Vaal River System demand forecast and Yield Analysis

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Microsoft Teams

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PURPOSE AND OUTLINE

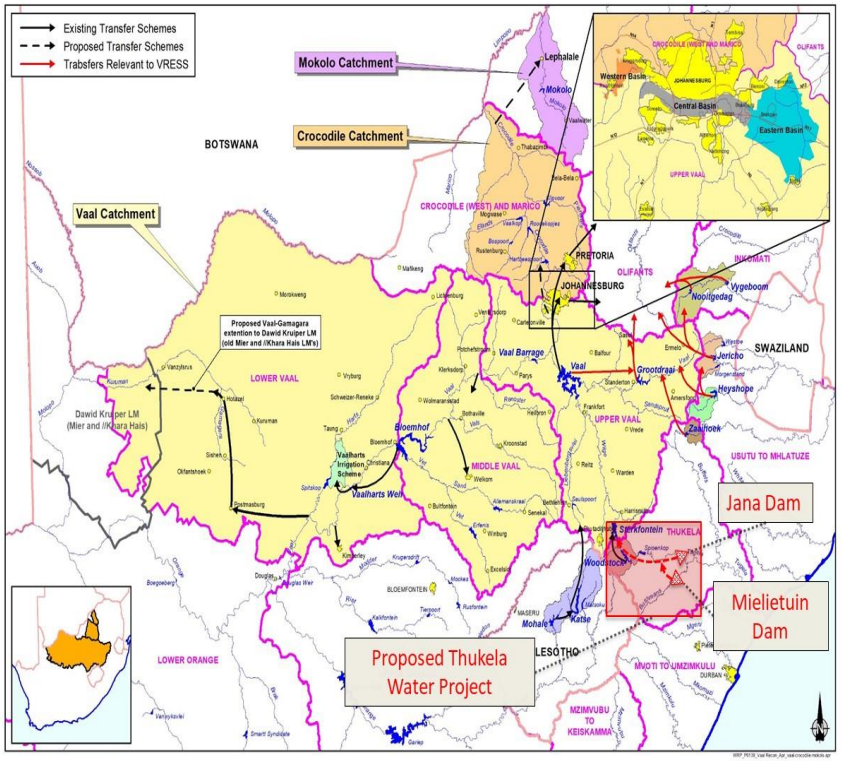
- **PURPOSE**
  - Provide inputs on actual water use, water requirement projections, yields and water resource development plans for the IVRS
- **OUTLINE**
  - Background/Description of the IVRS
  - Linkages of IVRS with other systems

INTEGRATED VAAL RIVER SYSTEM (IVRS)

