Development of Reconciliation Strategy for Luvuvhu & Letaba Water Supply System

WATER QUALITY AND RE-USE TASK

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Presentation Contents

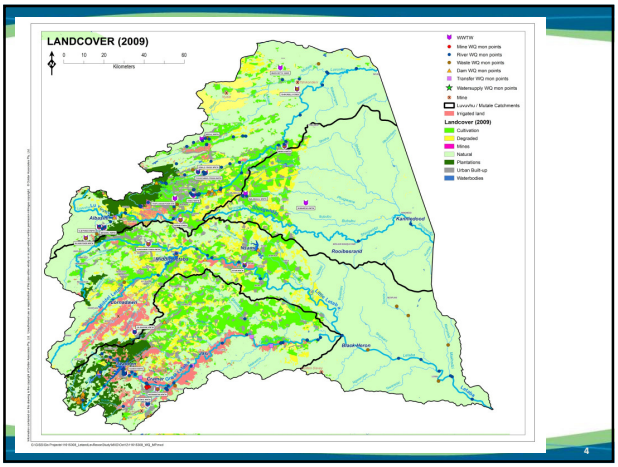
- Background
- Water Quality Assessment Approach
- Available Water Quality Data
- Water Quality Guidelines
- Water Quality Status
- Assessment of re-use potential

2

BACKGROUND

- The main water users in the Study Area are:
  - Domestic users (densely populated informal urban settlements and formal urban to scattered rural settlements);
  - Tourism;
  - Irrigation:
  - Fruit growers and tea plantations in the Magoebaskloof/Tzaneen area;
  - Commercial forests;
  - Dry land crops including (Maize; Sorghum; Cotton; Ground nuts; Sunflowers);
  - Limited underground coal mining in the Mutale catchment.

3



4

Assessment Approach

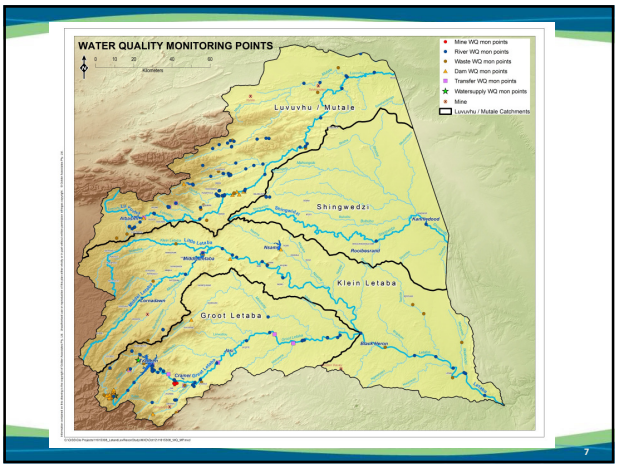
- Collated available water quality data
- Screened dataset based on duration, location and sampling frequency
- Calculated statistics – percentiles shown as box and whisker plots
- Establish Water Quality Guidelines against which to compare the statistics
  - Used South African Water Quality Guidelines for different users
  - Ecological Reserve – water quality
- Identify water quality variables of concern

5

Water Quality Data

- 62 water quality monitoring points data assessed – Key points included in this presentation
- The period covered varies in length – longest records are measured in the dams dating back to the 1960's
- Average sampling frequency is monthly
- Water quality variables assessed were pH, TDS/EC, Ca, Mg, Cl, PO4, NO3 and ammonia
- Limited instream microbiological data

