

VANDERKLOOF DAM

COORDINATES (degrees, minutes, seconds)

LATITUDE	LONGITUDE
29° 59' 28" S	24° 43' 54" E

LOCATION

Vanderkloof Dam is situated in the Free State on the Orange River (130 km downstream of Gariep Dam) in quaternary catchment D31E in South Africa.

DESCRIPTION

Vanderkloof Dam is a composite gravity arch dam. It has a central arch which transitions into a gravity flank on the left bank. Four sluice gates, which can in total discharge up to 20,400 m³/s, are positioned on the left flank of the dam.

PURPOSE

The dam supports requirements all the way to the mouth approximately 1,400 km away, including river-flow control, flood control, hydropower generation (Eskom) and storage of water for urban and irrigation use. The releases are primarily used for irrigation but also supply the urban requirements of Ritchie, Jacobsdal and Koffiefontein (including mining).

The dam, together with the Gariep Dam, forms an integral component of the Orange River Project and supplies water to the Riet River catchment as well as to the various users along the remaining 1,400 km of the Orange River. Water released from the Gariep Dam flows into Vanderkloof Dam where it is either transferred through the Orange-Riet Canal to the Riet River basin or released downstream. There are two hydropower generators at the dam which can collectively produce up to 240 MW of electricity at a discharge flow rate of 400 m³/s (each generator 120 MW at 200 m³/s). It was originally envisaged to extend the right bank canal, but due to economic factors it was decided not to proceed with the extension; it currently stops near Hopetown. All irrigation along the left bank between Vanderkloof Dam and Hopetown is supplied directly from the river using pumps.



Vanderkloof Dam (© S Crerar)



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Katse and Mohale dams do not support Vanderkloof Dam, only environmental flow releases and spills flow into Vanderkloof Dam. Vanderkloof and Gariep dams release water for the environmental flow requirements at the river mouth.

PHYSICAL INFORMATION

Dam name	River	Quaternary catchment	FSC* (million m ³)	FSA (km ²)	Owner	DWA code	Wall height (m)	Wall length (m)
Vanderkloof	Orange	D31E	3,188.60	133.40	DWA	D3R003	108	765

* Live full supply capacity (SANCOLD, 2009)

Year of completion	Demands/abstractions (million m ³ /a)			1:50 yield (million m ³ /a)
	Domestic*	Irrigation*	Other*	
1977	Unknown	4,848	Unknown	3,318

*The reservoir record for Vanderkloof shows three demands, namely: industry and town, power stations and mixed use. Industry and towns is relatively low and fairly constant – the 2009 hydrological year showed that 0.003 million m³ was abstracted. The power station's volume is available for downstream irrigation and varies considerably. The 2009 hydrological year gave 3,958 million m³ as having been released, but the amount varied between 2,124 million m³ (2004) and 7,004 million m³ (2005) over the last five years. The mixed use is denoted as missing throughout the reservoir record.

From 2010 AOA WRP Consulting Engineers Report (2010 demands, made up of South Africa and Namibia demands)

The yield result of 3,318 million m³/a represents a system yield of Vanderkloof and Gariep dams as they are operated as a system. This result can be broken down into the demands supplied by the dams (3,143 million m³/a) and the surplus yield obtained once those demands have been satisfied (175 million m³/a).

AREA–CAPACITY RELATIONSHIP

Elevation (m)	Storage (million m ³)	Surface area (km ²)
1,174.0	3,681.05	148.68
1,170.5	3,188.60	133.40
1,167.4	2,788.80	121.58
1,163.9	2,387.91	108.80
1,160.0	1,986.88	96.14
1,157.8	1,786.96	89.83
1,153.0	1,386.47	77.30
1,147.8	1,015.40	64.70
1,128.5	205.50	21.37
1,109.8	0.00	0.00



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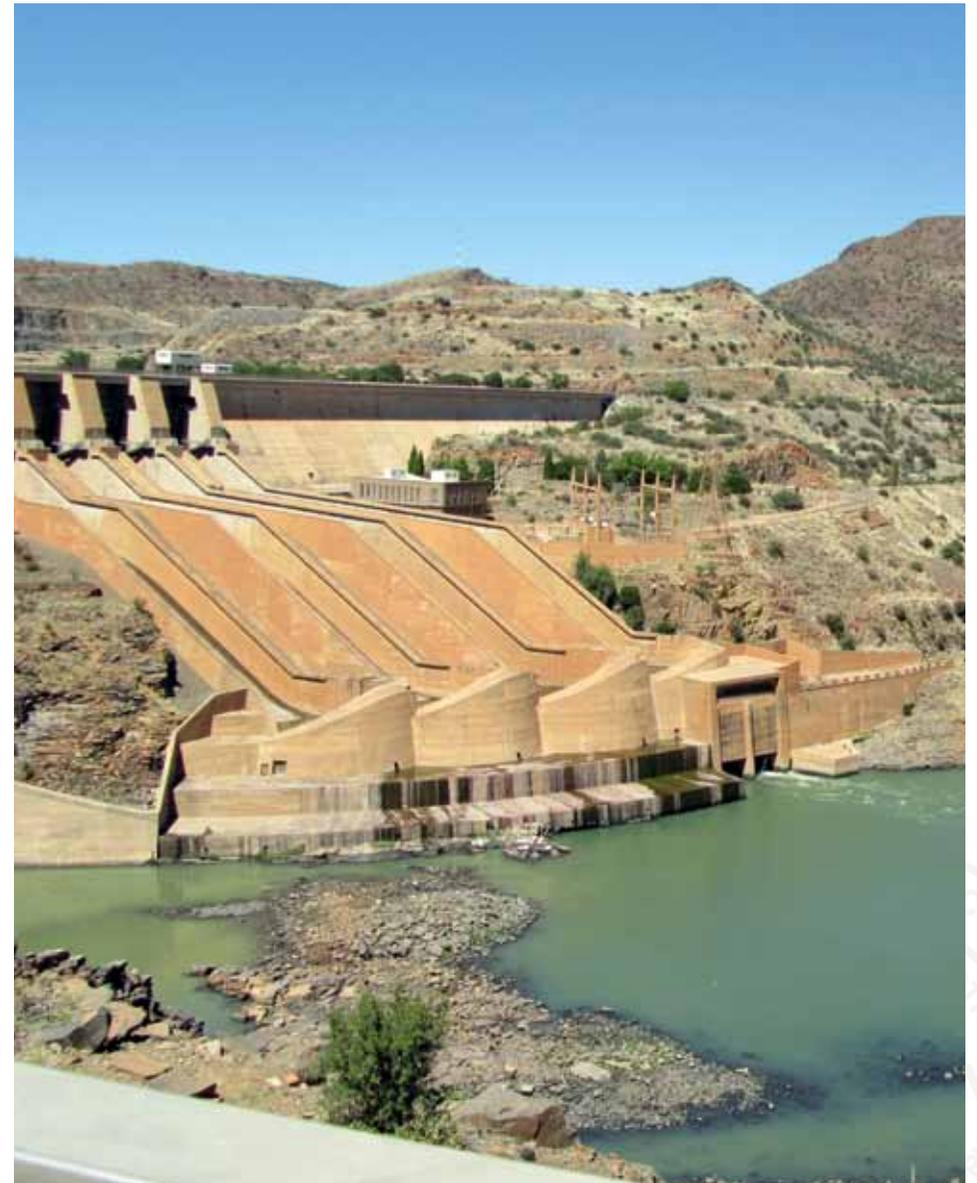
OPERATING RULE

The dam (along with Gariep Dam) works on an operating rule for hydropower which utilises releases to meet downstream requirements, for hydropower generation purposes. Eskom generates power according to downstream water requirements. Storage control curves are used to determine this rule, which utilises monthly water levels for operation. Once the level in the dam goes above a certain level, Eskom may open the hydropower turbines to utilise the water that would have otherwise spilled. This ensures minimum spillage and maximum usage of the flow.

Vanderkloof Dam is not supported at all by the Vaal River System, even the spills from the Vaal are not utilised downstream as the total demand for the Lower Orange is released from the Vanderkloof Dam (without taking the inflows/spills into account when releasing the flow). Katse and Mohale dams do also not support Vanderkloof Dam, only environmental flow releases and spills flow into Vanderkloof Dam. Due to the distance between Vanderkloof Dam and the location of abstraction points, water needs to be released two to six weeks in advance. The distance between Vanderkloof Dam and the river mouth is approximately 1,400 km and the flow takes roughly a month to reach the river mouth from the dam.

The Vanderkloof Dam inflow is highly regulated due to the upstream Gariep Dam, which is more dependent upon natural flows as it is far less regulated upstream. The inflow pattern for Vanderkloof is usually high in winter and low in summer.

Although the Fish River flows into the Orange River from Namibia, the confluence of the two rivers is too near the river mouth for the water to be usefully stored or even utilised along the lower Orange River. These demands are therefore satisfied by the Vanderkloof Dam.



Vanderkloof Dam (© Ian Cameron-Clarke)