the federation for a sustainable environment

n

(Reg. No. 2007/003002/08)
NPO NUMBER 062986-NPO
PBO No. (TAX EXEMPT) 930 039 506
Postnet Suite #113, Private Bag X153, Bryanston, 2021

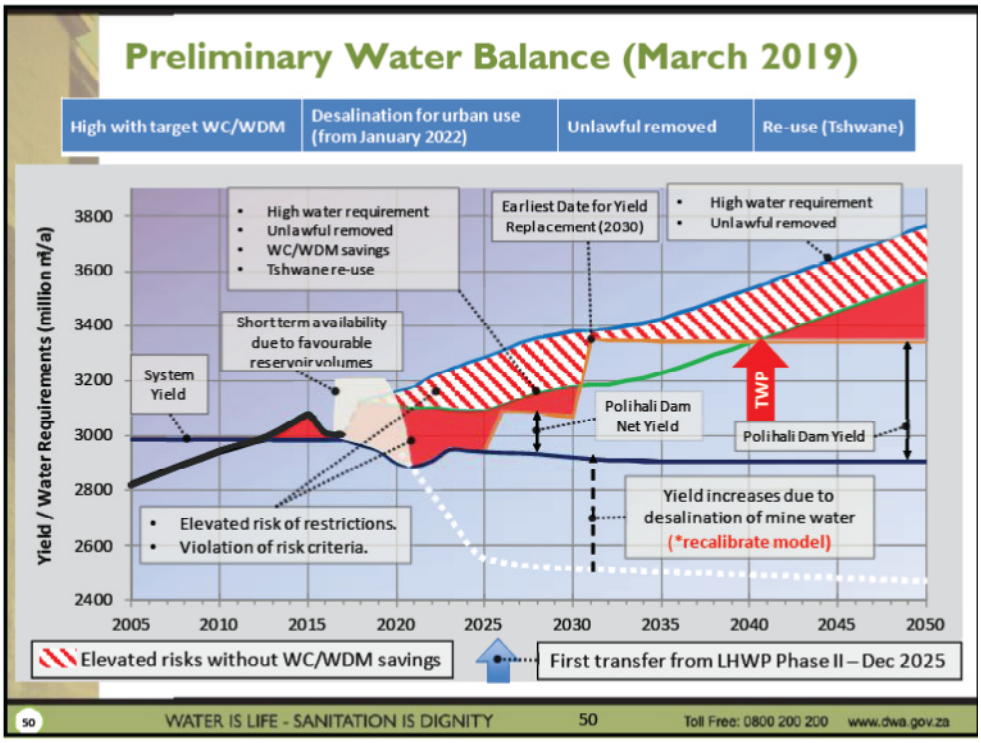
SUMMARY OF WATER QUANTITY AND QUALITY CHALLENGES WITHIN THE VAAL RIVER SYSTEM GROUNDED UPON THE INFORMATION WHICH WAS PRESENTED BY THE DEPARTMENT OF WATER AND SANITATION'S DIRECTORATE: NATIONAL WATER RESOURCE PLANNING TO THE STRATEGY STEERING COMMITTEE (SSC) FOR THE CONTINUATION OF THE INTEGRATED VAAL RIVER SYSTEM RECONCILIATION STRATEGY STUDY – PHASE 2

The following summary of water quantity and quality challenges within the Integrated Vaal River System is submitted on behalf of the Federation for Sustainable Environment (FSE). The FSE is a federation of community based civil society organisations committed to the realisation of the constitutional right to an environment that is not harmful to health or well-being, and to having the environment sustainably managed and protected for future generations. Their mission is specifically focussed on addressing the adverse impacts of mining and industrial activities on the lives and livelihoods of vulnerable and disadvantaged communities who live and work near South Africa's mines and industries.

The FSE is a member of the Strategy Steering Committee for the Integrated Vaal River System Reconciliation Strategy Study.