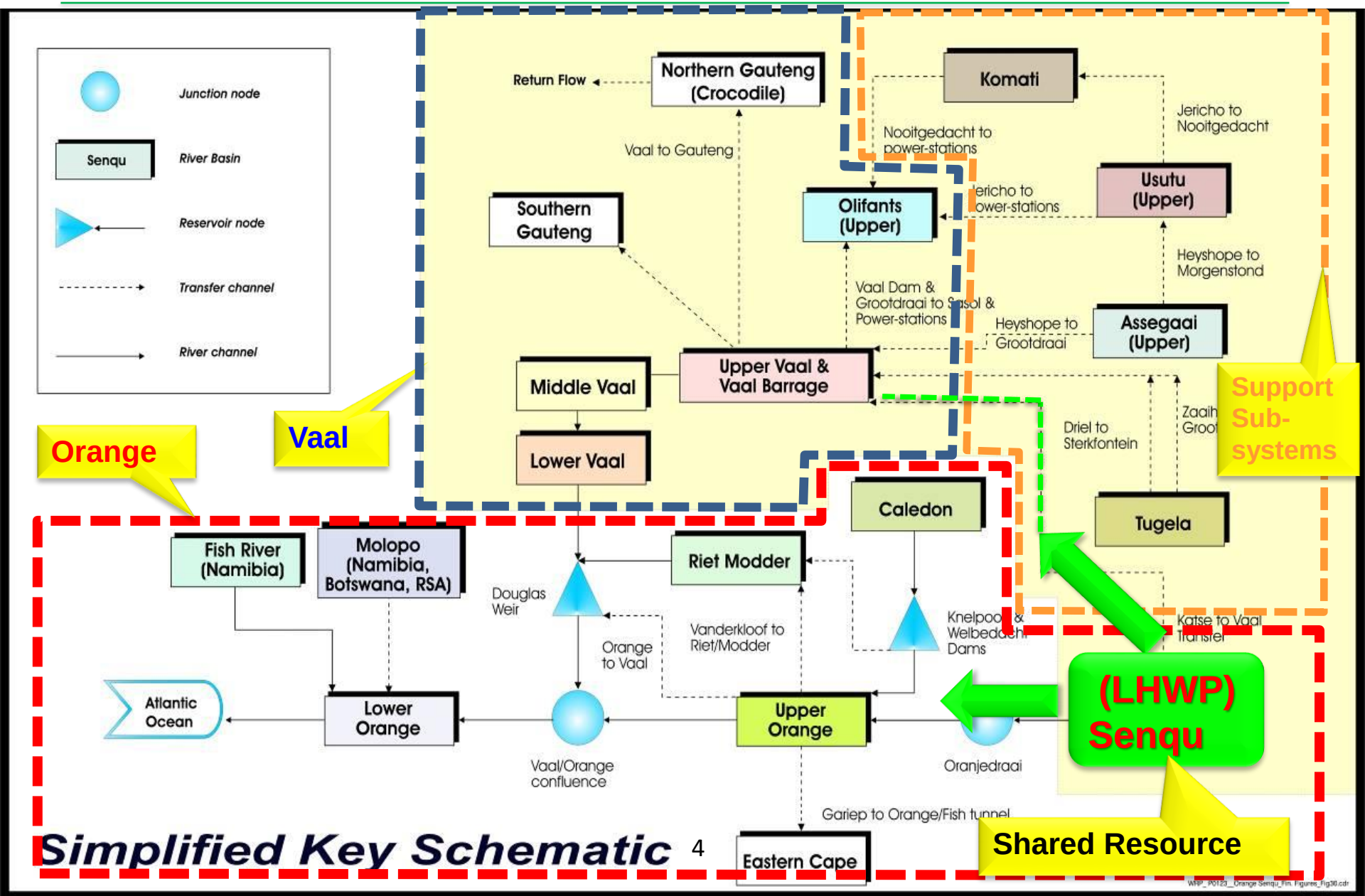
OVERVIEW

- The IVRS is a large, complex water system that draws water from **five** different river basins across **six** provinces.
- The IVRS comprises water resources of the Vaal River and other **linked** systems (Tugela, Orange (Senqu-Lesotho), Komati, Usuthu, Crocodile West, Olifants, Mokolo)
- Upper Vaal is characterised by sprawling **urban and industrial** areas, and extensive coal and gold **mining** activities and **power generation**;
- Integrated Vaal River System, supports almost **50%** of South Africa's GDP
- These activities generate substantial **return flows** that affect downstream water quality;
- **The outlook** is that the water requirements exceed available water resources