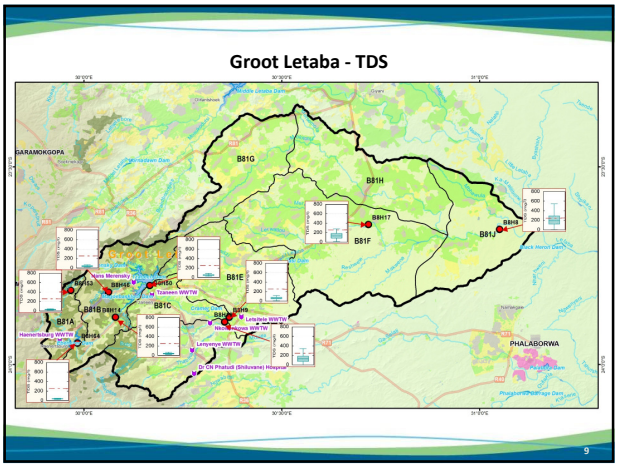
6

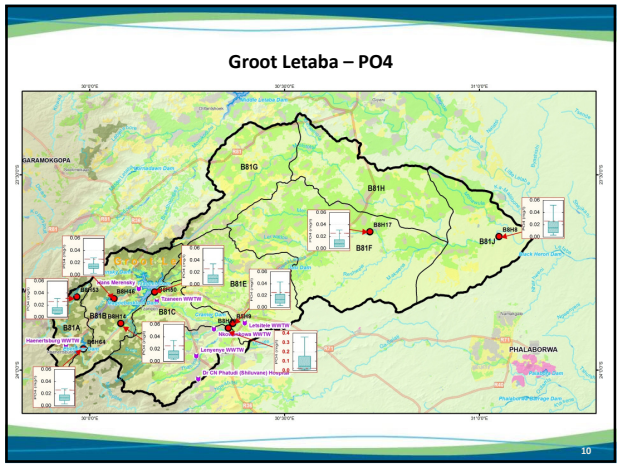


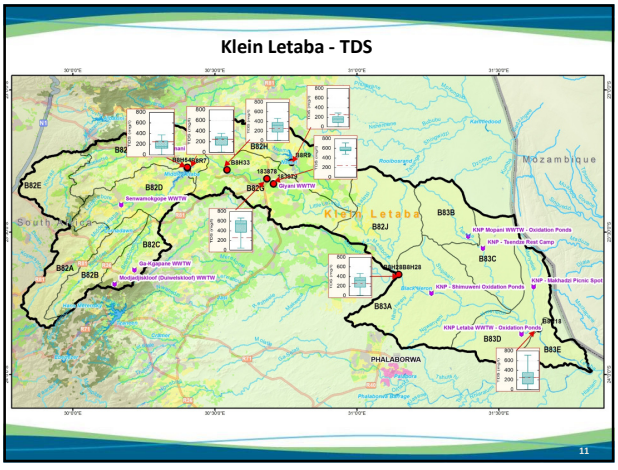
Water Quality Guidelines

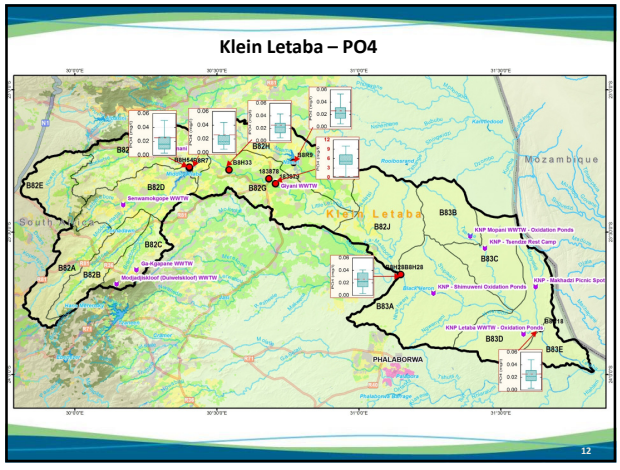
Parameter	Unit	WQG	Use category
Aluminium	mg/l	<0.01	Agric
Ammonia	mg/l	1 (0.007)	Dom/Agric (Res)
Arsenic	mg/l	0.01	Agric/Dom
Beryllium	mg/l	<0.1	Agric
Boron	mg/l	<0.5	Agric
Cadmium	mg/l	< 0.005 (<0.0005)	Agric
Calcium	mg/l	32	Dom
Chloride	mg/l	<100	Agric
Chromium III	mg/l	<0.012	Agric
Chromium IV	mg/l	<0.01	Agric
Cobalt	mg/l	<0.1	Agric
Copper	mg/l	<0.2 (0.0015)	Agric
Cyanide	mg/l	<0.001	Agric
Dissolved Oxygen	%	80-120	Agric
Electrical Conductivity	mS/m	40	Agric
Faecal coliforms	Counts per 100 ml	0	Dom
Fluoride	mg/l	0.7 (<2)	Dom (Agric)
Iron	mg/l	0.1	Dom
Lithium	mg/l	<2.5	Agric
Magnesium	mg/l	30	Agric
Manganese	mg/l	<0.02	Agric
Mercury	mg/l	0.001 (0.0004)	Dom (Agric)
Nickel	mg/l	<0.2	Agric
Nitrate	mg/l	6	Dom
Total inorganic nitrogen	mg/l	<0.5 (5)	Agric
pH	mg/l	6.5-8.4	Agric
Phenol	mg/l	0.001 (<0.01)	Dom(Agric)
Orthophosphate	mg/l	<0.025	Reserve
Potassium	mg/l	<50	Dom
Selenium	mg/l	0.02 (<0.002)	Agric
Sodium	mg/l	<70	Agric
SAR	mg/l	<2	Agric
Sulphate	mg/l	200	Dom
Total Dissolved Solids	mg/l	260	Agric
Zinc	mg/l	<1 (<0.002)	Agric