In terms of the subjoined Preliminary Water Balance for the Integrated Vaal River System, it can be inferred that the delay in the long term treatment (desalination) of Acid Mine Drainage (AMD) (yield increase due to the salination of mine water predicted after 2030) and the delay in the construction of the Lesotho Highlands Phase 2 (yield increase anticipated after December 2025) may result in growing deficits within the Vaal River System, which supplies water to 60% of the economy and 45% of the population and which augments the Crocodile West and Olifants Water Management Areas, and elevated risks of restrictions by 2021. Please see subjoined graph. (Reference: Continuation of the Integrated Vaal River System

Reconciliation Strategy – Phase 2. Strategy Steering Committee Meeting 2. 13 March 2019.)



It can be observed, based upon the above-mentioned graph that there will be:

- A reduction in system yield due to:
  - Dilution releases from the Vaal Dam until the proposed desalination of AMD.
  - Unused yield in Komati Subsystem due to reduction in Eskom power station water requirements.
- Elevated risks of restrictions prior to implementation of Lesotho Highland Water Project (LHWP) Phase 2.
  - High Water Requirement Scenario exceeds risk criteria throughout the planning period.
  - Further augmentation needed by 2041 - High Water Requirement Scenario with Water Conservation / Water Demand Management (WC/WDM) savings.

The following interventions are essential to reduce the risk of restrictions until the LHWP Phase 2 can deliver water:

• Water conservation and water demand management savings

• Eradication of Unlawful Use

• Desalination and Re-use of Mine Water in terms of a recalibrated model

• Tshwane Re-use Project

There is an urgent need to:

- Review the yield capability of the Thukela Water Project, which calls for a recalibration of the hydrology;
- Address the yield replacement scheme in the Orange;
- Recalibrate the hydrology and water quality modules of the Vaal Barrage Catchment's hydrology;
- Develop and implement the integrated water quality management plan;
- Implement Water Conservation/Water Demand Management;
- Integrate the Crocodile (West) and the Olifants reconciliation interventions.
- Update and recalibrate outdated models to develop water scenarios, which incorporate *inter alia* the impacts of atmospheric fallout (acid rain) from Coal Mines and Coal Fired Power Stations within the Highveld (Upper Vaal) on the rivers; the impact of future mines; the impact of the reclamation of Tailings Storage Facilities (TSF) on the salt balance within the Vaal River System; the contribution of salts from diffuse sources, such as TSFs, etc. and based on the current data to develop and implement a strategy.

The above-mentioned activities and planning require financial resources and political will, which is sadly lacking within the Department of Water and Sanitation.

ACID MINE DRAINAGE

The current (immediate and short-term) treatment of AMD is by means of neutralisation or a pH adjustment. In most cases, metals will precipitate out of solution if the pH is adjusted upwards, i.e. the water is made more alkaline. It should be noted that the metals do not simply disappear but change to a different oxidation state, which change them from a soluble form to a solid form. The metals are still there, in the area where the precipitation has occurred in the first place. The process can be reversed and the contaminants mobilised, should the water become acidic (Fourie 2006).