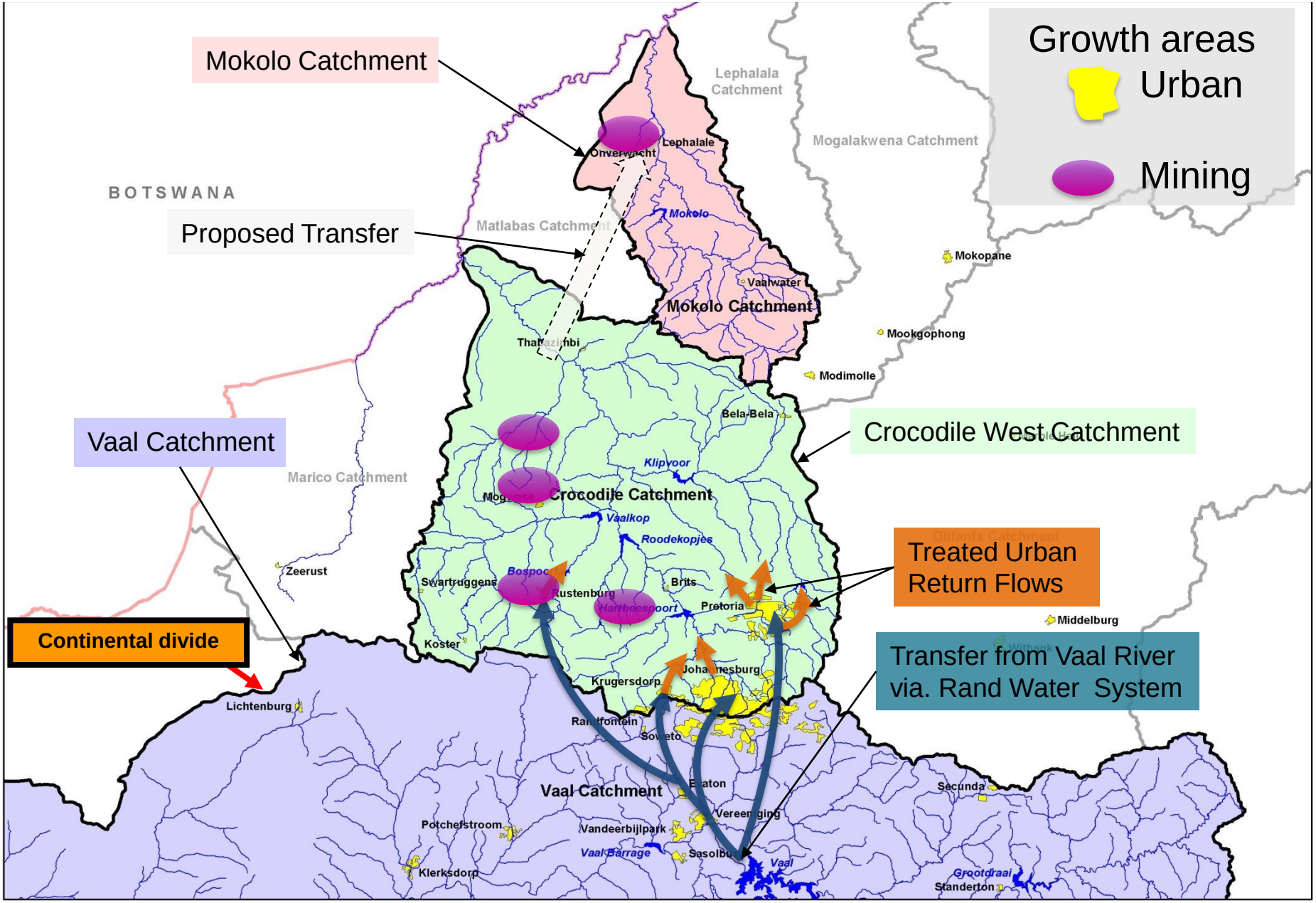
WATER SUPPLY AREA



VAAL LINKAGES WITH OTHER SYSTEMS



LINK WITH CROCODILE & MOKOLO

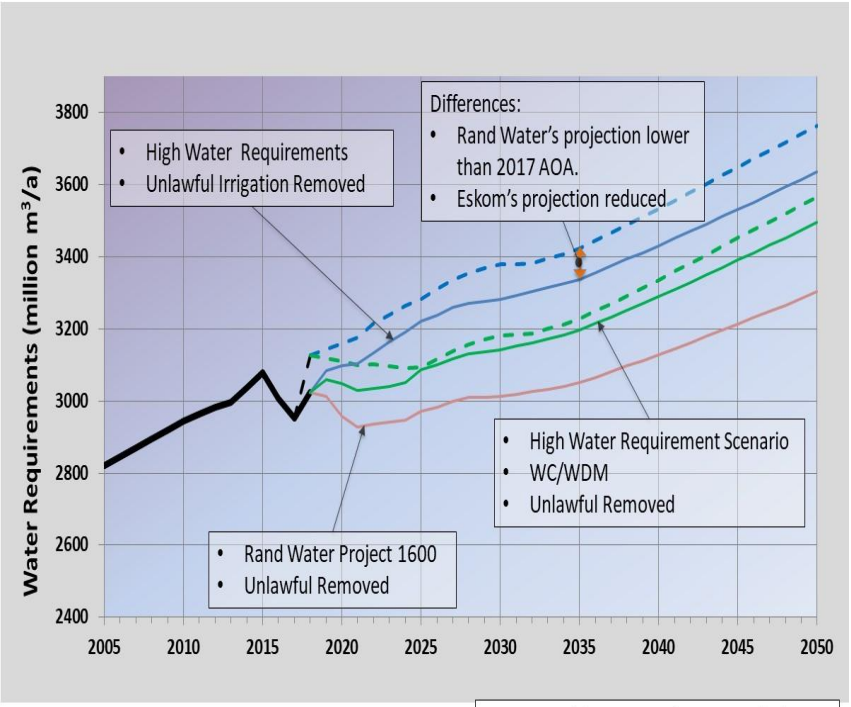


INTEGRATED VAAL RIVER SYSTEM WATER DEMAND CHARACTERISTICS

DRIVERS OF WATER DEMAND

- **Growth in Population – (3.2 billion m³/annum)**
  - The population is expected to grow from **12.5** million in 2016 to under **16** million by 2040
  - Water demand may grow from **2.1 billion m³/annum** to **3.2 billion m³/annum**
- **Power generation – (127 million m³/annum)**
  - ESKOM Coal generation fleet decommissioning will see water demand fall from **338 million** to about **127 million m³/annum** by 2050
- **Change in Industry – (125 million m³/annum)**
  - Change in industrial use may cause a decline in industrial use relative to domestic
- **Irrigation (1.1 Billion m³/annum)**
  - Projected to remain static or reduce over time
