




Briefing the Portfolio Committee on Water and Sanitation on Acid Mine Drainage and its Implications to Ground Water, Rivers and Dams

05 November 2014
Venue: E 249, 2nd Floor, New Wing





water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



Contents

- Introduction and Back ground
- Problem Statement and Risk associated with AMD/mine water
- AMD in the Wits and Implications for the Vaal Dam/River system
- Government's actions to manage Wits AMD
- ToE Recommendations approved by Cabinet
- Progress with "Emergency Works"
- Western Basin
- Central Basin
- Eastern Basin
- Long-term Solution
- Status Quo on Mines Operating without Water Use Authorisation (July 2014 – October 2014)



water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2

Introduction & Background

What is AMD?

- Associated with gold and coal mining when water reacts with ore body and becomes polluted
- Arises during active mining; more prevalent when mines cease operations and water management interventions are absent
- Characterised by water with low pH, high salinity and dissolved metals
- AMD usually unsuitable for the environment/ beneficial use unless suitably treated
- Also associated with mine by-products such as tailings storage facilities & waste rock dumps

$$4\text{FeS}_2(\text{s}) + 15\text{O}_2(\text{g}) + 14\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{Fe}(\text{OH})_3(\text{s}) + 8\text{SO}_4^{2-}(\text{aq}) + 16\text{H}^+(\text{aq})$$

Pyrite

Oxygen

Water


Isolate acid producing material from water and/ or oxygen


"Yellow boy"

Sulphate

Acid

Treat water (high-density sludge treatment and/ or de-salination)




 **water & sanitation**
Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA


3

Problem statement and risks associated with AMD/ Mine Water

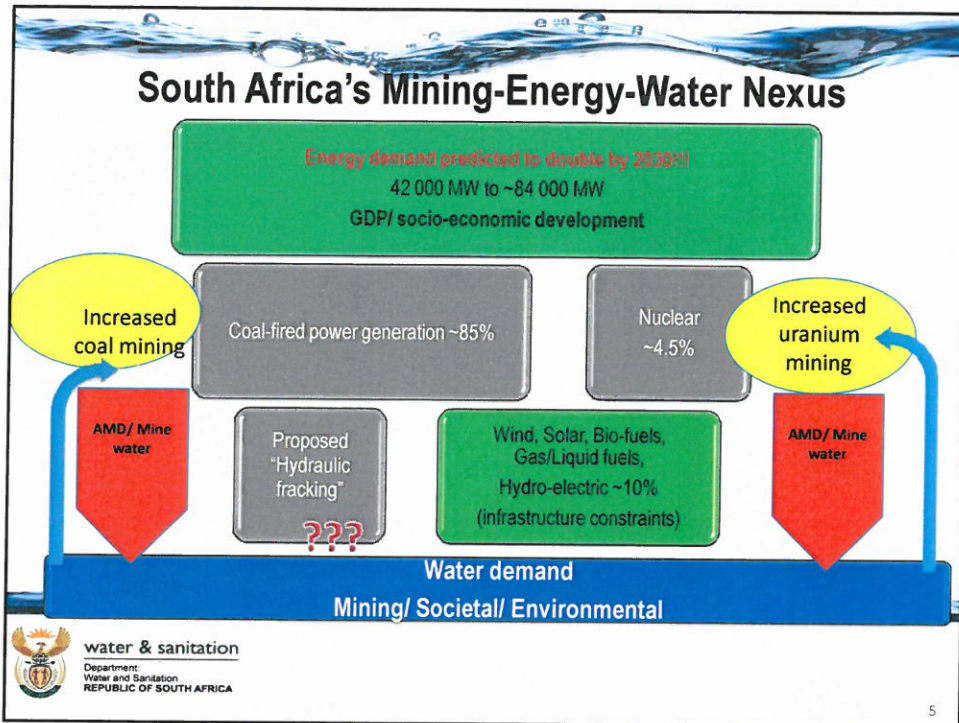
- **Considered one of the greatest environmental challenges**
- **Impacts water security** (urbanisation, economic development, job creation and social risks)
- **Negative impacts on surface- and groundwater quality (rivers, dams, boreholes)**
- **Emerging impacts on drinking water** (Carolina, Emalaheni, communities relying on groundwater)
- Ecological destruction/ impact on Heritage Sites e.g. Gold Reef City, Cradle of Humankind ???
- Flooding of neighbouring mines
- Ground stability impacts (subsidence and seismic activity)
- Lack of fund for environmental liabilities (such as US "superfund")
- New mining in water-sensitive catchments
- Fragmented legislation

