

1 JBS21 (EWR 17: LLOYDS WEIR (HARTS RIVER) – OSAEH 29.1)

The information is summarised from DWA (2009c,d; 2010c).

The Harts River system is in the C3 drainage region of South Africa and its source is near the town of Lichtenburg in the North West Province, although the larger part of the catchment is situated in the Northern Cape Province. The Harts River flows in a south-westerly direction *via* Barberspan, the Taung and Spitskop dams, after which it flows into the Vaal River near Delportshoop.

1.1 SITE DESCRIPTION

EWR 17 falls within MRU Harts C which includes Wentzel Dam which is delineated as a unit. The dam supports the domestic water use in Wentzel and the yield of the dam is fully utilised. The EWR site is in close proximity to OSAEH 29.1. This site was not assessed during the October 2010 field trip and the results of the EWR assessment are summarised below.

EWR 17 is situated downstream of Spitskop Dam in the Harts River. The banks are composed of bedrock, and the channel is incised. Paired low benches occur but terraces are absent. Some paths in the upper and lower riparian zones has caused erosion. Fish habitat is well represented at site but flow modification by Spitskop Dam a short distance upstream of site is expected to result in unnatural habitat fluctuation. The weir directly upstream of site may result in unnaturally high abundance of species during migrations. Macroinvertebrate habitat is good with limited aquatic vegetation and mud habitats.

Location	EWR 17 Lloyds weir	Altitude	1114 m
Longitude	24.30305	Latitude	-28.37694
EcoRegion	Southern/Central Kalahari/Ghaap plateau 29.02; 30.01	Quaternary catchment	C33C
Water Management Area	Lower Vaal	Geomorphological zone	Lower Foothills



EWR 17, Lloyds weir. Trampling and grazing pressure are evident along both banks.

1.2 PRESENT ECOLOGICAL STATE (PES)

Geom	PES is in a D category due to widespread cut banks along this reach; grazing and trampling disturbance on the upper and lower banks. Additionally, the upstream bridge has caused some localised erosion.		
WQ	Data from monitoring site C3H016 was used for present day. This data shows high salt concentrations (EC and SO ₄), mainly from irrigation return flows. Upstream diamond mining causes possible impacts on turbidity. The nutrients are low to moderate with moderate to high ammonia concentrations from degrading algal matter.		
Fish	The ecological category of D recorded at this site can be attributed primarily to the absence of three expected species and the lower than reference FROC of several observed species including <i>B. paludinosus</i> , <i>B. trimaculatus</i> , <i>L. umbratus</i> and <i>T. sparrmanii</i> . This can be ascribed to the flow modification (Spitskop Dam upstream) and the availability of cover. In addition to the indigenous species, four introduced fish species were recorded namely <i>C. carpio</i> , <i>G. affinis</i> , <i>C. idella</i> and <i>O. mossambicus</i> .		
Inverts	Sep 07 Apr 08	SASS5 score: 91 SASS5 score: 61	No of Taxa: 21 No of Taxa: 16 ASPT: 4.3 ASPT: 3.8
	The Ecological Category of C/D is a combination of flow and non-flow related impacts. Impacts mostly related to changes in flow regime due to upstream dams and poor water quality return flows from the Vaal-Harts irrigation scheme. Key families not sampled during the surveys were: Baetidae >2spp, Ecnomidae, Elmidae, Heptageniidae, Perlidae, Hydropsychidae >2spp, Philopotamidae and Tricorythidae.		
Rip veg	The area is currently considerably degraded due to the construction of bridges and mining activities that have disturbed much of the riparian vegetation and the introduction of a number of exotic species. The exotic species in the area contribute to a significant number of the total number of species identified during the surveys as well as a considerable percentage (approximately 30%) of the abundance recorded during the survey. This was the first site in the study that did not fall within the Highveld Alluvial vegetation type and, in fact falls within the Upper Gariiep Alluvial vegetation type. This vegetation type appears to be less impacted by the invasion of exotic species than the Highveld Alluvial vegetation type, possibly due to less agriculture in the surrounding areas. In the areas along the banks of the river the disturbed riparian vegetation has been invaded by some exotic species and pioneer grasses.		
Diatoms	Diatom results are based on a sample taken during 2007. The Ecological Category (EC) was a C.		

1.3 MAIN IMPACTS AT THE SITE

	PES	Causes	Sources	F/NF
WQ	D	High salts.	Mining impacts, agricultural return flows (salts and nutrient) and sedimentation.	F/NF
		High nutrients and other agro-chemicals.		
Geom	D	Increased baseflows and a slight reduction in small floods which may cause reduced sediment transport, increasing deposition and decreasing flushing of fines and scour.	Irrigation return flows and Spitskop Dam upstream.	F
Rip veg	D	Homogenisation of riparian zone.	Encroachment of terrestrial exotic invasive species (Anthropogenic).	NF
		Aquatic exotic invasive species.	Increased nutrients.	F
Fish	D	Non availability of specific habitat cover units due to the growth of invasive aquatic macrophytes.	Nutrient enrichment due to runoff from upstream agricultural activities.	NF

	PES	Causes	Sources	F/NF
		Lack of access to upstream river reaches for fish species with this migratory requirement.	Upstream Spitskop Dam is a significant upstream migration barrier breaking the link between the Vaal and Harts River catchments.	
Inverts	C/D	Water quality has a detrimental effect on taxa that have a high and moderate preference for good water quality.	Agricultural return flows from upstream agriculture.	NF

1.4 RESULTS: PRESENT ECOLOGICAL STATE

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

The main reasons for the PES are a mixture of flow and non-flow related impacts. Return flows from Vaalharts Irrigation scheme and Spitskop Dam upstream of the site have impacted present day low flows which are higher than natural low flows and this may have a major impact on the system. Anthropogenic activities in the reach are impacting heavily on water quality which in turn impacts on available habitat and biota.

1.5 SUITABILITY AS FUTURE BIOMONITORING SITE

According to DWAF (2009), based on the River Health Programme results of 2003, the overall water quality status of the lower Harts River is in a fair to poor condition while the upper region remains in a good to fair condition. In the river reach between Taung and Spitskop Dam the water quality and flows are impacted by return flows from the Vaalharts Irrigation Scheme. As a result of saline leachate from the irrigation fields, the water is of exceptional high salinity ($\pm 1\ 100$ mg/l TDS) and the salinity and nutrient loads associated with these return flows have resulted in increased concentrations in the lower reaches of the Harts River and in Spitskop Dam. Management of water quality (salinity) at the Vaalharts irrigation scheme and downstream of Spitskop Dam thus remains of primary importance.

Based on the results provided in RHP (2003) and the assessment results from October 2010 this site is an important monitoring point within the Harts River