- **Mining (estimated within industry)**
  - Gold and coal mines will reduce in number. Reworking of tailings continues. Water demand will decline
- **River losses/ environmental flows – (300 million m³/annum)**

WATER DEMAND PROJECTIONS



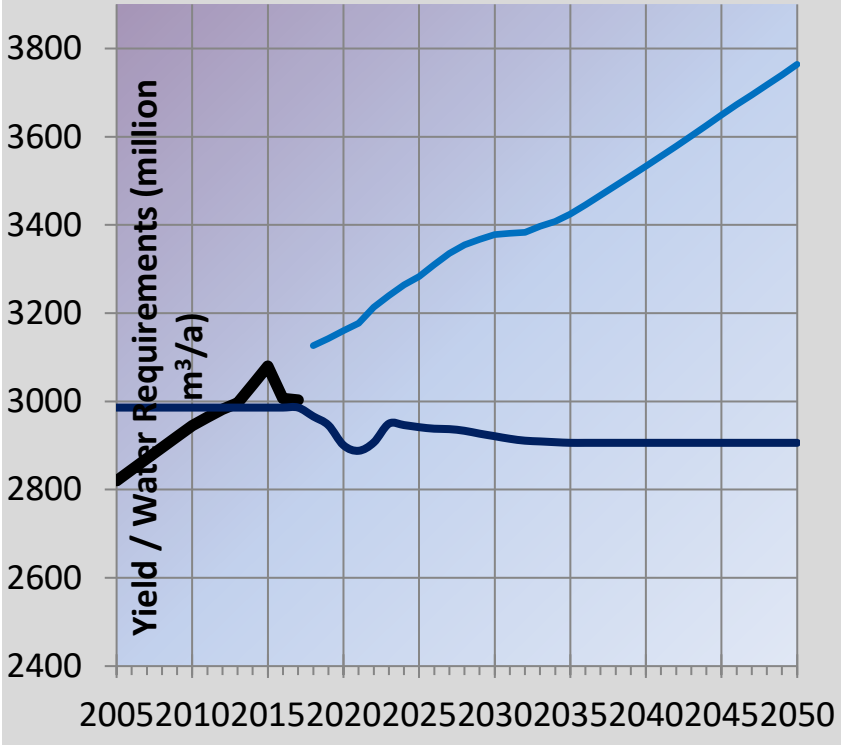
Dotted Lines = March 2019 Analysis

INTEGRATED VAAL RIVER SYSTEM WATER SITUATION

WATER SITUATION DESCRIPTION

- Rainfall decreases from Upper Vaal- (800mm), Middle Vaal- (500 mm), and Lower Vaal (100 mm);
- 14 major Dams in the IVRS system with gross storage of **11.2 Billion** m^3;
- Some smaller dams contribute additional storage to 11.5 Billion m^3;
- System yield is about **3 billion** m^3;
- The yield must increase to **3.7 billion** m^3
- Water availability is affected by water quality due to acid mine drainage;
- **The long-term outlook is that water requirements are out-stripping the available water resources**