8

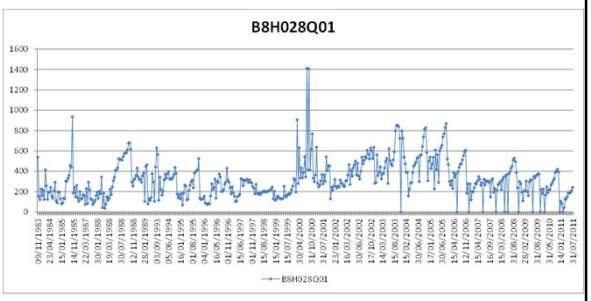






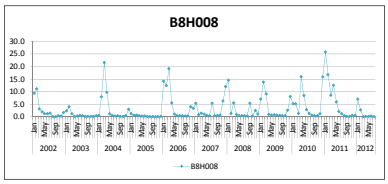


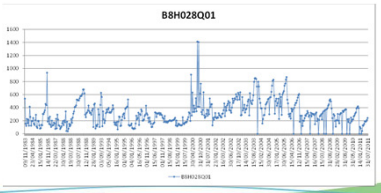
Groot Letaba – TDS – B8H028



13

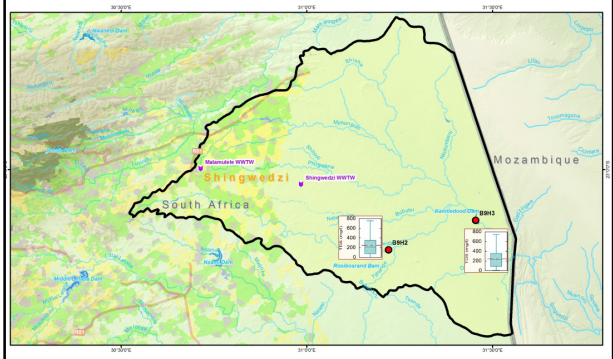
Groot Letaba – TDS – B8H028





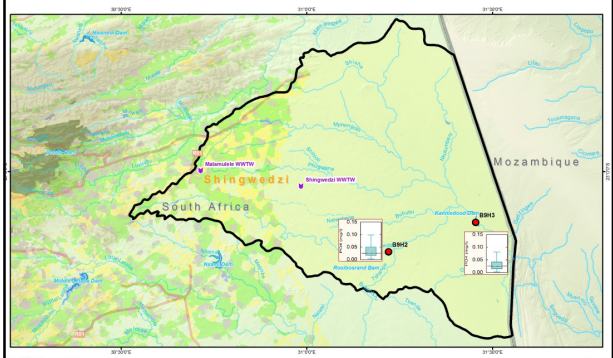
14

Shingwedzi – TDS



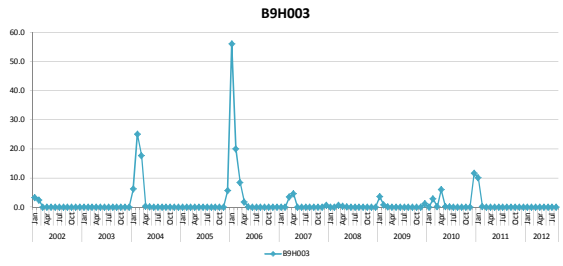
15

Shingwedzi – PO4



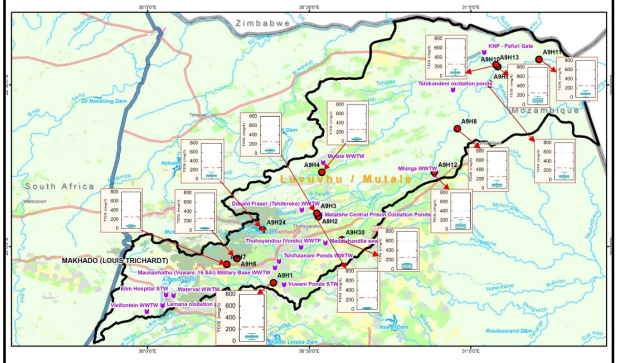
16

Shingwedzi - flow



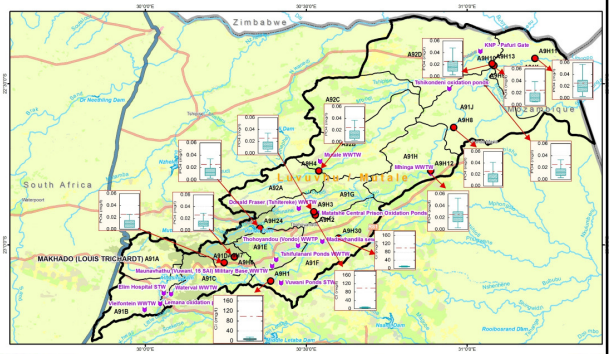
17

Luvuvhu – TDS



18

Luvuvhu – PO4



19

Water Quality Issues

- Luvuvhu
  - Intensive irrigation, urban areas numerous small WWTWs
  - Good quality from salinity perspective
  - Eutrophication potential with elevated phosphate concentrations
  - Microbiological pollution and cholera incidents reported
  - Research into use of DDT for malaria control

20

Water Quality Issues

- Groot Letaba
  - Salinity water quality good
  - Local areas of high phosphate in urban areas around WWTW
  - Elevated phosphate - mesotrophic range
- Klein Letaba
  - Higher TDS concentrations than Groot Letaba, particularly in middle reaches in irrigation and urban areas around Giyani
  - High localised phosphate concentrations around Giyani area

21

Water Quality Issues

- Shingwedzi
  - Limited sampling points
  - Most of the catchment is in KNP
  - 95 percentile TDS concentrations higher than other areas due to evaporation concentration during the dry season

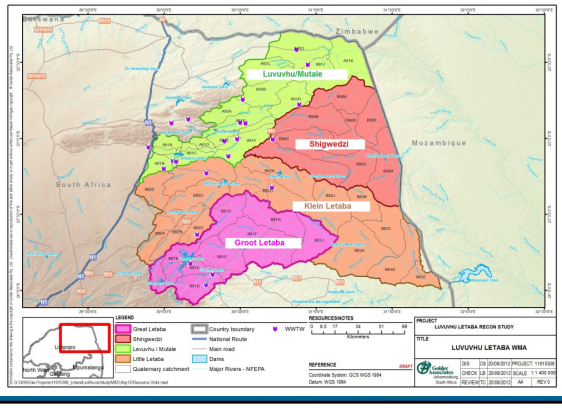
22

Water Re-use

- Direct Re-use – treatment to a water quality for a specific user – could be industrial or potable
- Indirect Re-use – Release to river or to a dam for use downstream

23

Wastewater treatment works location



Water Re-use: WWTW

Resource Units	Wastewater treatment works	Type	Capacity
Levuvhu Mutale catchment	Donald Fraser WWTW	Oxidation ponds	2 Ml/d
	Malamulele WWTW	Bio filter	2 Ml/d
	Maunavhathu Military Base WWTW	Oxidation ponds	2 Ml/d
	Mhinga WWTW	Oxidation ponds	2 Ml/d
	Muledeni WWTW	Oxidation ponds	Nil
	Siloam Ponds WWTW	Oxidation ponds	2 Ml/d
	Vuwani Ponds WWTW	Oxidation ponds	0.75 m3/d
	Tshifulanani Ponds WWT (Dzindi)	Oxidation ponds	2 Ml/d
	Vondo WWTW	Oxidation ponds	2 Ml/d
	Hlanganani Ponds WWTW	Oxidation ponds	2 Ml/d
	Louis Trichardt WWTW	Oxidation ponds	2 Ml/d
	Makhado (V) WWTW	Oxidation ponds	2 Ml/d
	Waterval WWTW	Activated sludge	10 Ml/d
	Dzanani oxidation ponds	Oxidation ponds	Nil
	Mutale WWTW	Oxidation ponds	Nil
	Masisi Septic tanks	Septic tanks	Nil
	Tshikondeli Ponds	Oxidation Ponds	Nil
Groot Letaba catchment	Tzaneen WWTW	Bio Filter & Activated sludge	8 Ml/d
	Nkowankowa WWTW	Bio Filter	4.5 Ml/d
	Lenyenye WWTW	Oxidation ponds	1 Ml/d
Klein and Middle Letaba Catchment	Ga- Kgapane WWTW	Bio filter	4 Ml/d
	Giyani WWTW	Bio filter	2.1 Ml/d
	Hlanganani Ponds WWTW	Oxidation ponds	2 Ml/d

Constituents of concern in all cases

Faecal coli, EC, pH, SS, NO_4, COD, NH_4, O-PO_4

Re-use of oxidation pond effluent for irrigation is not recommended unless the faecal coli count is < 1000 CFU/100 ml

Activated sludge and biofilters will need to be upgraded considerably before effluent can be re-used.

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25

Water Re-use: WWTW

- Limited volume of treated effluent available
- WWTW would have to be significantly upgraded for direct re-use for potable or industrial use
- Potential for irrigation use in urban areas – parks etc – need to improve treatment before irrigation can be considered
- Most useful to release to river for downstream use after treating to required standard

26

Thank You

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