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Presentation on Rooiwal Waste Water Treatment Plant and Temba Water Treatment Plant

Presented to: Parliamentary Portfolio Committee of Human Settlement, Water and Sanitation

Date: 10 September 2019

Presentation Outline

- Contextualising water resources & water services
- Location of City of Tshwane
- Problems statement and previous interventions
  - Broader context
  - Rooiwal, Apies River & Temba
- Short term to long term interventions
- Risk and mitigations
- Conclusion

Contextualizing water resources & Water Services

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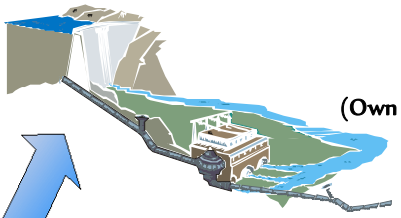
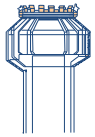


Water Resources

Water Purification
(Own Plants Water Boards Boreholes)

Bulk Distribution

Bulk Storage



Reticulation

Household/User

Water wastage, inefficiencies
Customer responsible after meter

Water meter/measuring
Municipality responsible up to meter

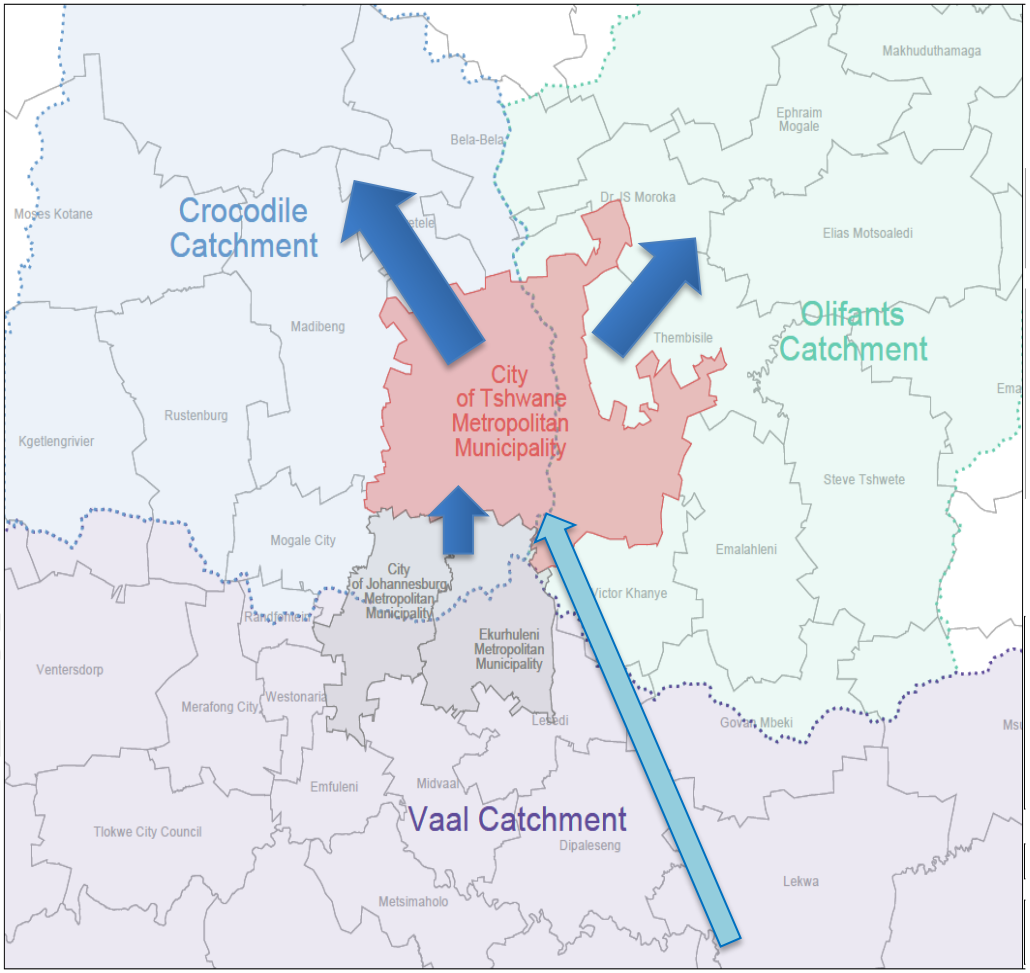
Waste Water Treatment

Waste Water Collection

Role Players:

- DWS
- Water Boards
- Municipalities
- Service Providers

Location of City of Tshwane



- Has 15 Waste Water Treatment Works and 4 Water Treatment Plants
- Treat sewage from households, Businesses, Industries etc.
- 500 million litres of waste water treated daily
- Over 270 million litres of water purified daily
- The plants operate 24 hours a day
- Treated waste water effluent is discharged into the nearest river to balance supply and demand of water resources (water re-use)
- The by-product of waste water treatment (sewage sludge) remains at the plant
- Must comply with the Water Use License conditions
- Continuously monitored by the Department of Water and Sanitation through compliance audits

Problem Statement in broader context

- City of Tshwane water and waste water services masterplan: not adhered to and implemented in terms of expansions and upgrades required on the infrastructure.
  - Of the 15 wastewater treatment works, only 2 are operating within the design capacity
  - 4 are at a critical state (i.e. Rooiwal, Klipgat, Baviaanspoort and Sunderland Ridge)
- Non compliant effluent discharged into water resources affects the quality of raw water abstracted for drinking purposes
- The Masterplan studies dating as far back as 2004 indicated the need to accommodate:
  - Population growth
  - Economic growth and developments
  - Inward migration (employment opportunities)
  - Changes in Municipality boundaries
  - Ageing Infrastructure
  - Pressure points in the system

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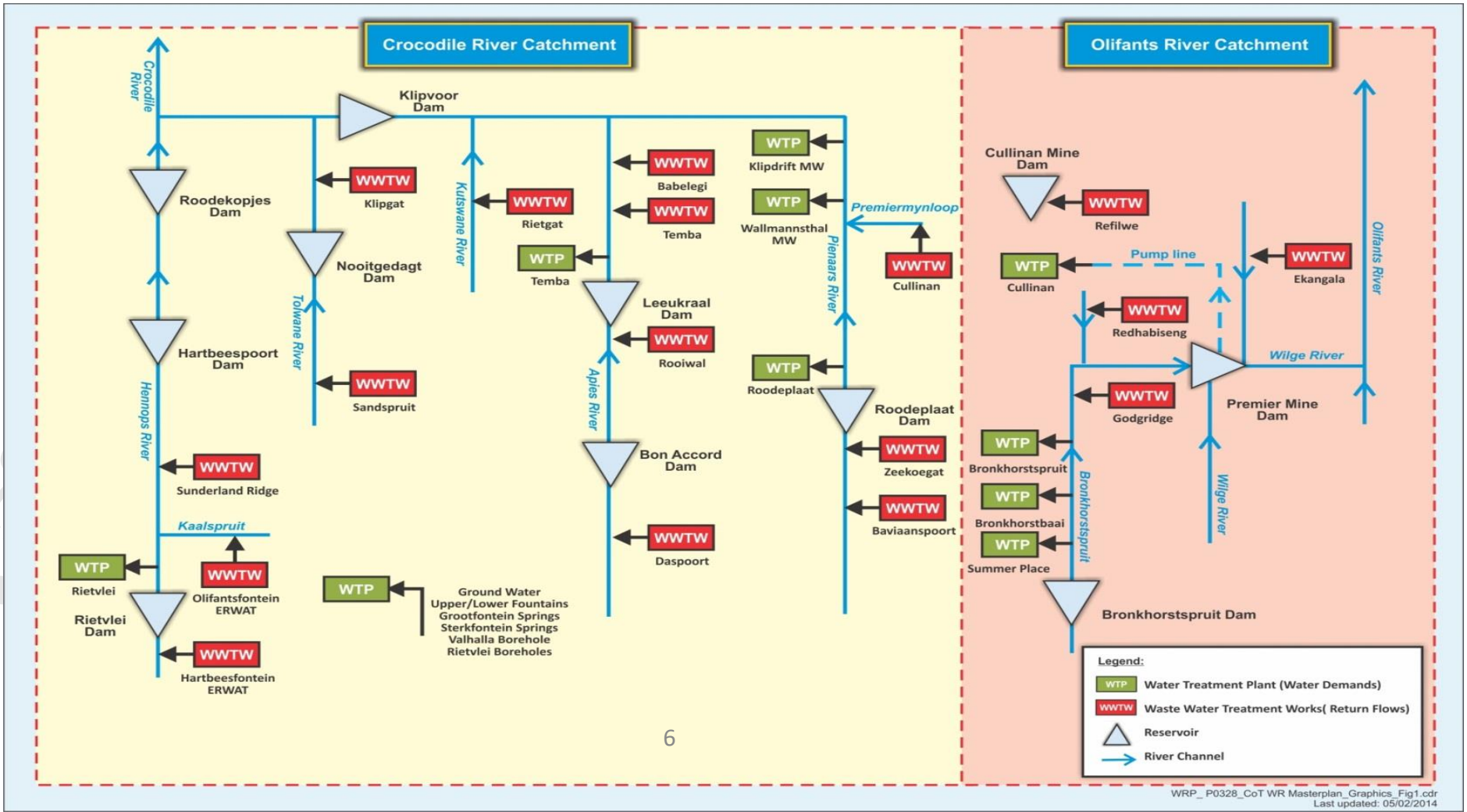
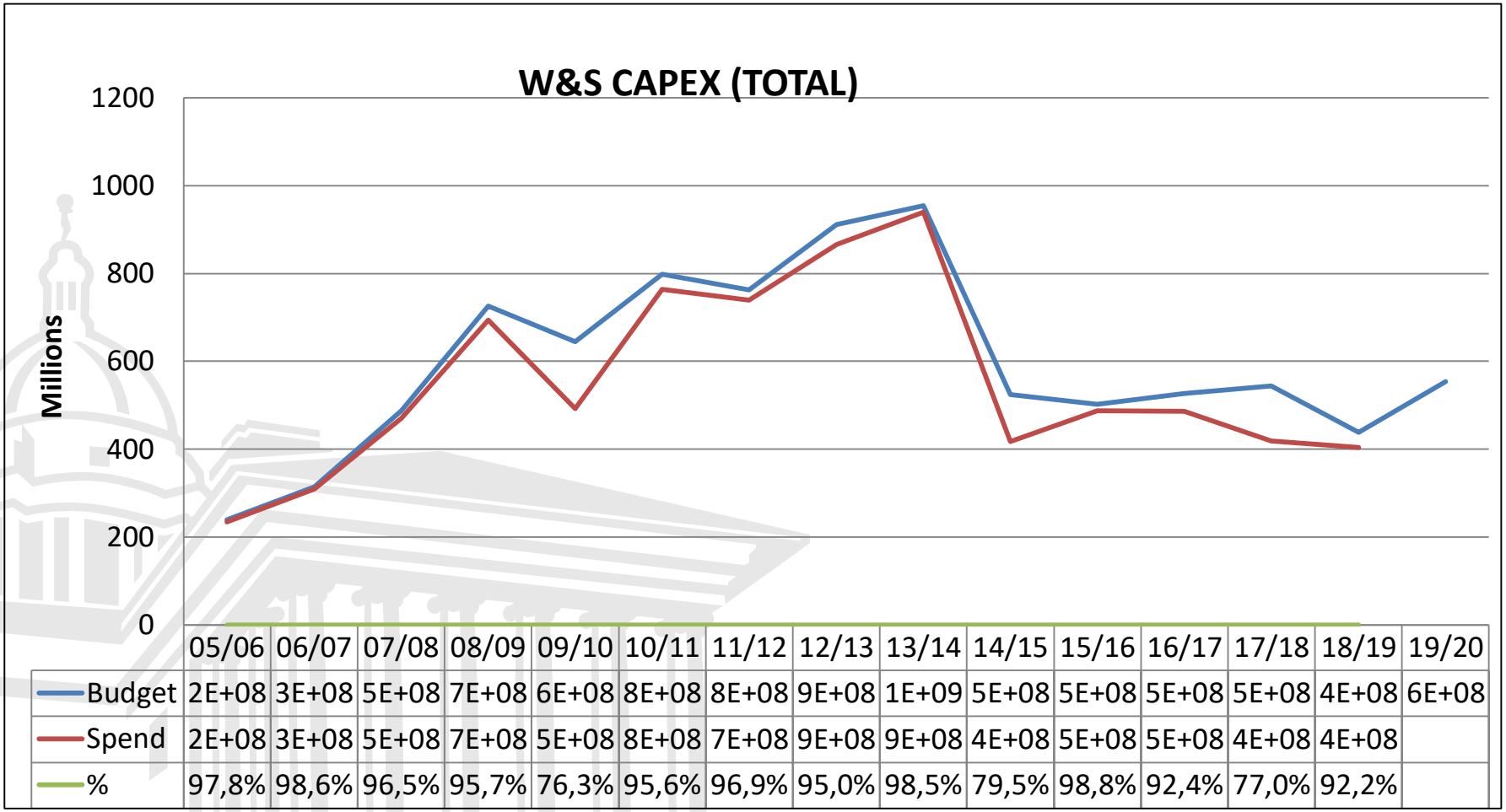
Schematic layout of water and waste water systems



