


1 JBS1 (EWR 1: UITKOMS (VAAL RIVER))

The information is summarised from DWA (2008a,b; 2009a; 2010a).

1.1 SITE DESCRIPTION

For the purposes of the EWR study, the Vaal River from the origins of the Vaal to the confluence of the Mooi River was delineated into five Management Resource Units (MRU Vaal A – E). EWR 1 falls within MRU Vaal B which is the delineated reach from the Klein Vaal confluence to the Grootdraai Dam. A transfer from Heyshope Dam takes place through the Perdewater, Skulpspruit and Rietspruit.

EWR1 is situated in the Vaal River downstream of the transfer which is characterised by extensive rapids and backwaters which form unique and the most critical habitat within this section. The site is a boulder riffle section which is highly atypical of the reach. Alluvial sections upstream show indications of increased flows (cut banks, likely due to interbasin transfers) – but the site is not very flow sensitive. Floodplain wetlands are present. Fish habitat is well represented at site as well as flow-depth categories and cover. Macroinvertebrate habitat availability is moderate.

Location	EWR 1	Altitude	1570 m
Longitude	29.61384	Latitude	-26.8728
EcoRegion	Highveld/Southern Central Kalahari 11.05	Quaternary catchment	C11J
Water Management Area	Upper Vaal	Geomorphological zone	Lowland
			
EWR 1, Uitkoms, September 2007			

1.2 PRESENT ECOLOGICAL STATE (PES)

Geom	The Resource Assessment Unit (RAU) consists of an anastomosing rapid section with off-channel pools and backwaters, making this a very critical habitat within this very homogenous MRU of the Vaal River. Wetlands (pools) are located in the bed of a seasonal channel at this site. The permanent nature of these pools appears to be unique in the reach. Very high base flows are present due to interbasin transfers and this may account for the cut banks on both banks upstream of the site. Google Earth images indicate an absence of bars and islands in the reach which may also be a result of the elevated base flows. No change in moderate or large floods is evident from the available hydrological data, although there are several farm dams in the upper catchment area.
WQ	Physico-chemical variables indicate that the water quality is fairly good, although some impacts are detected.

	Increased Total Dissolved Salts (TDS) could be diffuse impacts originating from coal mines. Witpuntspruit tributary is impacted (low pH, high sulphates) by Acid Mine Drainage (AMD) and there are temperature changes due to the interbasin transfer from the Usutu River to the Perdewaterspruit which also raise the base flow from April to October. Occasional fish kills occur in the MRU that could be related to water quality problems. Cattle grazing also occurs in the riparian zone.
Fish	All the expected fish species are still present within this Resource Unit (RU) although the Frequency of Occurrence (FROC) of some species has been reduced from reference conditions. The FROC of <i>L. kimberleyensis</i> has been altered potentially as a result of water quality deterioration as well as habitat deterioration (increased siltation and benthic algae). The FROC of <i>B. anoplus</i> , <i>B. paludinosus</i> and <i>Pseudocrenilabrus philander</i> have also been reduced and relates to loss of cover (vegetation loss as result of bank erosion and sedimentation of substrates) and especially due to the presence of the aggressive alien predator <i>Micropterus salmoides</i> .
Inverts	Sep 07: SASS5 score: 104 No of Taxa: 18 ASPT: 5.8 Apr 08: SASS5 score: 89 No of Taxa: 17 ASPT: 5.2 Key taxa expected but not observed were generally those that are sensitive to water quality changes, such as Perlidae, Leptophlebiidae, Heptageniidae, Gerridae, <i>Centroptiloides bifasciata</i> , Hydracarina, <i>Caridina nilotica</i> and <i>Hydropsyche longifurca</i> . Tricorythidae were more abundant than expected, while Hydropsychidae were less abundant than expected.
Rip veg	This site occurs within the Soweto Highveld Grassland vegetation type, which has an endangered conservation status with 52.7% of the type remaining and only 0.2% protected.
Diatoms	Three diatom samples were taken at the site (September and December 2007, and April 2008) and 2003 diatom data was also available (Taylor, 2004). The overall biological ¹ water quality EC is a C, but there are indications that the water quality deteriorates markedly during the months of March and September – November. The Specific Pollution Index (SPI ²) during these months indicates an increase in nutrient load, ionic concentrations and organic pollution. Due to the transfer schemes (Heysope and Zaaiohoek) that cause elevated base flows there seems to be a dilution effect on the water quality.

1.3 MAIN IMPACTS AT THE SITE

	PES	Causes ¹	Sources ²	F ³ /NF ⁴
WQ	C	Increased TDS.	Diffuse impacts originating from coal mines. Cattle grazing.	NF
		Some indication of phosphate contamination.	Agriculture.	
		Temperature changes.	Interbasin transfer and Perdewaterspruit.	F
Geom	B/C	Elevated base flows are causing river bank cutting and likely decreased beds and bars.	Interbasin transfers.	F
		Reduced sediment supply.	Small dams.	
Rip veg	A/B	Vegetation removal.	Some trampling/grazing pressure, but minimal impact.	NF
		Exotic invasion.	<10%, <i>Salix babylonica</i> and non-woody weeds mainly.	
		Water quantity.	Reduced sedge cover in marginal zone due to increased dry season base flows, but the same cause has increased sedge cover and vigour in the lower zone.	F
Fish	C	Loss of habitat (decreased SS and SD) diversity as a result of flow modification (especially during natural low flow periods).	Interbasin transfer.	F
		Decreased overhanging vegetation as cover for fish.	Increased bank erosion related to agricultural and livestock farming activities.	NF
		Increased sedimentation results in deterioration of substrate as habitat (clogging interstitial spaces, loss of important spawning habitats, etc.).	Bank erosion and dryland crops.	

¹ Diatoms are primary producers and form the base of the aquatic foodweb. Within the EcoClassification process diatoms are used as an additional response variable to physico-chemical information and therefore reference is made to biological water quality.

² A diatom based water quality index. The index evaluates organic and inorganic pollution based on the sensitivity of each taxon, while taking into account the response of the whole diatom community (Almeida, 2001). The index is used to indicate general water quality.

	PES	Causes ¹	Sources ²	F ³ /NF ⁴
		Decreased substrate quality related to increased benthic growth.	Effluents from mines and agricultural areas.	
		Decreased water quality affect species with requirement for high water quality.		
		Decreased species diversity and abundance (especially small species) as result of presence of aggressive alien predator (<i>Micropterus salmoides</i>).	Presence of aggressive alien predatory species (<i>M. salmoides</i>) naturally spreading and introduced for recreation / angling.	
		Increased turbidity and disturbed bottom substrates.	Erosion and presence of bottom feeding alien <i>Cyprinus carpio</i> .	
		Presence of migration barriers reduces migration success (breeding, feeding and dispersal) of some species.	Grootdraai Dam and other major downstream dams as well as weirs. Also farm dams in tributaries reduce refuge areas.	
Inverts	C	Increased flows during dry season.	Interbasin transfer.	F
		Water temperature shocks.		
		Water quality and associated benthic growth.	Agriculture and mining.	NF

1 **CAUSE:** A stressor that occurs at an intensity, duration and frequency of exposure that results in a change in the ecological conditions.

2 **SOURCE:** A source is the origin of a stressor. It is an entity or action that releases or imposes a stressor into the waterbody (EPA, 2000).

3 Flow related

4 Non Flow related

1.4 RESULTS: PRESENT ECOLOGICAL STATE

Driver Components	PES	Trend
GEOMORPHOLOGY	B/C	Negative
WATER QUALITY	C	Stable
DIATOMS	C	
Response Components	PES	Trend
FISH	C	Negative
MACRO INVERTEBRATES	C	Stable
INSTREAM	C	
RIPARIAN VEGETATION	A/B	Stable
ECOSTATUS	B/C	

The PES of a C is due to a combination of flow and non-flow related impacts. Flow related impacts are mainly due to interbasin transfers (Heysope and Zaaihoek). Mining and agricultural activities in area has caused water quality deterioration and erosion.

1.5 SUITABILITY AS FUTURE BIOMONITORING SITE

The site is adequate for biotic monitoring and below the Heysope transfer. It seems that the water quality at this site is problematic as the fish show signs of serious bacterial infection and quality sensitive macroinvertebrates are absent. This is the first site within the Upper Vaal WMA and could therefore be included in monitoring programmes.