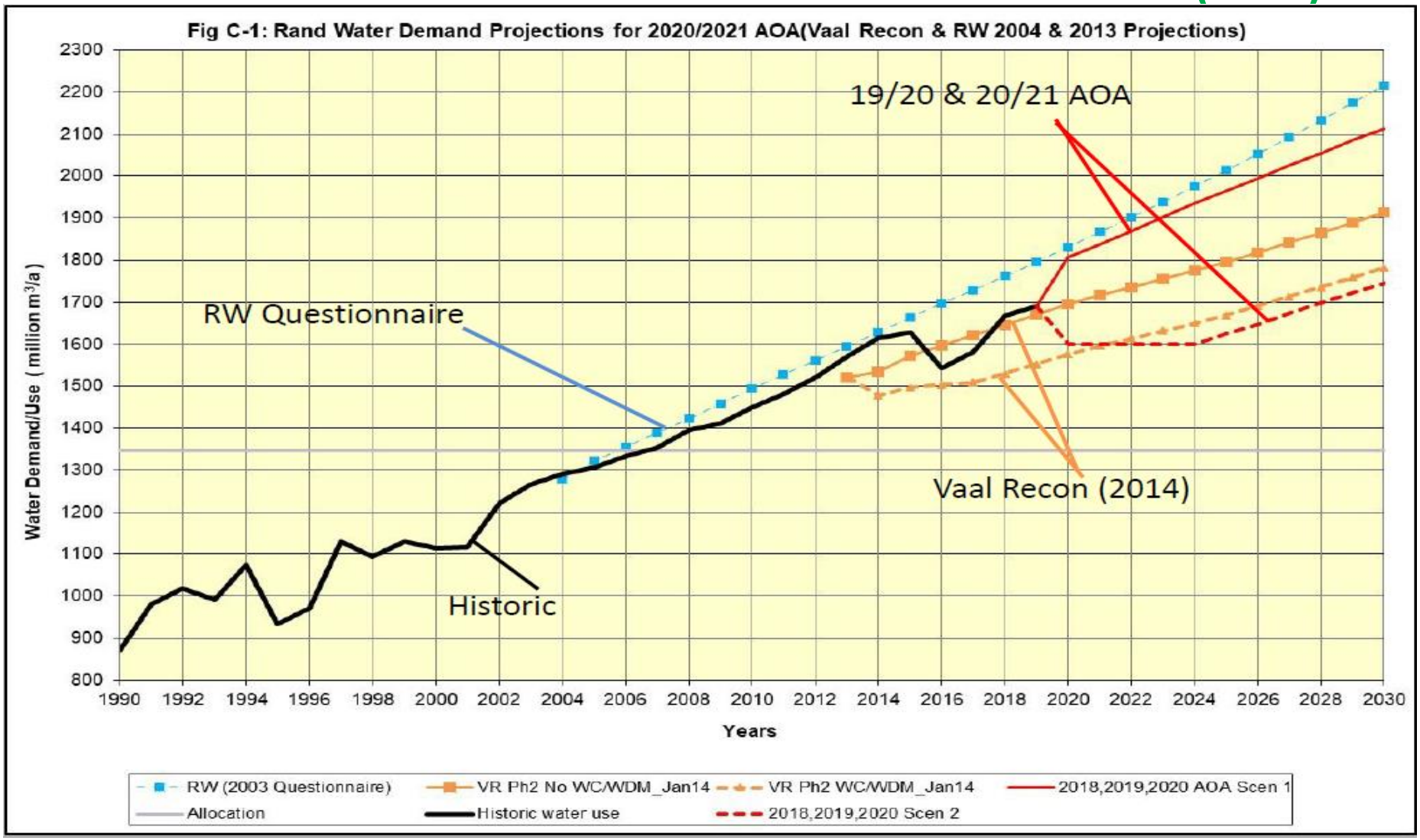
WATER AVAILABILITY



INTERVENTIONS

- Optimal operation of the existing Thukela-Vaal transfer scheme.
- Timeously implementation of water use restrictions during drought.
- WC/WDM to achieve target savings.
- Remove unlawful water use (irrigation).
- Implement the LHWP Phase 2.
- Water re-use project (Tshwane or other).
- Mine water effluent treatment (recalibrate model).
- Implement yield replacement scheme in Orange System.
- Implement Thukela Water Project (TWP) entailing additional storage dams (Millietuin & Jana Dams) and associated conveyance infrastructure.

