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SOUTH AFRICAN
INSTITUTE OF
CIVIL ENGINEERS

2023

**10th Southern African
Water Loss Summit**

Supported by:
The International Water Association
Water Loss Specialist Group

IWA
the international
water association

**WATER LOSS
SPECIALIST GROUP**

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SOUTH AFRICAN
INSTITUTE OF
CIVIL ENGINEERS

**15 & 16 August 2023
DBSA, Midrand**

WATER LOSS CASE STUDIES

Tshilidzi Godzwana

Participating and supporting organisations:

WRP
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RAND WATER

DBSA
DISTRIBUTION
BUREAU OF SOUTH AFRICAN
STATISTICS

**WATER
RESEARCH
COMMISSION**

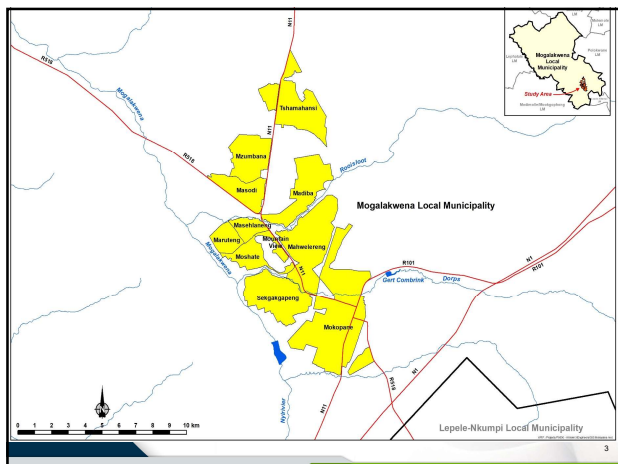
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MOGALAKWENA CASE STUDY

- The total water demand for Mokopane town and surrounding peri – urban areas is in the order of 23 Mℓ/d. Current supply from Doorndraai Dam is 8.0 Mℓ/d and various groundwater supplies are estimated to augment and contribute a further 7.8 Mℓ/d. Supply from Doorndraai Dam has recently dropped to 6-7 Mℓ/d due to the dam sitting at 8% storage.
- The shortfall of estimated 8.2 – 9.2 Mℓ/d has massive implications with respect to potable water supply to Mokopane and surrounding communities and has negative connotations towards the business community in Mokopane.
- *Investigation of Short-Term Water Supply options for Mokopane – January 2021*

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WATER SUPPLY STATUS QUO

- **Existing Surfacewater Resources and Assessment**
- **Existing Groundwater Resources and Assessment**
 - 10 Wellfields
- **New Groundwater Resources and Assessment**
 - 4 Wellfields
- **Water Conservation and Demand Management**

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STUDY RECOMMENDATIONS

1. Existing groundwater resources.
 - The Rooisloot, Planknek and Weenen wellfields.
 - The Mahewelereng and Sekgakgapeng boreholes.
2. New groundwater resources
 - The Pruizen Wellfield.
 - The Gillimberg Witrivier Wellfield.
3. Surface water resources.
 - Refurbish canal: Pipeline in canal.
 - Boreholes for four downstream users.
4. Water conservation and demand management.
 - Short-term intervention options.

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CONCLUSIONS - WCWDM

- The system operations are characterised by erratic and intermittent supply, visible leaks, households leaks, poor metering and control.
- There is scope for pressure reduction which will reduce the household and physical leakages, control the demand and enable the reservoirs to refill without implementing rationing.
- There is scope for reducing the demand in Mokopane and Mahwelereng. Reducing the average consumption in these areas to 180 $\ell/c/d$ could save 0.8 to 1.7 million m^3 /annum (2.2 to 4.7 $M\ell/d$) or 15% to 30% of the current consumption.
- The current intermittent supply has very little effect and the demand in the Mokopane and Mahwelereng are in line with similar systems.

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WHY WCWDM OPTION?

The main objective of the short-term interventions is to stabilise the system and move away from intermittent supply which has very little impact. Once the system is stable and the actual consumption is confirmed, interventions such as metering and billing audits and water tariff reviews should be undertaken. It will also form the basis for effective metering, billing and cost recovery.

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WHERE DO WE START?



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STRATEGY DEVELOPMENT

- This is one of the Anglo-American Platinum initiatives that aims at highlighting the current water demand management and water conservation status within the municipality while also providing strategy and interventions that may be applied to reduce water loss and ensure effective and reliable water supply.
- The Municipality can also use this report to source funding from DWS and other institutions.

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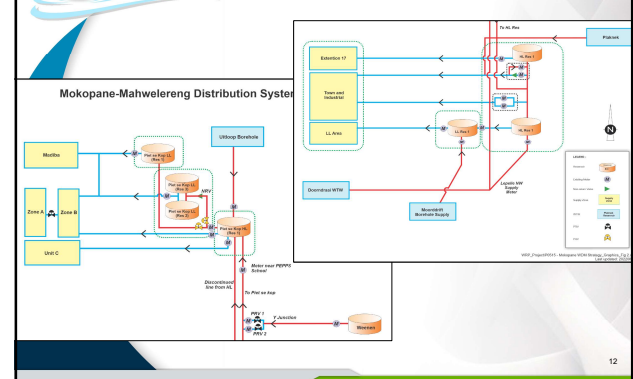
STATUS QUO ASSESSMENT – WATER RESOURCES

Demand Centre	WTW	Design Capacity $M\ell/d$	Operating Capacity %	Measured SV $M\ell/d$
Mokopane	Doordraai Dam	12	79	9.60
	Moordraai Borehole	1.5	61	0.92
	Planknek	3	83.3	2.5
Mahwelereng	Weenen	4	27.5	1.1
	Uitloop Borehole	0.5	94	0.47
Total		21	66	14.59

Combined system input volume averages 14.59 $M\ell/d$ (5.33 million m^3/a)

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BULK SUPPLY SYSTEM SCHEMATIC



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BULK METERING					
Cluster	Supply	Make	Model	Status	Comments
Mokopane	Extension 17	Precision Meter	LOGFX	Not Working	Meter dial leaking
	Town (CBO)	Precision Meter	LOGFX	Not Working	
	Industrial	Precision Meter	LOGFX	Not Working	
	LI Inlet	Precision Meter	LOGFX	Not Working	Meter dial is turning in an opposite direction
	LI to Town	Sensus	WP	Not Working	
Piet se Kop	LI Res Inlet	Precision Meter	LOGFX	Working	
	Zone A & B	Precision Meter	LOGFX	Not Working	Meter dial leaking
	Unit C	Precision Meter	LOGFX	Not Working	
	LI Res 1 and Res 2	Sensus	WPD	Working	

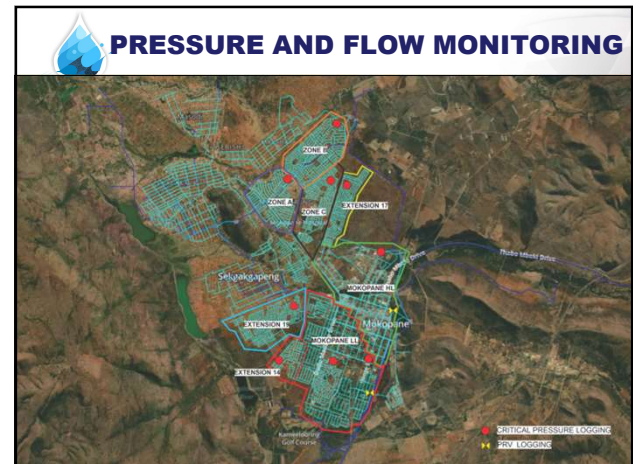
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WATER NETWORK LEAKAGE	
- Mokopane HL (Extension 17 meter) – leak has been running for years at very high rate. Meter dial is leaking and water constantly run as soon as the system is pressurized. - Piet se Kop Reservoir Air valve – Leak has been running for many years without being fixed. An air valve was removed, and upstream valve is not sealing properly. Water on this leak runs nonstop. - Piet se Kop HL Reservoir (outlet meter) – meter dial leak caused by the removal of the leaking Air valve upstream. Water constantly runs as soon as the system is pressurized. - Extension 19 PRV – The leak is massive to an extent that the supply area downstream hardly receives water, pressures in this area are always very low. The leak is inside a PRV chamber and the exact leaking point could not be confirmed	

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WATER NETWORK LEAKAGE	
Main contributing factors to leakages in Mokopane and Mahwereng include: - Inefficient operational measures that include supplying water intermittently; - Lack of proactive measures to maintain existing water infrastructure within the network; - PRVs are not functional which results in high pressures downstream; - The aging A/C pipes; - Poor workmanship on some consumer domestic meters connection points.	
	

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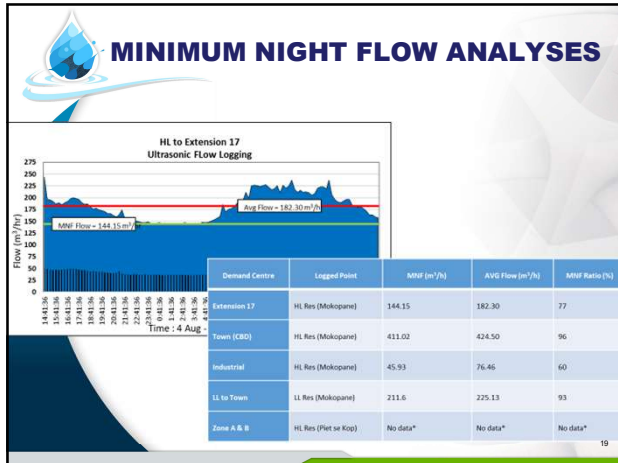
PRESSURE LOGGING

Demand Centre	Demand	Location	Date	Logged Pressure (m)		
				Maximum	Average	Minimum
Mahwereng	Zone A	-24.140730, 28.98666	05/08/2022 – 05/09/2022	21m	2.0m	0m
	Zone B	-24.125857, 29.00175	05/08/2022 – 05/09/2022	23m	1.3	0m
	Unit C	-24.140945, 28.99905	05/08/2022 – 05/09/2022	63m	3.2m	0m
Mokopane	Extension 17	Extension 17 – CP	08/01/2022 – 05/09/2022	75m	31.8m	0m
	HL Res	Sensus Street – CP	08/01/2022 – 05/09/2022	30m	16.7m	0m
	LI Res	Hooger Street – CP	08/01/2022 – 05/09/2022	44m	19.2m	0m
	LI Res	Steven Lekhalala St (Stand 12178646) CP	05/08/2022 – 05/09/2022	64m	42m	0m
	Extension 14	Cor Bussard and Chart St – LP	09/01/2022 – 05/09/2022	66m	31.5m	0m
	Extension 19	Extension 19 – CP	09/01/2022 – 05/09/2022	6m	0.2m	0m
	LI Res	PRV 1 – Cor Middelburg/Forster	08/01/2022 – 05/09/2022	86m	35.7m	0m
	HL Res	PRV 2 – Cor De Klerk/Hooger	04/08/2022 – 05/09/2022	45m	26m	0m

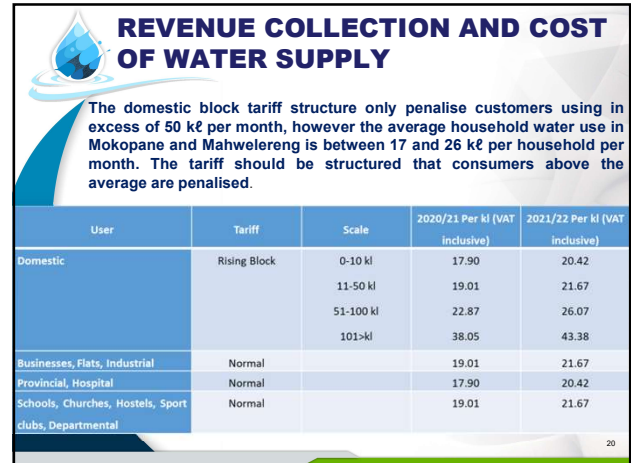
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FLOW LOGGING					
Demand Centre	Logging Type	Logged Point	MHD (m³/h)	AVG Flow (m³/h)	Logging Period
Extension 17	Ultrasonic	HL Res (Mokopane)	144.11	182.30	04-Aug – 05-Aug
Town (CBO)	Ultrasonic	HL Res (Mokopane)	411.02	424.50	04-Aug – 05-Aug
Industrial	Ultrasonic	HL Res (Mokopane)	56	76.46	04-Aug – 05-Aug
LI to Town	Ultrasonic	LI Res (Mokopane)	214.33	225.13	04-Aug – 05-Aug
Zone A & B	Ultrasonic	HL Res (Piet se Kop)	No data*	No data*	03-Aug – 05-Aug

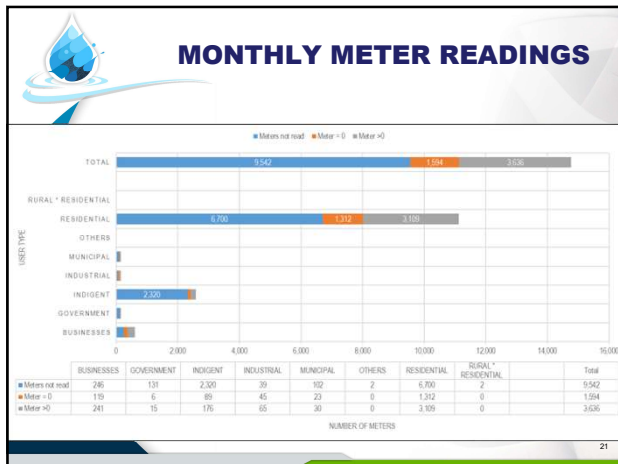
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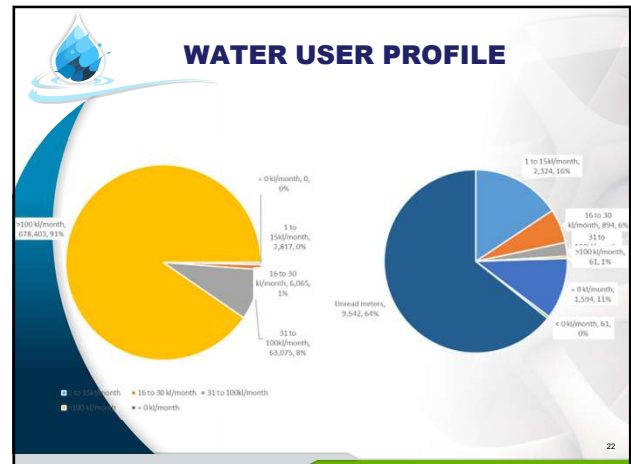
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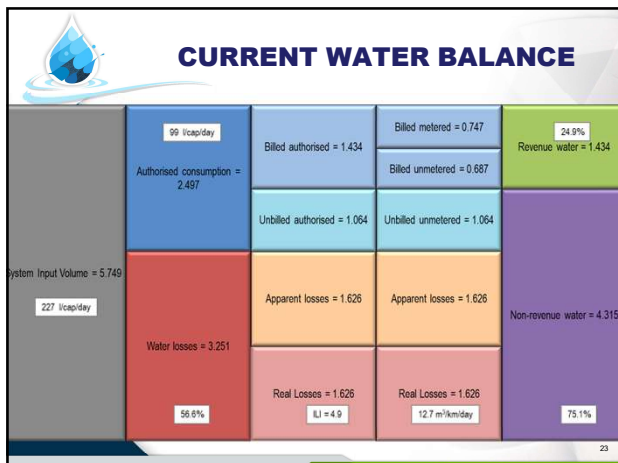
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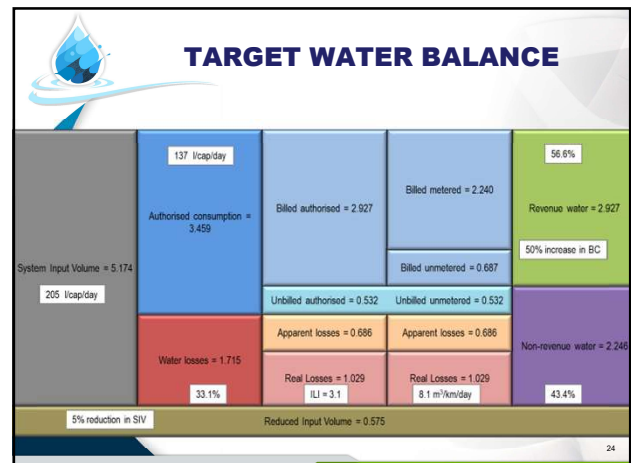
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PROJECT COST							
	Type	Year 1	Year 2	Year 3	Year 4	Year 5	Total
TOTAL COSTS							
Institutional	CAPEX	R 0	R 200 000	R 0	R 0	R 0	R 200 000
	OPEX	R 200 000	R 200 000	R 200 000	R 200 000	R 200 000	R 1 000 000
	TOTAL	R 200 000	R 400 000	R 200 000	R 200 000	R 200 000	R 1 200 000
Financial	CAPEX	R 100 000	R 300 000	R 0	R 0	R 0	R 400 000
	OPEX	R 1 477 200	R 1 477 200	R 1 477 200	R 1 477 200	R 1 477 200	R 7 386 000
	TOTAL	R 1 577 200	R 1 777 200	R 1 477 200	R 1 477 200	R 1 477 200	R 7 786 000
Social	CAPEX	R 2 587 720	R 2 587 720	R 147 720	R 147 720	R 147 720	R 5 618 600
	OPEX	R 1 316 600	R 1 316 600	R 1 316 600	R 1 316 600	R 1 316 600	R 6 583 000
	TOTAL	R 3 904 320	R 3 904 320	R 1 464 320	R 1 464 320	R 1 464 320	R 12 201 600
Technical	CAPEX	R 12 392 400	R 12 404 900	R 8 429 900	R 8 317 400	R 8 317 400	R 49 862 000
	OPEX	R 2 535 500	R 2 535 500	R 2 535 500	R 2 535 500	R 2 535 500	R 12 677 500
	TOTAL	R 14 927 900	R 14 940 400	R 10 965 400	R 10 852 900	R 10 852 900	R 62 539 500
Total	CAPEX	R 15 080 120	R 15 492 620	R 8 577 620	R 8 465 120	R 8 465 120	R 56 080 600
	OPEX	R 5 529 300	R 5 529 300	R 5 529 300	R 5 529 300	R 5 529 300	R 27 646 500
	TOTAL	R 20 609 420	R 21 021 920	R 14 106 920	R 13 994 420	R 13 994 420	R 83 727 100

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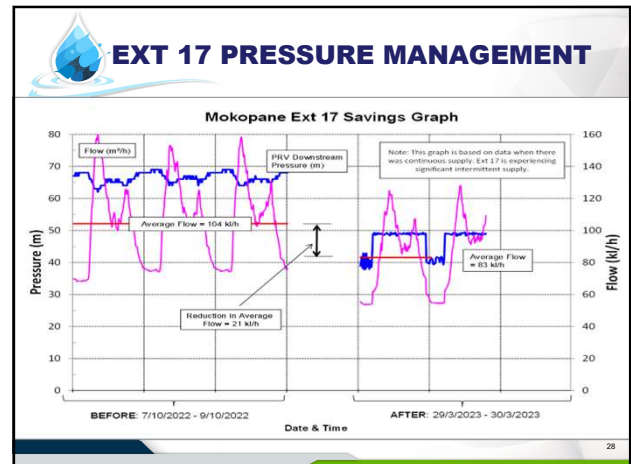
PRIORITY INTERVENTIONS

1. METER INSERTS REPLACEMENT
2. NEW METER INSTALLATIONS
3. CONSUMER METER IMPROVEMENTS
4. REFURBISHMENT AND SERVICING OF EXISTING CONTROL VALVES
5. BULK WATER SUPPLY REMOTE MONITORING
6. NETWORK LEAKAGE DETECTION AND REPAIR

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