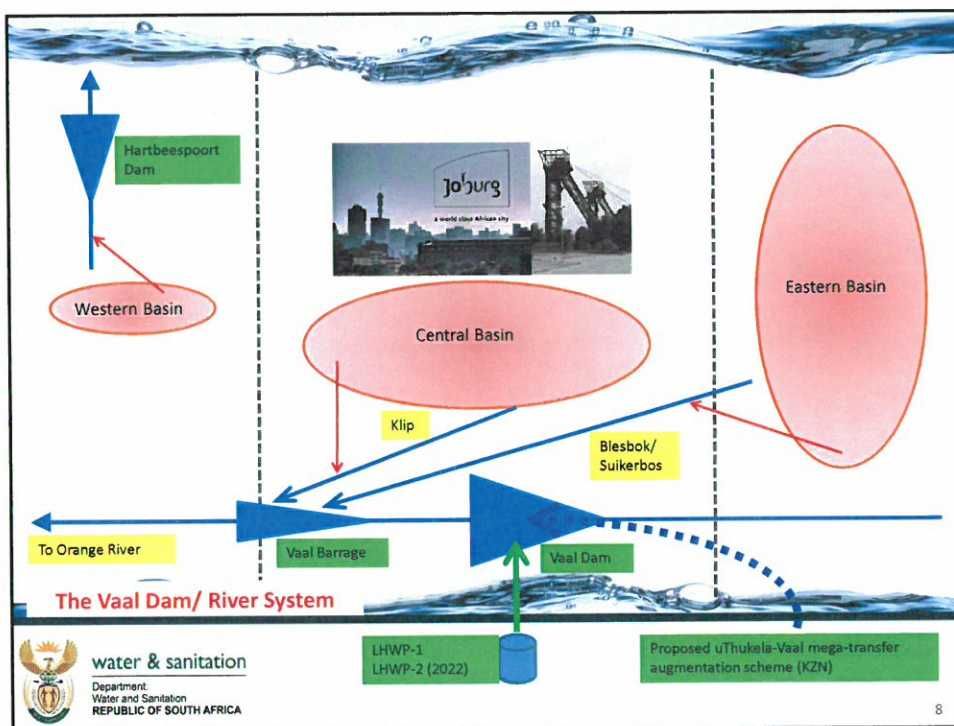
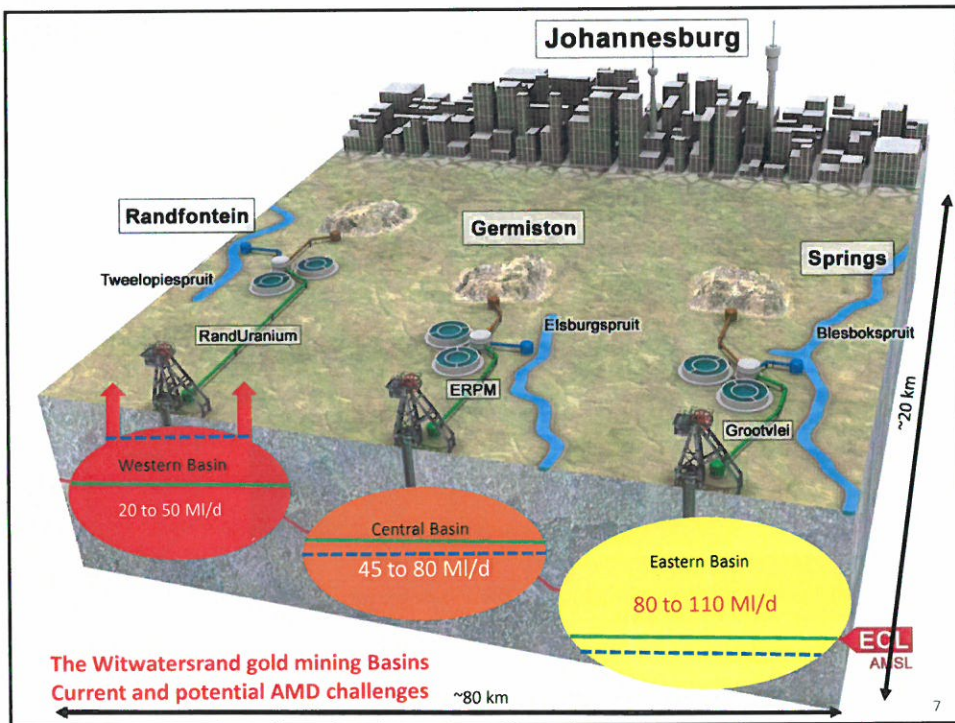
SA is a developing country and mining central to GDP – implication is that current and potential AMD challenges are perpetual – warrants sustainable management interventions!!!




 **water & sanitation**
Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

4









AMD in the Wits and implications for the Vaal Dam/ River System

- Uncontested evidence of AMD impacting the Vaal Dam/ River System (VRS)
- Unless mitigated, each m³ AMD requires 7-11 m³ dilution release from Vaal Dam to ensure downstream users are not compromised...**expensive, unsustainable and water lost from VRS**
- VRS Reconciliation Studies predict water security risks in VRS from 2016/17
- Potential catastrophic environmental and socio-economic impacts
- Even with LHWP-2 (planned commissioning in 2022), VRS may still face deficit
- **Challenge must be circumvented by de-salinating AMD thus:**
 - Ensuring water security in VRS
 - Promoting beneficial use of purified AMD (water re-use as articulated in NWRS-2)
 - Enabling proposed additional mega-transfer augmentation scheme to be deferred

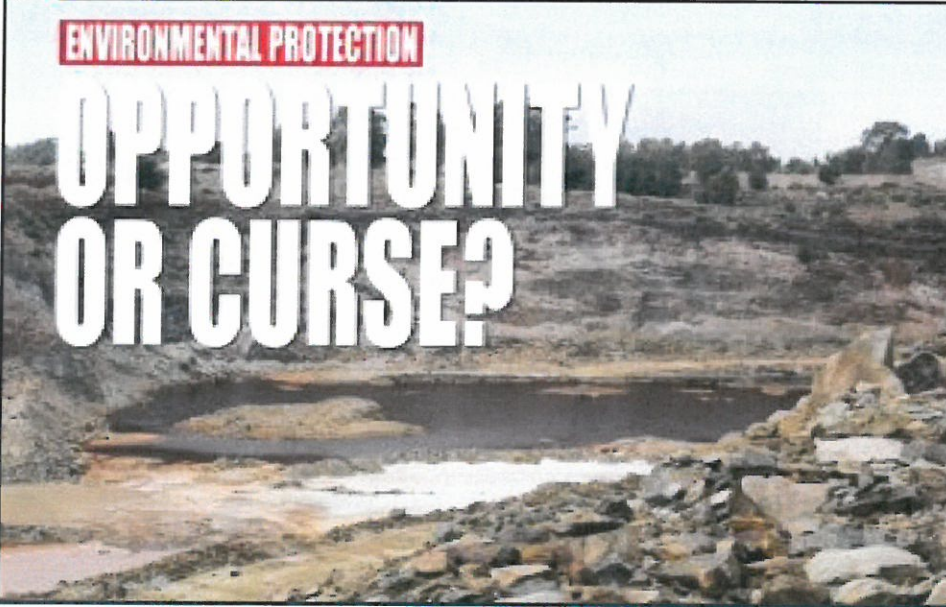
✓ **Cost comparison: AMD de-salination ~R10 billion vs ~R40 billion mega-transfer augmentation scheme**






water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

9



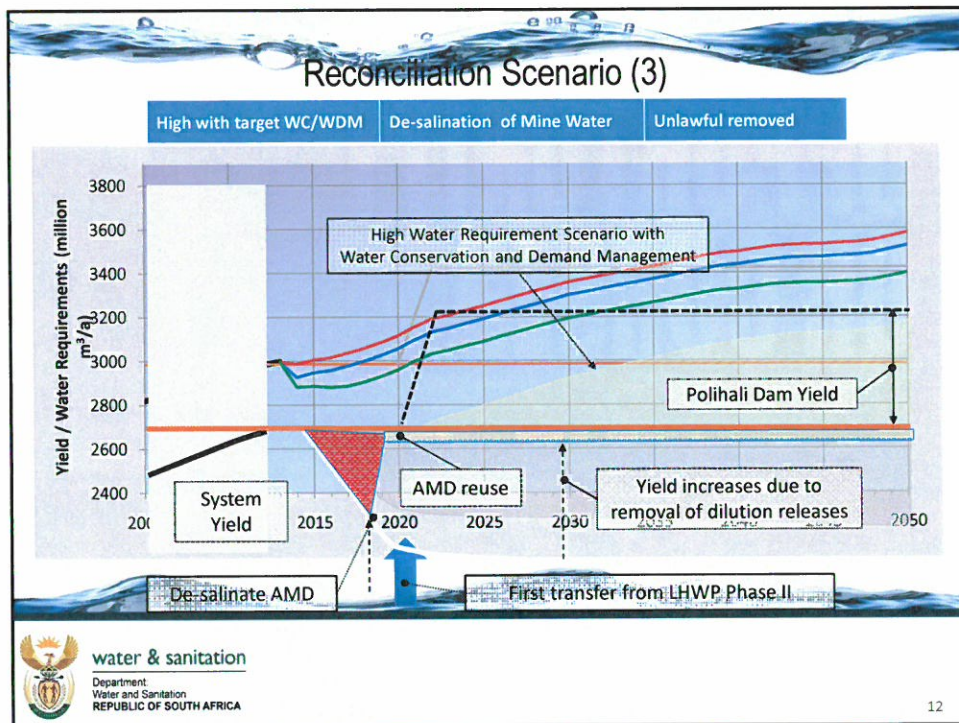
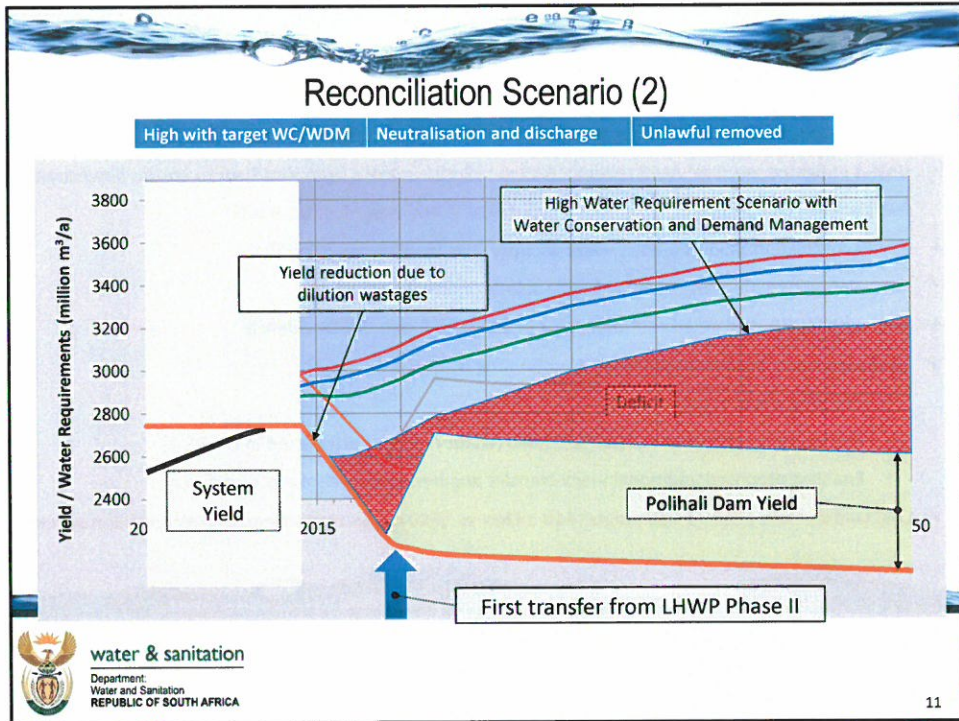
ENVIRONMENTAL PROTECTION


OPPORTUNITY OR CURSE?



water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA


10







Government's actions to manage Wits AMD

- 1 Sep 2010: Inter-Ministerial Committee (IMC) on AMD and mine water management
- Situation assessment: DWS/ DMR DGs appointed Team of Experts (DWS, DMR, CGS, CSIR, WRC, MINTEK and academics)
- ToE Report: *"Mine Water Management in the Witwatersrand Gold Fields with Special Emphasis on Acid Mine Drainage"* (AMD Report)
- 9 Feb 2011: Cabinet approval of AMD Report; and DWS tasked to action recommendations
- 6 April 2011: TCTA appointed Implementing Agent for **"emergency works"**




 **water & sanitation**
Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA


13



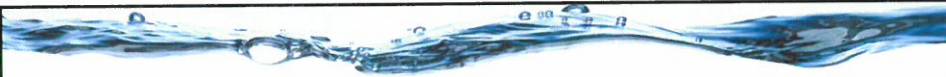
ToE Recommendations approved by Cabinet

- **Prevent decant** by pumping underground mine water to protect ECL
- Implement **ingress control** to reduce flooding rate & eventual decant + pumping volume & costs
- **Treatment of AMD & water quality management**
 - **Neutralization & metal removal** in the **immediate/ short-term**
 - **Removal of salt loads** from river systems in the **medium/ long-term** (direct use or desalination to potable quality)
- **Improve monitoring/** research to inform better decision-making
- **Monitor** other AMD sources within Witwatersrand e.g. slimes dams
- Investigate & implement an **environmental levy** on operating mines to help cover the costs of mining legacies




 **water & sanitation**
Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA


14




Progress with “Emergency Works”

Immediate and Short-term solutions





water & sanitation
 Department:
 Water and Sanitation
 REPUBLIC OF SOUTH AFRICA


15




Progress (emergency works)

1. **Immediate solution – WESTERN BASIN**
 - Rand Uranium (Gold 1) (Randfontein) AMD/ mine water plant upgraded and treating ~30 MLAMD daily
 - Improvement in surface and groundwater quality recorded
 - Additional refurbishment urgently required to eradicate decant (*high rainfall ???*)
2. **Short-term solution – CENTRAL BASIN**
 - New AMD pump-station, neutralisation and waste disposal facilities at the South-West Vertical Shaft, Germiston
 - Project commenced January 2013 and commissioned April 2014.
 - Pumping, treating (neutralising) and discharging ~56 ML AMD daily
3. **Short-term solution – EASTERN BASIN**
 - Project similar to the Central basin currently being developed at Grootvlei Mine No. 3 Shaft (Springs)
 - Project commenced June 2014 and commissioning projected for December 2015
 - Operational target to neutralise ~84 ML AMD daily





water & sanitation
 Department:
 Water and Sanitation
 REPUBLIC OF SOUTH AFRICA


16



Western Basin Immediate solution

 **water & sanitation**
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

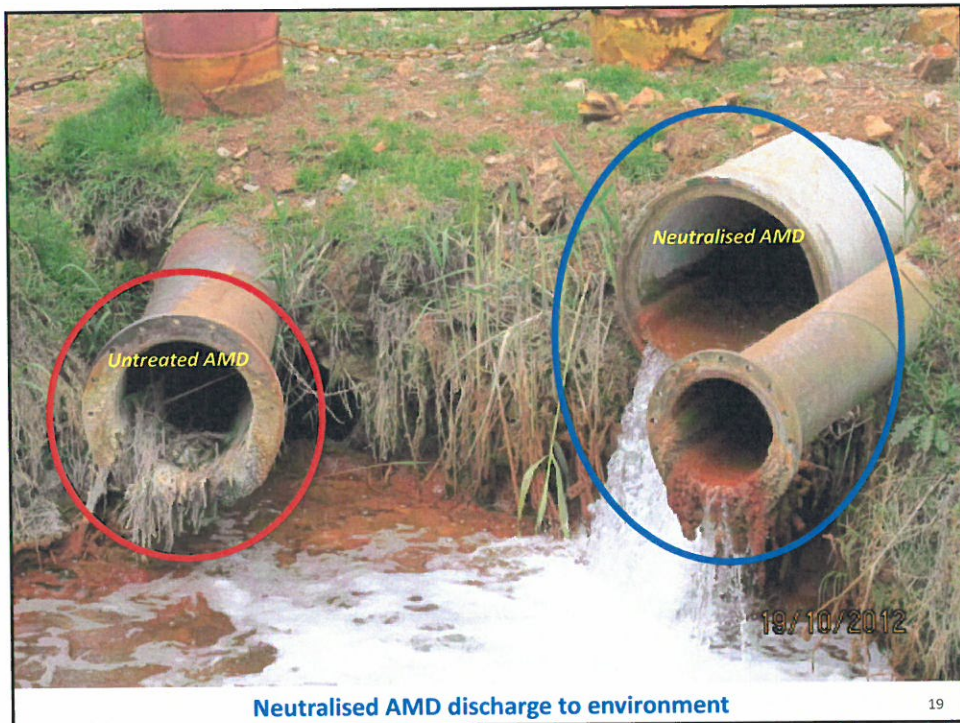
17



19/09/2012 13:21

Eradication of surface decant in the Western Basin within three months of commissioning immediate solution

18



Central Basin
Short-term solution

water & sanitation
Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

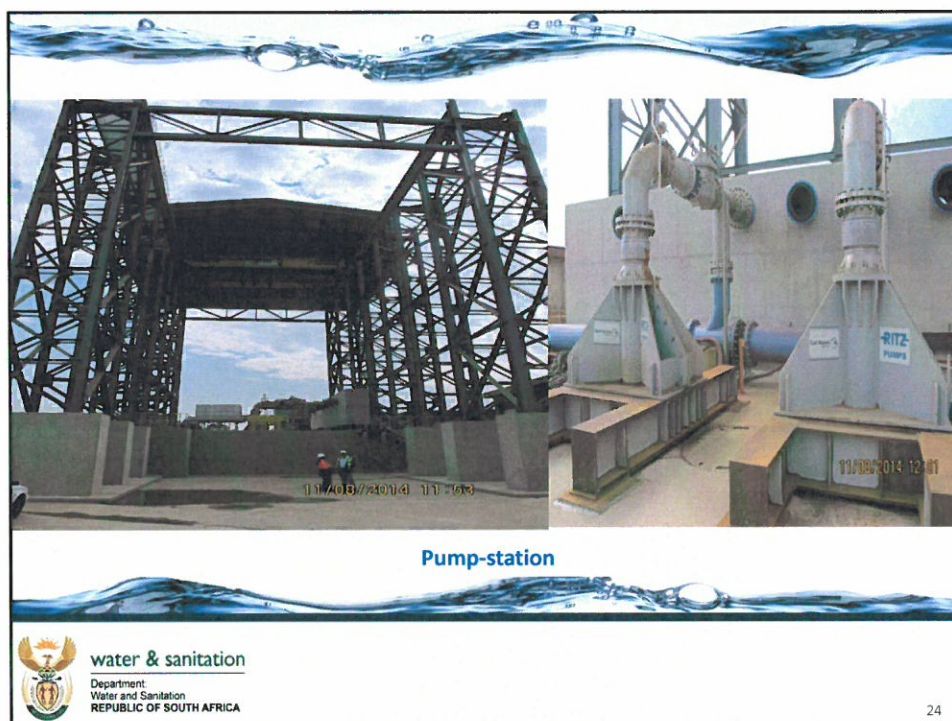
20





Construction – clarifiers and sludge thickeners

23



Pump-station

24