

VAAL DAM – Underlying Gauteng's Wealth



Lani van Vuuren

The wealth of South Africa's economic powerhouse, Gauteng, was not only built on the backs of the mineworkers who have toiled in its gold mines for more than a century, but on the supply of water, which made economic growth at all possible. Lani van Vuuren reports on the history of the Vaal Dam, which remains one of the province's main sources of bulk water supply.

The outbreak of two World Wars saw massive bursts of secondary industrialisation taking place on the Witwatersrand, and with it an exponential growth in population. This resulted in an insatiable demand for water. Between 1915-16 and 1921-22 the number of industrial establishments in and around Johannesburg more than doubled from 862 to 1760.

With Johannesburg being one of the few large cities in the world not built on a large river, the Rand Water Board looked to the nearby Vaal River to meet the growing demand, constructing the Vaal Barrage in the early 1920s. Soon, however, this proved not to be enough to meet the users' growing water needs.

The Rand Water Board reached the limits of its abstraction rights in the early 1930s

around the same time as the government was planning to build a dam at Christiania to provide water for the Vaalhartz Irrigation Scheme. After much debate, it was decided instead to build a dam at the confluence of the Wilge and Vaal rivers about 56 km south of Johannesburg, near Vereeniging.

The dam was to be a mass gravity concrete structure 518,6 m long, with a

height of 31,14 m above the mean river bed level and an earth embankment on the Transvaal (now Gauteng) side or right bank of the river, 1 890 m long.

The water board entered into a partnership with the South African government whereby it would secure 315 million litres per day from the Vaalbank Dam (as it was then known) and would contribute R3,3-million of the total R2,3-million cost. The Vaal River Development Scheme Act was subsequently passed in 1934.

RELIEVING UNEMPLOYMENT

The relief of unemployment, specifically among the white population, was an important consideration for the dam's construction. In fact, it was as a direct result of the Department of Labour's request on 31 March 1933, amidst the Great Depression, that public works be expedited to employ more white labourers that construction of the dam, along with the Vaalhartz Irrigation Scheme and the Loskop Irrigation Scheme began.

Government's main interest in the dam was to provide irrigation to the Hartz River Valley Afrikaner community in the Northern Cape. Nearly half of the dam's capacity, much of which evaporated along the way, was devoted to this idealistic project. The rest would be channelled to the Witwatersrand and finally resolve Rand Water's water shortage.

Many so-called 'poor whites' were employed on the scheme. Director of Irrigation, AD Lewis, stated in his annual report in 1934/35 that "in furtherance of the policy of employing European labour only, this work is also being carried out by means of white labourers." These labourers were between the ages of 18 and 45 and unmarried. The pay was two shillings per day, with a bonus of one shilling 6d per day worked. Interestingly enough, their bonuses were paid into a Post Office Savings Bank account, and they were only allowed to draw the money after they left the work. Money could be paid to dependents via a stop order.

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About 800 men worked on the construction of the dam. Notwithstanding this, in 1935 the Department of Labour found it impossible to keep the white labour force "up to the required strength, and it became necessary to employ natives on certain sections of the work." The reason for this, according to Lewis, was "the increased prosperity of the

country and the consequent demand for labour."

In 1938, work on the superstructure of the Vaal Dam was completed, and a superintendent and small staff were appointed for maintenance purposes. On 13 December 1938, the dam overflowed for the first time. At that stage the dam had a full supply capacity of 994 million m³.

Lewis noted in his report for the period 1938/39 that "the dam's usefulness as a regulator of the Vaal River flow has now been amply demonstrated and, although the year was admittedly a good one as

THE GREAT DEPRESSION AND THE POOR WHITE ISSUE



DWAf

The Great Economic Depression of the 1930s did not bypass South Africa. It struck the country in two waves – the crashing of Wall Street in 1929 and Britain abandoning the Gold Standard in 1931.

To compound matters the country was gripped in one of the worst droughts in living memory. Rains failed completely in 1931 and 1932 leaving crops to wither and farm animals to die in their dozens of starvation.

In the areas where farmers chose to stick it out black labourers were laid off in their thousands. They were forced to seek work in towns where they eked out a living as manual labourers and mine workers.

Many white farmers also abandoned their farms, seeking refuge in neighbouring towns. Interestingly, the daughters were often sent to town first to look for work. This was because their labour was not essential to keep the farm going as, for example, the labour

of black women to their homesteads. In addition, women earned less than men and generally found work easier.

Due to the priorities of the government at the time it was never recorded how many black people suffered due to the Depression. But by the 1930s, 300 000 out of a population of 1,8 million whites were poor. Ninety percent of them were Afrikaans speaking. They became known as the 'Armblankes' or the 'poor whites'.

Many laws were passed by the South African government to address the Poor White issue. Jobs were reserved on the railway and postal service, the police and defence force for whites. Industrial schools were set up to train poor white children to be skilled workers. Jobs were also provided through a series of irrigation schemes.

A scheme for subsidised housing was also introduced. By the 1940s the living standards of most whites had improved substantially.

regards water supply, it is clear that the reach between the dam and the Vaal-Hartz Weir will be vastly improved both in the increase of the winter minimum flow, and the reduction in the magnitude of floods."

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During the construction of the Vaal Dam, a small village named Deneysville after Deneys Reitz, who was Minister of Irrigation at the time of the dam's construction, was founded. Today, it is the centre of activity for the marinas and boating facilities that hug the shore of the dam.

VAAL-HARTZ SCHEME

The second component of the Vaal River Development Scheme – the Vaal-Hartz

distribution works was also constructed using manual labour. As in the case of the Vaal Dam only single white males were used.

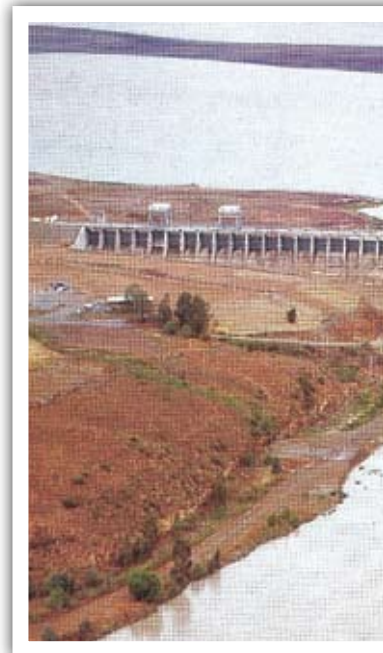
Modern machinery was also employed due to the extensive nature of this project. By the end of 1937 the Department of Lands settled 30 farmers on the scheme to work the land. This number increased to 126 in 1938. By March 1940, there were 304 settlers on the scheme.

VAAL DAM BETTERMENTS

After World War II, because of the rapid expansion in industrial activity and development of the Free State goldfields, it was decided that the Vaal Dam be raised by 6,1 m to make additional supplies of water available. This comprised raising the concrete overspill crest by 3,05 m and installing 60 crest gates 2,05 m high on top of the concrete. The earth embankment was also raised.

Work started in 1952 and was completed in 1956. The raising increased the storage capacity to 2 330-million m³, which increased the dependable yield to 1 029-million m³ a year. The cost of raising the dam was R2,9-million.

Vaal Dam as seen from the air.



DWAF

To better control floods, the gate height was increased by 1,82 m. This was done by adding a bottom extension to the existing gates. Furthermore, it was proposed that a pilot channel be provided through the saddle dam embankment. This saddle dam is situated on the Gauteng side of the Vaal River.

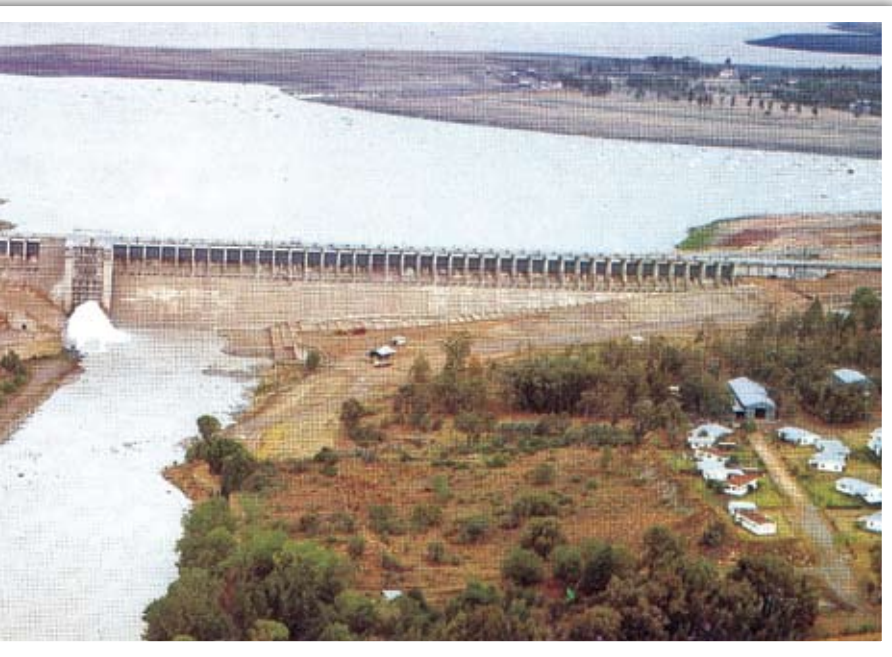
If this pilot channel were not installed a flood could breach the saddle dam and cause extensive damage to the undeveloped valley below the dam. Provision was also made for foundation drainage to uplift the dam wall itself. This was to improve the stability of the concrete wall, and was done by providing a foundation drainage tunnel in the foundations below the dam wall. This tunnel is 600 m long and a vertical curtain of drainage holes was drilled between the tunnel and the foundation line.

The stability of the concrete wall was also improved. Tensile stresses on the upstream face were decreased through the installation of pre-stressed cables. A total of 320 cables along the crest, 2,8 m from the upstream face, were installed. Each cable reaches from the crest to a maximum of 25 m below foundation level. New



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The Vaal Dam has 60 crest gates, each capable of releasing 115 m³/s.



FACTS & FIGURES ABOUT THE VAAL DAM

Capacity: 2,57 billion m³.
Shoreline: 880 km.
Dam surface area: 32 107 ha.
Number of crest gates: 60, each capable of releasing 115 m³/s. During high floods this can increase to 202 m³/s.
Number of provinces that make up the shoreline: Three (Free State, Mpumalanga and Gauteng).
Dam catchment area: 38 500 km².


hoisting structures and hoisting gear capable of raising the gates completely clear of the bridge deck were also installed.

In 1979, the Department of Water Affairs proposed to raise the dam wall to 3,05 m. This was to increase the capacity of the Vaal Dam by 1 033,5 million m³ to 3 364-million m³. It was proposed that 1,1 m of this raising be used for supply storage and the rest for flood storage. In this way, it was possible to store for consumption an addition 342 million m³ of water. This second raising took place in 1985.

The flood attenuation properties of the dam were severely tested in February 1996 when the largest flood ever recorded at the Vaal Dam site was experienced. An inflow of over 4 700 m³/s was measured into the Vaal Dam, which was already at full capacity due to good rains.

Full supply capacity was reached on 19 February 1996, i.e. only 194 million m³

of flood absorption capacity remained before the full inflow would have had to be released causing major damage. During the period from 15 December 1995 to 15 March 1996 the inflow volume to the dam was estimated at 7 605 million m³ – enough the fill the dam three times over. The inflow peak was estimated to have a return period of 70 years, while the outflow peak was estimated to have a return period of only 20 years.

Today, the Vaal Dam still forms the central storage reservoir for the Vaal River water supply system, which supplies water to Gauteng and surrounds. 

SOURCES

Hydropolitical History of South Africa's International River Basins (WRC Report No: 1220/1/04)
Rand Water – A Century of Excellence, 1903-2003 (Phil Bonner & Peter Lekgoathi)
www.randwater.co.za
www.dwaf.gov.za



The Vaal River downstream from the Vaal Dam. The dam is unique in that three provinces make up its coastline (Free State, Mpumalanga and Gauteng).

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