RAND WATER SUPPLY AREA SCENARIOS (2015)

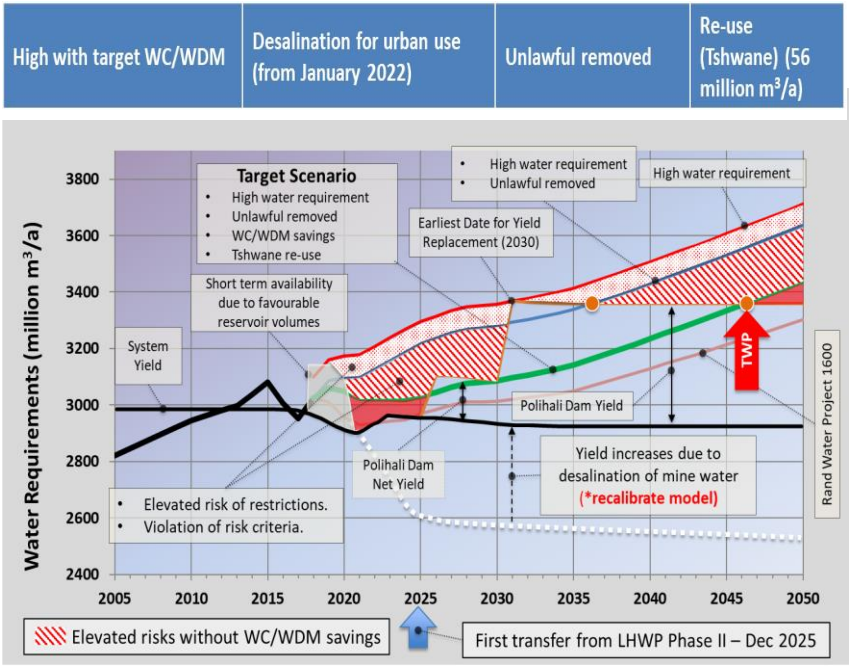


INTEGRATED VAAL RIVER SYSTEM WATER BALANCE

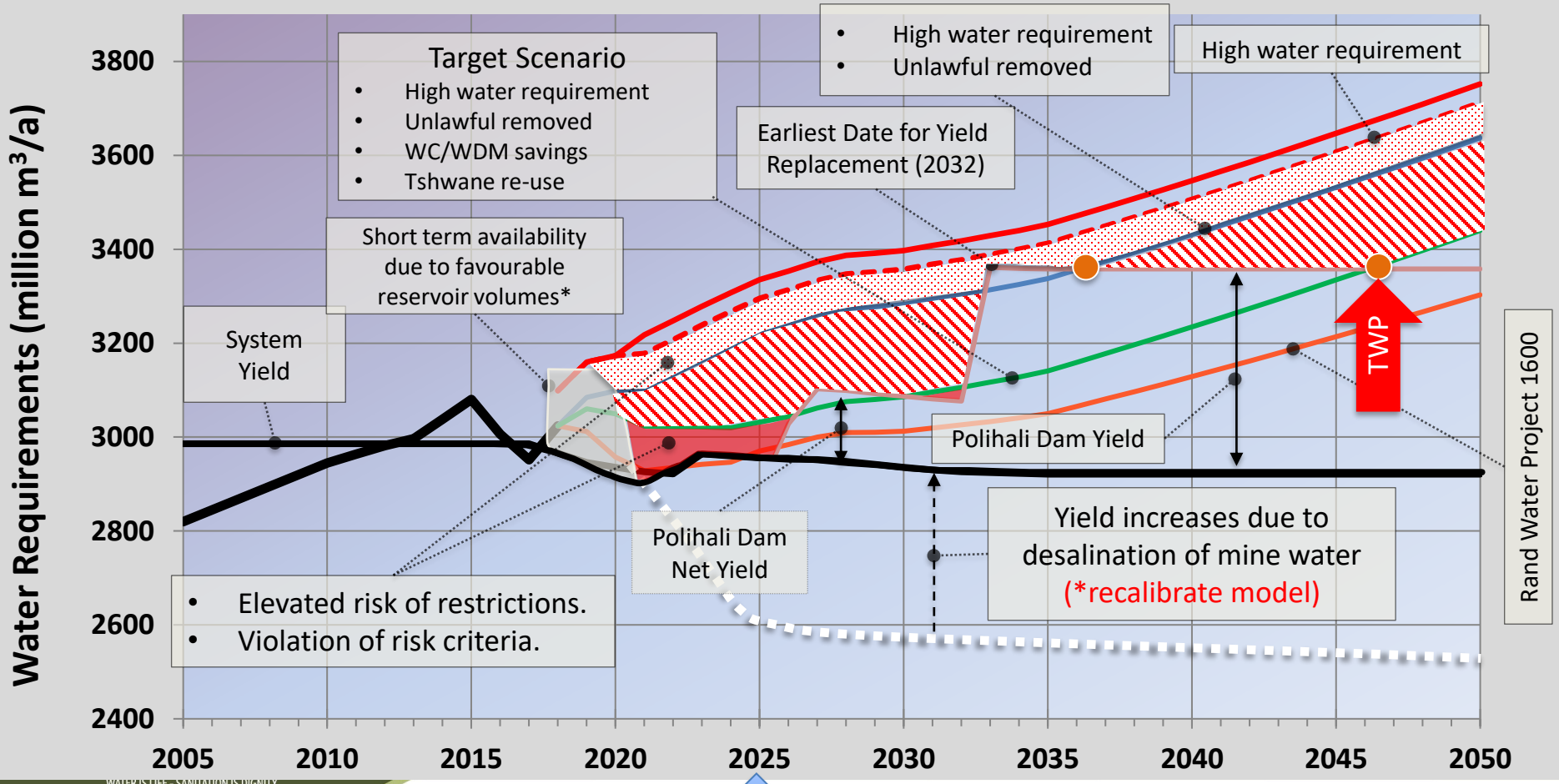
INTERVENTIONS

- Water Conservation and Demand Management to realise savings of about **200 Million m³/year**
- Eradication of unlawful irrigation water use by at least **100 Million cubic metres/annum**
- Desalination and Re-use of Mine Water - Gain to maintain yield at about **3000 million m³/annum** with the gain of **200 million m³/annum (2022)**
- Tshwane Re-use Project- **56 million m³/a (2021)**
- Reinstate full capacity of Thukela-Vaal transfer to prevent undesirable economic implications.
- Polihali Dam for - **437 m³ /annum by 2025 and 2032**, in conjunction with Noordoewer/ Vioolsdrift Dam for Yield replacement in the lower Orange by **2030** to realise full benefit of Polihali Dam
- Thukela Water Project – **290 million cubic metres per year by 2046**

WATER BALANCE 2019



WATER BALANCE (JUNE 2020)