Historical Water and Sanitation Capital Budget



	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Budget	2E+08	3E+08	5E+08	7E+08	6E+08	8E+08	8E+08	9E+08	1E+09	5E+08	5E+08	5E+08	5E+08	4E+08	6E+08
Spend	2E+08	3E+08	5E+08	7E+08	5E+08	8E+08	7E+08	9E+08	9E+08	4E+08	5E+08	5E+08	4E+08	4E+08	
%	97,8%	98,6%	96,5%	95,7%	76,3%	95,6%	96,9%	95,0%	98,5%	79,5%	98,8%	92,4%	77,0%	92,2%	

Description of Rooiwal WWTW

- Rooiwal Waste Water Treatment Works (WWTW) is situated in Region 2, next to the Apies River and the Rooiwal Power Station.
- The plant receives wastewater from Atteridgeville, Pretoria CBD, Pretoria North and Rosslyn
- Main outfall sewers draining to Rooiwal WWTW :
  - Rooiwal West and Northern Works are fed from the Central and Western regions of the City of Tshwane (CoT)
  - Rooiwal East Works is fed from the Eastern regions of the CoT.

Description of Apies River and Leeuwkraal Dam:

- The Apies River flows through the middle of the city of Tshwane.
- Two City of Tshwane wastewater treatment plants discharge into the Apies River; Daspoort and Rooiwal Wastewater Treatment Works (WWTW).
- The Rooiwal WWTW is a major contributor to the flows into the Apies River.
- The Apies River discharges into the Leeuwkraal Dam downstream of the Rooiwal waste water treatment works.
- Leeuwkraal Dam impounds a volume of 0.6 million m^3 and covers a surface area of 38 ha at full supply level.
- CoT has been awarded a Water Use License to abstract 130 Ml/d at the Temba WTW.

Description of Temba Water Treatment Plant

- Temba Water Treatment Plant (WTP) abstracts raw water from the Leeuwkraal Dam.
- The water then passes through the treatment processes in order to purify water to meet required SANS 241:2015 drinking water standard.
- The plant supplies water to Hammanskraal and surrounding areas including Moretele Local Municipality.
- The plant has undergone an upgrade from 60Ml/d to 120 Ml/d treatment capacity.
- The upgraded plant is currently in the final stages of completion and is already in operation and produces on average 85Ml/d

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PROBLEM STATEMENT & PREVIOUS INTERVENTIONS

- ROOIWAL WWTW (INCLUDING APIES RIVER)
- TEMBA WTP

Problem Statement: Rooiwal Waste Water Treatment Plant

- In 2004 the masterplan identified that the Rooiwal WWTW required 80Ml/d expansion by the year 2019, a further 50 Ml/d by 2024 and an additional 50Ml/d by the year 2034
- The plant does not have sufficient capacity to treat the incoming waste water/sewage flow, the plant is currently overloaded
- In terms of the type and strength of the sewage coming to Rooiwal (organic loading), the plant experiences a 70% overload.
- Regarding the hydraulic flow (amount of water) coming into the plant to be treated (130 million liters per day), the plant experiences an 18% overload (the plant can only treat 110 million liters per day)
- The final treated waste water discharged from the plant into the Apies River does not comply with the set standards (a serious non-compliance issue)
- Treated waste water from Rooiwal WWTW pollutes the Apies River and Leeuwkraal Dam (source of drinking water to the Temba / Hammanskraal area)

Previous interventions at Rooiwal

- Continuous maintenance work has been done at the plant over time to contain the situation and keep the plant operational (Refer to Annexure B: 2018/19 Financial Year Maintenance Plan)
- Emergency upgrade work in the year 2011 for:
  - ❑ Increased size of flow balancing on module 1 and 3
  - ❑ New sludge dewatering belts at the belt press building
  - ❑ Sludge solar dying beds
  - ❑ Upgrading of Rooiwal East anaerobic digesters
  - ❑ Upgrading of electrical infrastructure
  - ❑ Dissolved Air Flotation bypass pump station

Previous interventions at Rooiwal WWTW: Human Resources

- Human Resources
  - Process controllers
    - 8 process controllers
  - Maintenance team
    - 2 electricians and 1 mechanical technician
    - Maintenance contractors (see attached)
  - Security
    - Security personnel has been increased from 2 to 10
    - To date only 1 incident has occurred since the increased deployment.
    - A security technologies tender also being advertised to supplement static guards

Problem Statement: Temba Water Treatment Plant

- The City of Tshwane (CoT) has noted periodic water quality failures of the following parameters from Temba WTP.
  - ❑ Ammonia
  - ❑ Phosphates
  - ❑ Nitrites-Nitrate
  - ❑ Color, Taste and Odor
- Ammonia, nitrate, nitrite and phosphate failures are as a result of the poor raw water quality at the Leeuwkraal Dam resultant from the effluent discharges from Rooiwal WWTW

Previous interventions at Temba WTP

- Continuous maintenance work has been done at the plant over time to contain the situation and keep the plant operational (Refer to Annexure B: 2018/19 Financial Year Maintenance Plan)
- Temporary dosing of chemicals such as:
  - ❑ chlorine dioxide for colour removal and disinfection
  - ❑ potassium permanganate for colour removal and
  - ❑ powdered activated carbon for taste, odour and colour removal

Previous interventions at Temba WTP : Human Resources

- Human Resources
  - Process controllers
    - 1 Senior process controller, 8 process controllers , and 5 assistant process controller
  - Maintenance team
    - 2 electricians ,2 mechanical technician and 4 general workers
    - Maintenance contractors (see attached)
  - Security
    - Security personnel has been increased from 2 to 4. The rest of the securities are from the upgrade contractors .
    - A security technologies tender also being advertised to supplement static guards

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SHORT TO LONG TERM ACTION PLAN

Overview of Rooiwal action plan Short term Interventions

Intervention	Impact	Start/End Date	Cost
Refurbishment of the Sludge Belt Presses	Reduces sludge volume	Sept 2019	R500 000
Refurbishment of the Return Activated Sludge Screw Pumps	Prevents failures in the Secondary Settling Tanks	October 2019	R240 000
Dredging of Maturation Ponds	Creates buffering capacity during plant failures; creates tertiary treatment capacity before final disposal into the river	Sept 2018 - March 2020	R10m
Implementation of the Maintenance Plan	Continuous plant operation with minimal interruptions	On-going throughout the financial year	R44m
Phase 1 of upgrading of the plant	Additional 40 ML/d treatment capacity	Oct 2019 – Oct 2022	R290m

Rooiwal Wastewater Treatment Works: details of short-term interventions

- **Refurbishment of the Filter Belt Presses (BFPs)**
  - **Purpose:** The BFPs dewaters the sludge generated from the plant, resulting in volume reduction from 4% to 18% solids for ease of handling. The sludge can then be beneficiated to an agricultural product.
  - The refurbishment work aims to restore the full functionality of the BFPs. The work involves restoration of the mechanical components, dosing system, chemical make-up, electricals and controls.
  - **Impact:** Availability of belt filter presses will ensure that all sludge produced on the works is dewatered and dried on concrete slabs. This will discontinue flood irrigation of sludge on dedicated lands, curbing groundwater pollution and possibilities of sludge breakage from barrier walls into neighboring properties.
  - **Timeframes:** The top dewatering plant building houses 4 BFPs. It is planned that 2 of the 4 BFPs will be completed and operational by end of September 2019; the rest before end of December 2019.

Rooiwal Wastewater Treatment Works: details of short-term interventions

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Rooiwal Wastewater Treatment Works: details of short-term interventions

- **Refurbishment of the Return Activated Sludge (RAS) Screw Pumps**
  - **Purpose:** The RAS pumps convey thickened activated sludge from the secondary settling tanks to the bioreactor to serve as inoculum for settled sewage entering the bioreactor. The pumps break frequently due to the failure of the bottom bearings. The current refurbishment involves the conversion to a grease bearing as is applied on other works.
  - **Impact:** Continuous pumping of RAS provides inoculum to the bioreactor at required rates and prevents flux failure in the secondary settling tanks.
  - **Timeframes:** The 5 of the 6 RAS pumps have been repaired. The last pumps will be completed before the end September 2019.

Rooiwal Wastewater Treatment Works: details of current interventions

- **Dredging of the Maturation Ponds**
  - **Purpose:** The Rooiwal WWTW are designed with 13 hectares of maturation ponds. They serve as a buffer between the works and serves a settling function during process failures. The ponds are full of sludge due to an overload that spanned more than 10 years, depleting the buffering capacity and deteriorating the quality of the effluent flowing into the Apies River. The ponds are currently by-passed and all flow is diverted to the last portion of the pond.
  - **Impact:** Re-establishment of the buffering capacity and effluent polishing.
  - **Timeframes:** The dredging program has commenced and will be completed by end of March 2020.

Rooiwal Wastewater Treatment Works: details of short-term interventions

Maintenance Plans

- The City has developed a maintenance plan that is used for operation and maintenance of the plant
- The maintenance plan is updated weekly in terms of the maintenance / repair works done and new repair work required
- Tenders required for maintenance have been identified and some are already in place; only a few tenders are currently outstanding
- R44m is required to implement the maintenance plan
- Only R22m has been allocated for maintenance in the 2019/20 financial year
- Additional funding is required for implementation of the Rooiwal WWTW maintenance plan

Rooiwal Wastewater Treatment Works Upgrade (Phase 1): details of short-term interventions

- A contractor has been appointed for the project and is expected to start construction on 01 October 2019 at a cost of R290 million for a 36 months period
- The scope of work involves:
  - Upgrading of the Inlet works at the Rooiwal North Works
  - Construction of 1 primary settling tank at the Rooiwal North Works
  - Upgrading of the biological reactors mixing and aeration system
  - Upgrading of the anaerobic digester on the Rooiwal East Works & West
  - Upgrading of the top sludge dewatering facility
  - Upgrading of the Rooiwal North flow balancing tank control systems
  - The connection of a concrete 525 mm diameter pipe between Rooiwal West Works and Rooiwal East Works.
  - Construction of a sludge pipeline from the Rooiwal North primary settling tanks to the Rooiwal East Works raw sludge pump station.
  - Installation of additional forced ventilation in the blower building

Rooiwal Wastewater Treatment Works: Upgrade (Phase 1) details of short-term interventions

The impact of the Rooiwal Phase 1 Upgrade project is as follows:

- The construction of additional Primary Settling Tanks will decrease the organic loading on the biological reactors (Increase in capacity).
- The installation of new diffusers will increase the efficiency of oxygen transfer and improve the organic and nitrogen removal (addresses the issue of nitrates and nitrites).
- Additional mixers in the biological reactors will improve the mixing to aid nutrient removal.
- The digestion of WAS and primary sludge in an efficient operating system will address the fly breading and odors which occur from the sludge.

Rooiwal Wastewater Treatment Works: Upgrade (Phase 1) details of short-term interventions

- The new refurbished sludge treatment facility for primary sludge and WAS and a reduced loading on the biological reactors will reduce the incidents of sludge carry-over of the secondary settling tanks.
- New de-gritting equipment is needed to reliably remove the high levels of grit and sand entering the Rooiwal WWTW. The sand and grit causes operational and maintenance challenges and failures in the primary settling tanks, sludge dewatering and other parts of the plants

Rooiwal Wastewater Treatment Works Extension (Phase 2): long term interventions

- Implement Phase 2 of the Rooiwal WWTW project which involves creation of 80 Ml/d of additional treatment capacity with associated sludge processing.
- The project is estimated at least R2 billion.
- Rehabilitate the Apies River to improve the river and raw water quality. The estimated cost and rehabilitation period will be known once the assessment and investigations are done (Part of the phase 1 project).
- Dredge the Leeuwkraal Dam to remove the sludge that has settled over a period of time (at least 10 years), the estimated cost is R120m over a 3 year period.

Rooiwal Wastewater Treatment Works Extension (Phase 2): long term interventions

- Due to the high cost of the project and unavailability of funding, the city has decided to implement the project as a Public Private Partnership.
- The report to embark on a PPP has been approved by the Mayoral Committee.
- The specifications for the appointment of a transactional adviser are currently being finalized.
- Appointment of a transactional advisor is planned to be finalised by end of December 2019.
- Experience has shown that PPP agreements take long to conclude, often in excess of 3 years

Rooiwal Wastewater Treatment Works: Required Financial Resources

- Capital Expenditure Programme:
  - Phase 1 – Upgrade
    - Cost: R290m
    - Budget breakdown: R75 m for 2019/20; R120 for 2020/21
    - Funding source: own source and USDG
  - Phase 2 – Expansion
    - An estimated R2 billion is required for Phase 2. The city cannot afford the project and has opted to expand the works through a public private partnership (PPP). It is a lengthy process and approval from all stakeholders must obtained.
    - R20m for implementing the maintenance plan

Apies River and Leeukraal Dam: Interventions

Rehabilitation Study (during upgrade of Rooiwal Wastewater Treatment Plant)

- A rehabilitation study of the impacted land and water resources will be conducted during the implementation of the Refurbishment/Upgrade of the Rooiwal WWTW (Phase 1).
- The actual rehabilitation would be futile until the rehabilitation of the WWTW and the discharge of solids has been addressed.
- Environmental authorization will have to be obtained before work can be commence.

Apies River and Leeuwkraal Dam: Interventions

Rehabilitation Study (during upgrade of Rooiwal Wastewater Treatment Plant)

- A consultant will be appointed for the feasibility study for the rehabilitation of the Apies River which shall include the following scope:
  - Investigation of the extent of the impact of the Rooiwal WWTW on the affected land and water resources
  - To draw up a rehabilitation plan
  - Undertake a public participation process as part of the environmental impact assessment to obtain comment and input from all stake holders on the rehabilitation plan.
  - Implement the rehabilitation plan

Overview of Temba WTP Action Plan: Short Term Interventions

Intervention	Impact	Start/End Date	Cost
Cleaning of Reservoirs	Improve the water quality to the distribution water networks	26 – 28 Aug 2019	R150 000
Flushing & disinfection of the water networks	Improve water quality in the distribution network	23 Sept – 4 Oct 2019	R250 000
Supply water through the Sosha DD pipeline	Supply more areas with pipes water	Ongoing from Dec 2018	-
Water supply from Magalies Water	Supply more areas with pipes water	Ongoing from Sept 2018	R10m
Deployment of Water Tankers (30 Tankers)	Provide the community with potable water	Ongoing from 1 Oct 2018	R2.5m/month
Implementation of the Maintenance Plan	Continuous plant operation with minimal interruptions	On-going throughout FY	R12m
Completion of Temba Plant Upgrade Project	Create additional 60 ML/d capacity & provide quality water	End Oct 2019	R20m

Temba Water Treatment Plant and Supply: details of short-term interventions

Alternative Water Supply:

- The eastern part of Hammanskraal is supplied from the Magalies Water (Klipdrift WTP) supply system through the Babelegi Reservoir.
  - The current supplied volume is 22Ml/d as per agreement with Magalies Water.
  - The areas supplied include, Marokolong, Babelegi Industries, Ramotse and the Moretele area.
- The western part is supplied from Rand Water (Soshanguve DD pipeline) supply system.
  - The DD pipeline can only supply Refentse, New Eersterust and Extensions.

Temba Water Treatment Plant and Supply: details of short-term interventions

Water Tankers

- The central parts of Hammanskraal (Sekampaneng, Suurman, Manyeleti, Unit D and Oustad) are being serviced by water tankers for potable use.
- The water tankers source water from Magalies Water (Babelegi reservoir) and Rand Water (Soshanguve DD pipeline).

Temba Water Treatment Plant and Supply: details of short-term interventions

Cleaning of Reservoirs and water networks

- Reservoirs were cleaned from 26 to 28 August 2019.
- Reservoirs cleaned are Hammanskraal West, Rens Town, Sekampaneng and Babelegi.
- The purpose is to maintain and improve the water quality supplied to the consumers.
- Water quality sampling has been conducted and results are awaited

Flushing of the Distribution Network

- The flushing of the distribution network is planned to commence on 23 September to 04 October 2019.

Temba water Treatment plant: Required Financial Resources

- Financial Requirements:
  - R20 m for completion of the upgrade
  - R10m for deployment of water tankers (The department did not receive an allocation in the current Financial Year).
  - R15m top-up to implement the maintenance plan at Temba Water Treatment Plant (Only R1.4m is available for the 2019/20 FY)

Risks & Mitigations

Risks	Mitigations
Governance	Improve oversight on projects & contracts
Operation & Maintenance	• Prioritise appointment of critical staff • Effective monitoring of contractors
Budget	• Improve financial management controls • Adequate allocation of budget for infrastructure
Stakeholder relationship	Development of stakeholder management plan and implementation thereof
Vandalism	• Request declaration of WTWW as National key points • Performance of security assessment and development of security strategy
Unrests	Implementation of stakeholder management plan (Educational & awareness campaigns)

Conclusion

- The combined activities at the Rooiwal WWTW and Temba WTW will enable sustained provision of drinking water that meets the SANS 241 standard to the community in Hammanskraal.
  - Babalegi industrial area: tap water is drinkable as supplied by Magalies Water
  - New Eersterust & Refentse: tap water is drinkable as supplied by Rand Water
  - Temba area: water supplied through tankers
- Maintenance activities will be monitored to ensure equipment availability and reliability.
- Capital works programmes at Rooiwal WWTW and Temba WTP will, where possible, be accelerated to realize early completion.
- The Phase 1 project programme will, where possible, be reprioritised to realize earlier improvement in the quality of the wastewater effluent from Rooiwal WWTW.

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