

REPORT TO: WATER AND WASTE PORTFOLIO COMMITTEE

1. ITEM NUMBER : WW 13/08/21

2. SUBJECT

CAPACITY CONSTRAINTS AT WASTEWATER TREATMENT WORKS

KAPASITEITSBEPERKINGE BY AFVALWATERBEHANDELINGSWERKE

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LSU REF NO: N0191

3. DELEGATED AUTHORITY

In terms of delegation

This report is for NOTING BY

- ☒ **Committee name** : Water and Waste
- ☐ The Executive Mayor together with the Mayoral Committee (MAYCO)
- ☐ Council

4. DISCUSSION

A number of City of Cape Town Wastewater Treatment Works are currently operating at or over their design wastewater treatment capacities. As a result, Water and Sanitation Department support for new developments within the respective catchments is affected until the capacity upgrade projects have been completed. This report lists the affected Works and provides some background to the current situation.

4.1 Background

4.1.1 Wastewater treatment works design

A Wastewater Treatment Works (WwTW) is designed according to an ultimate design wastewater flow (volume) and a design nutrient load:

- Flow – Two ultimate flows are designed for, (i) the average dry weather flow (ADWF) and (ii) the peak wet weather flow. The peak wet weather flow is generally between 2 to 3 times the average dry weather flow, to allow for stormwater or groundwater infiltration into the sewers during the wet season;
- Nutrient load – The organic, nitrogen and phosphorus pollutant load contained in the wastewater.

Depending on the sewage characteristics, a WwTW can reach its design capacity before its design ADWF is reached (sewage has become stronger over time), when its design ADWF is reached (sewage characteristics did not change since design) or at flows higher than its design ADWF (sewage has become weaker over time). The nutrient load, not the flow, is the critical factor that determines whether a WwTW is operating under or over capacity.

A WwTW is designed to treat the incoming wastewater to a certain standard, usually the license standard at the time of design, or better. When this design capacity is exceeded, the treated effluent quality will deteriorate, resulting in increased pollution load into the receiving water body, non-compliance with the respective license and decreased scope for reuse by existing treated effluent customers.

WwTW are usually large infrastructure installations, requiring significant time and capital investment, and it is therefore best practice to provide for a 15 to 20-year design horizon when designing wastewater treatment capacity. The design horizon is projected and estimated using historical trends and future projections, however it remains an estimation and is subject to a number of constantly changing external factors.

4.1.2 Wastewater branch planning

The Wastewater Branch monitors the flows and loads to all WwTW, and capacity expansions are scheduled for completion when a respective works is projected to reach 90-95% of its capacity. This also incorporates future flow projections derived from modelling the current town planning strategy.

The programming and consequent kick-off / execution of the respective projects is however dependent on procurement and budget provisions and constraints, which can result in a project kick-off being significantly delayed.

Without any delays, a capacity and process upgrade of a medium or large WwTW within the municipal context takes a minimum of 6 years from tender advertisement for professional services to construction completion and handover of the infrastructure. With

delays (e.g. tender appeals, procurement issues, strikes and other labour issues during construction etc.) this can increase to 8 years or more.

This has resulted in a situation where some City of Cape Town WwTW are operating at or exceeding their design capacities and producing treated effluent that no longer complies with the license conditions before additional capacity is scheduled to come online.

As the load on the WwTW continues to increase, treated effluent quality deteriorates and causes increased pollution of the receiving water bodies. There is no 'quick fix' to remedy these situations, it will only be alleviated once the process upgrade and / or the additional capacity comes online.

4.2 WwTW Constraints Status Quo

Table 1 below lists the current Status Quo of all City of Cape Town WwTW:

- Severely constrained WwTW are works that are currently operating at or over capacity and treated effluent quality has already been affected;
- Constrained WwTW are the works that are currently operating within their design capacities, but may either be heading towards severely constrained, or they may have process unit limitations which could affect their treatment capacity.

Please note that estimated project completion dates listed in the "Comments" column refer to Contract completion, however the infrastructure is taken into operation one year earlier and the last year of the Contract is the Defects and Notification Period.

Table 1: Capacity status quo for CoCT WwTW

Wastewater Treatment Works	Current Status Quo	Comments
Klipheuwel	Severely constrained	Project underway to convert plant to pump station to Fisantekraal WwTW, completion 2026. Land acquisition / servitude registration currently underway. Awaiting appointment of new professional engineering consultant term tender.
Macassar	Severely constrained	Expansion project underway, completion estimated 2026/27. Section 33 for appointment of professional service provider underway.
Potsdam	Severely constrained	Expansion project underway, completion 2026/7. Detail design complete, tender for construction imminent.
Zandvliet	Severely constrained	Expansion and upgrade project underway, completion 2024. Currently under construction.
Athlone	Constrained	Phase 1 upgrade project underway. Completion 2026. One Contract currently under construction. Finalising second tender MOA and start of Section 33 process to follow. This was delayed due to PAIA appeals. Phase 2 expansion in detail design stage. Completion currently estimated 2028/9.
Bellville	Constrained	'DA' Works upgrade underway. Completion 2026. Finalising MOA and start of section 33 process to follow. Awaiting appointment of new professional engineering consultant term tender.
Philadelphia	Constrained	Well beyond the urban edge, not currently earmarked as a growth area. Should this change, an upgrade will be required.
Wesfleur	Constrained	Aeration system replacement project underway. Completion 2025. Currently design stage. Awaiting appointment of new professional engineering consultant term tender.

Wildevolevlei	Constrained	Dewatering installation upgrade underway. Completion 2025. Currently conceptual design stage. Awaiting appointment of new professional engineering consultant term tender.
Borcherds Quarry	Not Constrained	
Camps Bay Outfall	Not Constrained	
Cape Flats	Not Constrained	
Groot Springfontein	Not Constrained	
Fisantekraal	Not Constrained	
Gordons Bay	Not Constrained	Inflow capped at design, balance bypassed to Macassar. Gordon's Bay catchment therefore part of Macassar catchment and same constraints apply.
Green Point Outfall	Not Constrained	
Hout Bay Outfall	Not Constrained	
Kraaifontein	Not Constrained	
Llandudno	Not Constrained	
Melkbosstrand	Not Constrained	
Millers Point	Not Constrained	
Mitchells Plain	Not Constrained	Heading towards constrained, being monitored.
Oudekraal	Not Constrained	
Scottsdene	Not Constrained	
Simons Town	Not Constrained	

4.3 Severely Constrained WwTW

Severely constrained WwTW are works that are currently operating at or over capacity and treated effluent quality has already been affected. The constraints at the respective WwTW are having a significant impact on the ability to support new developments, and this situation is likely to continue until the respective upgrade projects have been completed.

4.3.1 Macassar

The catchment of the Macassar WwTW includes the suburbs of Firgrove, Somerset West, Sir Lowry's Village, Gordon's Bay, Strand, Paardevlei, Macassar, Sitari, Croydon and Kelderhof.

Please note that the small catchment of the Gordons Bay WwTW is included in the catchment of the Macassar WwTW, because the Gordons Bay WwTW takes in its design

flow, and the remainder of the wastewater generated in its catchment is already bypassed to the Macassar WwTW.

The Macassar WwTW is currently severely constrained and operating above its nutrient load design capacity, even though its average dry weather flow is still below design values. This is due to the wastewater characteristics within the catchment changing over time, resulting in a significantly stronger wastewater from the catchment than when the WwTW was originally designed. This is exacerbated by breakdowns of ageing mechanical infrastructure and flooding events at the inlet works.

The requirement to upgrade the Macassar WwTW was noted in the 2011 Water and Sanitation Master Plan as “it is proposed that the works be extended by two 16 Ml/day modules to be available by 2015 and 2025 respectively”, however procurement for professional services to upgrade the Macassar WwTW from 34 to approximately 70 Ml/d (one upgrade project as opposed to the two recommended in the Master Plan) only began in 2019 due to budgetary constraints caused by the significant delay of both the Zandvliet and Potsdam projects, both very high capital value projects.

A Section 33 process is currently underway for the appointment of the professional services provider, and the design process is expected to kick off in the fourth quarter of this year.

Completion of the project (Contract completion) is currently estimated to be 2026/27.

4.3.2 Potsdam

The catchment of the Potsdam WwTW includes Milnerton, Sunset Links, Sunset Beach, Table View, Blouberg, Sunningdale, Sandown, Parklands, Rivergate, Du Noon, Killarney Gardens, Montague Gardens, Summer Greens, Century City, Brooklyn, Rugby, Atlas Gardens, Richwood, Burgundy Estate, Platteklouf (partial), Welgelegen, Monte Vista, Platteklouf Glen, Edgemoor, Bothasig and N1 City.

The Potsdam WwTW is operating near its design capacity for both flow and nutrient load. Two pre-directives have been issued regarding the treated effluent quality from the Potsdam WwTW following a spate of mechanical equipment breakdowns during 2019, and it is also part of a directive that was issued to the City regarding the Diep River as a whole. OUTA and a number of ratepayer associations are also actively involved.

A project to upgrade the Potsdam WwTW was kicked off in 2009 with a tender for professional services, for an estimated construction completion in 2015/16. This tender was issued at the same time as the tender for professional services for the upgrade of the Zandvliet WwTW. Both professional services tenders were the subject of a High Court case due to appeals and this was only resolved in 2013. Once resolved, only one of the two projects could proceed due to budgetary constraints, and at the time it was decided that the Zandvliet project would proceed first, because the WwTW was already over capacity and its treated effluent quality was already showing significant deterioration in quality.

The upgrade and capacity expansion of the Potsdam WwTW from 47 to 100 Ml/d went out to tender for professional services again in 2017, and was awarded in 2018. Detail design is complete, and advertisement of construction tenders is imminent. Completion of the Project (Contract completion) is currently estimated to be 2026/27.

4.3.3 Zandvliet

The catchment of the Zandvliet WwTW includes Delft, Blue Downs, Kuils River (partial), Zevenwacht / Zevenzicht / Zevendal, Blackheath, Welmoed, Eerste River, Dreamworld, Faure and Khayelitsha.

The Zandvliet WwTW is currently operating significantly above its design capacity for both flow and load, and treated effluent quality has deteriorated over time. One pre-directive regarding the treated effluent quality from the Zandvliet WwTW was issued to the City in late 2018, however the issuer is satisfied with mitigation measures implemented.

A project to upgrade the Zandvliet WwTW from 72 to 90 Ml/d (with some process units sized for the ultimate 150 Ml/d), including significant upgrades to the existing process trains and infrastructure was kicked off in 2009, and a tender for professional services was advertised in 2010:

- May 2010: Prof. services tender advertised;
- September 2010 awarded, and award appealed;
- Appeal upheld, tender re-advertised and awarded September 2011;
- Award appealed, and went to High Court;
- High court order December 2012 to cancel both the Zandvliet and Potsdam Professional services tenders;
- Tender re-advertised and awarded October 2013;
- Award appealed, however appeal was not upheld;
- Land claim lodged against the City, all work had to stop, resolved June 2016;
- 4 off construction tenders advertised October 2016 and December 2016 respectively;
- 2 of the 4 construction tenders were appealed, one appeal not upheld the other ordered to re-evaluate;
- Construction tenders awarded September 2018, November 2018, June 2019 and September 2019 respectively;
- Construction commenced November 2018.

Construction currently on schedule with infrastructure completion scheduled Q4 2023 and Contract completion Q4 2024.

4.3.4 Klipheuwel

The Klipheuwel WwTW is a small septic tank / rotating bio-contactor treatment combination with a capacity of 0.09 Ml/d, which serves the Klipheuwel housing project only.

The Klipheuwel WwTW is operating above its design capacity for both flow and load, and treated effluent quality has deteriorated. Due to its remote location it was decided to replace the WwTW with a pump station that will pump the wastewater to the existing Fisantekraal WwTW. Conceptual design is complete and land acquisition / servitude registration is currently underway. Currently awaiting the appointment of new professional engineering consultant term tender. The project is expected to be complete in 2026 (Contract completion).

4.4 Constrained WwTW

The WwTW designated as constrained represent works that are currently operating within their design capacities, but may either be heading towards severely constrained within the next few years, or they may have process unit limitations and /or aging mechanical equipment which could affect their treatment capacity and hence the quality of the treated effluent produced.

There is currently no effect on development applications within the catchments of these WwTW, however, there is a risk that they could become severely constrained at relatively short notice due to changing operating conditions or delays in current project and / or upgrade implementation. They are not discussed in detail here, and the Committee will be informed should the status of any of these works change to severely constrained.

- 4.1. Financial Implications ☒ None ☐ Opex ☐ Capex
- ☐ Capex: New Projects
 - ☐ Capex: Existing projects requiring additional funding
 - ☐ Capex: Existing projects with no additional funding requirements

4.2. Policy and Strategy ☐ Yes ☒ No

4.3. Legislative Vetting ☐ Yes ☒ No

4.4. Legal Compliance ☒

4.5. Staff Implications ☐ Yes ☒ No

4.6. Risk Implications ☐ Yes ☒ No

5. RECOMMENDATIONS

It is recommended that the report BE NOTED.

AANBEVELINGS

Daar word aanbeveel dat daar van die verslag KENNIS GENEEM WORD.

IZINDULULO

Kundululwe ukuba MAKUQWALASELWE ingxelo.

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ANNEXURES

NONE

FOR FURTHER DETAILS CONTACT

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Approval Form

Supported for inclusion on the agenda



CAPACITY CONSTRAINTS AT WASTEWATER TREATMENT WORKS

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Meeting Venue: Committee Room D

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Item	Section	Approver	Approval	Approved Date	Approver Comments
01	Author	SEPTEMBER LEANDRE	Approved	16.07.2021 12:54:42	
02	Director	Zolile Basholo	Approved	16.07.2021 12:59:34	
03	Executive Director	Michael John Webster	Approved	18.07.2021 11:53:39	
04	Legal Compliance	Jason Sam Liebenberg	Approved with Comments	19.07.2021 10:20:17	For information.

ECS Officer: