholders through meetings, the City's website, and a range of information materials including videos, this brochure, a leaflet, fact sheets and frequently asked questions and answers.

For more information, visit www.capetown.gov.za/water-reuse.

Give us feedback. If you would like to comment or engage with us on this, please email water@capetown.gov.za or call **0860 103 089**.

Join us on our journey to diversify our water sources so that we can have a more secure water supply for ourselves and future generations.

Our shared water future.



"UCT's Future Water Institute welcomes the City's initiative to invest in a large-scale water reuse project. This investment has potential to increase Cape Town's future water requirements by diversifying its supplies."

The plan is in accordance with the City's new Water Strategy in terms of addressing both resilience (responding to water shortages), as well as long-term sustainability associated with the transition to becoming a Water Sensitive City."

Dr Kirsty Carden and Dr Kevin Winter,
Future Water Institute at the University of Cape Town



For more information about water reuse,
visit www.capetown.gov.za/water-reuse.

To report water-related issues, contact the City
of Cape Town through **ONE** of these channels:

Online: www.capetown.gov.za/servicerequests

Email: water@capetown.gov.za

SMS: 31373 (max 160 characters)

Call: 0860 103 089

Visit: City walk-in centres, see
www.capetown.gov.za/facilities



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