Elevated risks without WC/WDM savings

First transfer from LHWP Phase II – Dec 2025

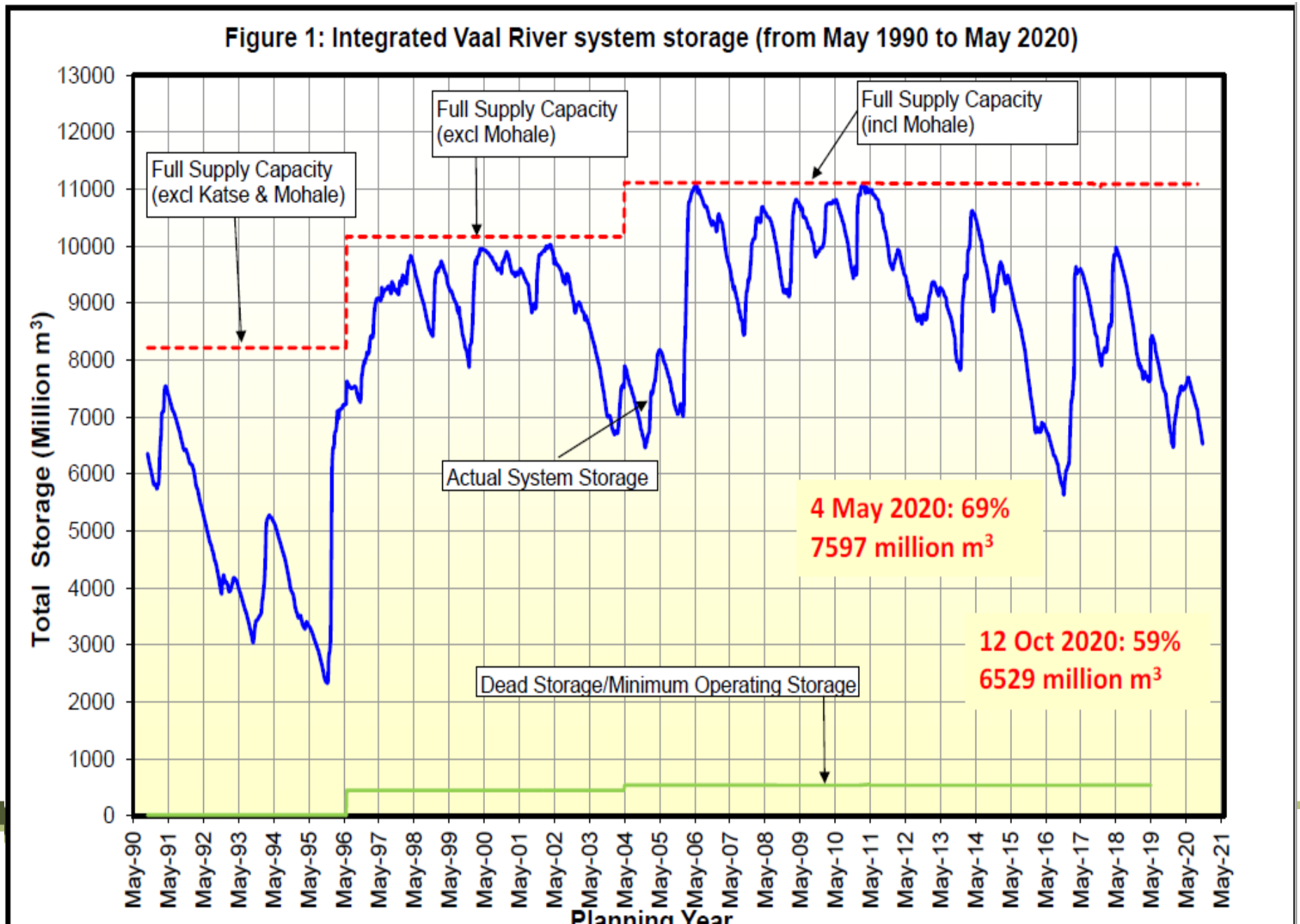
IMPLICATIONS OF DELAYS OF INTERVENTIONS ON THE INTEGRATED VAAL RIVER SYSTEM BALANCE

No	Intervention	Status	Target Date	Revised Date	Delay	Implications
1	WC/WDM to achieve target savings	Implementation	2017	2024	• >7 years • Regressing implementation	• Elevated risks without WC/WDM savings • Less resilient system
2	Remove unlawful water use (irrigation)	Implementation	2015	None specified	• Regressing implementation	• Elevated risks of restrictions • Loss of revenues
3	LHWP Phase 2	Under implementation	Dec 2025	June 2026	6 months	• Elevated risk of restrictions
4	Water re-use project (Tshwane or other)	Planning	2020	2025	• >5 years • Capacity reduced from 56 to 18 million m^3	• Elevated risk of restrictions. • Violation of risk criteria
5	Mine water effluent treatment (recalibrate model)	Operational Implementation Planning	2020	2023	• >3 year	• Yield decrease due to impaired water quality • Increased treatment costs
6	Implement yield replacement scheme in Orange System.	Feasibility study	2026	2028	2 years	• Elevated risk of restrictions. • Violation of risk criteria
7	Thukela-Vaal Transfer Scheme	Pre-feasibility studies	2036 to 2045	No revision	likely	• Planning must commence immediately

ACTIONS TO MITIGATE AGAINST DELAYS ON IVRS INTERVENTIONS

- The suite of actions to manage risk of delays respond to all interventions, including **LHWP Phase II**
  - Implementation of water use restrictions during drought, informed by Annual Operation Analysis of the IVRS
  - Optimal operation of the existing Thukela-Vaal transfer scheme
  - Maintain water quality by avoiding pollution of the water in the IVRS
  - Reduce amount of water used for dilution – for 600mg/l water quality target
  - Implement engineering and social solutions on Thukela-Vaal Transfer Scheme to fully utilise installed transfer capacity
  - Retain water in the upstream dams of LHWP Phase I ? (this will entail renegotiating LHWP Phase I operating rules and involving Eskom regarding possible compensation for lost power generation)
  - Accelerate the implementation of the Thukela Water Project ? (this will entail Updating the Feasibility Study including undertaking an Environmental Impact Assessment (EIA) of the project).

Total System Storage Trajectory



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Thank you

DIGNITY

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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP