



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD



INFRASTRUCTURE REPORT

December 2022

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FOREWORD FROM THE EXECUTIVE MAYOR



Most of South Africa is facing an infrastructure crisis. In cities and towns across the country, pipes are leaking, roads are crumbling, and electricity assets are breaking down. The burden of this failure does not rest on government, however, infrastructure failure translates into real economic harms that prevent growth and keep people in poverty.

Infrastructure enables productivity and productivity drives growth. We cannot build a Cape Town that offers residents hope of a more prosperous life without world-class infrastructure. It must be at the forefront of the City's governance agenda.

While Cape Town stands apart from other metros as one place where most infrastructure is kept in working order, we have challenges of our own. Over the past few years, we have underinvested in new infrastructure and allowed maintenance backlogs to build up, especially during the drought and over the pandemic period. This is not good enough.

This report is clear and honest about the City's past shortcomings and makes no attempt to hide them. It is also clear about the solutions. Having identified the infrastructural factors holding Cape Town back from greater success, it explains in detail how we are going to fix them. In essence, in the next ten years, we are investing in infrastructure and performing maintenance on a scale unseen in decades. The upscaling of the City's capital budget over the medium-term revenue expenditure framework (MTREF) period demonstrates our commitment to this goal.

We have a lot of work to do to get on the right trajectory across all infrastructural sectors. But I am confident that, through this plan, Cape Town will have water and sanitation, waste, energy, and transport infrastructure that will rival that of the world's best-run cities.

A key challenge the writers of this report have taken into account is the fact that, as cities and towns across the country continue to crumble, more people are moving to Cape Town. This will increase the already above-average population growth Cape Town is experiencing as a result of urbanisation trends.

To ensure that 'semigration' is maximally beneficial to our local economy (as opposed to a burden), we are planning for a future Cape Town that is far bigger than the one of today. The report not only takes the enhanced demand for infrastructure arising from population growth into account, but also plans for eventualities such as increasing levels of informality and unplanned densification, the increasing inadequacy of public transport offerings, and declining average household incomes. Accordingly, we will remain resilient in the face of (even extreme) change.

I hope Capetonians will feel a sense of renewal and vitality as the City government rolls up its sleeves to build a Cape Town for the future. I, for one, can't wait to see Cape Town become one big construction and maintenance site. This will mean progress, prosperity, and flourishing. And that is what we are here to achieve.



Geordin Hill-Lewis
Executive Mayor

MESSAGE FROM THE CITY MANAGER



I am proud to introduce this first-ever public infrastructure report by the City of Cape Town. This is a significant step forward in metro government transparency in the infrastructure planning and delivery space, and is testament to our commitment to deliver quality services to our residents.

This report is the culmination of years of work that I have personally overseen and driven across the administration. This work has been behind the scenes, building the systems and processes necessary to be able to assess the full suite of infrastructure plans across the organisation, not just for the next year or even five-year term of office, but for the long term.

Having sight of the City's long-term infrastructure pipelines is important for many reasons. Our long-term planning allows us to plan, prepare and deliver infrastructure better by identifying and filling gaps that exist. Long-term planning and pipelines also allow us to identify synergies between directorates which can drive efficiencies and cost savings into the future.

For the private sector, I trust this report will provide a level of certainty over future major capital investments across the metro, to enable economic growth and reliable services. This report will also be of interest to Province as they plan in areas of intersecting responsibility, and for our colleagues in National Government, especially National Treasury, who will be able to gain insight and certainty about future funding needs and opportunities in the City of Cape Town.

This report identifies several infrastructure investments needed from state-owned enterprises and other spheres of government. The City administration will work closely with the Mayor and his team to ensure we do everything

possible to make sure our intergovernmental partners deliver for our city.

A priority for me, which is also expressed in the IDP, is the enablement of a modernised and adaptive city government. Key to this is optimisation and innovation, and this report is one such expression of this intent. The City of Cape Town is committed to constantly improving its services through innovation. Important building blocks for this are system enhancements to the way we plan, prepare and deliver infrastructure for the benefit of the future Cape Town.

This report shows that in the main, the City of Cape Town has robust long-term infrastructure plans to deliver bulk infrastructure to the areas of future growth. These plans will allow us to drive project preparation and execution on critical projects. We are not perfect and this report does identify gaps in some areas, but what it also shows is that we already have plans to actively address those gaps.

Capetonians can read this report and rest assured that this administration is actively planning for the future and doing what we need to today to create a City of Hope.

Lungelo Mbandazayo
City Manager

ABBREVIATIONS

BBF	bio-solid beneficiation facilities	LED	light-emitting diode
BESS	battery energy storage systems	LPG	liquid-petroleum gas
BNG	Breaking New Ground	LUM (2040)	Land Use Model (2040)
BRT	bus rapid transit	MBT	minibus-taxi
BWAS	bulk water augmentation scheme	Mℓ/d	megalitres per day
CCT	City of Cape Town	MPP	Mayoral Priority Programme
CEF	capital expenditure framework	MSDF	Municipal Spatial Development Framework
CITP	Comprehensive Integrated Transport Plan	MTREF	Medium-term Revenue and Expenditure Framework
COD	chemical oxygen demand	MTS	main transmission station
Covid-19	Coronavirus Disease 2019	MV	medium voltage
CSIR	Council for Scientific and Industrial Research	MVA	megavolt amperes
DMTN	Domestic Medium-Term Note Programme	MW	megawatt
DSDF	District Spatial Development Framework	MWh	megawatt hour
EFF	external financing fund	Nersa	National Energy Regulator of South Africa
EIA	environmental impact assessment	NMT	non-motorised transport
EPHP	Enhanced People's Housing Process	PHSHDA	priority human settlements housing development area
EU	European Union	PPM	Project Portfolio Management
EV	electric vehicles	PTI	public transport interchange
FBE	free basic electricity	PV	photovoltaic
FLISP	Finance-linked Individual Subsidy Programme	SDF	Spatial Development Framework
GABS	Golden Arrow Bus Service	SOE	state-owned entity
GWh	gigawatt hours	SSEG	small-scale embedded generation
HSDG	Human Settlements Development Grant	TOD	transit-oriented development
IDP	Integrated Development Plan	UISP	Upgrading of Informal Settlements Programme
IPPNs	independent power producers	WCWSS	Western Cape Water Supply Scheme
IRT	integrated rapid transit	WWTW	wastewater treatment works
JSE	Johannesburg Stock Exchange		
kV	kilovolt		

DEFINITIONS

Affordable housing	Affordability is a function of context. National Government determines that the gap market (those households who should be targeted for affordable housing provision) refers to households earning less than R22 000 per month. The Municipal Spatial Development Framework (MSDF) and District Spatial Development Framework (DSDF) recognise that nominal indicator while maintaining that affordability fluctuates depending on the context in which housing is available; and that it would never be targeted at the highest earning income group of that context. In this Spatial Development Framework (SDF), affordable housing refers specifically to the household income brackets of R3 501 to R22 000 per month, which is in line with current national income thresholds. The term is inclusive of social, gap, and inclusionary housing. Different government subsidised products (rental and ownership) target different household incomes. R22 000 is also the upper threshold for the Financed-linked Individual Subsidy Programme (FLISP) which enables households to purchase their own homes. It also refers to residential units valued at approximately R634 000 or less (for 2022 at 5% annual increase from R522 000 in 2018). In the city of Cape Town, on average between 2015 and 2018, 70% of households earned below R20 000 ¹ .
Aggregator²	An aggregator is a grouping of agents in a power system (i.e consumers, producers, prosumers or any mix thereof) to act as a single entity when engaging in power system markets (both wholesale and retail) or selling services to the operator.
Alternative energy	Energy sourced from a supply other than from a direct connection to a municipal or Eskom electricity distribution network, including, but not limited to, (a) electricity from portable or rooftop or ground-mounted photovoltaic (PV) systems, (b) liquid-petroleum gas (LPG), or (c) solar water heaters.
Aquifer	An area identified as reflecting the physical extent of a water-bearing layer of soil, sand, gravel or rock that will yield significant usable quantities of water. A ground-level protection zone is required to prevent pollutants from leaching into the water supply.
Backyard dwelling	Backyard dwellings refer to informal structures on formal, residential erven, regardless of ownership. These structures are used for habitation and may be positioned behind, in front, or next to the primary dwelling.
Carbon neutral	Limiting the carbon emissions produced citywide to a point of neutrality from energy use, transport, and waste that can be absorbed or offset. The City of Cape Town has committed to being carbon neutral by 2050, meaning that it will not emit more carbon from energy use, transport, and waste than can be absorbed or offset.
Climate change	Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity ³ .
Climate change mitigation	The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects ⁴ . It's a human intervention to reduce emissions or enhance the sinks of greenhouse gases in the context of climate change.

¹ Figure F34 in MSDF Tech Supplement F. An upper threshold of R22 000 thus targets a very wide spread of Capetonians, and definitely those households who need the most assistance.

² MIT, 2016.

³ IPCC 4th Assessment

⁴ IPCC Glossary, 5th Report

Densification	Increased use of space, both horizontally and vertically, within existing residential areas/properties and new developments, accompanied by an increased number of units and/or population threshold.
Development corridor	Typified by intensified and diversified land use, these corridors reflect the targeted, prioritised areas earmarked for the largest spectrum of land use mix associated with the highest density of population and employment. They are inclusive of integration zones and link diverse economic nodes – ranging from mature and developing to emerging, and across a hierarchy of function and service levels (metropolitan and submetropolitan).
Flood line	A line on a map depicting water levels likely to be reached by a flood having a specified recurrence interval.
Gap housing	Housing for households with a monthly income of between R3 500 and R10 000, who fall outside the government housing subsidy income limit of R3 500 per month, and find it difficult to access housing in the private market.
Household	A household is a group of persons who live together and provide for themselves jointly with food or other essentials for living, or a single person who lives alone. Note that a household is not necessarily the same as a family.
Inclusionary housing	Policy directive and/or approach that seeks to leverage the development application process for new residential or commercial developments to secure the construction and perpetual availability of affordable housing in an integrated manner. (See also Affordable Housing.)
Initiative	An initiative (programme) represents a grouping of projects (items) that relate to one another or are logically linked.
Internal engineering services	All engineering services network points related to the internal distribution network inside a land parcel. Link services connect this internal network to the bulk network.
IRT feeder route	A secondary and usually smaller carrying route of an integrated rapid transit (IRT) system, which feeds the main trunk route.
IRT trunk route	A primary carrying route of an IRT system with a higher than average large travel demand.
Mobility	The ease with which people can travel with minimal delay on a route.
Non-motorised transport (NMT)	Transport modes that are not motorised, e.g. walking and cycling.

Population density	The number of people per given area, e.g. square kilometre.
Population growth	This is a change in the size of the population (increase or decrease) of a particular place, at a defined time as a function of births, deaths and net migration.
Project	Projects (items) can be grouped together under a single programme (initiative) or have a one-to-one relationship with a programme (initiative).
Public transport interchange (PTI)	Supports the transfer of public transport users between modes (rail/bus/taxi), but also functions to support economic activity.
Resilience	The capacity of individuals, communities, institutions, businesses and systems in a city to survive, adapt and thrive no matter what kind of chronic stresses and acute shocks they experience.
Rivers	Include all quantities of water sources and courses and/or water sources as mentioned in both the Metropolitan and District Spatial Development Framework.
Transit-oriented development (TOD)	Transit-oriented development (TOD) is a multifaceted and targeted strategic land development approach to improve urban efficiencies and sustainability by integrating and aligning land development and public transport services provision. It promotes inward growth and compact city form, with an emphasis on building optimum relationships between urban form, development type, development intensity, development mix and public transport services to create a virtuous cycle of benefits over the long term as described in the City of Cape Town's TOD Strategic Framework. Different TOD objectives, tools and outcomes are applicable at metropolitan, corridor, nodal, precinct and project scales.
Transit corridors	Transit corridors include one or more routes that connect centres of economic activity. The routes have different alignments but common transfer points and common ends, which are gateways that allow traffic to enter or exit the corridor.
Triggers	According to the medium-growth scenario (as per the detailed demand forecasting model), triggers will cause main substation supply areas (as mentioned in the "Infrastructure Name" column) to become over-firm.
Vulnerability	The degree to which a system or population is susceptible to, or unable to cope with, adverse events.
Waste management facility	A place, infrastructure, structure or containment of any kind wherein, upon, or at which a waste management activity takes place and includes a waste transfer station, container yard, landfill site, incinerator, recycling or composting facility.



EXECUTIVE SUMMARY

The vision for Cape Town is to be a City of Hope for all – a prosperous, inclusive and healthy city where people can see their hopes of a better future become a reality, for themselves, their children and their community. To this end, the City is focused on creating the conditions for meaningfully faster economic growth, which will enable more Capetonians to lift themselves out of poverty and take advantage of the opportunities available to them. Investment in Cape Town's infrastructure is critically important to achieve this vision because it reduces the barriers to opportunity and creates pathways to greater economic participation and social mobility. New, and well-maintained existing, infrastructure assets also give the Cape Town economy a competitive advantage, stimulate growth and support inclusive economic development.

The 2022 Infrastructure Report is the first consolidated attempt by the City to evaluate its infrastructure delivery plans for the next 10 years. This first Infrastructure Report is limited to the evaluation of the City's bulk infrastructure across the five directorates of Energy, Urban Waste Management, Water and Sanitation, Human Settlements and Urban Mobility. The analysis is based on data extracted from the City's project preparation management system (SAP PPM) as at 4 May 2022.

The term **bulk infrastructure** refers to the public infrastructure by means of which water, sewerage and electricity services are provided and managed. This includes infrastructure involved in generation, collection, storage, purification, conveyancing and disposal, as the case may be, and which is connected to the reticulation system that, in turn, distributes services to or from end users (City customers).

This report aims to answer three main questions:

1. Is the City's bulk infrastructure master planning in these five sectors adequate?
2. Does the City bulk infrastructure pipeline in these five sectors meet current and future demand?
3. If the answer to question 2 is 'no', are there projects in the pipeline that will address any shortfalls?

This report lays the foundation for future, deeper analysis across the City's infrastructure portfolio, including additional typologies of infrastructure such as community facilities, reticulation and distribution infrastructure, environmental infrastructure, etc. Future iterations of this report may also include other aspects, such as reviews of infrastructure requirements related to precincts/ areas (location-based analysis) or specific typologies of infrastructure (thematic-based analysis). Importantly, future iterations of the report will deepen the City's understanding of its infrastructure planning, risk and delivery against organisational strategic objectives.

The City's infrastructure planning and projects must consider all future realities and challenges, including the following key trends:

- Increasing informality and unplanned densification
- A growing population
- Declining household income
- Increasing occurrence of extreme climate events and related shocks
- The ongoing inadequacy and unreliability of passenger rail.

In this regard, demographic changes are of critical importance to infrastructure planning to ensure that the right infrastructure gets built, in the right locations and at the right time, in order to meet future demand. For this reason, the City's long-term planning is informed by long-term population projections. The latest City projections, as used in the IDP and MSDF, suggest 5,8 million people will reside in Cape Town by 2040. This represents 1,75 million more people than the current population. It is thus critical that infrastructure planning keeps pace with this growth to ensure that services exist in the future to meet the requirements of this growing population.

The findings of this report indicate that infrastructure capacity constraints exist, to varying degrees, across all of the five sectors evaluated. Exacerbated by backlogs in investment and maintenance, these constraints impede the City's ability to deliver services, adapt to increasing instances of climate-related risk, promote economic opportunity, and respond to the growing Cape Town population.

This report highlights the following about the City's current response to infrastructure constraints:

- Considerable efforts to address existing infrastructure constraints in the Energy, Urban Waste Management, and Water and Sanitation Sector Plans. This is evidenced by planned projects within each directorate that, to a large extent, aim to address existing investment backlogs and improve infrastructure capacity to meet future demand.
- Despite programmes in the Human Settlements Sector Plan that aim to tackle the city's complex human settlements issues, there is a clear gap between the current demand and supply of housing.

An analysis of the current state of infrastructure, against the planned capital investment projects across the five directorates, revealed the following key findings:

- The integrated portfolio is generally responsive to future trends in the water and sanitation, energy, and urban waste management sectors.
- Neither the Urban Mobility nor the Human Settlements directorates have adequate plans to match the scale of current need (next five years), nor are there sufficient projects in the five- to 10-year horizon to meet future demand. This is largely as a result of a grant-dependent approach to funding projects in these sectors. The City leadership has given direction that all sectors must plan for required critical infrastructure, regardless of certainty of funding. In response, the sector plans are being updated and enhanced on the understanding that the question of financing will be dealt with in the formal budgeting process.
- The City does not currently have a full set of stormwater master plans for each catchment area, and the process to develop them has a long lead time. Additional funding is being sourced to shorten the projected timelines.

Master planning is a key informant of infrastructure planning and investment; however, the adequacy of master planning varies across the City's directorates. Inadequacies or gaps in master planning data prevent the City from doing the following:

- Evaluating the degree to which infrastructure addresses the future needs of the City.
- Assessing whether the City is spending enough on infrastructure in each sector.
- Implementing effective evidence-based infrastructure decision making that is informed by accurate data.

The City will therefore prioritise master planning in order to ensure that infrastructure decisions are informed

by current and future realities of the city. Long-term infrastructure planning in the City remains a challenge, as demonstrated by the relative absence of capital projects in the outer years of the next 10-year period. This can be explained by the volume of current infrastructure backlogs in the City that consumes immediate focus, as well as the current gaps in master planning in the City.

The City is committed to improving capital planning in the outer years and is actively pursuing improvements in project preparation, master planning, and project prioritisation, as well as resourcing and prioritisation of long-term planning in the City.

The findings of the assessment of the planned capital projects over the next 10 years that increase existing bulk infrastructure capacity, are in line with the City's spatial strategy to promote 'inward growth' of urban development. However, the absence of projects relating to the expansion of public transport networks hinders the City's strategies to promote transport-oriented development. In light of this, a revision of the City's Integrated Transport Plan (CITP) is essential. This revision is currently under way. The CITP must inform an adequate pipeline of capital projects that is aligned to the City's spatial strategies, which should be included in future updates of the Transport Sector Plan.

This report also outlines findings that, in several cases, infrastructure owned and operated by other spheres of government has a direct negative impact on the City's bulk infrastructure in the five directorates assessed. The City will drive an active programme of advocacy over the next five years and will include the following infrastructure pressure points:

- The new Erica main transmission substation – scheduled for commercial operation in 2028⁵
- The Philippi substation extension project – scheduled for commercial operation in 2026⁶
- Access to rail for waste haulage
- Passenger rail

Infrastructure project preparation and spending are a significant challenge across South Africa and in all spheres of government. The City is committed to growing its portfolio of implementation-ready projects to ensure that it is able to spend its capital budget every year, able to grow its capital budget annually, and able to increase the potential for projects to be brought forward should additional funding become available.

⁵ Source: Eskom's Transmission Development Plan 2022–2031.

⁶ Source: Eskom's Transmission Development Plan 2022–2031.



INTRODUCTION

As the backbone of the economy, infrastructure is vital to productivity, competitiveness and increasing the quality of life for people across Cape Town. It acts as a direct 'input' for businesses and residents, that rely on the dependable delivery of basic services. The demand for these services has increased significantly over the past several decades, emphasising the importance of well-maintained, high-quality, and effective infrastructure to the economy, environment, society, and continued development. However, long-standing challenges continue to affect the City's ability to deliver the required infrastructure.

Key historical challenges include inadequate spending commitments, policy uncertainties, and a lack of precise data on the state, quality and performance of existing assets. The Covid-19 pandemic added another layer of complexity by significantly affecting infrastructure development. This has highlighted the critical importance of many infrastructure systems and services, both for maintaining economic and social activity, and enabling responses to unexpected threats and challenges. Specifically, during the pandemic, the City saw a significant increase in theft of infrastructure assets. The pandemic also had a significant negative impact on the economy, which was exacerbated in Cape Town due to the city's large tourism industry. As a result of the pandemic, and in line with the national trend, economic growth in Cape Town contracted by 5,1% in 2020⁷ and 4,9% in 2021. As a result, the need to grow the economy has never been more pressing.

Infrastructure systems, in particular, form the basis of building resilient societies and are crucial in renewing the fabric of a city. They form the basis of economic recovery by creating the conditions conducive to long-term sustainable growth. In light of this, it is critical for the City to focus on the ways in which infrastructure delivery can best support Cape Town's recovery from recent shocks. According to the City's latest model, demographic projections suggest 5,8 million people will reside in Cape Town by 2040. This is 1,75 million more people than the current population. It is thus critical that infrastructure planning keeps pace with this growth to ensure that services meet future demands.

Project and portfolio management (PPM): The delivery of quality infrastructure is directly impacted by the quality of project management. As such, the City has, in recent years, worked to strengthen its project and contract management capabilities. In addition, the City has adopted a portfolio management approach whereby all capital projects are managed through a central system called SAP PPM. All information relating to a given project is captured and regularly updated on this system, which helps determine whether the project is ready to progress to the next stage of development or not.

The City's 2022 Infrastructure Report forms the basis for a long-term approach to investing in infrastructure to improve the quality, accessibility and sustainability of services that Capetonians use every day. This report leverages existing investments in project and portfolio management and sector planning to enable an evidence-based, data-driven, and integrated approach to long-term and strategic infrastructure investment and delivery. In this regard, the analysis is based on data extracted from the City's project preparation management system (SAP PPM) as at 4 May 2022. The report provides a technical assessment of the implementation and delivery of Council-approved plans and strategies, guided by the IDP and MSDP, in order to improve planning and project preparation. This marks a decisive step change in the City's infrastructure ambitions.

Sector plans: These plans provide an assessment of infrastructure needs over a 20-year period. They are a critical link between the spatial strategies of the MSDP and the land-use forecasts that inform them, as well as the medium- and short-term instruments of the IDP and budget. They provide detailed insight to guide decision making related to investment in infrastructure.

⁷ Cape Town Integrated Development Plan 2022/27.

Given the important information provided in this technical assessment, a decision was taken to make a summary available to the public.

The objectives of the 2022 Infrastructure Report are:

- To provide a consolidated view of the City's infrastructure pipeline planning
- To show how the City's capital investments support its spatial strategy. As such, the report will serve as the Capital Expenditure Framework (CEF) for the City
- To serve as a strategic mirror, to determine whether infrastructure is:
 - › meeting capacity needs and demand;
 - › aligned to the City's strategic priorities and objectives; and
 - › facilitating the City's climate adaptation and mitigation efforts
- To highlight critical projects that need to be supported for project preparation and execution to meet current or future demand
- To provide the basis for key communication and advocacy with Provincial and National government and state-owned entities (SOEs).

- To provide a stocktake of the implementation of the City's infrastructure strategy (Infrastructure Planning and Delivery Framework) and key planning interventions
- To create the opportunity to do a 'deep dive' or thematic infrastructure analysis into areas of particular concern (e.g. sewage-related infrastructure).

The report evaluates the City's spatial, infrastructure and financial planning against the IDP over the 10-year period on basic and economic infrastructure linked to bulk municipal service delivery. This first iteration is limited to the energy, solid waste, water and sanitation, human settlements, and transport (urban mobility) sectors.

The publication of this report underscores the City's commitment to boost its productivity and competitiveness through the provision of high-quality infrastructure. It also demonstrates the City's commitment to openness and transparency.

MAYORAL PRIORITY PROGRAMMES

The Executive Mayor and City Manager have identified five priority programmes where additional resources have been allocated to ensure that progress is made during the current term of office. These five areas are broadly: sanitation, energy, land release, safety, and ease of doing business.

Of these, the first three are specifically infrastructure focused, as detailed below, and are therefore relevant to this report.

1. Sanitation and inland water quality

The programme aims to:

- prioritise critical wastewater treatment works (WWTWs) upgrades
- improve the performance of wastewater treatment facilities
- reduce the frequency, duration and impact of sewer

spills, and improve the response time to address spillages

- improve sewer system performance through replacement and proactive cleaning of critical sewer networks
- develop a citywide stormwater ingress programme

2. Energy security for economic growth

The programme aims to address priority focus areas on: energy security; power utility reform; investment in the distribution grid of the future; and using energy efficiently.

3. Land release for affordable housing

The programme focuses on the identification and optimisation (and/or release) of City-owned land and buildings for affordable housing (in line with the City's spatial strategy).



FINANCING FOR INFRASTRUCTURE

While investment in urban infrastructure drives economic growth, that investment must first be financed. The City has four main sources through which it finances infrastructure projects and funds their operation and maintenance:

Revenue

This is income generated by the City through rates, tariffs and development contributions. It accounts for a very small portion of overall infrastructure financing.

External Financing Fund

External, long-term loans are used to finance the outlay of capital assets funded by the External Financing Fund (EFF). The EFF is one of the largest sources of funding for infrastructure investments by the City.

The City funds a large portion of capital infrastructure investments through the issue of municipal bonds or by obtaining external loans from financial institutions. The City has issued four bonds thus far to raise external finance. These bonds are listed on the JSE (formally, the Bond Exchange of South Africa) and have raised

R5,2 billion as part of the City's R7 billion Domestic Medium-Term Note Programme (DMTN).

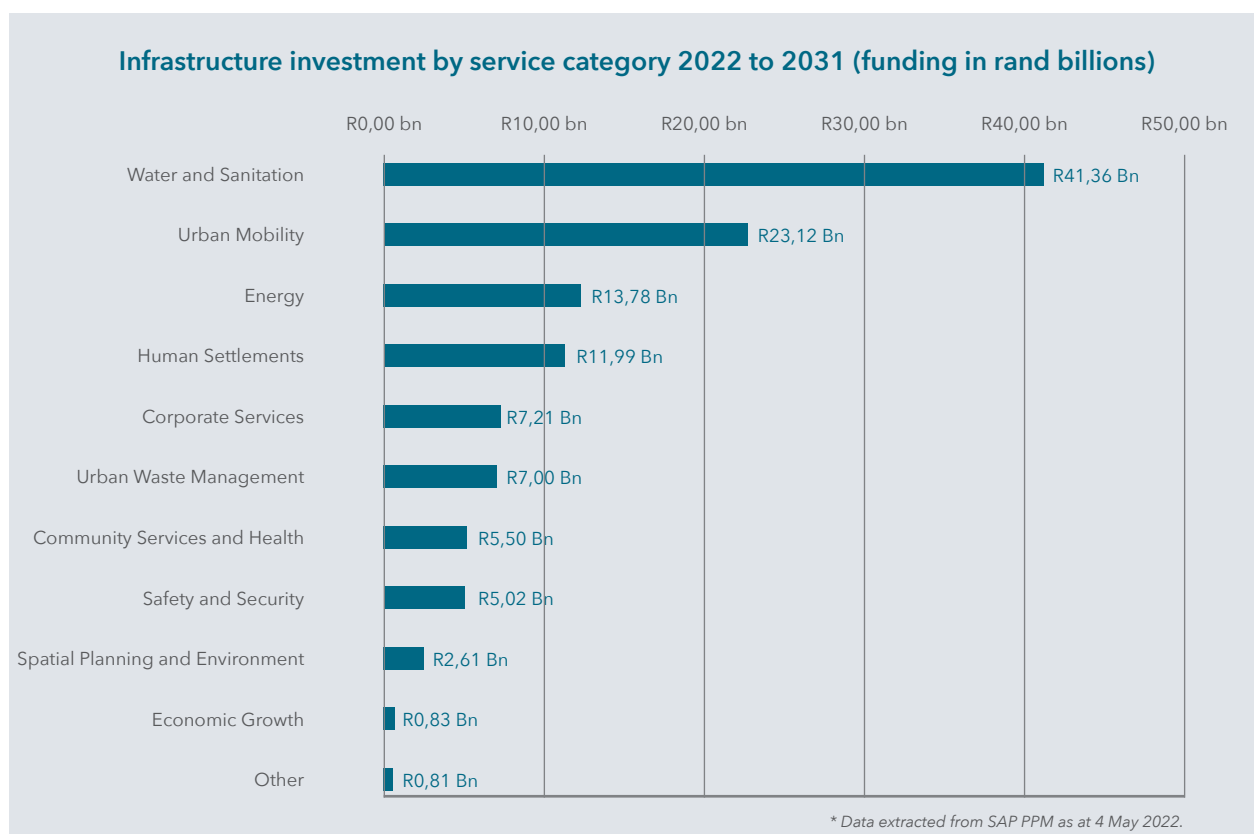
Grants and donations

The City receives a number of intergovernmental transfers from National and Provincial Government in the form of conditional grants. These are particularly important to fund infrastructure in the human settlements and urban mobility sectors, although the lack of certainty regarding future grants makes long-term planning in these sectors challenging.

Capital replacement reserve

The City maintains a dedicated reserve of funding for the replacement of capital assets. At present, the majority of capital replacement reserve funding is committed to the Energy (49%) and Urban Mobility (34%) directorates. Below is an overview of planned infrastructure over the next 10 years. Importantly, this represents amounts planned, but not necessarily committed, as projects need to pass a project preparation process to prove their readiness before they can be allocated funding through the budget process.

Figure 1: Potential infrastructure investment by service category 2022 to 2031



THE STATE OF BULK INFRASTRUCTURE IN THE CITY OF CAPE TOWN

According to current projections, in the next 20 years, Cape Town will experience the following:

- a growing population
- a reduction in household income
- increasing informality
- increasingly frequent and intense extreme climate events

Effective, long-term infrastructure planning will be critical to managing the future realities that are within the City's control, such as extending basic services, and adapting to those realities over which the City has little or no control, such as extreme weather events.

In addition to these possible future realities, the City is by no means starting from an equal baseline. Overcoming historical backlogs and the legacy of apartheid spatial planning remain key informants for Cape Town's future infrastructure requirements.

In order to plan for these future realities, the City recognised that a thorough stocktake of the existing state of its bulk infrastructure departments was needed.

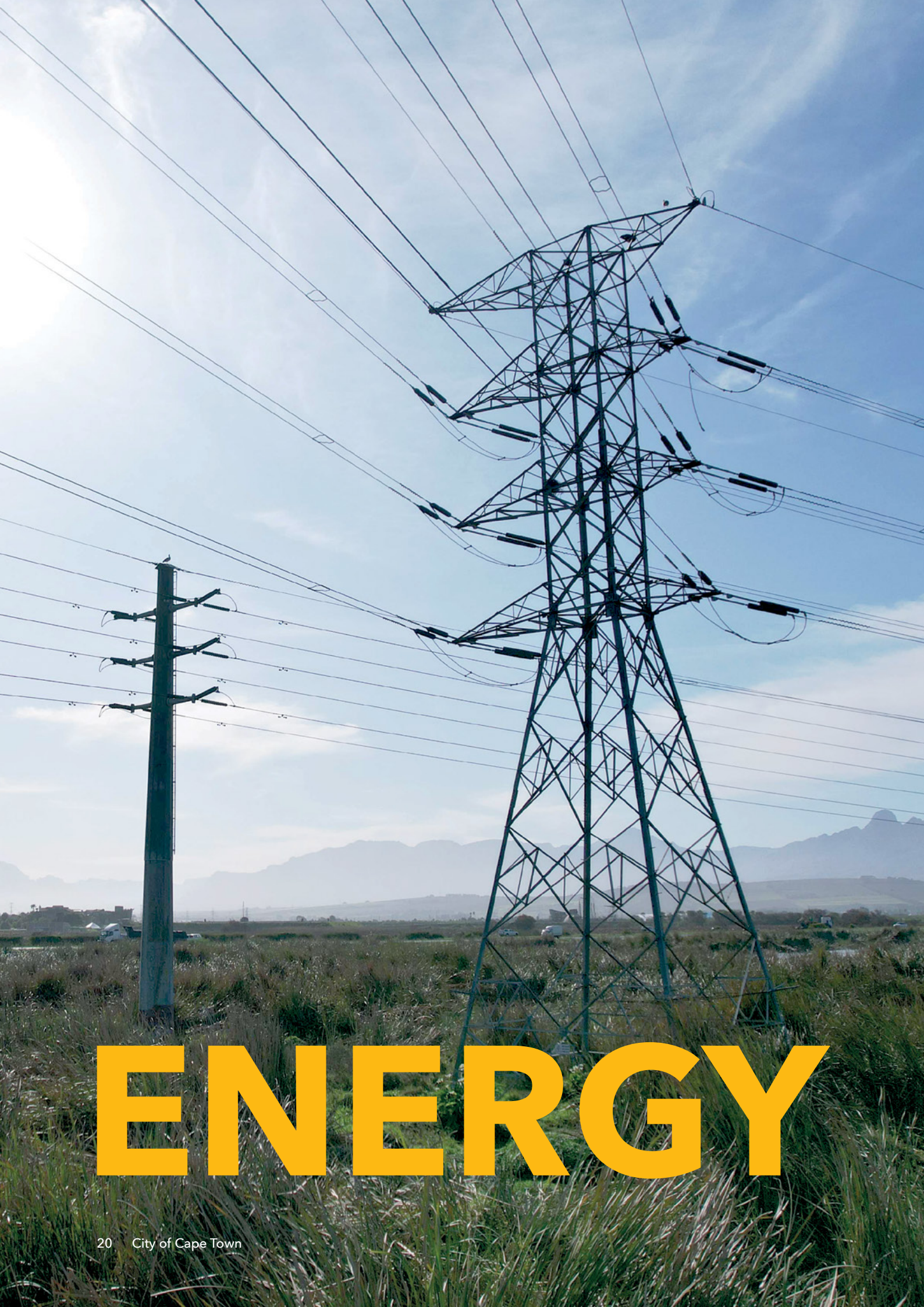
This report aims to answer three main questions:

1. Is the City's bulk infrastructure master planning in the five sectors mentioned adequate?
2. Does the City bulk infrastructure pipeline in these five sectors meet current and future demand?
3. If the answer to 2 above is 'no', does the City have projects in the pipeline to address the shortfalls?

In addition to assessing the current state of infrastructure and future outlook of the five directorates and the sectors they represent, the report also makes recommendations for strengthening infrastructure delivery in each case.







ENERGY

Energy is a primary input into the daily lives of Capetonians and an enabler of local economic development. Providing access to secure energy is critical to ensuring that residents and the economy in Cape Town can prosper and thrive.

Some areas in Cape Town are supplied with electricity directly by Eskom and others by the City, as shown in figure 5. The supply areas are established under the National Electricity Regulation Act via the National Energy Regulator of South Africa (Nersa) issued distribution licences. The Eskom distribution licence defines the Eskom supply area within Cape Town, and the City's distribution licence defines the City's supply area. Each licensee has exclusive authority to supply electricity and operate electricity networks in their supply area.

The City is thus prohibited by law from supplying, operating or responding to electricity faults in the Eskom supply area. The City also cannot determine or change the supply areas; only Nersa has the authority to make such changes. While Eskom infrastructure is mentioned in this section, as it impacts on City distribution, the primary focus is on assessing electricity infrastructure under the control and management of the City.

This City's distribution network is supplied from the national grid via 37 points of delivery. Main substations transform the bulk power received at voltages of 132 kV, 66 kV and 33 kV to lower voltages (11 kV) for further distribution. A total of 76 main substations and 44 switching stations service the City's supply area. Managing this network is the primary responsibility of the City's Energy Directorate.

Despite a very high (97,7%)⁸ degree of electrification in the Cape Town metropolitan area, and the City's provision of an energy services social package to low-income households – including subsidised grid connections, Lifeline and Home Light tariff⁹ and Free Basic Electricity (FBE) allocations – the most vulnerable households remain largely in a position of energy poverty.

Grid electrification can take up to three years from planning to implementation, leaving residents with an extended period during which they are without a formal electricity supply. Furthermore, grid electrification is not

possible in informal settlements on encumbered land such as flood-risk zones, servitudes, and private land (unless permission is obtained from the private owner).

The City currently has no mechanism to provide alternative basic modern energy services in informal settlements that cannot be electrified. It is, however, investigating the possibility of providing these alternative energy services to residents in the future.

Free Basic Electricity* is the electricity allocated to support low-income households. It is the amount of electricity considered to be enough to run basic lighting, get basic media access, do ironing, and boil water using an electric kettle.

The **Home Light tariff** is part of a suite of Eskom electricity tariffs based on the size of the supply that provides a subsidy to low-usage single-phase residential properties, churches, schools, halls, clinics, old-age homes or similar supplies in urban areas and electrification areas.

The **Lifeline tariff** applies to customers who:

- have a municipal property valuation of R400 000 or less;
- receive less than 450 kWh per month on average, including any free electricity; and
- have a prepayment meter.

For customers who receive a pensioner or disabled persons rebate in terms of the rates policy; or who are tenants who otherwise would have qualified for such a rebate; or who are registered as indigent in terms of the Credit Control and Debt Collection Policy, the property valuation provision falls away.

*<https://www.eskom.co.za/eskom-encourages-indigent-households-to-claim-free-basic-electricity/>

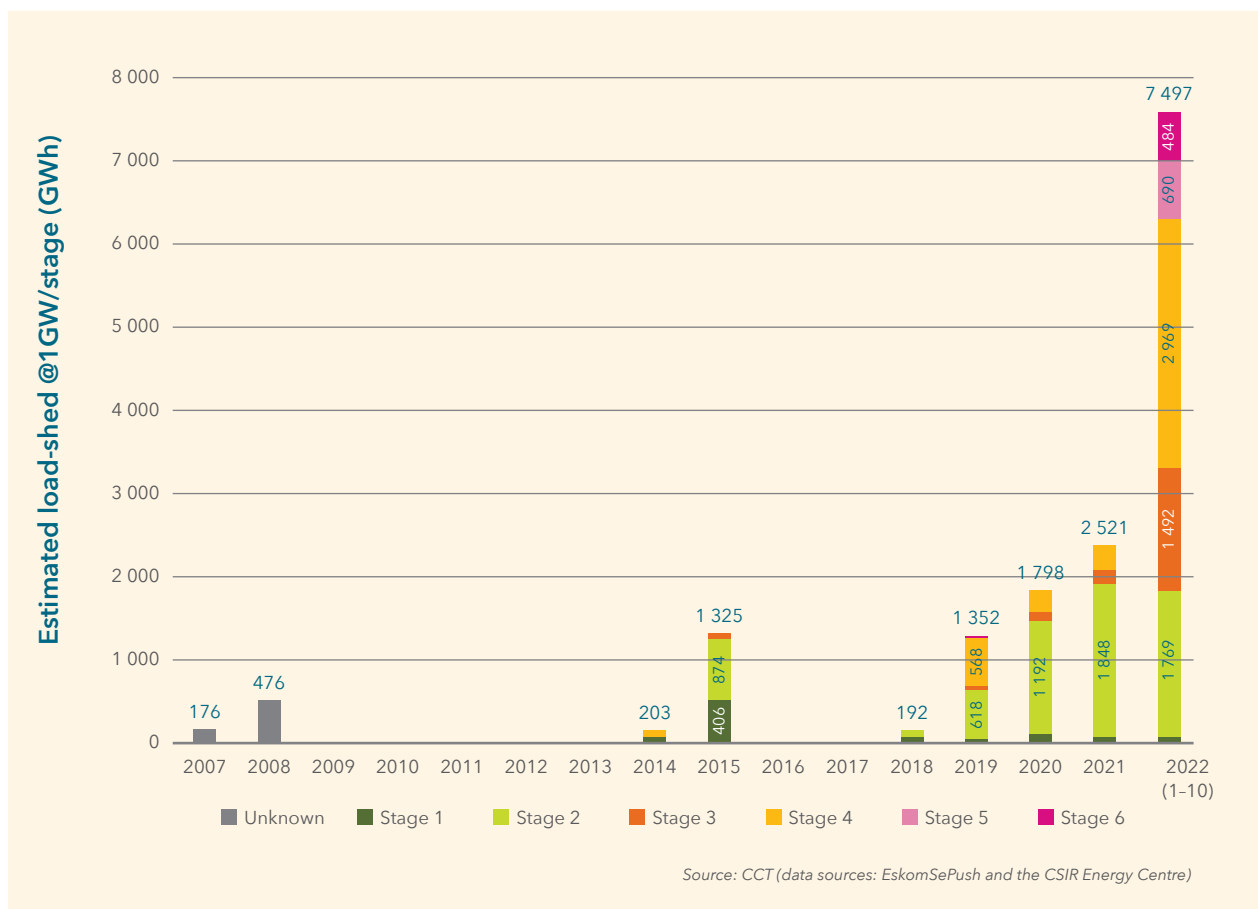
As South Africans are acutely aware, the national electricity network is under constant stress with load-shedding being a regular occurrence. Load-shedding has a direct negative impact on households and a devastating impact on businesses and the economy. It is for this reason that the City is committed to doing everything possible to mitigate the impacts of load-shedding in Cape Town.

⁸ Cape Town State of Energy and Carbon Report (2022), pg.100.
⁹ Eskom 2022 Tariff booklet and CCT.

Currently, the City is able to shield residents from up to two stages of load-shedding. It is undertaking several initiatives to further protect residents and end load-shedding in Cape Town over time. These include:

- Increasing the availability of dispatchable energy to limit the immediate impact of load-shedding via:
 - › the Steenbras hydro pumped storage optimisation;
 - › the dispatchable independent power producers (IPP) programme; and
 - › developing a City battery energy storage systems (BESS) roadmap.
- Increasing installed capacity more generally to reduce load-shedding over time via:
 - › the City-initiated embedded generation;
 - › the large-scale independent power producers programme;
 - › customer-initiated embedded generation; and
 - › wheeling.¹⁰
- Enabling an incentivised demand response from customers, via:
 - › the Power Hero Programme (third-party demand response aggregators).

Figure 2: Amount of electricity load-shed nationally, 2007 to October 2022



¹⁰ Wheeling refers to the financial transactions representing the transportation of third-party electrical energy (kWh) over the municipal/Eskom distribution network. It allows a third-party supplier to sell this electrical energy to a customer at their point of supply. The sale is governed by a bilateral power purchase agreement (PPA) that exists within a market environment, as opposed to a regulated environment, as the price of the energy is set between the parties and not by the City/Eskom or the National Energy Regulator of South Africa (Nersa).

Distribution network

The state of electricity distribution network infrastructure in the City's municipal border as at January 2022 is as follows (see annexure A:1 for more details):

- One area in the City supply area is reliant on infrastructure that has reached over-firm capacity and requires intervention. The firm capacity of this network was exceeded for only 34 (non-consecutive) hours in 2021 (i.e. less than 1% of the time).
- A total of 10 Eskom-owned and maintained main substations (MSs) are over-firm capacity and present a risk to the reliability of supply to those residents in the Eskom supply areas.
- There are City-supplied areas where the infrastructure is firm, but where the upstream Eskom infrastructure is non-firm or over-firm, e.g. City MSs receiving power from Eskom's Philippi main transmission station (MTS).
- In response to constraints at the Eskom-owned Philippi MTS, which supplies the Southern Peninsula, the City looped one of the Mitchells Plain-Steenbras 132 kV lines in and out of Eskom's Pinotage MTS in 2020. This successfully prevented loss of supply for substantial periods during the Philippi transformer failure from October 2020 to June 2021.

The **state of electrical infrastructure** is determined by a network reliability index of firm vs. non-firm vs. over-firm capacity. **Firm capacity** indicates the network ability to withstand an N-1 fault condition, meaning that it is capable of experiencing an outage of a single network component without causing losses in electricity supply. This should not be confused with the total installed transformer capacity at the MS. **Over-firm capacity** means the demand peak (in MVA) for the preceding year exceeded the firm network capacity.

Non-firm capacity means the network is only designed for the normal system condition (N-0). During a single system component failure, electricity will be interrupted in line with the load supplied. The City aims to initiate projects when network capacity reaches 95% of firm capacity, subject to financial feasibility and the relevant governance processes.

New developments and/or new connections will nonetheless be considered on a case-by-case basis, even in non-firm/over-firm areas or areas identified as being at risk of over-firmness in the short- to medium-term.

Generation

The City's current generation assets comprise Steenbras hydro pumped storage (180 MW, 2 200 MWh) and two small gas turbines (78 MW), which are usually only run in emergencies. Steenbras can be operated in a range of ways depending on the objective, which normally is a reduction in maximum demand or energy arbitrage.¹¹ Steenbras has also proven to be highly beneficial in limiting the stages of load-shedding experienced by City-supplied customers. The City's generation facilities are all operational, but require varying levels of refurbishment to ensure operational quality and extension of life (see annexure A:2 and A:5 for further details).

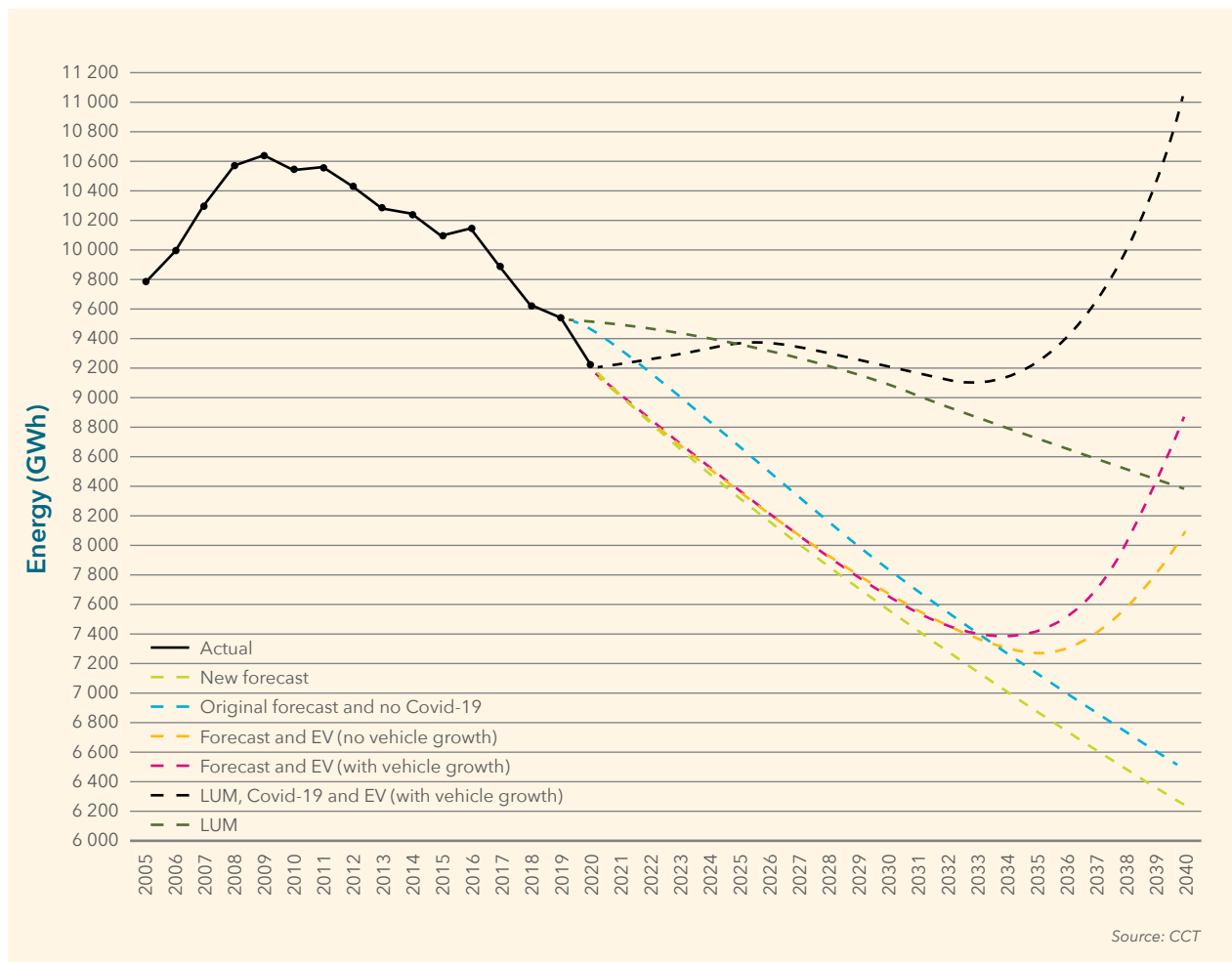
¹¹ Source: State of Energy and Carbon Report (2022, pg. 60).

FUTURE OUTLOOK

Energy consumption has declined at an average annual rate of 1,9% since 2008/09 and this trend is expected to continue in the near future. Of the scenarios presented in the City's energy consumption forecast, five of the six project a further decline in the City's energy consumption within the next 10 years. Citywide economic growth, household income and energy-efficiency measures, as well as the adoption of small-scale embedded generation (SSEG) and electric vehicles (EVs) are expected to impact electricity consumption. This modelling does not yet take into account the

sustained load-shedding experienced in 2022, which will likely further drive this downward consumption trend. To ensure that consistent planning assumptions are used across the City, it has also produced electricity consumption forecasts (see figure 3 below) based on the City's Land Use Model (LUM) 2040, that is a forecasting tool which considers projected population growth and spatial location patterns. EV uptake is underpinned by the assumption that the manufacturing of internal combustion engines is likely to cease across the EU by 2030.

Figure 3: Electricity consumption and forecast consumption in the City supply area

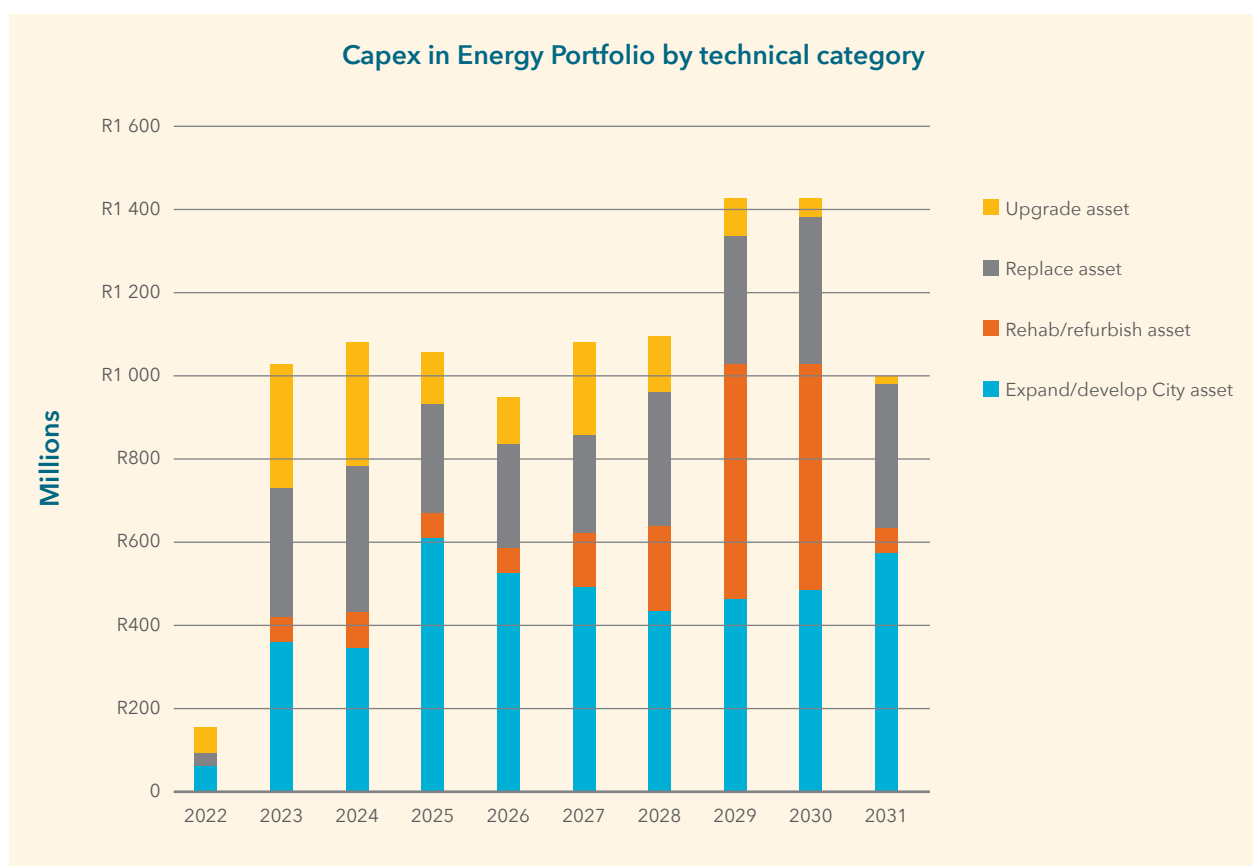


The 'Energy Security for Economic Growth' Mayoral Priority Programme will have a critical impact on the future of the City's electricity infrastructure. The aim of this programme is to explore mechanisms to protect customers from load-shedding over time, while formalising current and undertaking additional reviews of power utility reform opportunities, and streamlining the embedded generation application process within the context of a longer-term Energy Strategy. In the interest of residents and businesses, the City will continue to seek out and implement measures to mitigate the impact of load-shedding for City-supplied customers based on financial feasibility and successful partnerships with energy system stakeholders.

The Energy Directorate has a fairly consistent capital spending plan for the next 10 years. The majority of this is committed to the expansion and development of new and existing assets, while spending on the rehabilitation and refurbishment of assets is projected to increase steadily over the next 10 years, peaking in 2029 and 2030.

Small-scale embedded generation (SSEG) refers to power generation facilities, located at residential, commercial, or industrial sites, where electricity is generally also consumed. These are mainly rooftop solar PV systems, but also include other technologies such as wind generation and biogas.

Figure 4: Energy sector's capital expenditure by technical category over the 10-year period from 2022 to 2031 (as extracted from SAP PPM at 4 May 2022)



Distribution network

While the City projects a decreasing overall demand of electricity, new housing and business developments (particularly data centres), as well as growth in low-income households, suggest that the location of electricity demand will change spatially.

The following future scenarios can be expected with regard to electricity distribution:

- A total of 19 of the City's 183 power transformers are expected to reach theoretical end-of-life in the next 10 years (see annexure A:4 for further details). End-of-lifecycle projects are subject to a thorough condition-based assessment of the equipment in order to determine the correct time of project initiation and potential extended useful life.
- While the City's measures to mitigate the risk of the currently over-firm Philippi MTS have been successful to date, it is vital that Eskom delivers the following two projects to alleviate the load at the Philippi MTS:
 1. The new Erica main transmission substation – scheduled for commercial operation in 2028¹²
 2. The Philippi substation extension project – scheduled for commercial operation in 2026¹³

'System equipment and replacement' is one of the two largest spending areas for planned refurbishment and replacement energy projects over the next 10 years. These projects are spatially situated across the City's distribution network.

The majority of the 'new and upgrade' projects planned in the next 10 years relate to transmission system

development (40%) and medium-voltage (MV) system infrastructure (18%). This is aligned with the Energy Directorate's primary role as distributor of electricity to Cape Town's residents. These infrastructure projects adequately address the existing and future over-firm capacities expected in the City.

Generation

Large-scale electricity generation is being pursued in order to mitigate load-shedding in the future. Specifically, the City has initiated a process to procure electricity from IPPs and to increase its own generation capacity, for example, through the installation of solar PV systems that will generate 7 MW of electricity in Atlantis. A list of planned City-owned generation projects currently being pursued can be found in annexure A:6.

The City has installed a number of small-scale rooftop PV systems on City-owned facilities and will continue to do so in order to reduce its reliance on the national electricity grid and meet its carbon commitment goals. In this regard, investments in rooftop PV installations are noted in the planned, new and upgrade, energy projects between 2026 and 2030.

'Electricity generation' makes up the second largest spending item in planned refurbishment and replacement projects over the next 10 years. These projects address the refurbishment and replacement needs at the City's three existing generating facilities of Steenbras, Roggebaai and Athlone (see annexures A:2 and A:5 for further details).

Infrastructure highlight: Atlantis PV project

The aim of the Atlantis solar PV project is to design, build, operate and maintain a 7 MW ground-mounted solar PV installation on vacant land between existing industrial and residential zones in Wesfleur, Atlantis. The facility will be connected directly to the City's electrical network.

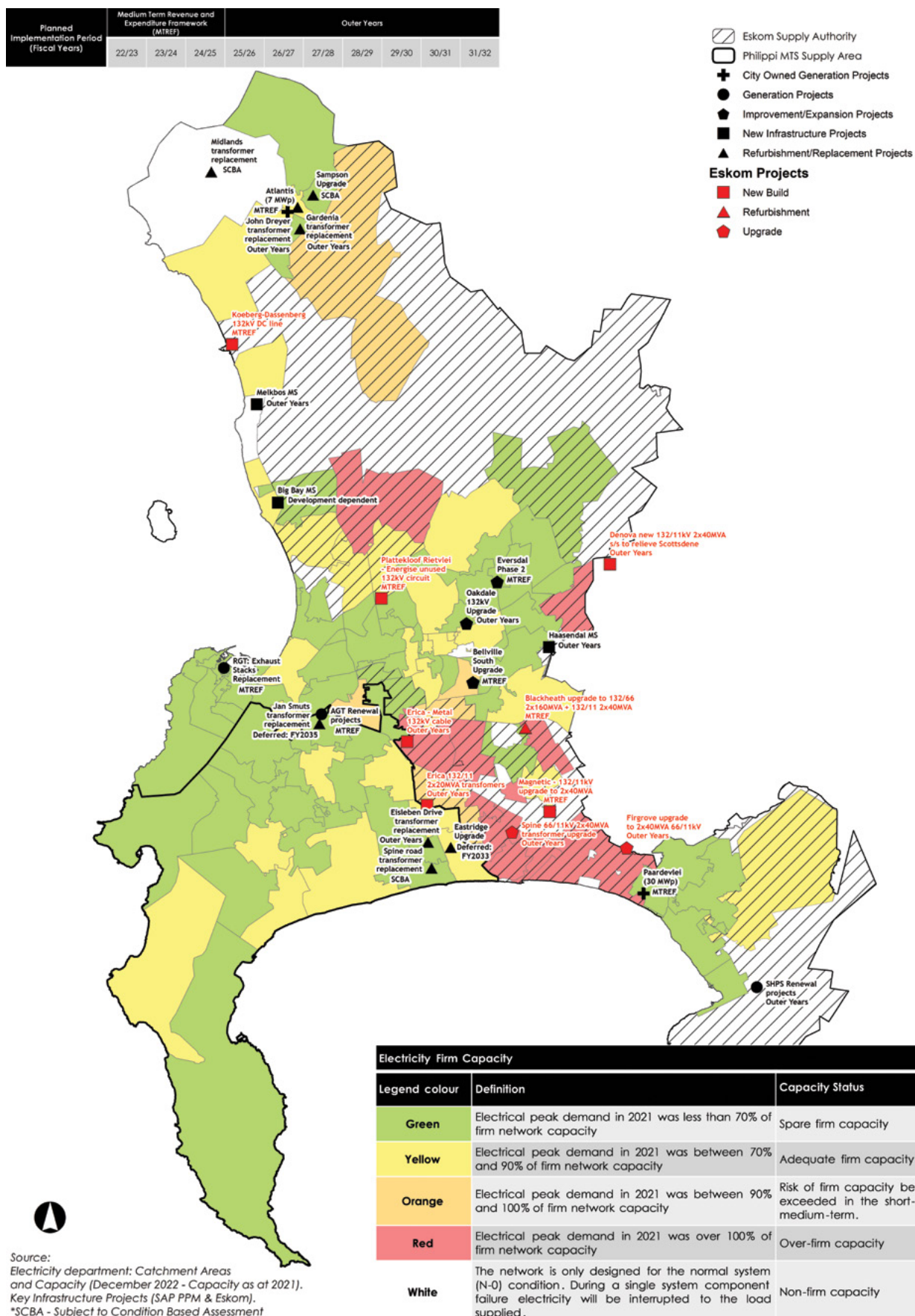
This is one of a range of interventions to end load-shedding over time. The power plant would start generating electricity in 2024 and be in operation for 20 years, with a foreseen annual output of 14,7 GWh.

It is expected that the Atlantis solar plant will enhance the City's financial sustainability as the cost of generating the electricity will be lower than bulk procurement from Eskom.

¹² Source: Eskom's Transmission Development Plan 2022-2031.

¹³ Source: Eskom's Transmission Development Plan 2022-2031.

Figure 5: Electricity capacity and capital projects - incl. Eskom (status as at December 2022)



KEY TAKEAWAYS AND RECOMMENDATIONS

- The City's planned infrastructure projects in energy over the next 10 years respond to over-firm distribution network concerns and accommodate energy-efficiency measures to support energy security and reduce the City's carbon emissions.
- Capital commitments exist in the portfolio that support the MPP, including generation fleet, new ground-mounted PV, rooftop PV installations, resource efficiency in municipal buildings, and LED street lighting refurbishments.
- Electricity generation investments by the private sector and households are likely to rapidly increase due to licence changes and more severe load-shedding. The Energy Directorate has established a work package under the Energy Security for Economic Growth Programme to streamline the application and registration system for EGs.







URBAN WASTE MANAGEMENT

Capetonians currently generate 4 400 tonnes of solid waste daily, equating to approximately 1,6 million tonnes of waste per year. The Urban Waste Management Directorate’s bulk infrastructure supports the City’s waste services through the provision of landfills, drop-off facilities, leachate plants, composting plants, refuse transfer stations, materials recycling facilities and waste management facilities.

The long-term vision for Cape Town’s waste management infrastructure is not only to provide basic services, but also to augment economic activity and minimise the effects of waste on human and environmental health. Integrated waste minimisation and recycling are also significant components of Cape Town’s Climate Change Action Plan.

Waste minimisation systematically reduces waste ‘at source’, increases the efficiency of production, and protects the environment. For instance, the effectiveness of waste collection has a direct link to the quality of our rivers and waterways.

The likelihood that population growth in Cape Town will predominantly occur in informal settlements over the next 20 years means that there will be an increasing need for the City to extend waste collection to new settlements and improve the level of collection to meet demand in existing settlements as they grow.



CURRENT STATE

Landfill

The City of Cape Town owns and operates two landfill sites, namely Coastal Park and Vissershok. Coastal Park has approximately five years of remaining capacity, after which all waste will have to be transported to Vissershok, unless a new regional landfill is established within this timeframe (see annexure B:1).

Collections, cleansing, disposals and drop-offs

The City’s network of refuse transfer stations and drop-off facilities is responsible for transporting municipal solid waste between generation areas and landfills. These

facilities have sufficient capacity to handle Cape Town’s solid waste. However, the following factors are noted as constraints to operations:

- Persistent infrastructure breakdowns (see annexure B:2) resulting in all four of the City’s refuse transfer stations missing operational targets
- Lack of access to rail for the transportation of solid waste to and from the City’s four refuse transfer stations. This prevents facilities from meeting their designed capacities and has major cost implications (R190 vs R90 per ton) for the City. In particular, the unavailability of the Dunoon/Montague Gardens rail line, due to unlawful land occupations near Dunoon, is identified as a major challenge.

PREFACE
ENERGY
URBAN WASTE MANAGEMENT
WATER AND SANITATION
HUMAN SETTLEMENTS
URBAN MOBILITY
CONCLUSION
ANNEXURES

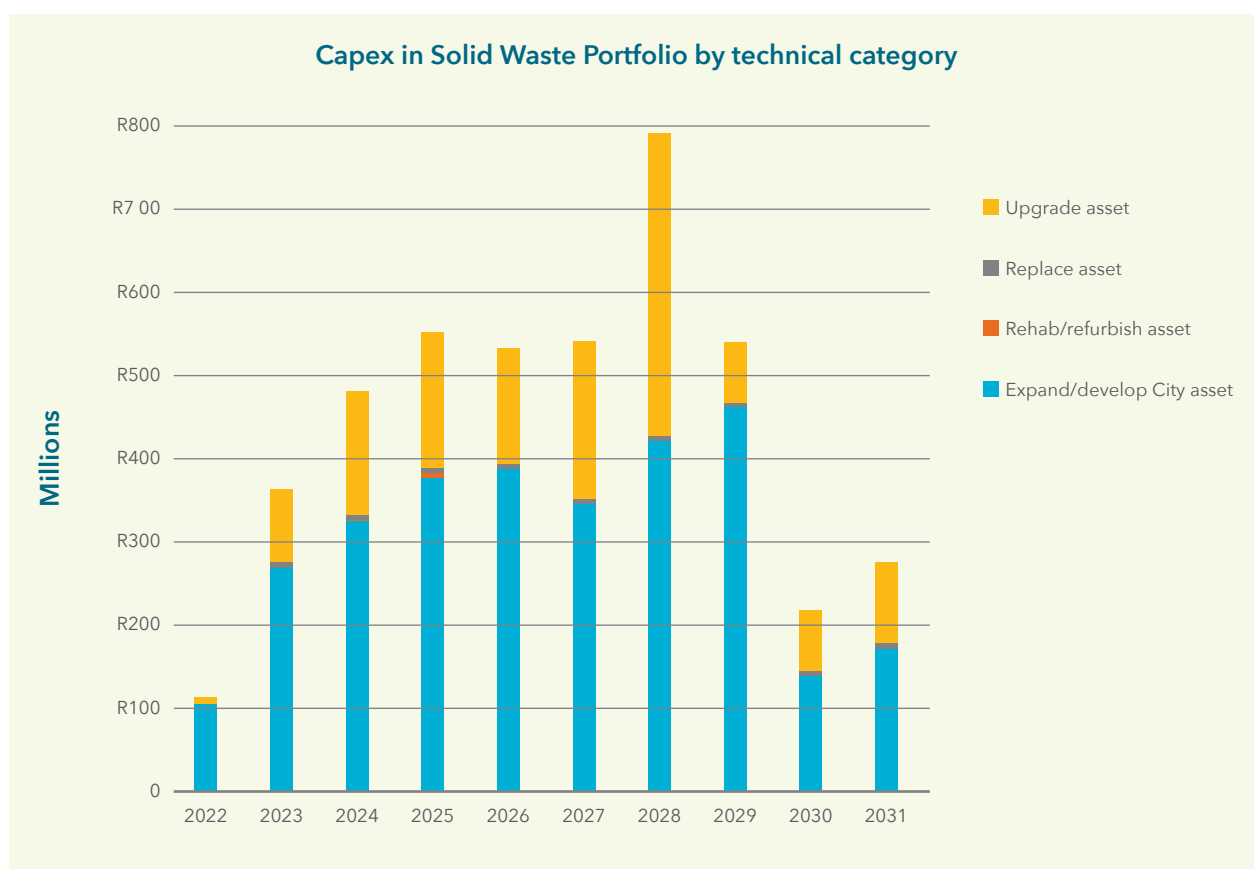
FUTURE OUTLOOK

The City is expected to continue producing waste at a consistent rate for the foreseeable future. Given that two landfills are constrained by limited airspace, there is pressure on the Urban Waste Management Directorate to implement measures that effectively divert waste.

The following trends are noted in the Urban Waste Management Directorate's planned capital spending over the next 10 years:

- Total capital spending increases consistently for the first eight years and drops considerably thereafter due to fewer planned 'new and upgrade' projects in the outer years.
- A total of 98% of planned capital spending relates to 'new and upgrade' capital expenditure. This is largely due to the capital requirements for the construction of a regional landfill site.

**Figure 6: Solid Waste capex over the 10-year period from 2022 to 2031
(as extracted from SAP PPM on 4 May 2022)**



Landfill

The aim is to extend the Vissershok airspace availability between 2037 and 2040. This will require a reduction in the current baseline waste consumption rate of 10,2% across the city.

In addition to the need to reduce the city's waste consumption, landfill airspace shortages in the Stellenbosch and Drakenstein municipalities present

a potential challenge as this may result in the need to use the City's Vissershok site. This would reduce the life expectancy of this landfill. However, Stellenbosch municipality's ability to procure additional land for their existing landfill site means that there is not an immediate threat to City landfill airspace availability from this quarter. On the other hand, airspace remains a concern for Drakenstein Municipality, where a plan to develop a waste incineration plant is being developed. These

measures will only temporarily address regional capacity constraints and there is still a requirement to plan for a regional landfill site.

The City is in the process of planning for such a regional landfill site, which will provide the City with a projected 35 additional years of landfill airspace. A candidate site has been identified in Kalbaskraal and the establishment of the site is projected to cost R300 million. The process will also need to include an extensive Environmental Impact Assessment (EIA). At the time of writing this report, the EIA for the site was in the process of submission with optimistic estimates forecasting approval in 18 months.

A significant portion (21%) of the Urban Waste Management Directorate's planned spending on 'new and upgrade' initiatives over the next 10 years relates to the development of landfill infrastructure, including provision for the procurement of the regional landfill site in 2027/28. Alongside the development of landfill infrastructure, the Urban Waste Management Directorate aims to improve the City's waste minimisation efforts, thereby slowing the rate of disposal at the City's landfill sites in the future.

Collections, cleansing, disposals and drop-offs

The need to divert waste from the City's landfills is expected to increase with the imminent closure of Coastal Park as well as the continued extension and expansion of basic service delivery to informal settlements. In addition, the following factors are expected to inform the infrastructure needs of the City's drop-off facilities:

- A proposed City amendment to the service radius of drop-off sites will see the radius decrease from 7 km to 3 km. This will require additional drop-offs to be established in Philippi, Mitchells Plain, Khayelitsha, Bellville and Durbanville and will necessitate waste disposal improvements in informal settlements. An estimated R600 million has been committed to develop new drop-off facilities.
- Storage capacity at drop-off sites is expected to

come under strain as recycling efforts increase the volume of useable waste in the city. This will place pressure on the City to promote waste beneficiation and the implementation of a circular economy action plan in order to put usable waste to good use.

- Volatility in the recycled waste commodity market may also place additional pressure on storage capacity at the City's waste facilities, as reduced export demand will force the City to stockpile export-ready recycled waste.

The majority (68%) of the Urban Waste Management Directorate's planned capital spending on 'refurbishment and replacement' projects over the next 10 years relates to the repair of damaged or broken equipment at the City's four regional transfer stations. This will ensure that the directorate can execute planned maintenance at these facilities over the next 10 years.

There are also significant capital commitments planned for the improvement of the Kraaifontein integrated waste management facility and Athlone refuse transfer station. This is aligned to the City's goal to normalise integrated waste management as part of the City's waste minimisation and recycling strategy.

There are also plans for shipping container replacement representing 17% of the sector's 'planned refurbishment and replacement' spending over the next 10 years. Shipping containers are critical to waste collection and disposal efforts in informal settlements. Projects to replace shipping containers consistently over the next 10 years are therefore in line with the sector's basic service response to informal settlements in the face of growing informality.

Planned spending on 'new and upgrade' infrastructure increases exponentially to 2028, declining thereafter, largely due to the development of transfer stations over the first seven years of the portfolio. Investment in transfer station development is in line with the directorate's efforts to improve operational efficiencies at these sites. In addition to capacity improvements, investment in waste beneficiation at these sites will improve the City's ability to divert waste from landfills, thereby protecting valuable airspace.

KEY TAKEAWAYS AND RECOMMENDATIONS

- Capital commitments to refuse transfer stations, integrated waste management facilities and landfill infrastructure are aligned to the City's intention to improve operational efficiency, promote waste beneficiation, and reduce the current volumes of waste to landfills.
- The EIA process for a new regional landfill has commenced and the requisite funds have been made available in the capital portfolio. The City will work to produce all necessary information and studies to expedite the EIA approval process to secure a site as soon as possible. This will prevent the potential need for the future diversion of waste to alternative landfill sites as a result of reaching current airspace limits before a new regional landfill site is developed.
- While provision for new waste drop-off sites has been made, additional capital projects are required if the City intends to reduce the service radius of drop-off sites from 7 km to 3 km in the short- to medium term.
- The capital projects within the portfolio address service delivery in informal settlements with provisions made for additional skips, drop-off sites and containers. However, these capital projects are an extension of the current service delivery model in informal settlements, which is both costly and has yet to address instances of illegal dumping. The Informal Settlement Waste Management Strategy should be completed as a matter of urgency so as to inform a more sustainable and effective approach to informal settlement waste management. Capital projects informed by this strategy should be defined and included in an updated sector plan as soon as possible.
- The inability of the City to access the rail network to transfer waste to and from refuse transfer stations inhibits the operational efficiency and financial sustainability of metropolitan solid waste management. In the face of fiscal constraints and Cape Town's carbon emission goals, the City should continue to advocate for interventions that allow access to waste haulage services by rail.



Kraaifontein integrated waste management facility

An integrated waste management facility is a shared waste management facility where a combination of all integrated waste services are provided, such as composting of green waste, crushing of builders' waste, a drop-off facility for general waste and recyclables, and a waste transfer station. It incorporates several waste controls and methods for waste disposal in one facility.





WATER AND SANITATION

The City is responsible for the reticulation, treatment and provision of water to residents of Cape Town, while National Government, through the Department of Water and Sanitation, is responsible for bulk water supply and infrastructure. Cape Town is part of the Western Cape Water Supply System (WCWSS), which gets its water from six major rain-fed dams.

The City is also responsible for the provision of sanitation services in the metro. This includes developing and maintaining an extensive network of sewers and pump stations to safely pipe wastewater to the City's wastewater treatment works.

Securing a reliable supply of water in the future, and providing quality sanitation and refuse collection services, are essential to enable a life of hope and dignity for communities, as well as to support Cape Town's businesses and most essential industries.

Consistent management and maintenance of the City's stormwater system are also critical for managing flood risks, improving inland water quality and optimising the harvesting of stormwater as a valuable water resource.

The City's water and sanitation bulk infrastructure thus consists of a complex and integrated network. For the purposes of this report, bulk supply reservoirs, bulk supply conveyance, water treatment plants, wastewater treatment works, sewerage pump stations, wastewater reticulation and stormwater catchment infrastructure are considered.

The Mayor's Sanitation and Inland Water Quality Programme will have a direct impact on the future infrastructure plans of the Water and Sanitation Directorate. These projects were not captured in the infrastructure plans of the directorate at the time of writing this report, but will be included in future reports.

CURRENT STATE

Bulk water and reticulation network and reservoirs

The City's bulk water network is made up of a total of 658 435 km of pipelines, with 24 reservoirs and 35 pump stations. While approximately 11 012 km of water pipes, 154 reticulation reservoirs/tanks (including disused) and 120 water pump stations (including boosters) make up the City's water reticulation network. An assessment is currently under way to identify the upgrade and refurbishment requirements of the City's bulk and reticulation water reservoirs. In the interim, the following have been noted:

- Bulk storage capacity is sufficient to meet the city's water demands throughout the week.
- A total of 19 of the City's reticulation reservoirs experience capacity constraints as they have less than 48 hours of storage capacity for their distribution areas (see annexure C:1 for further details).
- A total of four of the City's bulk water reservoirs, Blackheath Upper, Wynberg No. 2, Monterey and Constantia Nek, experience capacity constraints with a significant reduction in water levels during peak usage. This indicates insufficient redundant capacity.

- Concerns have been noted at the Brakkloof reservoir, which ensures security of supply to the so-called 'Deep South' (Muizenberg to Simon's Town). This area is supplied by a single distribution pipeline and, in the event of a prolonged water outage due to required repairs, it will not have sufficient storage to secure supply for the duration of the repair.

Bulk supply conveyance

The majority of the pipelines in the City's bulk supply system have flow velocities within acceptable limits. However, regions one to four (see figure 7 overleaf) contain lengths of bulk pipelines that are noted as having capacity constraints (see annexures C:2 and C:3 for further details).

Water flow velocities in water systems should not exceed certain limits, to avoid noise and prevent wear and tear of pipes and fittings.

Figure 7: Graphical representation of the City's four bulk water regions



Source: CCT

Water treatment plants

The City's 12 water treatment plants have a total design capacity of 1 655 Ml/d. However, actual usable peak capacity is about 1 422 Ml/d due to the age of the infrastructure and other constraints. These constraints will be factored into the Bulk Water master plan as well as the timing and phasing of future infrastructure builds and upgrades. The master plan will include a plan for how these water treatment plants are going to be returned to full capacity.

The following capacity constraints and risks are noted with regard to the City's water treatment plants (see annexure C:4 for further details):

- A total of five water treatment plants currently have no surplus capacity during peak demand.
- The Voëlvlei and Wemmershoek water treatment plants cannot shut down for extended periods due to capacity constraints, meaning that much-needed routine maintenance activities cannot be carried out.
- The Blackheath and Faure water treatment plants are fed directly from Theewaterskloof Dam via the Rivieronderend tunnel system. In the event of the tunnel failing, or being out of operation for extended periods, the City would lose approximately 40% to 50% of its water treatment capacity as well as the ability to access approximately 45% of its current usable allocation of surface water resources.

Wastewater treatment works

Land-based WWTWs are designed for a certain flow and pollution load capacity. The designed pollution load capacity (the ability to treat wastewater flow and nutrients such as COD, nitrogen, and phosphorus) is the critical factor that determines the need for a capacity upgrade. WWTWs compliance with national licence conditions, regarding the quality of effluent, at these facilities has declined from 90% to 80% over the last 10 years, due to ageing infrastructure and capacity constraints. When a WWTWs experiences 90% or more of its hydraulic flow and load, the implementation of an upgrade is triggered; if 100% load is reached, then it is considered over capacity.

The following capacity constraints are noted:

- The Potsdam, Zandvliet, Klipheuwel and Macassar facilities have either flow or load capacity constraints (see annexure C:5 for further details).
- The Borchers Quarry WWTWs is the only facility that can accept delivery of tankered faecal sludge and chemical toilet waste from informal settlements.

WWTWs are designed to accommodate a hydraulic or **flow capacity**, which is a specific volume of wastewater per day in order to be able to treat a specific nutrient **load capacity** (organic, nitrogen and phosphorus load – in essence, the pollution load contained in the wastewater).

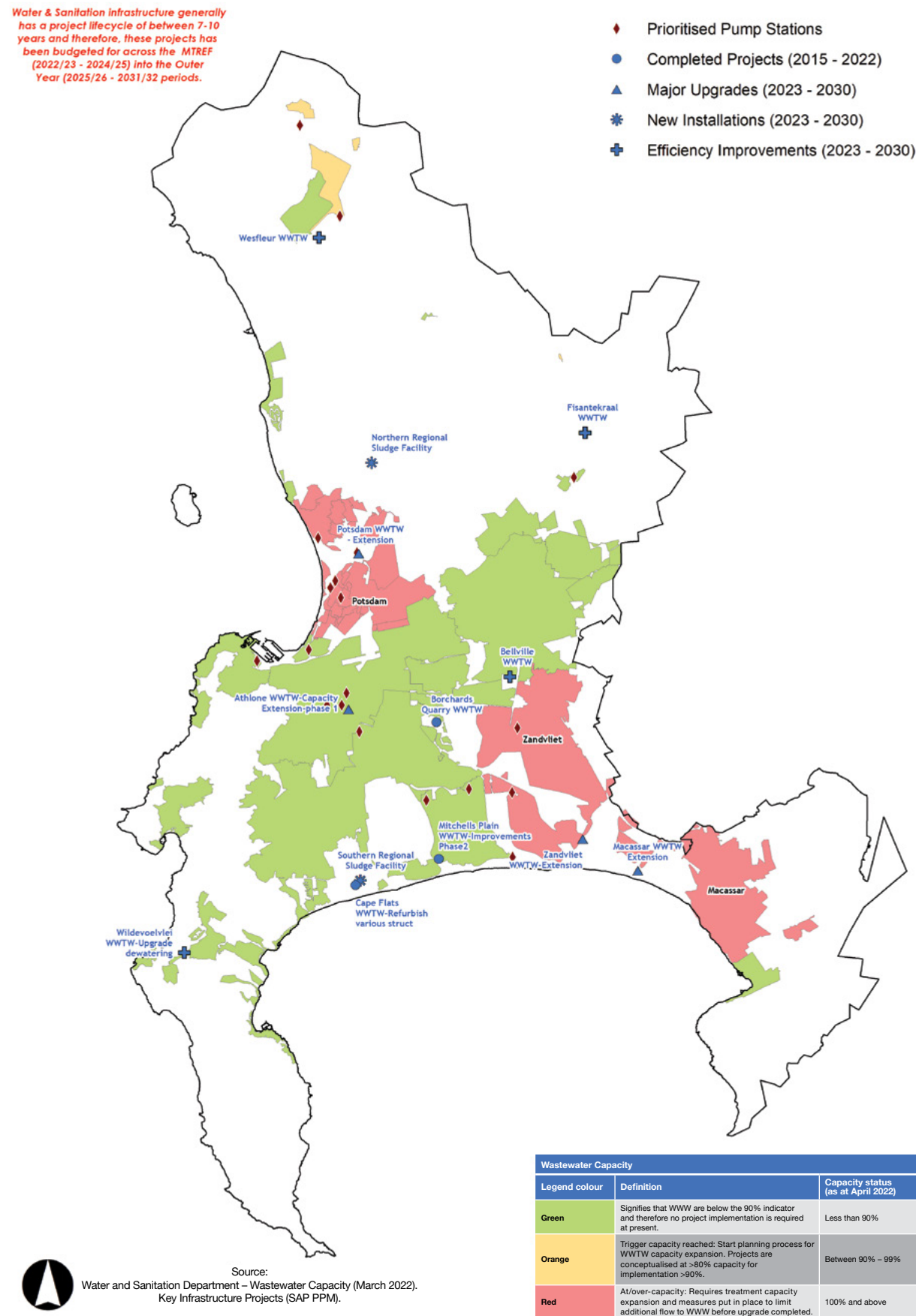
Wastewater sludge treatment: Cape Town produces two types of wastewater sludge: waste-activated sludge (approximately 150 tonnes/day) and primary sludge, which is classed as a hazardous waste (about 50 tonnes/day). Each sludge type requires a different disposal approach:

- Waste-activated sludge is disposed of to agricultural land as soil conditioner/fertiliser, as per applicable legislation.
- Hazardous primary and waste-activated sludge cake is collected, transported, and disposed of by private contractors at a hazardous landfill site.
- National legislation, effective from 2019, prohibits the disposal of liquid to landfills, with organic diversion from landfill partially prohibited by 2023 and totally prohibited by 2027.
- In anticipation of this legislation, three bio-solid beneficiation facilities (BBFs) are planned in order to treat and beneficiate the bio-solids to Class A1a (safe for distribution to all agriculture and public facilities as soil conditioner and fertiliser) to enable a much larger range of disposal options and divert primary sludge from landfill. However, to date, none of these facilities have been completed (see annexure C:6 for further details).

Wastewater sludge is the residual, semi-solid material that is produced as a byproduct during sewage treatment of industrial or municipal wastewater.



Figure 8: Wastewater capacity and capital projects (status as at April 2022)





Bulk sewer and pump stations

Cape Town has 487 sewerage pump stations and 9 615 km of sewerage network. A package of work has been developed by the City as part of the MPP, with the objective of reducing the frequency, duration and impact of sewage spills, and improving the response time to address spillages. As part of this, a conditional assessment of pump stations was undertaken by the City, which noted the following:

- In areas of high density and increasing informality, frequent blocking of sewers with foreign objects resulted in sewer spills.
- A total of 25 of the City's pump stations have insufficient capacity (see annexure C:7 for further details).
- The Rietvlei pump station, upstream of the Bellville WWTWs, requires upgrading of its rising main and

gravity system¹⁴ to accommodate developments in the Bellville WWTWs catchment. This project will take approximately three to four years to complete.

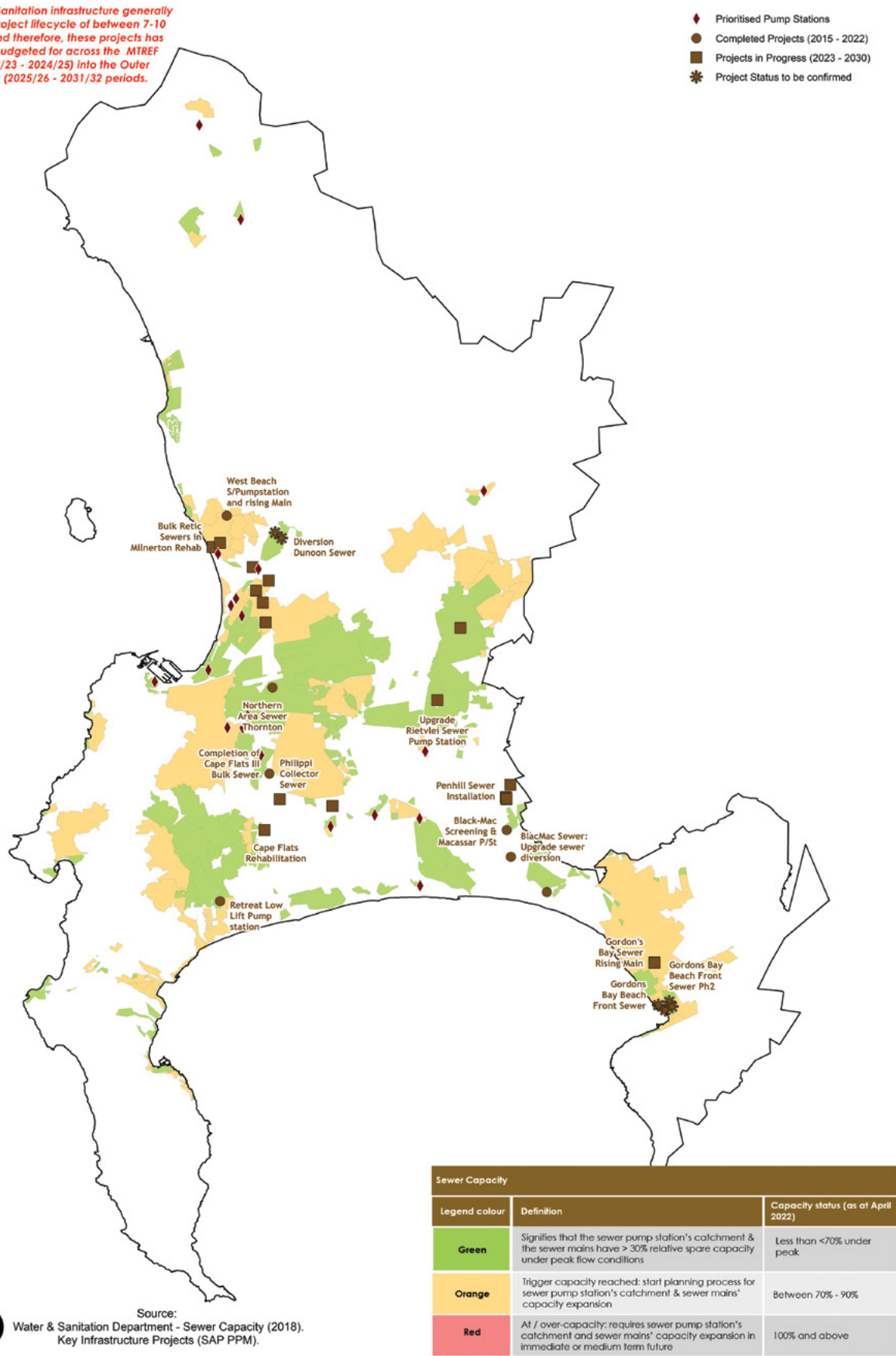
Challenges to maintenance in the sewerage reticulation network are mainly due to the following:

- The age of pump station infrastructure (e.g. replacement parts no longer available)
- Abuse of the sewer network through vandalism and the disposal of foreign objects
- Delayed maintenance
- Low rate of pipe replacement
- Lack of capacity in parts of the network
- Load-shedding

¹⁴ In certain parts of the system, water moves through pipes by means of gravity, but in other parts where pipes run vertically, water needs to be pumped via a pump station in order to move through the system.

Figure 9: Sewer capacity and capital projects (status as at April 2022)

Water & Sanitation infrastructure generally has a project lifecycle of between 7-10 years and therefore, these projects has been budgeted for across the MTREF (2022/23 - 2024/25) into the Outer Year (2025/26 - 2031/32 periods.



Catchment stormwater and river management

Catchment and stormwater management infrastructure is vital to address public safety and improve the water quality in Cape Town's waterways. Each of the City's 21 catchments requires its own stormwater master plan to effectively manage flooding, pollution and inform the Water and Sanitation Directorate's capital planning needs into the future. The following have been noted with regard to the City's stormwater master plans:

- To date, only 10 high-level master plans, covering 50% of the city, have been developed.
- The completion of the remaining master plans is dependent on available funding. A programme has been developed to allow for the procurement of stormwater master plans for each catchment by 2029.
- The lack of adequate stormwater master plans poses a risk to the City's ability to effectively manage stormwater for flood protection and water harvesting (see annexure C:8 for further details).

- The quality of the data relating to the City's stormwater infrastructure is insufficient. This presents a challenge in terms of assessing the state of this infrastructure. Only the Elsieskraal River catchment stormwater drainage system status is presented in the sector plan and it is thus the only area covered in this report.
- The catchment area's bulk minor stormwater drainage system (600 mm diameter and above) is noted as being under pressure.

Approximately 78,4% of the underground drainage system presents a high risk to water quality in the catchment as the system conveys illicit polluted discharges to the rivers. Illicit discharges include flow from informal settlements, backyarder dwellings, sewer reticulation and pump station spills that occur either directly into the stormwater system or are transported there via roads.

FUTURE OUTLOOK

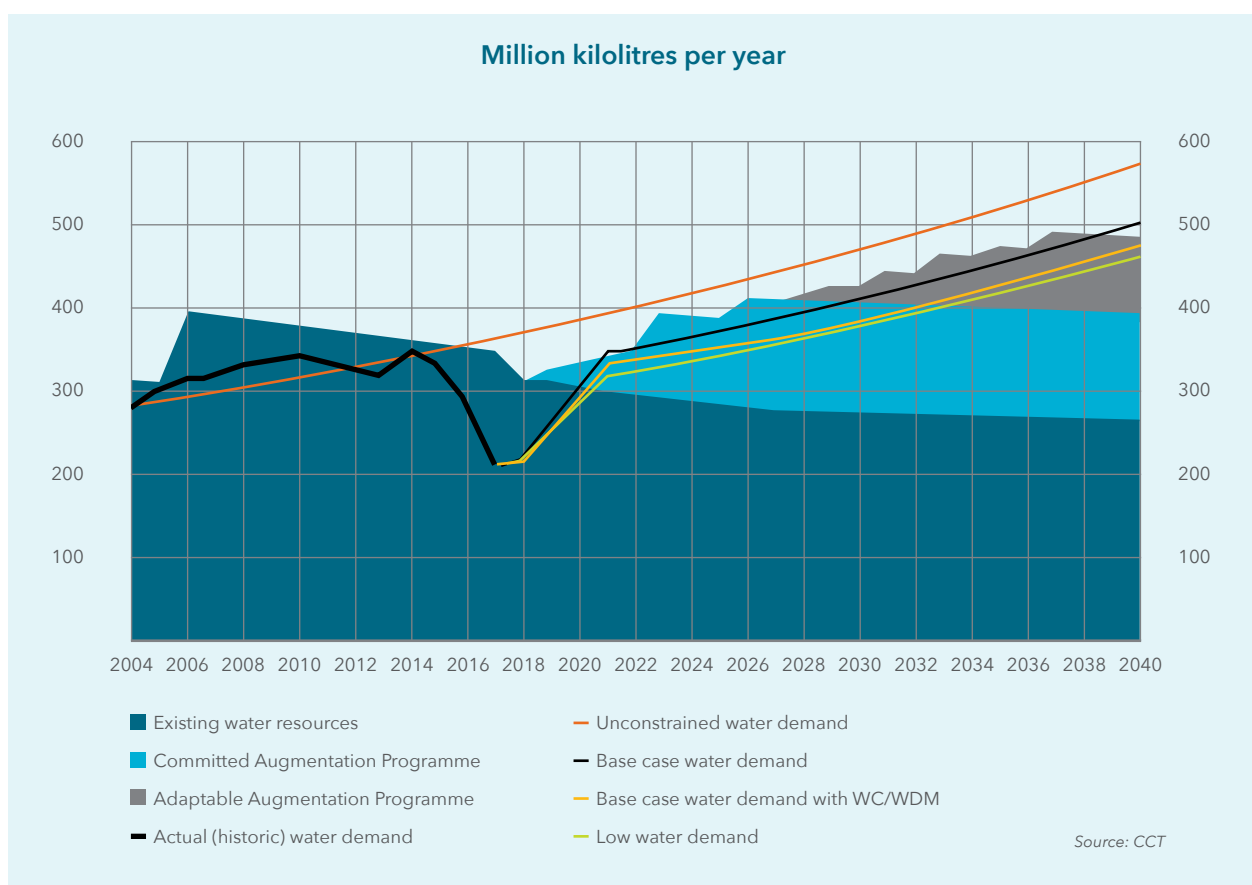
The City of Cape Town's New Water Strategy (informed by the City's New Water Plan) aims to secure 300 million litres of water per day, while saving approximately 70 million litres of water per day by 2029. This will improve reliability of supply in the city from the current 98% to 99,5%. It will also improve the resilience of the city and will mitigate the risk of severe water restrictions being imposed in the future. Important aspects of the strategy are as follows:

- Investment into alternative water sources, including groundwater, wastewater reuse and desalination, to supplement the city's existing water supply.
- The need for additional infrastructure to improve the flexibility and redundancy of the bulk water supply system.
- Capital projects included in the strategy have been revised to accommodate longer timeframes. However, these revisions still allow for the City to achieve the intended water supply by 2030 (see annexure C:9 for further details).

Figure 10 illustrates the City of Cape Town's expected water demand based on the City's Water Strategy. The Water Strategy was drafted prior to the Covid-19 pandemic and was based on the 2015 Water Master Plan. Despite the data being outdated, the directorate expects water demand to remain subdued until 2024. Thereafter, the city will experience growth in demand while at the same time having to manage a reduction in the yield of the WCWSS. This will require integrated infrastructure to allow for a higher level of supply assurance and reduce the likelihood of severe water restrictions being imposed in the future.

Alongside this, significant focus is being placed, over the next 10 years, on expanding the City's sanitation infrastructure to absorb new growth in households and businesses, and to transition Cape Town to a water-sensitive city with investments into catchments and stormwater infrastructure.

Figure 10: Scale and timing of the New Water Strategy



The Water and Sanitation Directorate plans to extend its capital spending increases up to 2026, dropping annually thereafter. The majority of planned capital projects (93%) relate to new and upgrade projects linked to the New Water Plan (alternative water sources, including groundwater, wastewater reuse and desalination, to supplement the city's existing water supply) and the bulk water augmentation scheme (BWAS).

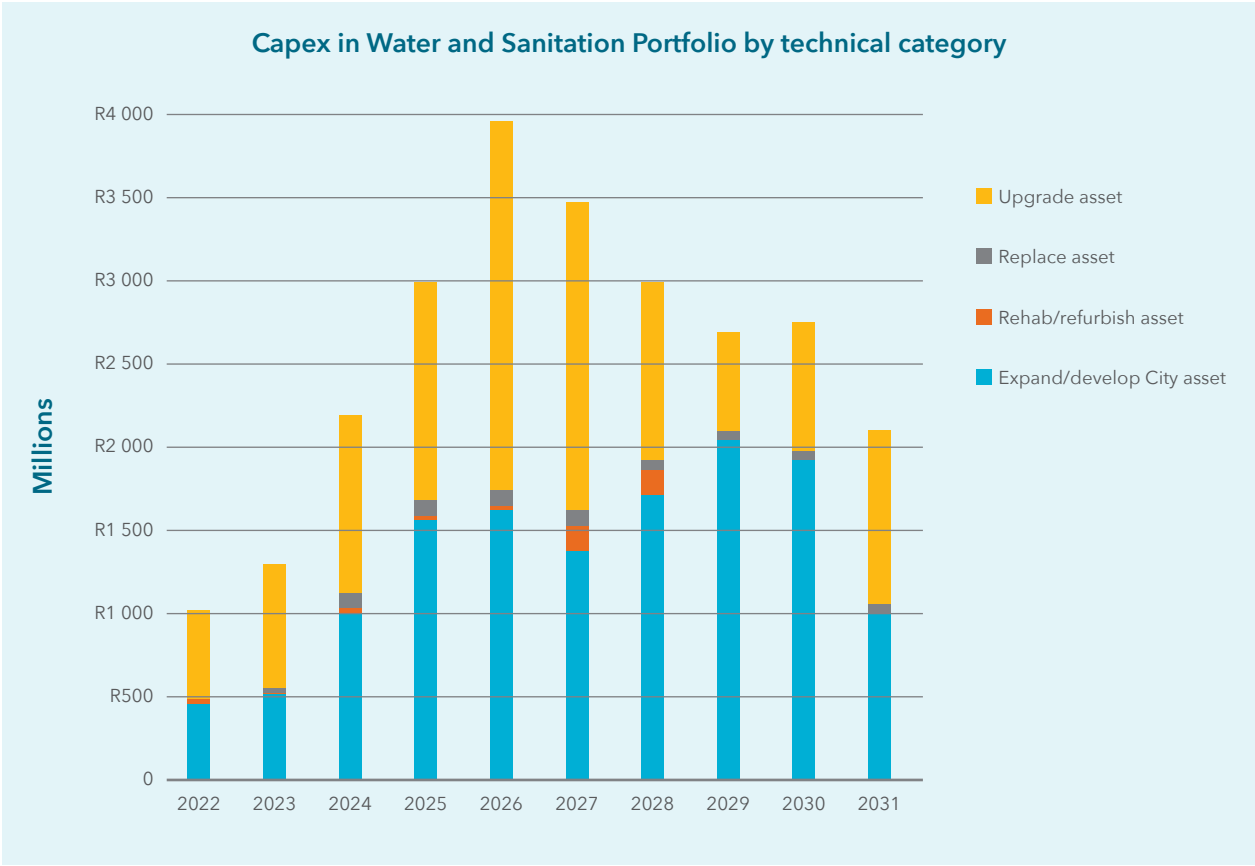
Planned investment in 'refurbishment and replacement' projects are fairly consistent over the coming 10-year period.

Almost all (99%) of the planned 'refurbishment and replacement' projects relate to bulk water infrastructure replacement as a result of the Water and Sanitation Directorate's regular pipe replacement programme (informed by the Water and Sanitation Master Plan).

Of the projects under the New Water Plan, the following are likely to come online soonest, and once online will provide 46 MlD of water, hence contributing to the resilience of the water supply system towards the 99,5% assurance of supply target. See annexure C:9 for a full list of projects.

Project name	Expected completion date	Yield MlD
Cape Flats aquifer: Hanover Park	Jun-24	4,8
Atlantis aquifer	Jun-24	16
Cape Flats aquifer: Strandfontein North and East	Dec-25	18
Cape Flats aquifer: Philippi	Jun-26	7,2

Figure 11: The Water and Sanitation Directorate's total budgeted capital expenditure for the 10-year period from 2022 to 2031 (as at 4 May 2022)



The BWAS aims to (a) meet peak growth in water demand and (b) mitigate significant risk to the security of water supply. The BWAS is a gravity scheme that can be fed from the Berg River Dam or from the Theewaterskloof Dam (see annexures C:10 and C:11 for further details). A total of 28% of new and upgrade projects in the next 10 years relate to the BWAS. This is in line with the City's plans to improve security of bulk water supply.

Bulk water reservoirs

In addition to existing constraints noted in the City's bulk water reservoirs (see annexure C:13 for further details), rapid development in areas surrounding Zevenwacht (region 2) necessitates an additional reservoir to aid future development in this area and ensure water security. There are 'new and upgrade' projects planned for the Contermanskloof and Steenbras reservoirs, which will assist in alleviating capacity constraints to the City's bulk water reservoirs.

Pump stations

The rapid pump station condition assessment (as part of the MPP) covered over 50% of the City's sewer pump stations, with the remainder currently being assessed. The assessment gave rise to the Priority Pump Station

Programme, which consists of a rolling list of 20 pump stations that will be upgraded in the future.

Wastewater treatment works

Capacity upgrade projects are currently underway to address the constraints noted in the City's WWTWs, specifically those in Athlone, Macassar, Potsdam and Zandvliet.

Planned refurbishment and replacement projects relating to the City's WWTWs are focused in the five years between 2024 and 2028. This highlights the immediate maintenance needs of the City's WWTWs in order to continue to treat water reliably into the future. However, the absence of planned refurbishment and replacement projects in the outer years (2029 to 2031) is concerning given the age of the City's WWTWs infrastructure. In addition to existing treatment capacity constraints, the forecast growth in informality along with the extension of basic services will likely increase the load on the Borchards Quarry facility. A second receiving WWTW will have to be designated to reduce the load on Borchards Quarry.

Infrastructure highlight: Faure New Water Scheme

The Faure New Water Scheme (FNWS) is currently in the final stages of detailed design. It is a direct potable reuse scheme involving the purification of advanced treated effluent from Cape Town's largest WWTWs, Zandvliet, to potable water standards. This is to augment the supply of water to Cape Town. The scheme has been designed to initially supply 70 million litres per day (MlD) of potable water, upgradable to 100 MlD. The aim is for this scheme to start delivering water to the city by 2028.

The FNWS will integrate with the existing Faure WTP, owned and operated by the City. The advanced purification plant will be located at the Faure WTP campus (referred to as zone 2 of the scheme) situated some 7 km away from the Zandvliet WWTW (referred to as zone 1), from where the source water (treated effluent) will be pumped via a rising main.



Catchment and stormwater management

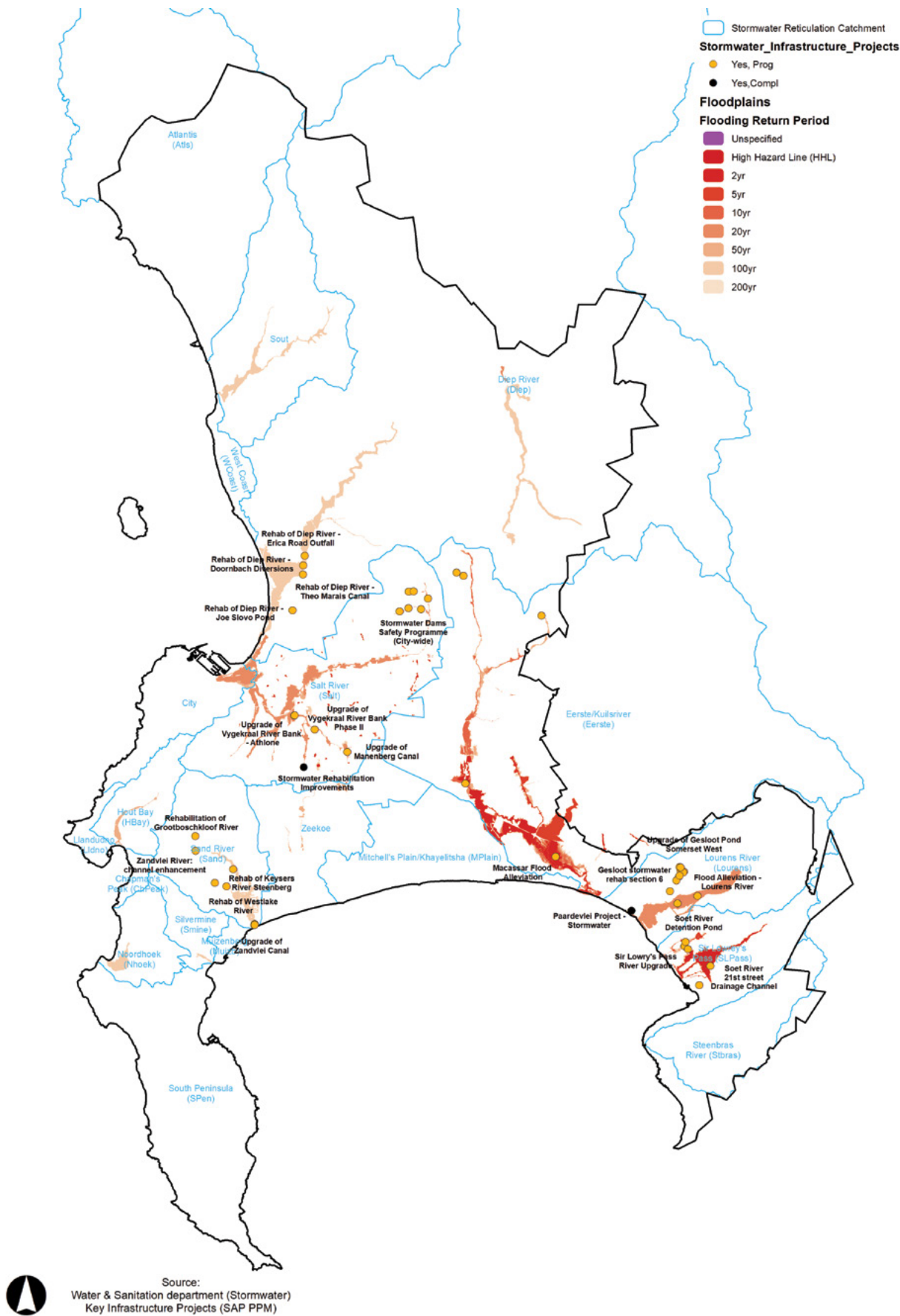
Forecast increases in the frequency and severity of major weather events put Cape Town at increased risk of flooding. This necessitates adequate stormwater master planning so that the City can develop appropriate infrastructure interventions in stormwater management. A programme has been developed to allow for the procurement of stormwater master plans for each catchment by 2029. This is subject to the availability of appropriate funds.

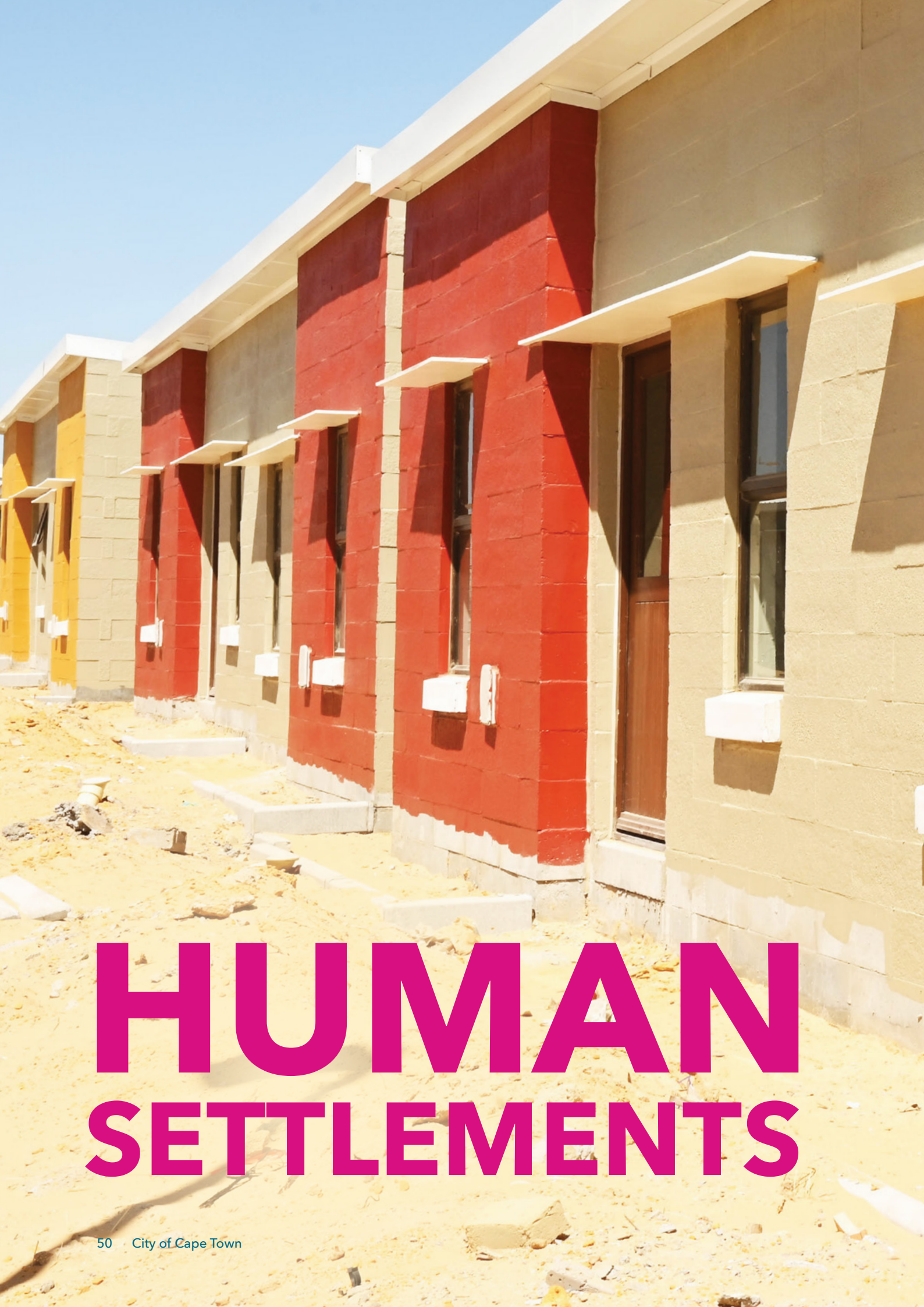
The lack of sufficient stormwater master planning makes it challenging to present an adequate future analysis of infrastructure requirements. However, there are a number of flooding management and pollution abatement projects on the 10-year horizon that will positively impact on the Diep River, Kuils River, Lourens River, Soet River, Vygiekraal River, Spaanschemat River, and Prinskasteel River.

KEY TAKEAWAYS AND RECOMMENDATIONS

- A sizable portion (38%) of the integrated portfolio relates to water and sanitation projects. Of these, 17,5% relate to the New Water Plan. The scope of the New Water Plan was conceptualised during the multi-year drought and was designed to provide an improved level of assurance of supply. While some of these projects contribute to alleviating existing capacity constraints in the City's bulk water infrastructure network, a review of the approach to implementing the New Water Plan is being undertaken, primarily to confirm that the programme is still aligned to the City's current investment priorities and risk tolerance (in light of climate change and pressure on consumers) and secondarily to assess the impact on affordability.
- Stemming from the New Water Plan, there are a number of projects planned for the next 10 years (see annexure C:9), which will diversify and augment the City's water sources and provide redundancy in the system. This should mitigate risks in the event of future droughts.
- Current projections place the earliest completion of a BBF facility at 2028 (Cape Flats phase I, 2026 and phase II, 2028). In the interim, this positions the City as being non-compliant with relevant national legislative requirements for an extended period of time, and requires additional operational expenditure on alternative BBF management during a time of increasing fiscal constraints.
- Stormwater master planning needs to be prioritised by the Water and Sanitation Directorate. The absence of master plans will lead to delayed investment in infrastructure, which impacts on the City's ability to mitigate flooding and adapt to climate change. Funding needs to be secured to accelerate the development of master plans that cover the entire city of Cape Town, so that appropriate projects can be captured in the portfolio.

Figure 12: Stormwater capacity and capital projects (status as at April 2022)





HUMAN SETTLEMENTS

The Human Settlements Directorate provides housing opportunities in the form of serviced sites and top structures, in line with the national housing programme outlined in the National Housing Code (2009). These programmes cover a range of housing typologies and the City balances its role as regulator, provider, and enabler in its efforts to support housing delivery. For the purposes of this report, human settlements infrastructure refers to public housing, hostels, formal housing, social housing and land available for development. In addition to formal housing programmes and the provision of serviced sites, the City's in-situ informal settlement upgrading programme has also been considered.

The Mayoral Land Release Programme focuses on the identification and optimisation (and/or release) of City-owned land and buildings for affordable housing (as per the District SDFs and Local SDFs). These projects will not necessarily reflect in the City's capital portfolio as these are not capital items.

The Mayor's Sanitation and Inland Water Quality Programme will have a direct impact on the future infrastructure plans of the Water and Sanitation Directorate. These projects were not captured in the infrastructure plans of the directorate at the time of writing this report, but will be included in future reports.

CURRENT STATE

The Human Settlements Sector Plan focuses on developing and enabling integrated human settlements for households that earn a monthly income of R22 000 or less. This equates to 76% of all households in Cape Town. Determining the exact shortage of housing in the city is challenging, however the following facts provide an indication of the magnitude and typology of housing requirements:

- There is a shortfall of between 22 970 and 27 980 housing units per annum at current supply rates.
- As of January 2022, 359 277 applicants had registered their need for housing on the City's Housing Needs Register.
- Based on household income trends in Cape Town, the most in-demand housing typography is social and public housing for renters and gap market housing for prospective homeowners (see annexure D:2 for further details) who earn between R3 501 and R10 000 per month. However, a clear view in terms of preference between ownership and rental is not possible
- The City's human settlements plans do not currently include a determination of the appropriate mix of owned or rented units.

The **Housing Needs Register** provides an accessible account of residents who have expressed their need for state-assisted housing (ownership and rental tenure) and it records beneficiaries of the City's various housing programmes through a single, centrally managed list.

The **City's Allocation Policy: Housing Opportunities** (2022) governs and directs the way the City selects and allocates state-subsidised housing opportunities to qualifying beneficiaries who are registered on the City's Housing Needs Register.

Public housing stock

At the time of producing this report, the City owns 50 085 public housing rental units that are divided into saleable and non-saleable units. The units are aimed at providing affordable rental housing to residents who earn R15 000 or less per month.

Hostels

There are 47 hostels in Cape Town located across six wards in Nyanga, Langa and Gugulethu, accounting for a total of 18 243 hostel beds. The existing hostel buildings, which need redevelopment, are located in established urban areas where land availability is limited.

In response to the need to upgrade the hostels, the City embarked on a Hostel Redevelopment Programme to transform the existing hostels into community residential units, i.e. rental units. To date, the City has successfully concluded one hostel redevelopment project in 2016 in Langa, named Hamilton Nkomo Square. Two additional hostel transformation projects were

planned, however due to national policy and grant funding changes, these planned projects have been put on hold. At present, it is not possible to determine a project start date.

Land reservations

Adequate and suitable land is required to deliver affordable housing. The City currently has over

12,2 million m² of reserved land parcels for the purpose of delivering affordable housing (see annexure D:3 for further details).

Land reservation refers to land owned or acquired by the City and reserved for housing development, so as not to inadvertently be sold.

FUTURE OUTLOOK

The Human Settlements Directorate estimates that, by 2028, the total demand for housing will range between 479 200 and 529 300 housing opportunities required. At present supply rates, this will result in a shortfall of between 22 970 and 27 980 housing opportunities per annum. The Human Settlements Directorate will therefore come under increasing pressure to provide housing opportunities while continuing to upgrade informal settlements in the face of growing informality. In response to the above, the Human Settlements Directorate has committed to the following programmes:

Priority investment projects

Future developments Cape Town will be focused on the urban inner core, incremental growth areas and consolidation areas, with additional projects being located along transport corridors. This is in line with the MSDF and Priority Human Settlements and Housing Development Area as gazetted by the National Human Settlements Department. Figure 13 shows the areas identified for human settlements investment within the catalytic investment area. These projects consist of a mixture of housing typologies (see annexure D:1 for further details).

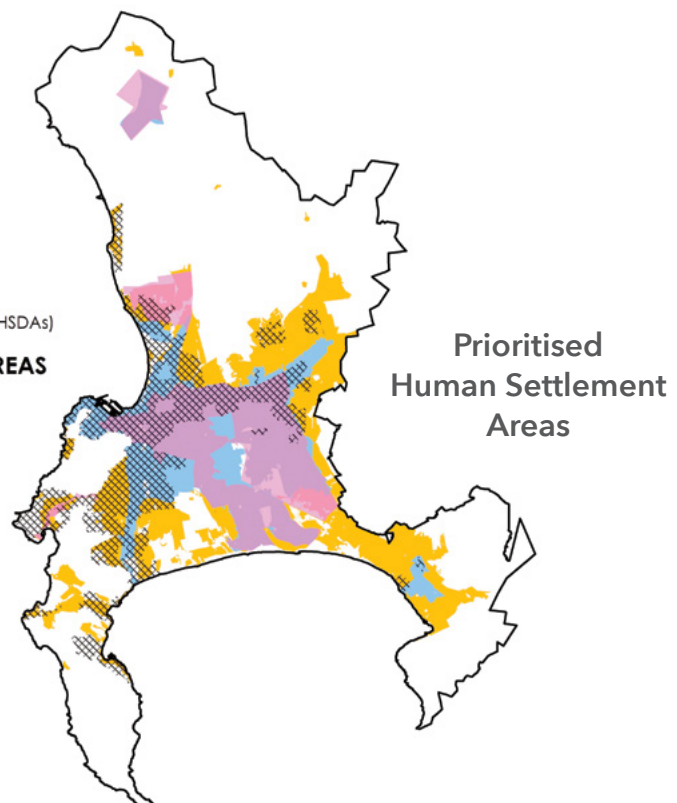
Figure 13: Prioritised Human Settlement Areas

Prioritised Human Settlement Areas

-  Social Housing Restructuring Zones (SHRZ)
-  Priority Human Settlements and Housing Development Areas (PHSDAs)

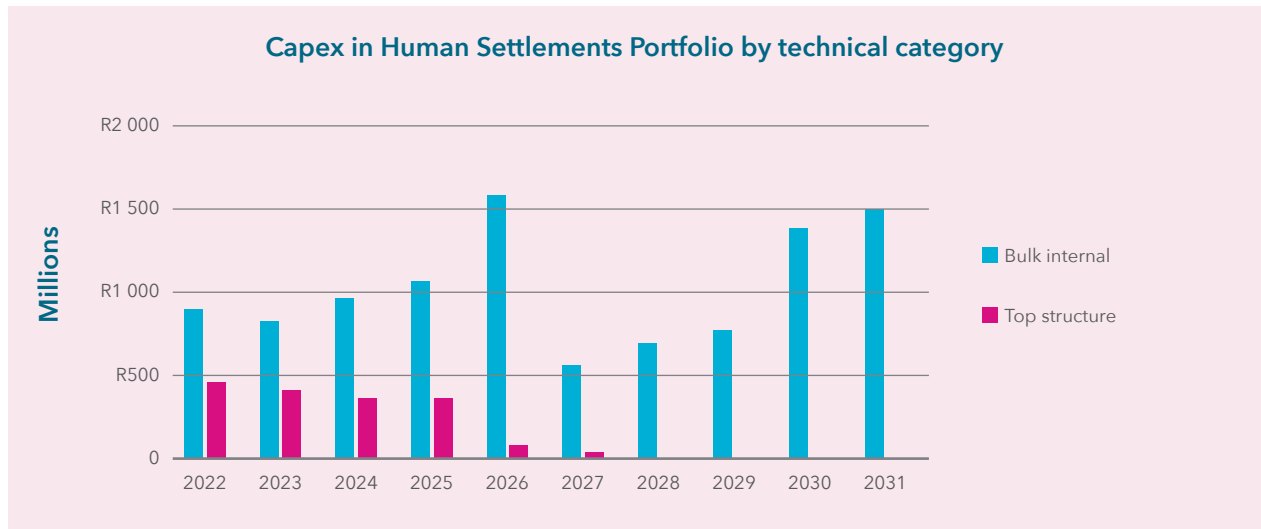
PRIORITY DEVELOPMENT/INVESTMENT FOCUSED AREAS

-  Incremental Growth and Consolidation Area
-  Urban Inner Core



The Human Settlements' planned capital spending over the next 10 years increases steadily in the first five years from 2022 to 2026 and then again from 2027 to 2031 due to the Human Settlements sector's reliance on grant funding cycles.

Figure 14: Human Settlements Directorate total capital expenditure for the 10-year period between 2022 and 2031 (as extracted from SAP PPM on 4 May 2022)



The majority (68%) of the Human Settlements Directorate's planned capital spend over the next 10 years is committed to the provision of serviced sites (i.e. including internal services such as water and electricity). This is in line with the recent national directive that grant funding Human Settlements Development Grant (HSDG) should prioritise the supply of serviced sites instead of BNG top structures. Top structures will be developed for select vulnerable groups such as the elderly and disabled, child-headed households and military veterans.

A total of 24 691 formal housing opportunities and 15 533 social housing units are currently in planning at various decision points. This equates to 40 224 housing opportunities over the 10-year period, or approximately 8% of the City's 2028 housing requirements.

Formal housing development

The current list of formal housing developments in planning by the Human Settlements Directorate is expected to yield approximately 32 243 housing opportunities over the next 10 years, representing 49% of the total planned 'new and upgrade' capital projects planned by the City for the next 10 years.

Top structure development is provided only for the first five years of the planned capital projects. This is

a reflection of the sector's reliance on grant funding to develop these structures, as well as policy uncertainty around the long-term financial sustainability of the BNG programme.

Formal housing developments fall into four categories:

- Breaking New Ground (BNG) – joint monthly income <R3 500
- The Enhanced People's Housing Process (EPHP) – joint monthly income <R3 500
- Gap housing – joint monthly income of between R3 501 and R22 000
- Social housing – joint monthly income of between R1 850 and R22 000

Public housing stock

Planned capital spend on 'refurbishment and replacement' capital projects relating to rental housing stock is consistent over the 10 years from 2022 to 2031. This is concerning, given planned additional public housing units in the human settlements pipeline. The addition of rental stock will necessitate increases in the provision of capital and operational funds for the maintenance and refurbishment of these units.

Planned capital project spend over the 10-year period is weighted in line with the number of housing units in each of the City's four services areas, with the central area making up 71% of all housing stock.

Hostels

A relatively small provision of R2,75 million has been committed to the transformation and development of the remaining 46 hostels. This is due to national policy and grant funding changes that prevent the use of HSDG money for the construction of rental housing opportunities.

Backyard dwellers (backyarders)

The prevalence of backyard dwellers will increase in line with the growing need for housing in the city. Ultimately, it is the City's desire that all backyarders should have access to water, sanitation, and electricity, with a priority focus on backyarders in City-owned rental housing. It is the City's intent to establish a policy framework for the administration of backyard structures and to put mechanisms in place for basic service access for backyarders. The City has adopted the following two backyarder programmes:

Backyarder refers to a person occupying a backyard residential unit under some type of rental agreement with the main homeowner or City tenant. The backyard unit is a structure constructed of any material, intended or used for human habitation, on the same residential property as a main dwelling, built according to approved plans (formal) or no approved plans (informal backyard), and is therefore not categorised as an informal settlement.

1. **Backyard dwelling service support project (City public rental stock):** The City will prioritise the connection of these households to basic services infrastructure, including electricity, water and sanitation connections.
2. **Backyard dwelling service support project (private properties):**¹⁵ The City proactively plans for density and the upgrades of infrastructure in these areas to prevent infrastructure failures and ensure a healthy urban environment. In addition, the City works to ensure that each property is connected to water, sanitation, and electricity, with the property owner carrying the responsibility for the further connections and infrastructure required on the property to provide services to additional dwellings.

¹⁵ This is an IDP project for which Water and Sanitation, Energy and Urban Waste Management are listed as the responsible directorates.



Informal settlements

Population growth, in-migration and poor socioeconomic conditions are expected to contribute to the growth in informal settlements in Cape Town. This requires that the City works with informality using a dual approach:

Firstly, where settlements have no services (generally as a result of unlawful land occupation), emergency relief services are provided where possible.

Secondly, where settlements have some basic services, full basic service upgrading can be provided, with a ratio of one water point for every 25 households and one toilet for every five households. Extension of basic services to informal settlements is undertaken using a 'superblock' or 'serviced site' approach. Planned informal settlement upgrades make up 38% of the total planned 'new and upgrade' capital projects planned by the Human Settlements Directorate over the next 10 years. This focus on informal settlements is aligned to the City's strategy to accommodate growing informality in Cape Town.

The Human Settlements Directorate has committed to a total of 38 capital projects in informal settlements over the next 10 years, which will impact approximately 39 689 households. Of these, 17 relate to serviced sites, 12 to superblocking and nine to enhancing services.

A **superblock** comprises a residential block of approximately 90 m x 30 m with the provision of shared water (1:25 ratio), sanitation (1:5 ratio), door-to-door waste collection and individual electrification. All roads, stormwater and pedestrian accessways are developed to an A-grade standard.

A **serviced site** refers to a plot or site demarcated in a general plan, with individual municipal services such as water and sanitation.

In-situ upgrading provides every household in the settlement with its own individual serviced site (no or limited relocation required).

Re-blocking and enhanced re-blocking unfold as above, but through collaboration between NGOs and community, top structures are improved from basic informal structures (no or limited relocation required).

Superblocks provide formal access roads with formal services infrastructure, but no individual serviced sites and only shared services (no or minimal relocation initially required).

The Managed Settlement Programme is a greenfield site prepared for rapid occupation with shared services initially, but with the potential to upgrade to individual serviced sites over time. The owner constructs the top structure.



KEY TAKEAWAYS AND RECOMMENDATIONS

- At current supply levels, housing supply does not meet housing demand in Cape Town.
- Currently, there is no sufficiently systematic and programmatic approach to meeting housing demand across multiple housing typologies. That said, the Human Settlements Strategy does set out human settlements challenges and potential responses, with action required from multiple directorates and external stakeholders. However, the current sector plan does not provide an appropriate gap analysis between current housing opportunity development rates and required housing opportunity development rates. It also does not quantify the funding requirements, over the short, medium and long term, to bring housing opportunity production up to acceptable levels to address current backlogs and meet future demand in the income categories that the City currently serves. This is being addressed in a sector plan update that is currently underway.
- Inadequacies in programme planning have significant downstream consequences for the other sectors as well. A clear pipeline of planned human settlements projects would provide certainty to the bulk infrastructure sectors on where large increases in demand are likely to take place. Without this

information, the City creates a chicken-and-egg situation whereby potentially viable sites for human settlements development cannot be utilised because of a lack of bulk infrastructure capacity.

- Despite a clear demand for housing, there is a significant drop-off in human settlements projects (top structures) in the outer years of the portfolio. While this is due to the uncertainty surrounding grant funding, the City leadership has directed that the full pipeline of what is needed be captured in internal project management systems, so as not to impede long-term project planning across the City's directorates. This will ensure that planning leads the budget process rather than the other way around. The City is thus actively working through the sector plan update to ensure a healthy pipeline of execution-ready human settlements projects across the 10-year portfolio, using a broad range of typologies as set out in the Human Settlements Strategy.

It should be noted that public funding will only be able to account for a small portion of housing provision in the future. As such, the City's investment focus has shifted to unlocking the potential for quality private housing supply in less formal areas.





URBAN MOBILITY



The aim of transport infrastructure is to provide affordable and efficient public transport-, roads-, and transport-related infrastructure that ensures the city's residents can access economic and social opportunities in an affordable manner. This objective is further supported by transport-related operations, regulations, management and enforcement, as well as direct public transport services provided through MyCiTi.

Given the failure of rail as a public transport mechanism over the last decade, the majority of Cape Town's daily commuters now use private transport (58%), followed by minibus-taxis (22%), formal bus services (9%), and non-motorised transport (9%). Rail currently serves only 2% of commuters.

CURRENT STATE

Transport flexibility is the key metric used to assess the adequacy of Cape Town's transport infrastructure. This is a measure of how many members of the Cape Town population have access to at least three relatively frequent public transport modes (e.g. minibus-taxis, Golden Arrow and MyCiTi buses) within a radius of 500 m.

At present, only 11% of the city's population has full transport flexibility. The City is committed to addressing this lack of transport flexibility, particularly in the areas of greatest need. An example of this commitment is the roll-out of the MyCiTi corridor in the metro south-east, which will link Khayelitsha and Mitchells Plain to Claremont and Wynberg.

Public transport

The City's public transport infrastructure is informed by the Integrated Public Transport Network (IPTN) plan. The plan comprises trunk services (i.e. rail and the bus rapid transit (BRT) service), supported by feeder services, and non-motorised transport (NMT) infrastructure. It is an integral component to the MSDF as it represents the spatial backbone around which the future Cape Town can be restructured. The trunk routes of the IPTN service link nodes within the city's urban inner core and enhance mobility and efficiency of movement for residents and visitors.

The MyCiTi BRT system is designed to complement the existing rail system. Phase 1 of the MyCiTi BRT system has been completed and the N2 Express has been revived. Work is currently under way to construct MyCiTi causeways, and upgrade the public transport interchanges (PTIs) along the new BRT corridor. Other PTIs are also being upgraded, or are earmarked for upgrading. As the key informant to the City's Public Transport Plan, the IPTN is currently being revised and

updated, with a focus on the importance of planning in uncertainty and making resilient choices.

While the BRT system is designed to complement the existing rail system, the absence of a functional and reliable passenger rail system requires the City to respond with increased road-based options (such as the N2 Express), which in turn requires significant subsidisation and directly impacts operational expenditure. For this reason, the City is investigating the devolution of aspects of the passenger rail system in Cape Town.

Roads

As the reliability and safety of rail transport has diminished, road-based public transport has become increasingly important. This places growing stress on Cape Town's road network. In response, the Urban Mobility Directorate has several programmes in place relating to road bulk infrastructure, including: the Congestion Relief Programme; the maintenance of roads under the City's jurisdiction; and various programmes relating to operations, NMT, safety and transport systems management.

The Congestion Relief Programme includes 14 projects, six of which relate to new infrastructure builds, while the remaining eight are expansions of existing infrastructure. These programmes are intended to relieve congestion on the city's main road networks. As of the 2021/22 financial year, two projects had begun construction (see annexure E:1 for further details). The Roads Maintenance Programme focuses on the overall maintenance and rehabilitation of the city's road network. The projects include rehabilitation, resurfacing, resealing, patching and minor base repairs. They are funded from the operating budget (see annexure E:1 for further details).

FUTURE OUTLOOK

The City is currently finalising its Comprehensive Integrated Transport Plan (CITP) 2023–2028, which sets out the ways in which the safety, convenience, reliability and quality of public transport services can be improved, for the greatest number of residents, as quickly as possible. The plan outlines an incremental approach to drive rapid, smaller-scale improvements across multiple transport modes, ensuring a range of interventions to improve the network for road-based public transport services such as MBT and GABS. It also proposes increased investment in NMT (recognising the percentage of commuters for who

NMT forms part of their journey) as well as a viable and implementable plan of action for the revival of Cape Town's rail system. The Urban Mobility Directorate's planned capital projects increase steadily to 2026 and drop off considerably after 2027 as a result of the metro south-east corridor spend, which is largely reliant on government grant funding. Planned capital spending from 2027 onwards relates largely to the Congestion Relief Programme, but further BRT interventions will be added once the IPTN is finalised. The continued attention to road maintenance is considered a responsible approach to road asset management.

Figure 15: Urban Mobility integrated portfolio expenditure over the 10-year period from 2022 to 2031

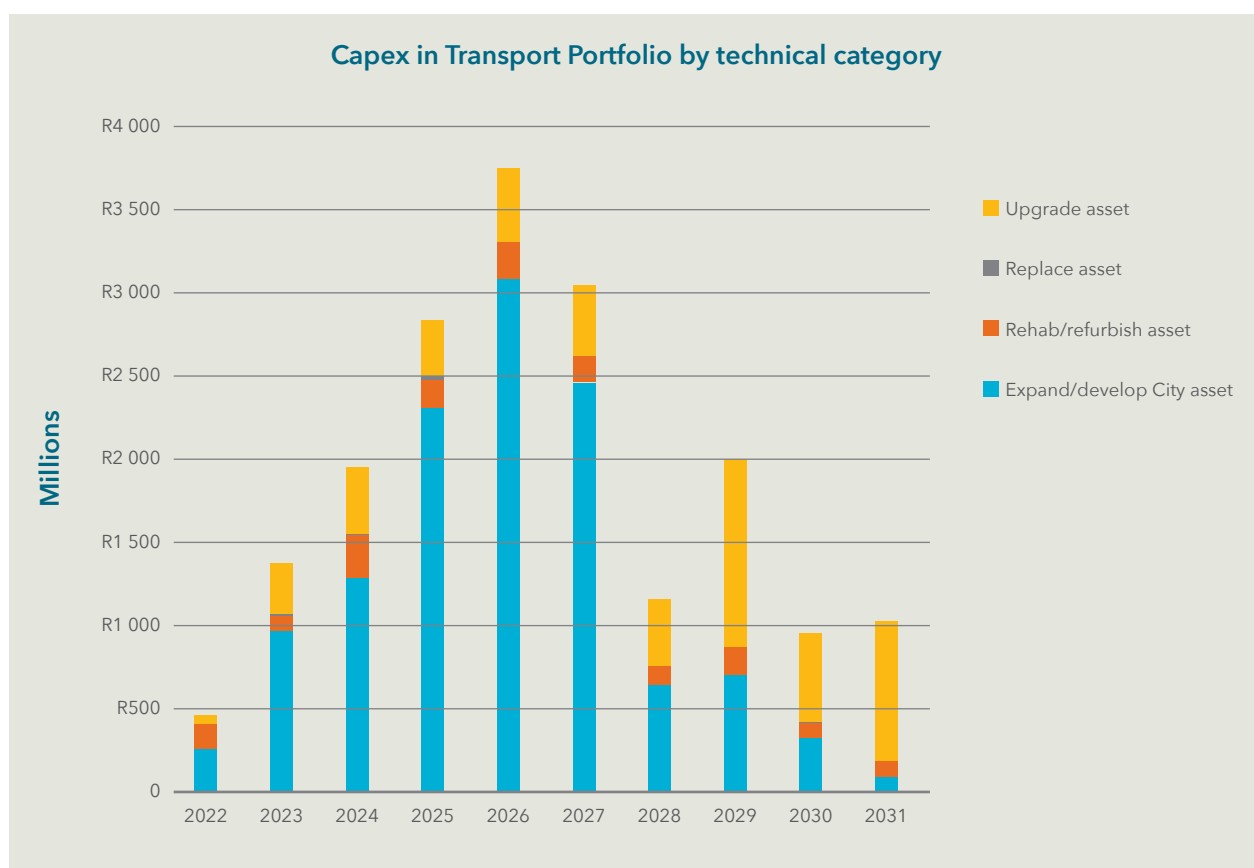
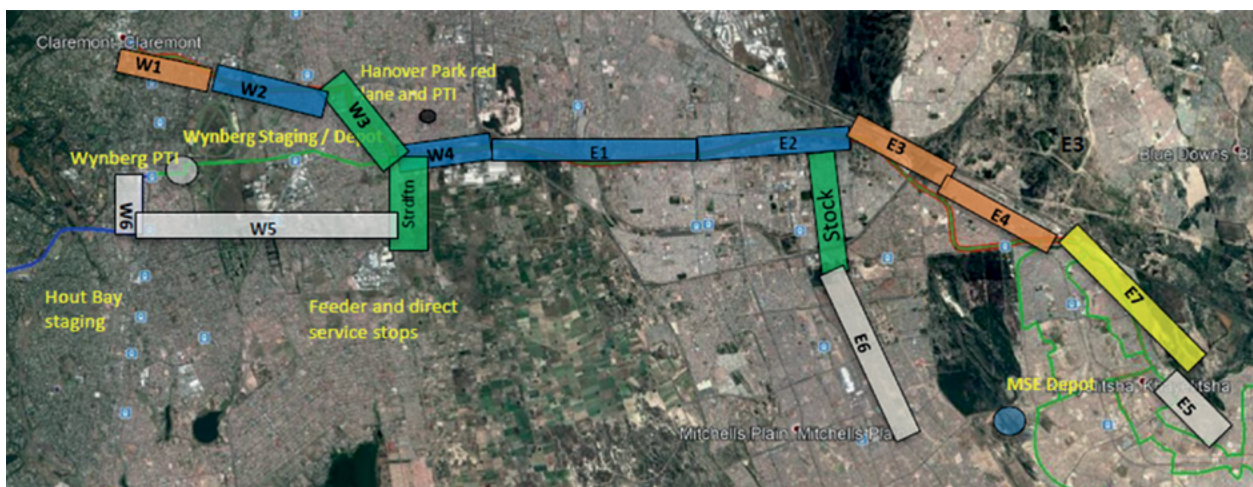


Figure 16: Phase 2A of the MyCiTi BRT



Public transport

The metro south-east corridor of the MyCiTi BRT is currently under construction and will be rolled out across 10 trunk routes. Once fully rolled out, it will serve more than 1,4 million commuters. This will provide the missing east-central trunk link across the southern part of the urban inner core and help the City deliver on its commitment to continuously improve transport options for all residents.

The provision of NMT infrastructure, which is complementary to the BRT service, is integral to this plan and is envisaged to support the commuter and promote the associated economic benefits created by the associated foot traffic.

A lack of planned 'rehabilitation and refurbishment' capital projects relating to public transport interchange has been noted beyond 2025. This is concerning given the intended expansion of the MyCiTi BRT. As earlier phases of the BRT network age, and an extension of the network results in increased use of key nodes, the need for refurbishment will increase.

Planned spending on 'new and upgrade' capital projects is concentrated between 2022 and 2027, driven largely by the metro south-east corridor of the BRT. The review of the IPTN will direct where further corridors should be implemented based on several scenarios. It will also identify where incremental improvements should be made so that several public transport corridors can

be implemented simultaneously. Together they will enable the realisation of the City's spatial strategy in the long term.

Road

The portfolio of road construction and upgrade projects will continue to provide relief from congestion, support major land development projects, and facilitate NMT.

Planned capital spending on 'rehabilitation and refurbishment' projects is concentrated in the period from 2024 to 2028. Most of these projects relate to road rehabilitation (49%) and metro road reconstruction (39%), which is in line with the Urban Mobility Directorate's strategic objectives. Planned road rehabilitation projects are spread throughout the 10-year period, in line with the need to consistently address the road rehabilitation backlog. The planned metro road reconstruction projects are aimed at addressing the R450 million in backlogs noted in the Transport Sector Plan. The top five projects in terms of planned spending on rehabilitation are Broadlands Drive, Jakes Gerwel Drive, and roads in Simon's Town, Delft and Swartklip.

There are a number of planned 'new and upgrade' capital projects over the next 10 years, which adequately account for the planned road expenditure programmes in the Transport Sector Plan.

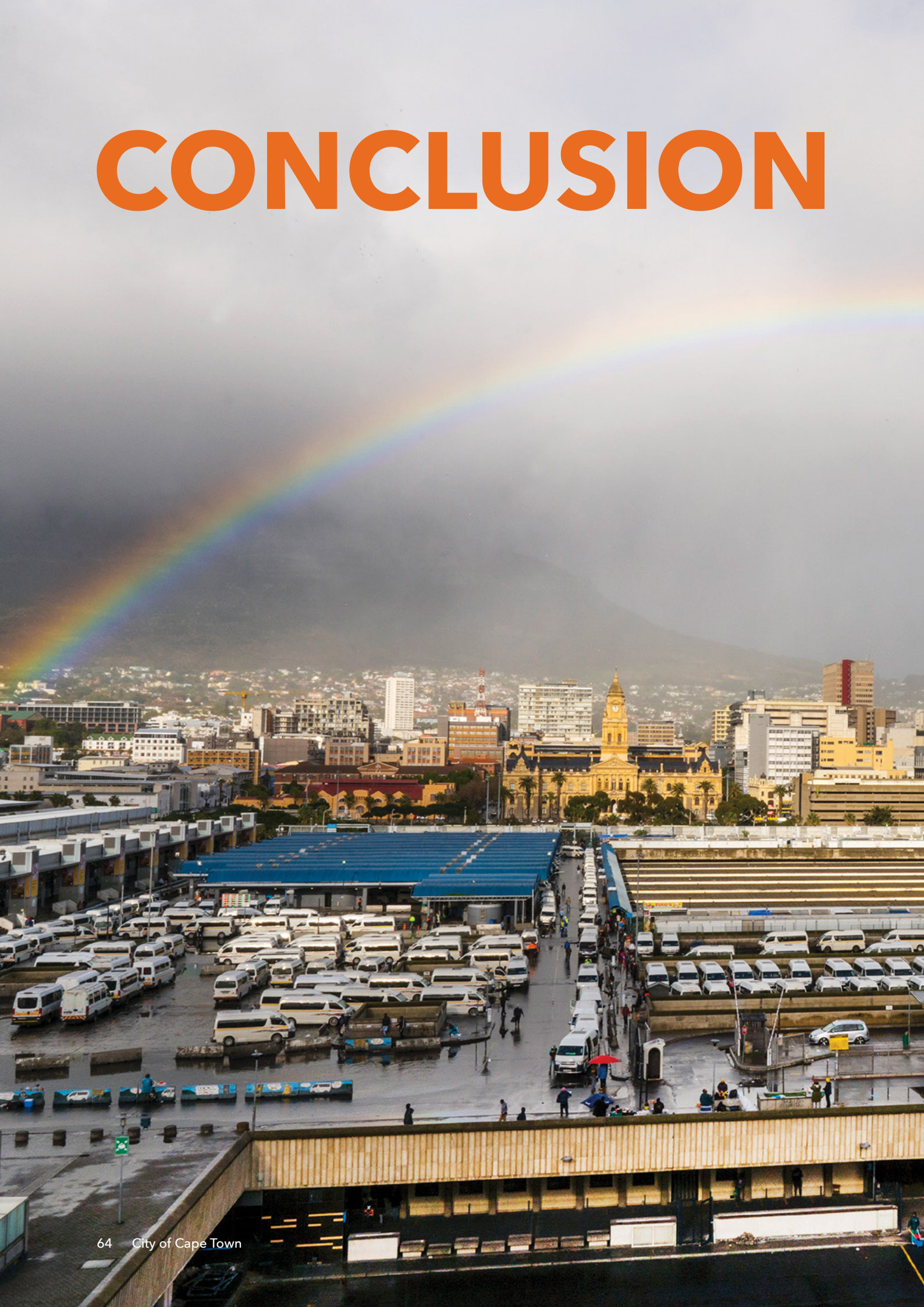
KEY TAKEAWAYS AND RECOMMENDATIONS

- The absence of public transport projects in the outer years of the portfolio is a concern and is being addressed. Additional public transport projects will be included in updates to the sector plan, as informed by the IPTN, to ensure the City continues to increase access well into the future.
- The updates to the sector plan will take into account the needs of a city with a growing population, rather than being driven by available grant funding. These plans will also consider the most cost-effective public transport solutions to improve travel time and safety for the greatest number of residents, where BRT may not be sustainable, to complement passenger rail.
- The revisions of the CITP and IPTN, which are currently under way, take a scenario-based approach (one being the future of the rail service, which is a fundamental informant). However, this does not provide a prioritisation framework and, as such, translating these scenarios into capital plans for the sector will be very difficult. The development of a prioritisation framework linked to the sector plan will be critical for informing choices within the capital portfolio.
- The draft CITP aims to incrementally improve public transport infrastructure and operations to enhance the safety, convenience, reliability and quality of public transport services for the greatest number of commuters, as quickly as possible. This will include the upgrading or reconfiguring of roads to give priority to road-based public transport.





CONCLUSION





The 2022 Infrastructure Report is the first consolidated attempt to evaluate the City's infrastructure delivery plans across sectors for the next 10 years, taking into account the current status and future outlook. This first report was limited to evaluation of the City's bulk infrastructure across the Energy, Urban Waste Management, Water and Sanitation, Human Settlements and Urban Mobility directorates only. It lays the foundation for future, deeper analysis across the City's full infrastructure portfolio, including additional infrastructure typologies such as community facilities, reticulation and distribution infrastructure, environmental infrastructure, etc.

Future iterations of this report may also include other aspects, such as reviews of infrastructure requirements related to precincts or areas (location-based analysis) or on specific typologies of infrastructure (thematic-based analysis).

A key takeaway from the analysis of the portfolio is the importance of long-term or master planning and its role in informing efficient and effective long-term infrastructure planning. Adequate master planning should be prioritised across the City and should form the basis from which the integrated portfolio is developed in each of the City's directorates.

This report also highlights the importance of prioritising project preparation resources for projects that have been identified as critical to meet future demand. The key risks identified across the five assessed directorates are as follows:

Long-term capital pipeline deficiencies

An absence of planned capital projects in the outer years of the next 10-year horizon was noted in the Human Settlements and Urban Mobility directorates' plans. This is the result of the reliance of these sectors on grant funding to finance projects, and is being addressed.

In terms of the Human Settlements Directorate:

- Capital expenditure on projects relating to top structures reduces by $\pm 75\%$ after 2025, and continues reducing annually thereafter. This is reflective of the reliance of the City on grant and donation funding to finance the development of top structures.

- Spend on top structures will need to be replaced by spending on other typologies, with the City playing a different role, in order to meet housing demand over the next decade.

In terms of the Urban Mobility Directorate:

- There is a notable drop in planned capital expenditure after 2026 owing to the completion of the metro south-east corridor of the MyCiTi BRT.
 - › This corresponds with a drop in grant and donation funding over the same period and will be addressed once the revised IPTN identifies the next priority corridors.
 - › The absence of projects in the outer years needs to be addressed through the development of a pipeline of capital projects.
- Public transport is a critical informant of the City's MSDP, where transport-oriented development is the basis for land-use intensification, as well as in the IDP, where public transport is recognised as a key economic enabler. The updated Transport Sector Plan will inform an infrastructure investment pipeline in the face of significant unknowns relating to rail, grant funding and conventional bus services.

The Philippi MTS

- The Eskom-owned Philippi MTS, which is critical to the security of supply to the City's entire southern peninsula, is currently at 116% of firm capacity.
- The new Erica main transmission substation and the Philippi substation extension project are intended to address this over-firm capacity at the Philippi MTS. These projects are due to be completed in 2028 and 2026 respectively.
- The timely execution of these Eskom-led projects is critical to ensuring the security of supply to the area. The City continues to engage Eskom in this regard.

Solid waste rail access

- The location of the City's regional transfer stations on the urban edge, and the design of these facilities, are aligned with the intention to utilise rail for the transport of waste.
- At present all of the city's solid waste is transported via road as rail access is currently unavailable.

- This reliance on transport by trucks not only prevents regional transfer stations from meeting operational targets, but is costly and contributes to congestion and raising Cape Town's carbon footprint.
- The City will continue to engage with Transnet to facilitate access to rail for the transport of solid waste to and from regional transfer stations.

Regional landfill

- Current estimates are that the Coastal Park landfill will reach airspace capacity by 2024. While alternative disposal sites are available, making use of these would incur additional costs, thereby increasing the City's operational expenditure.
- A regional landfill is therefore needed to manage current and future waste demands.
- The development of the regional landfill is dependent on EIA approval. Optimistic estimates put this approval process at 18 months from the date of submission, which was April 2022.
- Procuring a regional landfill site and accelerating the EIA approval process are both critical to securing sufficient landfill airspace for the city.

The BWAS

- The BWAS must continue to be prioritised.
- In the event that the Riviersterend tunnel system fails, or is out of operation for an extended period of time, there is a risk that the city could lose approximately 40% to 50% of its water treatment capacity as well as its ability to access approximately 45% of its usable allocation of surface water resources.
- The BWAS is intended to mitigate the risk associated with the Riviersterend tunnel system in addition to helping to meet the city's future water demand.
- Capital projects under the scheme relate to the Muldersvlei and Spes Bona reservoirs and associated tunnel systems.
- These projects are critical to mitigating associated risks and ensuring security of bulk water supply to the city.

Stormwater master plans

- Stormwater master planning is seen as a priority in the Water and Sanitation Directorate.

- However, the completion of outstanding master plans is dependent on costs and available budgets. Unless additional budget can be secured, current estimates are that all the City's master plans will only be completed by 2029.
- Additional budget should therefore be made available (or external funding secured) to accelerate the development of stormwater master plans.

Declining passenger rail services

- Reliable passenger rail is considered the backbone of Cape Town's public transport system, as indicated in the City's IPTN and MSDF. The decline of passenger rail services in Cape Town places the city's movement network at risk of inefficiencies and increasing congestion, as passengers move to alternative road-based forms of transport. While the City takes steps towards rail devolution in some form, there is a need to build out a complementary infrastructure pipeline.

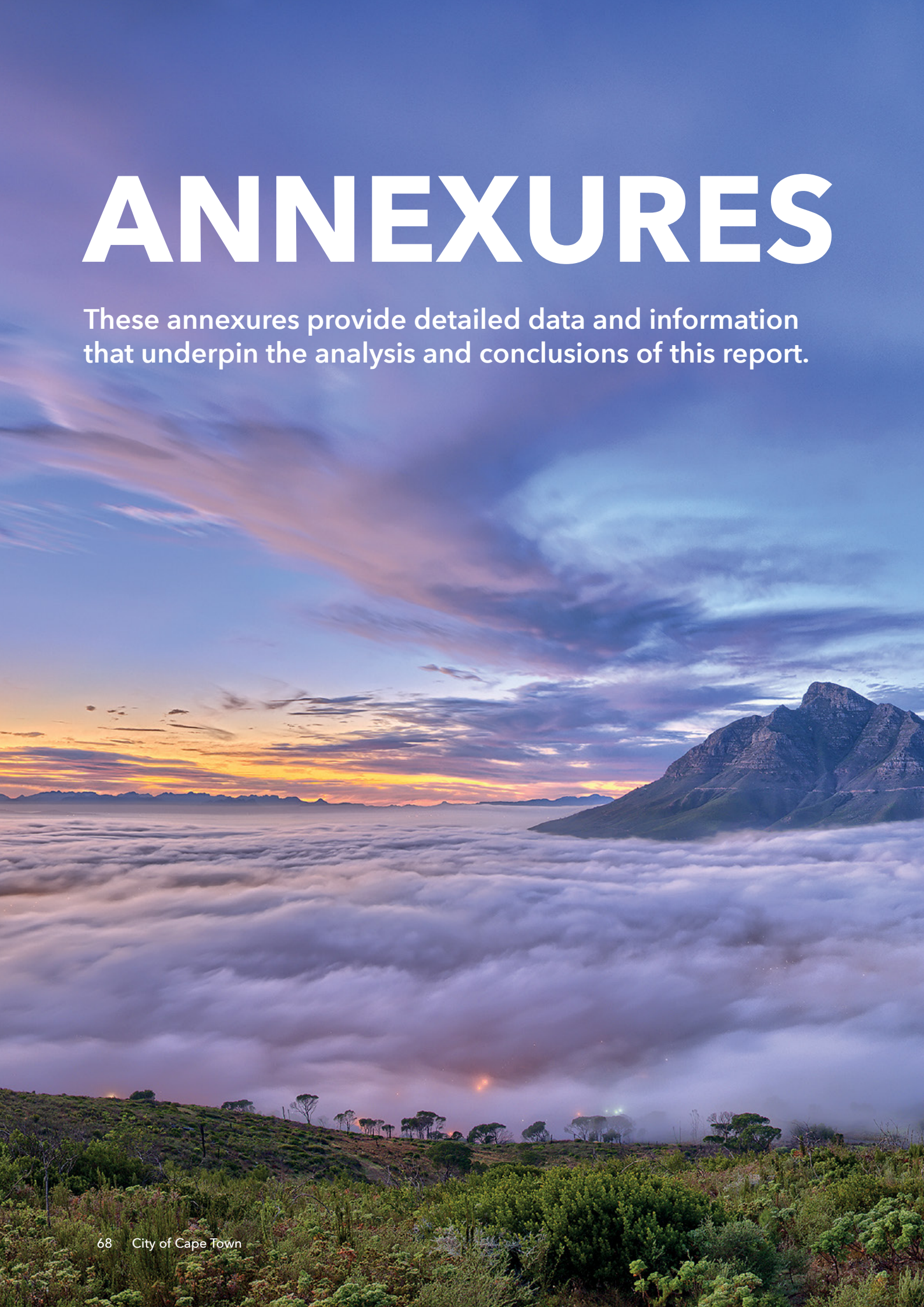
The City's ability to assess the current and future operational expenditure requirements linked to infrastructure operating and maintenance is less mature than its ability to analyse current and future capital requirements. In the face of fiscal constraints, operating expenditure requirements should be a key informant in the City's infrastructure investment decisions. This should be a key focus in future planning and reporting documents in order to provide a more comprehensive view of the City's development, operation and management of infrastructure.

Understanding project dependencies within individual sectors, and between sectors, is critical to infrastructure planning. Existing 'stage gate' processes in the City identify critical dependencies within sector portfolios to ensure successful project progression and development.

Sector plans are a critical source of information and key reporting informants. The existing sector plans have been developed to varying levels of maturity, and efforts to improve these existing sector plans should be prioritised in order to ensure consistent planning quality.

ANNEXURES

These annexures provide detailed data and information that underpin the analysis and conclusions of this report.





ANNEXURE A: ENERGY

Annexure A:1 State of main substation over firm capacity (City- and Eskom-owned)

City-owned:

Infrastructure name	Infrastructure type	Owner	% of firm capacity 2021	Indicator
Mfuleni and Garden Cities	Main substation	CCT	104	Over-firm

Eskom-owned:

Infrastructure name	Infrastructure type	Owner	% of firm capacity 2021	Indicator
Scottsdene	Main substation	Eskom	172	Over-firm
Spine			146	
Blackheath			140	
Khayelitsha and Firgrove			116	
Mpilo and Esethu			114	
Visserhok			112	
Delft			106	
Airport			102	

Annexure A:2 State of City-owned generation units

Infrastructure name	Infrastructure type	Status
Steenbras hydro pump storage (SHPS)	Generation facility	The power station is currently 43 years old and many parts of the plant have either exceeded, or are approaching, end of useful life. This is affecting the output and reliability of the station. The operability of the plant is also negatively affected due to some inherent design limitations, which will also be addressed by the planned refurbishment project.
Roggebaai gas turbine (RGT)	Generation facility	The RGT has been in operation since 1981. The corroded exhaust stacks and thermal acoustic insulation materials need to be replaced.
Athlone gas turbine (AGT)	Generation facility	The AGT is approaching 50 years of age. While it has been utilised very sparingly over its operational lifespan, assuming a typical 30- to 40-year design life expectancy, this unit has reached 112% to 150% of its expected lifecycle. The viability of AGT was reviewed in 2020 and the identified risk factors were addressed by the projects listed in annexure A:8.

Annexure A:3 City of Cape Town areas supplied by electrical infrastructure expected to be over-firm capacity by 2030

Area	Triggers ¹⁶	Description
Big Bay	Development	Big Bay main substation
Melkbos/West Coast intake	Development	Melkbos new main substation
Morgen Gronde main substation	Development	Haasendal main substation

Annexure A:4 City of Cape Town power transformers that will reach theoretical end-of-life in the next 10 years

Infrastructure (number of transformers)	Transformer age in years	Initiative description
Bellville South (3)	63, 58, 50	Bellville South main substation upgrade
Doordekraal (2)	45	Oakdale 132 kV upgrade
Eversdal (1)	45	Eversdal substation upgrade - phase 2
Gardenia (2)	45	Gardenia transformer upgrade
John Dreyer (1)	45	John Dreyer transformer upgrade
Eisleben Drive (2)	45	Eisleben Drive main substation transformer upgrade
Midlands (1)	45	Load is normally less than 1 MVA. Operational life is expected to exceed 50 years
Spine Road (2)	42	The transformer will be reaching its end of life by 2040. Transformer replacements will occur in the year when the transformer has reached its end of life, subject to a thorough condition assessment
Jan Smuts (1)	41	The second Jan Smuts transformer only reaches theoretical end of life in 2037. The plan is to replace both transformers in 2035
Sampson (2)	41	The transformer will be reaching its end of life by 2040. Transformer replacements will occur in the year when the transformer has reached its end of life, subject to a thorough condition assessment
Eastridge (2)	40	Eastridge main substation upgrade

¹⁶ Triggers according to the medium growth scenario (as per Energy's detailed demand forecasting model) that will cause main substation supply areas (as mentioned in the Description column) to become over-firm.

Annexure A:5 Energy Directorate's response to maintenance requirements of the City's generation units

Generation facility	Initiative description	Project preparation status
Athlone gas turbine	Refurbishment of the main plant	Scoping
	Fire suppression	Execution
Steenbras hydro pump storage	Transformer replacement	Detailed design
Steenbras hydro pump storage	Concrete ASR remediation	Scoping
Steenbras hydro pump storage	Refurbishment of main plant	Feasibility
Steenbras hydro pump storage	SPS crane refurbishment	Detailed design
Roggebaai gas turbine	Exhaust stacks replacement	Detailed design

Annexure A:6 Planned City-led utility-scale generation projects

Infrastructure name	Infrastructure type	Potential capacity	Planned construction
Atlantis	PV	7 MW	2023
Somerset West (Paardevelei)	PV	20-60MW	2024

Annexure A:7 Energy Directorate's list of refurbishment and replacement capital projects by initiative¹⁷ for the period 2022 to 2031

Initiative description	Initiative description
System equipment replacement	Steenbras generation
Electricity generation	HV - switch/stat battery replacement
MV switchgear refurbishment	HV cables - link box replacement and installation
Substation fencing	OH line refurbishment
Substation protection replacement	HV cables - strategic joints and materials
Transmission system development	HV substation programme
LED street lighting refurbishments	NWLDS NCC UPS battery replacement
HV substations	LED streetlights ward programme
OH line refurbishment	

¹⁷ An 'initiative' is a system categorisation for multiple projects with the same overarching project goal. Thus for any one initiative listed, multiple individual projects may be encapsulated.

Annexure A:8 Energy Directorate's list of 'new and upgrade' initiatives for the period 2022 to 2031

Initiative description	Initiative description
Transmission system development	Supervisory control and data acquisition
MV system infrastructure	Electrification programme
Service connections: quote - new connections	Resource efficiency
Street lighting	Renewable energy
LED street lighting refurbishments	Electricity facilities
Ground-mounted PV	Power quality meter system expansion
Service connections: tariff - new connections	Substation protection replacement
Telecommunication infrastructure - additional	Electricity demand-side management
Resource efficiency - retrofit in municipal buildings	Overheads: fencing
Electrification	Substations: fencing
Rooftop photovoltaic installations	

ANNEXURE B: URBAN WASTE MANAGEMENT

Annexure B:1 State of the City's landfills

Infrastructure name	Infrastructure type	Expected full capacity
Coastal Park	Landfill	2027
Vissershok		2039

Annexure B:2 State of the City's refuse transfer stations

Infrastructure name	Infrastructure type	Challenge
Athlone	Refuse transfer station	Infrastructure breakdowns and lack of accessibility to rail
Kraaifontein, Swartklip, Bellville		Infrastructure breakdowns

ANNEXURE C: WATER AND SANITATION

Annexure C:1 The state of the City's bulk and reticulation water reservoirs

Infrastructure name	Infrastructure type	Challenge
Wynberg large reservoir (SPM), Wynberg small reservoir (CMC), Verwoerd High, Verwoerd Low, Upper Mountainside, Macassar, Bakkerskloof, Strand reservoir, Kleinvlei, Philadelphia Small, Philadelphia Large, Suikerbossie, Hout Bay, Hout Bay Hts/Bay, View/Sentinel, Swaanswyk Upper, Brakkloof, Da Gama Park Top, Kogelfontein	Bulk and reticulation water reservoir	<48-hour storage

Annexure C:2 Bulk conveyance network constraints defined as pressure below 15 m, velocity 2 m/s (hydraulic model)

Region	Infrastructure type	Km constrained
Region 1	Bulk supply conveyance	5,70
Region 2		3,80
Region 3		19,40
Region 4		18,90

Annexure C:3 Bulk conveyance network constraints noted in the Water and Sanitation Sector Plan

Infrastructure name	Infrastructure type	Challenge
Short portion of the Wemmershoek pipeline downstream of Glengarry reservoir	Bulk supply conveyance	Excess flow velocity
The southernmost tip of the 915 mm supply link to southern district		Below minimum pressure
Voëlvlei pipeline		High static pressure
Wemmershoek pipeline		Operational constraints at the Wemmershoek WTP

Annexure C:4 The state of the City's water treatment plants

Infrastructure name	Infrastructure type	Design capacity	Operational capacity	Peak demand	Surplus capacity
Mℓ/d					
Wemmershoek	Water treatment plant	270	210	270	0
Constantia Nek		3	3	3	0
Brooklands		5	4	5	0
Witzands		14	6	14	0
Albion Spring		4	3	4	0
Silwerstroom		3	3	2,7	0,3
Faure (hillside to the north of Faure)		500	400	351	49
Voëlvlei		273	160	198	38
Steenbras		150	110	130	20
Kloof Nek		18	18	5,2	12,8
Blackheath		420	360	400	40

Annexure C:5 The state of the City's wastewater treatment works

Infrastructure name	Infrastructure type	Expected full capacity
Macassar, Klipheuwel, Potsdam and Zandvliet	Wastewater treatment works	Over capacity
Gordon's Bay, Athlone, Mitchells Plain and Wesfleur Residential		Near capacity
Bellville, Borchers Quarry, Camps Bay, Cape Flats, Fisantekraal, Green Point, Hout Bay, Kraaifontein, Llandudno, Melkbosstrand, Philadelphia, Scottsdene, Simon's Town, Wesfleur Industrial, Wildevoëlvlei		Within capacity

Note: The above table is based on design average dry weather flow capacity constraints and is not inclusive of nutrient-load capacity constraints.

Annexure C:6 Details of the three bio-solid beneficiation facilities (BBFs) planned by the City

Infrastructure name	Infrastructure type	Capacity (tons/day)	Status
North BBF	Bio-solid beneficiation facility	150	Planning and design completed in 2013. Ongoing legal dispute over site since 2014
South BBF		150	Design complete and construction ready to go out for tender. Budget constraints have resulted in delays.
East BBF		150	Future facility

Annexure C:7 City-owned pump stations (PSs) with insufficient capacity

Infrastructure name	Infrastructure type	Region	Capacity
Melville Road PS, Section 10 PS, Tokai PS, Clifton Rd PS, Simon's Town No 1 PS, Fish Hoek No 3 PS, Fish Hoek No 2 PS, Fish, Hoek No 1 PS, Fish Hoek No 5 PS	Pump station	1	Insufficient
Rietvlei PS		2	
Sacks Circle 1 PS, Sacks Circle PS, Fisantekraal 2 PS, Ascot PS, Lupin Crescent PS, Table View East PS, West Beach PS, Diep River PS, Northpine PS		3	
Raapenberg PS, Beach Rd PS, Camps Bay outfall PS, Raapenberg A PS, Wingfield A PS, Cape Flats A PS		4	

Annexure C:8 Status of stormwater master plans across Cape Town's 21 catchment areas

Infrastructure name	Infrastructure type	Expected full capacity
Diep River	50- and 100-year flood line	High
Hout Bay	Various models – limited 100-year data	
Silvermine	Study completed for golf course	
Muizenberg	Various models	
Sand River	Outdated study	
Zeekoe	Various models	
Atlantis	None	Moderate
Sout River	100-year flood line	
West Coast	None	
Salt River	High-level plan currently being developed	
Llandudno	None	Low
Chapman's Peak	Dated studies	
Noordhoek and South Peninsula	Various models	
Mitchells Plain, Khayelitsha, Eerste River and Kuils River, Lourens River, Sir Lowry's Pass River, Soet River	High level	
Steenbras River	None	

Annexure C:9 Capital commitments in the New Water Plan over the 10-year period from 2019-2029

Intervention	Completion/first water date		
	Water Strategy	Revision: Nov 2020	Revision: Nov 2021
Table Mountain Steenbras phase 1	2020	Jul-20	Jul-21
Table Mountain Nuweberg phase 2	2022	Dec-26	Jun-35
Table Mountain Groenlandberg phase 3	2022	Jan-28	Jul-35
CFA Strandfontein West	2022	Jul-21	Mar-22
Cape Flats aquifer: Hanover Park	2021	Jun-24	Jun-24
Cape Flats aquifer: Strandfontein North and East	2021	Dec-25	Dec-25
Cape Flats aquifer: Philippi	2021	Jun-26	Jun-26
CFA Mitchells Plain WTP	2021	Jun-27	Jun-27
Atlantis Aquifer	2021	Jun-24	Jun-24
Berg Voëlvlei River augmentation scheme	2023	Jun-24	Jun-25
Faure New Water Scheme phase 1	2024	Jun-26	Nov-27
Desalination phase 1	2026	Jun-28	Feb-30

Annexure C:10 Planned projects in the City's bulk water augmentation scheme

Infrastructure name	Infrastructure type
300 Mℓ Muldersvlei reservoir	Bulk water reservoir
500 Mℓ/d Muldersvlei water treatment works	Water treatment works
Pipeline between Wemmershoek pipeline and Muldersvlei reservoir	Bulk water pipeline
Pipeline between Muldersvlei reservoir and Wemmershoek pipeline	
Dasbos and Berg River Dam to Muldersvlei WTW pipeline	
Muldersvlei WTW to Muldersvlei reservoir pipeline	
Muldersvlei reservoir to Spes Bona reservoir pipeline	

Annexure C:11 Planned projects in the City's Voëlvlei-to-Glengarry transfer scheme

Infrastructure name	Infrastructure type
300 Mℓ Spes Bona reservoir	Bulk water reservoir
Spes Bona reservoir to existing Glengarry reservoir pipeline	Bulk water pipeline
PRV on the 1 000 mm pipeline between the future Spes Bona reservoir and the existing Voëlvlei pipeline	Bulk water pipeline
A 200 to 300 Mℓ/d (capacity still to be determined)	Pump station

Note: The Voëlvlei-to-Glengarry transfer scheme is a sub-scheme of the BWAS.

Annexure C:12 Water and Sanitation refurbishment and replacement capital projects by initiative description for the 10-year period from 2022-2031

Initiative description
Cape Flats WWTW - refurbish various structures
WWTW infrastructure replace/refurbish
Wesfleur WWTW - capacity extension
Bellville WWTW DA module reactor reconfiguration and refurbishment

Annexure C:13 Water and Sanitation Directorate planned replacement and refurbishment projects to respond to identified constraints and backlogs at City's wastewater treatment works

Infrastructure name	Indicator ¹⁸	PPM item description	Project preparation status
Macassar, Zandvliet, Potsdam and Klipheuwel	High	PPM Item noted in 'new' infrastructure	Scoping
Gordon's Bay and Wesfleur residential	Moderate	Replacement of membranes: Bellville WWTW	Scoping
Athlone	Low	Item noted in 'new' infrastructure	Scoping
Bellville		Cape Flats WWTW - refurbish various structures	Execution
Borcherds Quarry		Cape Flats WWTW inlet works and rising maintenance	Scoping
Cape Flats		Wesfleur aeration and blower replacement	Conceptual design
Wesfleur Industrial		Wesfleur WWTW: mobile pump (16 inch)	Detailed design

Annexure C:14 Water and Sanitation Directorate wastewater new and upgrade projects by initiative description over the 10-year period from 2022 to 2031

Initiative description
Athlone WWTW - capacity extension phase 1
Macassar WWTW extension
Potsdam WWTW extension
Cape Flats WWTW - refurbish various structures
Zandvliet WWTW extension
Northern regional sludge facility
Borcherds Quarry WWTW
Bellville WWTW
Mitchells Plain WWTW phase 2
Fisantekraal WWTW
Camps Bay outfall sewer
Green Point WWTW outfall sewer
Wildevleivlei WWTW - upgrade dewatering
Sundry equipment: various WWTW

¹⁸ Capacity constraint as indicated by directorate.

Annexure C:15 Water and Sanitation Directorate's response to identified constraints as they relate to new and upgrade capital projects on the City's WWTWs

Infrastructure name	Indicators ¹⁹	PPM item description	Project preparation status
Macassar	High	Macassar WWTW – Extension	Feasibility
Potsdam		Potsdam WWTW – Extension	Scoping
Zandvliet		Zandvliet WWTW: Prim treatment and sludge	Execution
		Zandvliet WWTW 60Mℓ/d	Scoping
Gordon’s Bay	Moderate	To be diverted to Macassar	n/a
Klipheuwel		Project noted in refurbishment	n/a
Wesfleur residential		Project noted in refurbishment	n/a
Athlone	Low	Athlone WWTW – capacity extension – phase 1	Detailed design
		Athlone WWTW – capacity extension – phase 2A	Scoping
		Athlone WWTW – capacity extension – phase 2B	Scoping
Bellville		Bellville WWTW extension	Execution
		Upgrade clarifiers - Bellville WWTW phase 2	Scoping
Borcherds Quarry		Borcherds Quarry WWTW	Commission and close-out
		Borcherds Quarry WWTW phase II	Scoping
Wildevölvlei		Wildevölvlei WWTW – upgrade dewatering	Scoping
Green Point		Green Point outfall improvements	Scoping
Fisantekraal		Fisantekraal WWTW	Conceptual design

¹⁹ Capacity constraint as indicated by directorate.

Annexure C:16 Water and Sanitation Directorate's capital expenditure projects response to constraints noted at the City's wastewater pump stations for the 10-year period 2022 to 2031

Infrastructure name	Infrastructure type	Region ²⁰	Indicator	PPM item description	Project preparation status
Rietvlei pump station	Pump station	2	Insufficient capacity	Upgrade Rietvlei sewer pump station	Scoping
Table View East pump station	Pump station	3		Table View West pump station (20) upgrade	Scoping
Raapenberg pump station	Pump station	4		Raapenberg pump station upgrade	Scoping
Langa pump station	Pump station	Unknown		Langa pump station (9) – screens, pumps	Scoping
River Road pump station	Pump station	Unknown		River Road pump station (16) upgrade	Scoping
Koeberg pump station	Pump station	Unknown		Koeberg pump station capacity upgrade	Scoping
Sanddrift East pump station	Pump station	Unknown		Sanddrift East pump station upgrade	Scoping
Retreat pump station	Pump station	Unknown		Retreat low-lift pump station	Commission and close-out
General provision	Pump stations	n/a		Replace and upgrade sewer pump stations FY23–FY30	Scoping

²⁰ Capacity constraint as indicated by directorate.

ANNEXURE D: HUMAN SETTLEMENTS

Annexure D:1 Housing development projects aligned to the City's catalytic investment strategy

Priority areas	Programme
Bellville Future City, Philippi opportunity area, MyCiTi IRT phase 2A	Catalytic investment
The Southern Corridor Human Settlement Programme	Integrated greenfields development with mix of typologies (BNG, FLISP)
The north-eastern corridor Public-Private Partnership and the Voortrekker Road Integration Zone Social Housing	Social housing, catalytic

Annexure D:2 Formal housing supply options based on monthly household income

Tenure options	Monthly household income bracket	Housing typology	Programme	Percentage of households by income category
Rental	R0-R1500	Public housing	City of Cape Town	12%
	R1 850-R 3 500 ²¹	Social housing and public housing opportunities		13%
	R3 501-R10 000			33%
	R10 001-R15 000			10%
	R15 001-R22 000	Social housing and private rental	City of Cape Town and private	8%
Total				76%
Ownership	R0-R1500	Formal housing	Breaking New Ground (BNG) or Enhanced People's Housing Process (EPHP)	12%
	R1 501-R 3 500		Gap (FLISP subsidy)	13%
	R3 501-R10 000			33%
	R10 001-R15 000			10%
	R15 001-R22 000			8%
Total				76%

²¹ Adjusted from R1 501 to R1 850 in line with recent social housing income band amendments, City of Cape Town Human Settlements, 2022.

Annexure D:3 Land reservation within Cape Town (in km²)

Area	km ² of land in the pipeline		
	Available/Acquired	In project phase	Total
Central	60 559	159 052	219 611
East	983 946	2 100 519	3 084 465
South	451 959	563 207	1 015 167
North	103 901	941 565	1 045 466
Data unknown	3 136 219	3 751 225	6 887 444
Grand total	4 736 583	7 515 570	12 252 153

ANNEXURE E: URBAN MOBILITY

Annexure E:1 Current projects in the transport sector as they relate to the Congestion Relief Programme

Current project	Typology	Start date	End date
Voortrekker Rd widening between Salt River canal and Prestige Dr; and Cannon St widening between Royal Rd and Voortrekker Rd	Expansion	2021/22	2026/27
Erica Dr extension across R300 to Belhar Main Rd	New	2020/21	2024/25

Annexure E:2 Current projects in the transport sector as they relate to the Metro Roads Reconstruction Programme

Current project	Typology	Start date	End date
Jakes Gerwel Drive between Frans Conradie Drive and Viking Way	Rehabilitation	2022/23	2024/25
Main Road Simon's Town/St George Street Road/Queens Road/McFarlane Road from Dido Valley Road to Rocklands Road	Rehabilitation	2025/26	2027/28

ANNEXURE F: GENERAL

PROJECT PREPARATION

The following information is a summary of the City of Cape Town's Stage Gate Review process that supports various elements of infrastructure delivery management and, more specifically, project preparation. The Stage Gate Process design was informed by the five-case model used by the UK Government and other international best practices.

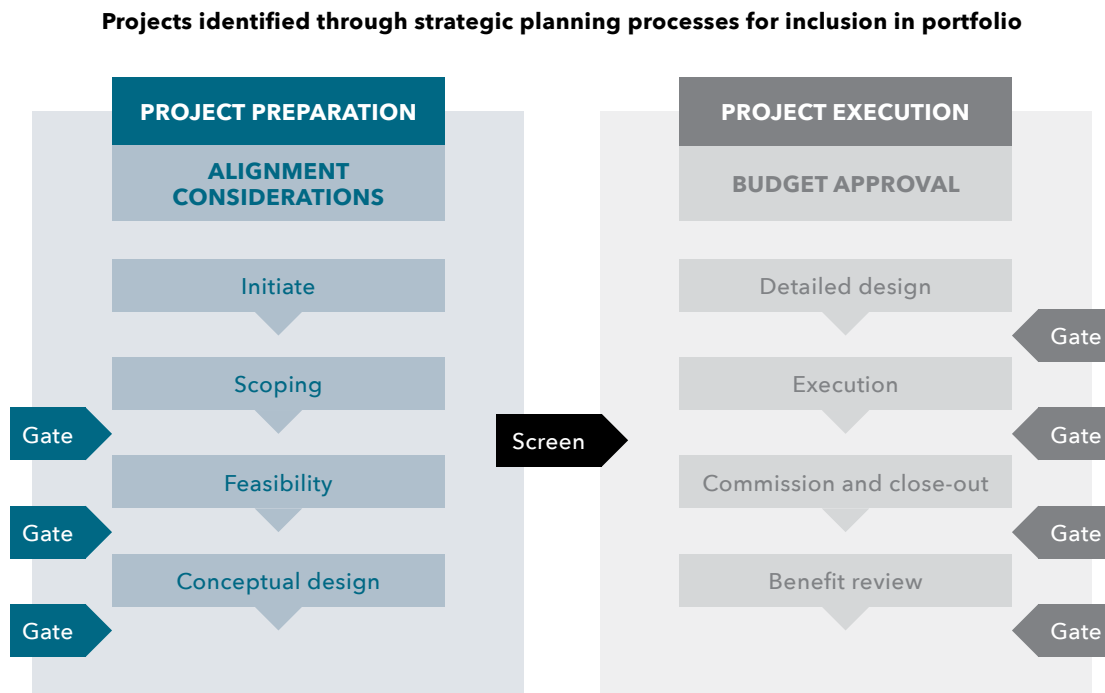
Council adopted the MFMA Circular No. 106, Local Government Framework for Infrastructure Delivery and Procurement Management (LGFIDPM), as a best practice guideline that underpins the Stage Gate Review process. This is a formal process to specify, verify and record the transition between critical stages in the project and programme lifecycle.

A Stage Gate Review guideline has been developed to ensure understanding of, and compliance with, the

process. It verifies acceptance of specific deliverables required for associated stages and ensures mutual understanding, alignment and commitment of key internal stakeholders as to what the project must accomplish. This process is designed for capital infrastructure projects and is based on well-proven techniques that lead to more effective delivery of benefits, together with more predictable costs and outcomes. It is compulsory for all capital infrastructure projects valued at R16 million or more to undergo this Stage Gate Review process.

Proper project and programme management implementation is vital to achieving specific outputs and outcomes that contribute to the desired results and objectives. The City has adopted a standard project lifecycle as shown in figure 17 that also indicates the Gate Review requirements after each stage.

Figure 17. City of Cape Town project lifecycle



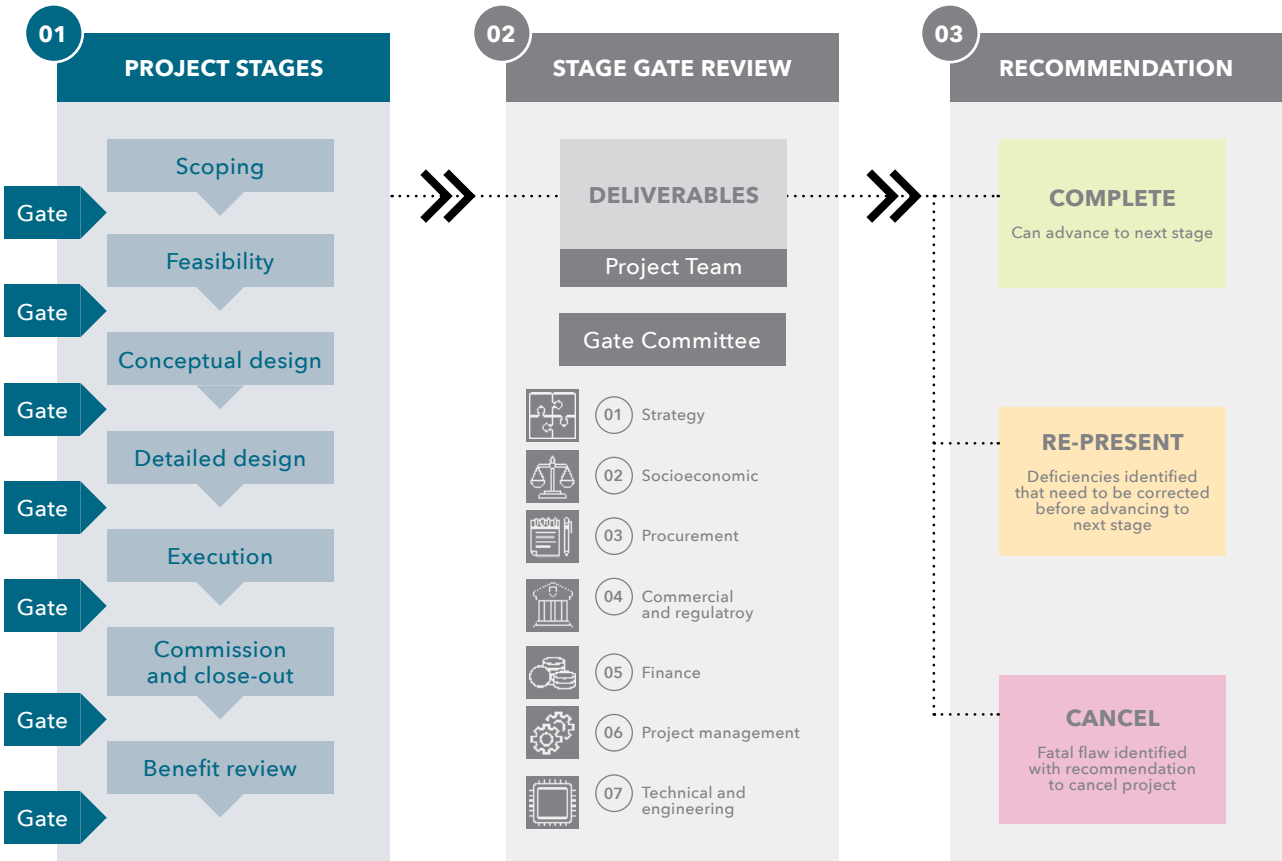
A similar approach applies to programmes that follow a specific programme lifecycle and that are appraised at specific stages. Projects are managed through the PPM application and created as individual items with assigned project managers.

Each stage of a project and programme develops specific deliverables that are appraised in accordance with seven key focus areas/cases namely: strategy; socioeconomic; procurement; finance; commercial and regulatory; project management; and technical and engineering. These focus areas are appraised by subject matter experts within key City departments, in accordance with specific checklists developed per stage.

These are designed to ensure the relevant deliverables contain adequate information to justify the project proceeding to the next stage.

The project team presents the information to the Stage Gate Review Committee for approval to advance to the next sequential stage. Once the deliverables are appraised by the committee members, a recommendation report is compiled with potential corrective action items that need to be addressed by the project team. The project then either advances to the next stage, re-presents the current stage, or may be cancelled based on the committee’s recommendation.

Figure 18. Stage Gate Review process



This process has several benefits, but ultimately ensures adequate preparation and planning are done on infrastructure projects and programmes through the appraisal of key activities and deliverables at each stage. This, in turn, improves the likelihood of success and an outcome that meets with relevant stakeholders’ approval.







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