Findings of the Research Study into the Umzimvubu,by BR Madikizela 2011: Water Research Commission

1. About the catchment

- Umzimvubu catchment is approx.; 20 060km^2 in extent.
- Catchment provides land for more than one and a half million people, most of who rely on untreated water.
- Umzimvubu mainstream is 408km long.
- Has four tributaries that originate from the Drakensberg mountains; Umzintlava, Kinira, Tina and Tsitsa rivers.
- Catchment receives high mean annual rainfall of 800mm/annum.

2. Results of study

- Study carried out between 1996 and 1998. Study showed that generally the Umzimvubu river catchment has a good water quality with an Average Score per Taxon (ASPT) range of 5.3 – 8.9.
- Water quality in the Umzimvubu River and selected tributaries is also good. This was attributed to the rural nature of the catchment and lack of catchment development (such as industrialization – there were isolated patches of commercial farming and forested land and a few municipal areas that were considered to be insignificant in terms of effluent discharge) which have minimized human impacts.
- Water quality was measured using physiochemical indicators in terms of nutrients (ammonium, nitrites, nitrates, and phosphates), conductivity, alkalinity, pH, oxygen concentration, temperature, flow, sediment and turbidity. Biological indicators were also used as an indication of river health, a process known as biomonitoring[1] and

[1] Defined as the monitoring of living organisms, usually as indicators of habitat integrity

bioassessment[2]. For this, the fourth version of the South African Scoring System (SASS: 4) was used.

2.1 Water Quality results are summarized as follows;

- **Ammonium** – Non-toxic ammonium (NH_4-N) concentrations were below 0.1 mg/l. A few sampling sites showed higher concentrations on the Umzimvubu River, recording just below 0.5mg/l.
- **Nitrates (NO3-N)** – Mainly low concentrations with seasonal range of 0.03 to 1.12mg/l.
- **Nitrites** – Concentrations were mostly below 0.5mg/l and with a seasonal range of 0.01 to 0.04mg/l.
- **Phosphates** – Concentrations were mostly below 0.5mg/l in spring and summer going up to 0.23mg/l. The seasonal range was 0.01 to 0.065mg/l.
- **Oxygen** – Mean oxygen concentrations in spring was 111% while that in summer was 97%.
- **Temperature** – lowest recorded temperature was 4^{o}C (in autumn) and highest was ±28^{o}C (in summer).
- **Dominant ions** – these were sodium (9mg/l); magnesium (8.5mg/l); calcium (14.09mg/l; chlorides (less than 10mg/l).
- **Alkalinity** – Determined by pH and calcium carbonate (85.2mg/l).
- **pH** – recorded as slightly alkaline with a range of just below pH7 to just below pH9.
- **Trace metals** – most were below detection limits except for Al (0.46mg/l), Fe (0.14mg/l) and Si (6.92mg/l).
- **Flow, sediment and turbidity** – Flow increased downstream as river order (width) and contributions from tributaries increased. Dominant particle size of sediment was less than 0.2mm. TSS in the Umzimvubu catchment were particularly high, recording 8232mg/l compared to that of a 1978 recording of the orange river (4600mg/l).
- **Aquatic invertebrates** – Were generally dominated by Chironomidae, particularly Orthocladinae (sub-family), Baetidae and Simuliidae. The least common taxa recorded

[2] Defined as the use of living organisms to assess conditions (usually with reference to some aspect of conservation)

were caddis fly, Macrostemum capense. The Umzimvubu River and its selected tributaries recorded low numbers of taxa (104) and abundance. Plecopetra (*N. spio*), family Perlidae was the only stone fly recorded and it occurred from the middle to the lower reaches. *B. harrisoni*, family Baetidae was also recorded from the upper to lower reaches. The trichopterans (Family: Hydropsychidae) such as *C. thomasseti, C. afra* and *Hydropsche longifurca* were recorded from the upper to the lower reaches.

- **Tolerance tests** – There were no physical abrasions on the two species (*C. afra* and *H. longifurca*) that were subjected to a 96hr acute test period and examined under an electron microscope.

Occasional floods and good summer rainfalls have helped the rivers to clean themselves (self-purification) during peak flow.

3. Conclusion

- The only threat to water quality was sedimentation, measured by the amount of Total Suspended Solids (TSS).
- Source-directed catchment management was identified as a key strategy to solving the problem of sedimentation.
- Sedimentation was identified to be caused by soil erosion, which in turn was a result of overstocking which led to overgrazing, sparse vegetation cover, ploughing on valleys – sometimes down to the river bank and lack of a riparian zone.
- Study also highlighted that impoundment of the rivers could lead to possible outbreaks of bilharzia and proliferation of black fly, a stock pest.
- Study highlighted rural community awareness of catchment activities and associated consequences as a measure to reduce further catchment degradation.