



# GARIEP DAM

COORDINATES (degrees, minutes, seconds)

LATITUDE	LONGITUDE
30° 37' 24" S	25° 30' 24" E

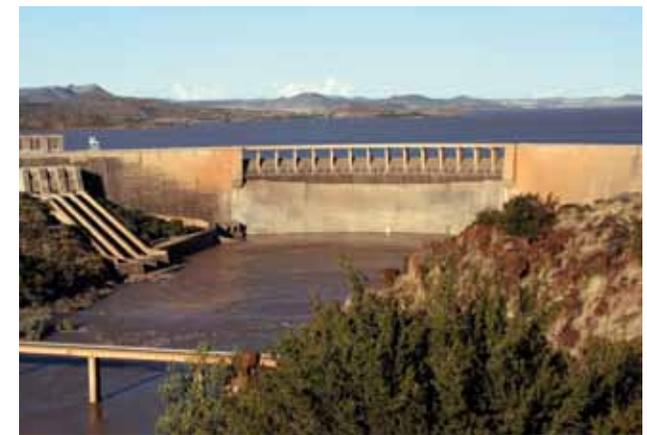
## LOCATION

This dam, which is the largest dam in South Africa, is situated in a gorge at the entrance to Ruigte Valley on the Orange River in quaternary catchment D35KE, upstream of Vanderkloof Dam (the second largest dam in South Africa).

## DESCRIPTION

It is a combined gravity and arch dam built entirely of concrete. However, only the central part of the wall is arched due to the gorge at the dam being too wide to allow a complete arch. The two concrete flank walls were needed to form artificial gravity abutments for the main arch. The dam is a double curvature structure and the wall incorporates two outlet structures on the upstream side of the wall.

There are three rubber sealed, stainless steel-faced radial gates on each side of the wall. These are used to discharge floodwaters into six concrete chutes, which lead the water away from the base of the dam wall into the downstream flow of the river, which aids in decreasing the risk of erosion to the base of the dam wall. The radial gates' life expectancy greatly exceeds that of the dam, estimated at three centuries. There are two concrete flanks to aid in artificial gravity abutments for the main arch. The dam has a full supply level of 1,258.7 m, with a dead storage level of 1,233.1 m and reservoir bottom at 1,202.9 m.



Gariep Dam (© Hendrik van den Berg/www.panoramio.com)



## GARIEP DAM

### PURPOSE

The dam is the central structure of the original Orange River Project (ORP) which involves the supply of water to parts of the Vaal, Fish and Sundays catchments, including the 82-km Orange–Fish Transfer Tunnel from Gariep Dam to Grassridge Dam (located on a tributary of the Great Fish River).

Gariep Dam serves to generate hydropower (Eskom), capable of providing up to 360 MW of electricity at a flow rate of 800 m<sup>3</sup>/s (four generators, each having the capacity of 90 MW at a flow rate of approximately 200 m<sup>3</sup>/s), served by the outlet structure on the left flank of the dam. However, both outlet structures are used for controlled releases.

The dam also supplies water for irrigation along the Orange River, as well as a wastewater treatment plant owned by Bloem Water.

### PHYSICAL INFORMATION

Dam name	River	Quaternary catchment	FSC* (million m <sup>3</sup> )	FSA (km <sup>2</sup> )	Owner	DWA code	Wall height (m)	Wall length (m)
Gariep	Orange	D35K	5,343	370	DWA	D3R002	88	914

\* Live full supply capacity (SANCOLD, 2009)

Year of completion	Demands/abstractions (million m <sup>3</sup> /a) ‡			1:50 yield (million m <sup>3</sup> /a)	Maximum spillway capacity (m <sup>3</sup> /s)
	Domestic	Irrigation	Other		
1971	39.84	658	Unknown	Unknown	20,450

‡ DWA, 2008–2010

The Gariep and Vanderkloof dams are operated as the ORP. The total yield obtained for these dams is 3,318 million m<sup>3</sup>/a. This yield is representative of the total demands imposed on the system (3,143 million m<sup>3</sup>/a) plus the surplus yield of 175 million m<sup>3</sup>/a as determined in 2010.



## GARIEP DAM

### AREA-CAPACITY RELATIONSHIP

Elevation (m)	Storage (million m <sup>3</sup> )	Surface area (km <sup>2</sup> )
1,263.7	7,342.96	446.82
1,258.7	5,348.12	352.16
1,255.8	4,419.49	298.91
1,252.4	3,488.91	238.27
1,250.3	3,022.55	210.98
1,245.2	2,092.89	156.99
1,241.9	1,628.18	128.96
1,237.9	1,163.24	102.73
1,231.6	638.09	65.69
1,202.9	0.00	0.00

### OPERATING RULES

The dam (along with Vanderkloof Dam) works on an operating rule for hydropower which utilises releases to meet downstream requirements for hydropower generation purposes. Only when surplus water is available will it be allocated for power generation purposes. Storage control curves are used to determine this rule, which utilises monthly water levels for operation. Once the level in the dam rises 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.

Gariep Dam is largely dependent upon natural flows (as opposed to Vanderkloof Dam, which is dependent upon releases from Gariep and therefore highly regulated). The inflow pattern for Gariep is usually low in winter and high in summer (opposite of the regulated Vanderkloof Dam).