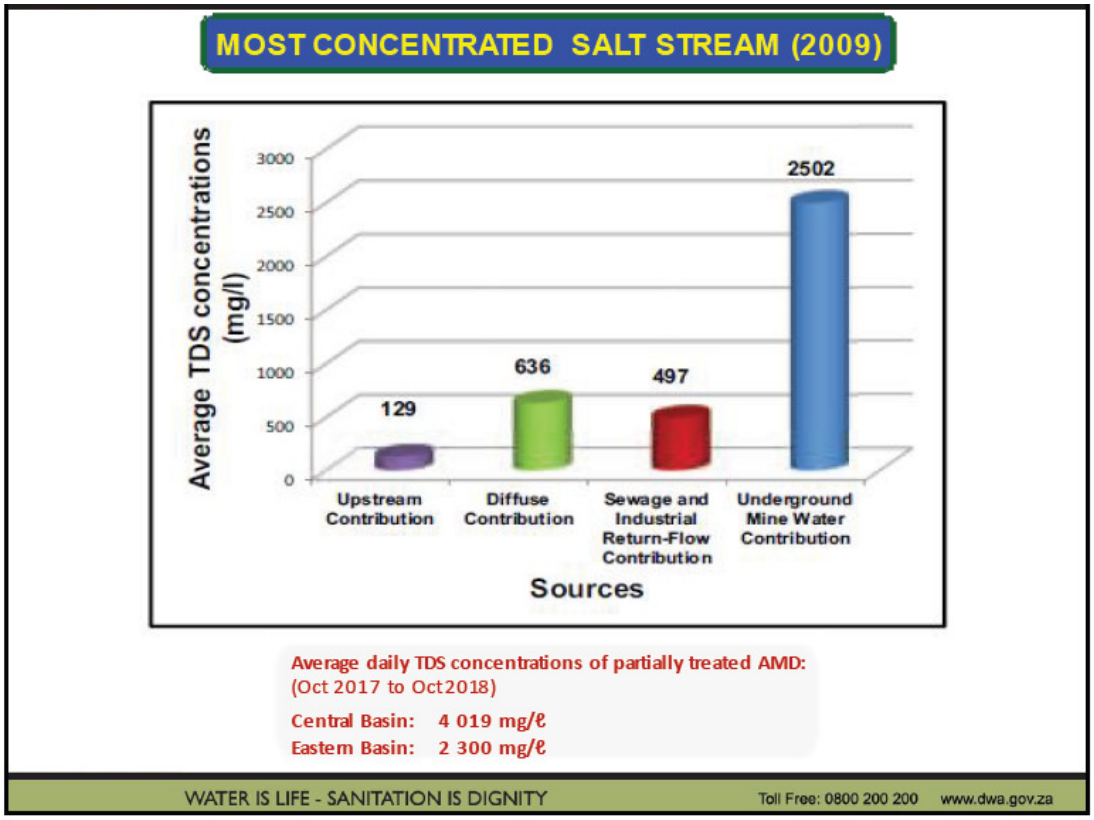
The sulphate concentrations in neutralised AMD remain high (2,000–3,000mg/l). High concentrations of sulphate exert predominantly acute health effects (diarrhoea). Sulphate concentrations of 600 mg/l and more cause diarrhoea in most individuals and adaptation may not occur. Usually, individuals exposed to elevated sulphate concentrations in their drinking water for long periods adapt and cease to experience acute health effects (diarrhoea). The numerical limit for sulphate in terms of the resource quality objectives for the Upper Vaal is between 200 and 500 mg/l, depending on the water use.

Elevated sulphate concentrations increase the corrosion rate of metal fittings in water distribution systems.

In livestock watering, it was found that sulphate levels above 250 mg/l suppress copper and selenium which result in poor fertility and condition (Myburgh n.d.). Eskom, a South African electricity public utility, requires water with sulphate levels between 15 and 40 mg/l.

The highest cost burden of combating salinity is currently being carried by the household sector and not by the industry as might be expected. The 'polluter pays principle' in terms of the NEMA is based on the internalisation of externalities and, therefore, is central to the equitable resolution of pollution costs currently being borne by the end user (Pilson 2000).

The Department of Water and Sanitation's feasibility study for the long-term treatment of AMD (Department of Water Affairs 2013) and the Reconciliation Strategies for the Integrated Vaal River System warned that the additional salinity as a result of AMD will create water security risks (Department of Water and Sanitation 2015) and recommended the utilisation of treated effluent and other discharges, especially those from the mines. In order to comply with the regulatory Instream Quality Objective (IQO) limit of 600 mg/l sulphate, good quality water has to be released from the Vaal Dam in order to ensure that the water below the Vaal barrage is fit for use, that is, by means of dilution. The additional volume of water that has to be released, as a result of the salinity associated with AMD, has resulted in a considerable reduction of water supply to the Upper Vaal, to the extent that it will cancel out the addition of the total capacity of Phase 2 of the Lesotho Highlands scheme.



Reference: Continuation of the Integrated Vaal River System Reconciliation Strategy – Phase 2. Strategy Steering Committee Meeting 2. 13 March 2019.)

Notwithstanding the short term treatment of AMD, surface and groundwater will continue to find its way into the underground workings of the East, Central and West Rand underground mine workings. The rate of ingress of such water into the underground mine workings can be reduced, but cannot be halted all together. AMD will continue to be produced when surface and groundwater come into contact with pyritic surfaces in the presence of oxygen. In order to protect environmental and socio-economic interests, from rising AMD levels in the mine voids, and to prevent uncontrolled decant to surface, continuous pumping of underground mine drainage is a prerequisite. The elevated TDS concentrations in and below Vaal Barrage remains to be of concern.

There is an urgent need, in addition to the continued pumping of mine water from all three underground mining basins to:

- Implement ingress control as a high priority
- Improve governance and management cooperation with the DMR
- To expand the monitoring of the water quality and water level
- To develop and pilot new and innovative treatment solutions
- To prioritise the updating of the Vaal Integrated Water Quality Management Strategy and the implementation thereof
- To re-establish the ToE to advise on the way forward
- To conduct an EIA for the long term treatment of AMD and to assess the impact of the short term treatment on downstream water users and the environment.

WATER QUALITY

The following water planning issues are of serious concern. Notwithstanding the fact that these needs were identified since during 2000, 2004, 2009, 2013 and 2016 most remain unaddressed or inadequately addressed.

	WHAT SHOULD HAVE BEEN DONE	WHAT WAS DONE
1	Internal Strategic Perspective, 2004: Identified the need for **linked Water Quality Management Strategies** to be developed and implemented for the Vaal River and Orange River Basins, respectively	Partially addressed
2	Internal Strategic Perspective, 2004: Identified the need for effective monitoring networks and information management systems, as a prerequisite for the effective operation of the IVRS.	Not adequately resourced
3	Internal Strategic Perspective, 2004: Identified the need for the integration of Water Resource management, planning and the **allocation** of water quantity and **water quality**	Not addressed
4	Waste Discharge Charge System, 2000 – 2012: Under	Waste Discharge Charge

	development	System not yet piloted
5	Integrated Water Quality Management Strategy, 2009: Identified the need for the expansion of the current Water Quality **monitoring programmes** to address planning and management needs.	Not adequately resources and in fact, moving backwards
6	Integrated Water Quality Management Strategy, 2009: Identified the need to pilot a **flow manipulation investigation** as part of a eutrophication management strategy	Not addressed
7	Integrated Water Quality Management Strategy, 2009: Identified the need for the implementation of a **strategy to address microbial pollution** in the Vaal River	Not addressed
8	Integrated Water Quality Management Strategy, 2009: Identified the need for the development and **implementation of a Water Quality Management Plan to address salinization** caused by mining, coal burning activities and wash-off from agricultural land in the Upper Vaal	Not addressed
9	Integrated Water Quality Management Strategy, 2009: Identified the need for a **Strategy Steering Committee** to be established to oversee the further development and implementation of the Water Quality Management Plans and Strategies for the Vaal River Basin	Not addressed
10	National Water Resource Strategy, 2013: Required the **reuse** of the Gauteng mine water return flows to address the high salinity levels in the Middle and Lower Vaal River	Feasibility study was completed in 2013. No further progress
11	Classification, 2016: Produced the Water Resource Management Classes and Resource Quality Objectives that should be **accommodated in the Water Quality Policy** for the Vaal River Basin	Partially considered
12	Integrated Water Quality Management Policy, 2016: Found that **emerging pollutants** (e.g. nanoparticles, EDCs, POPs and antibiotics) exist, that due to the relative low levels of knowledge, may have adverse effects that are currently uncertain	Non comprehensively addressed
13	National Water and Sanitation Master Plan, 2019: States that all water resources must be **fit for use** by 20130	To be addressed
14	Sustainable Development Goals 2015 – 2030 (Country target 6.3) : **By 2030**, **improve Water Quality by reducing pollution, eliminate dumping and minimizing release of hazardous chemicals** and materials, halving the proportion of **untreated wastewater** and substantially increase **recycling** and safe **reuse.**	To be addressed

(Reference: Continuation of the Integrated Vaal River System Reconciliation Strategy – Phase 2. Strategy Steering Committee Meeting 2. 13 March 2019.)

SUBMITTED BY:
Mariette Liefferink

CEO: FEDERATION FOR A SUSTAINABLE ENVIRONMENT

8 April 2019