

1 JBS22 (OSAEH 26.10: RIET RIVER)

The Riet River generally flows in a north-westerly, to the confluence with the Vaal River. The Tierpoort Dam which is used for irrigation purposes is situated on the tributary of the Riet River, and the Kalkfontein Dam which supplies water to the Riet River Government Water Scheme, is located just downstream of the confluence of the Kromellenboogspruit and Riet Rivers (DWAF, 2009).

1.1 SITE DESCRIPTION

The site is situated in the upper reaches of the Riet River and falls within MRU C1 which is delineated from the origin of the Riet River to the Kalkfontein Dam. Region is rural in nature and includes irrigated agriculture as major land use. The site mainly constitutes bedrock and boulder substrate and no flow was present at the time of sampling. Large pools were present with abundant marginal vegetation consisting of sedges and reeds. GSM biotope occurs at the site. Riparian vegetation consists of trees, shrubs, grasses, sedges and reeds. No large dams occur upstream but small weirs are present upstream. Surrounding land use is natural fields for grazing and agriculture.

Location	OSAEH 26.10	Altitude	1273
Longitude	25.70805	Latitude	-29.57528
EcoRegion	Nama Karoo 26.03	Quaternary catchment	C51F
Water Management Area	Upper Orange	Geomorphological zone	Foothill



OSAEH 26.10, Riet River. Large deep pool below bridge with bedrock and rocks, as well as marginal vegetation for cover.

1.2 SAMPLING CONDITIONS

At the time of sampling no flow was present at the site. Large pools with bedrock and boulder substrate were present for sampling. Moderate sedimentation occurred and no odours were detected. No exotic macrophytes or vegetation encroachment observed. Benthic algal growth and filamentous algae were present.

1.3 PRESENT ECOLOGICAL STATE

IIHI	The Instream Index of Habitat Integrity (IIHI) is a C (72.7%). This is mostly due to poor bed conditions, with elevated levels of sediment and benthic growth (also associated with elevated nutrients at the site), and to a less extent altered flow regimes with reduced base flows and flooding, and increased occurrence of zero flows.
RIHI	The Riparian Index of Habitat Integrity (RIHI) is a B/C (77.9%) with the main impacts being poorer bank conditions due to a higher substrate exposure, with trampling pressure exacerbating the situation. Reduced base flows and small floods facilitate an increase in marginal and lower zone vegetation and flow regulation promoted reed expansion and density.
Fish	All of the fish species (8 out of 8) expected under reference conditions are still expected to be present under the present conditions at this site and in the river. Note: <i>L. capensis</i> was sampled at an increased/improved FROC from reference conditions as it was sampled in high densities at the site, indicating that habitat conditions are suitable for species with a preference for a variety of flow depth classes, and species which are moderately intolerant to no flow conditions (<i>L. aeneus</i> , <i>L. kimberleyensis</i> , and <i>L. capensis</i>). The FROC of <i>L. kimberleyensis</i> was reduced due to flow modification and lower base flows resulting in a loss of FD habitat. No flow at time of sampling. Very large pools were present and all the species will be able to survive in these pools over extended periods of time. The pools serve as cover and refugia. Good spawning habitat is present for spawning during high floods, and pools are present as refugia and nursery area, after floods. Reduced base flows and loss of longitudinal connectivity, due to the impacts as discussed in this document, may be causes of concern for the fish population and their successful migration, spawning and recruitment. The presence of carp, which can prey on fish eggs and causes bio-turbation, may also negatively impact on the fish species present in the system. The FROC of <i>C. gariepinus</i> , <i>L. umbratus</i> (quiet water benthic species), <i>B. anoplus</i> , <i>P. philander</i> and <i>T. sparrmanii</i> is unchanged from reference as these species are moderately tolerant to tolerant to no-flow conditions. Habitat diversity is also high in terms of their different habitat preferences (Cover – water column, bedrock, rocks and cobbles, bank undercut, marginal aquatic veg. and tree overhang etc.). The EC was a C as determined by the FRAI (72.9%).
Inverts	Oct 2010: SASS5 score: 74 No of Taxa: 16 ASPT: 4.6 Key taxa expected but not observed were generally those that are sensitive to water quality changes, such as Hydropsychidae (>2 spp), Baetidae (>2 spp), Aeshnidae, Chlorocyphidae, Elmidae, Gerridae, Leptophlebiidae, Tricorythidae, and Vellidae/ Mesovellidae. Most of cobble dwelling expected taxa were missing during the time of sampling despite moderate abundance of stones habitat. The MIRAI model generated a PES for macroinvertebrates as a Category C (65.4%).
Rip veg	The site has a VEGRAI score of 83.5% (B EC). Marginal Zone: Various vegetation components exist: 1) Narrow high density <i>Phragmites australis</i> along deep pools, 2) Open sheet rock or damp mud where the river has stopped flowing, with some grazed <i>Cynodon dactylon</i> , 3) Alluvial deposits with dense and tall stands of <i>S. mucronata</i> , 4) <i>Schoenoplectus</i> species or <i>Gomphostigma virgatum</i> associated with sunny areas with some bedrock. Lower Zone: Marginal zone components 1 and 3 similar, with dominant and extensive component 4 above; also <i>Agrostis lachnantha</i> (a hydrophilic grass). Upper Zone: Dry: RB - is an alluvial terrace with <i>Searsia pyroides</i> and <i>Lycium</i> sp. as dominants mixed with terrestrial grasses; LB - open sheet rock with some fine sediments, not well vegetated. MCB: Alluvial; woody and grass mix, with <i>Diospyros lyceoides</i> and terrestrial grasses dominant.
Diatoms	The assessment is based on a single sample taken during the current assessment. The overall EC of this site is a C. Nutrient levels are elevated at times while organic loading is moderate. The site is generally moderately polluted.

1.4 MAIN IMPACTS AT THE SITE

	PES	Causes	Sources	F/NF
Rip veg	B	Reduced cover of indigenous riparian obligate species, mainly grasses and some woody species.	Moderate to high trampling and grazing pressure (sheep mainly) with bank destabilization in places.	NF
		Altered species composition.	Small impact of alien vegetation (5% annuals, 5% perennial mainly <i>Populus alba</i>).	
		Increased vegetation cover of sedges and reeds.	Flow regulation and reduced flooding disturbance facilitates an increase in reed and sedge cover and density in the marginal and lower zone.	F

	PES	Causes	Sources	F/NF
Fish	C	Loss of all flow classes and mainly FD habitat as a result of flow modification (especially during naturally low flow periods).	Smaller weirs and water abstraction for farming and irrigation upstream.	F
		Lower breeding success and recruitment for fish = lower FROC.	Lower, less and/or no natural flushes and smaller floods. Flow modification due to smaller weirs and water abstraction for farming and irrigation upstream.	
		Loss of species diversity or numbers due to loss of habitat diversity due to lower flows.	Flow modification due to smaller weirs and water abstraction for farming and irrigation upstream.	
		Loss of habitat with substrate (cobbles and rock), and water column in FD due to lower than natural flows.		
		Loss of longitudinal connectivity for migration.		
	Decreased species diversity and abundance due to presence of carp.	Presence of alien species (carp) introduced for aquaculture and angling.	NF	
	Enrichment.	Agriculture upstream.		
Presence of dams and weirs as migration barriers (breeding, feeding and dispersal), also causing loss of habitat of some species (inundation).	Dam downstream and other smaller weirs in area.			
Inverts	C	No flow. Sedimentation and bank erosion.	Agriculture	F
		Poor water quality and associated benthic growth.		NF

1.5 BASELINE SURVEY RESULTS: PRESENT ECOLOGICAL STATE

Driver Components	PES	Trend
IHI: INSTREAM	C	
IHI: RIPARIAN	B/C	
DIATOMS (WQ)	C	
Response Components	PES	Trend
FISH	C	Stable
MACRO INVERTEBRATES	C	Stable
INSTREAM	C	
RIPARIAN VEGETATION	B	Stable
ECOSTATUS	C	

The main reasons for the Present Ecological State Category of a C are flow modification and resultant loss of habitat diversity due to smaller weirs and water abstraction for farming and irrigation. Lower breeding success and recruitment of fish, as well as loss of species diversity or fish numbers occur due to flow modification. Loss of connectivity for movement of aquatic biota due to small weirs. Nutrient enrichment due to agriculture, instream

sedimentation and bank erosion reduce the quality of the available biotopes. Altered riparian vegetation species composition and increased vegetation cover of sedges and reeds due to flow regulation and reduced flooding disturbance.

1.6 SUITABILITY AS FUTURE BIOMONITORING SITE

A moderate quality and quantity of SOOC biotope is available for SASS sampling. Marginal vegetation out of current is also available. No instream biotopes are available for SASS sampling. Good habitat diversity and cover for all expected fish species is available. Undercut banks, aquatic marginal and overhanging vegetation, water column and substrate provide abundant cover for fish. Pools are abundant for water column cover for fish. Erosion and abstraction upstream, instream weirs modify flows and thus instream habitat. Site is situated downstream of a bridge. Benthic growth due to nutrient enrichment impacts negatively on the available habitat. Riparian vegetation obligate species are present and dominant at the site.