

Today, the Wemmershoek Dam still plays a critical role in the bulk water supply to Cape Town and surrounds. But it took several decades from the time the engineering project was first contemplated to being executed by the City of Cape Town, to whom the dam still belongs.

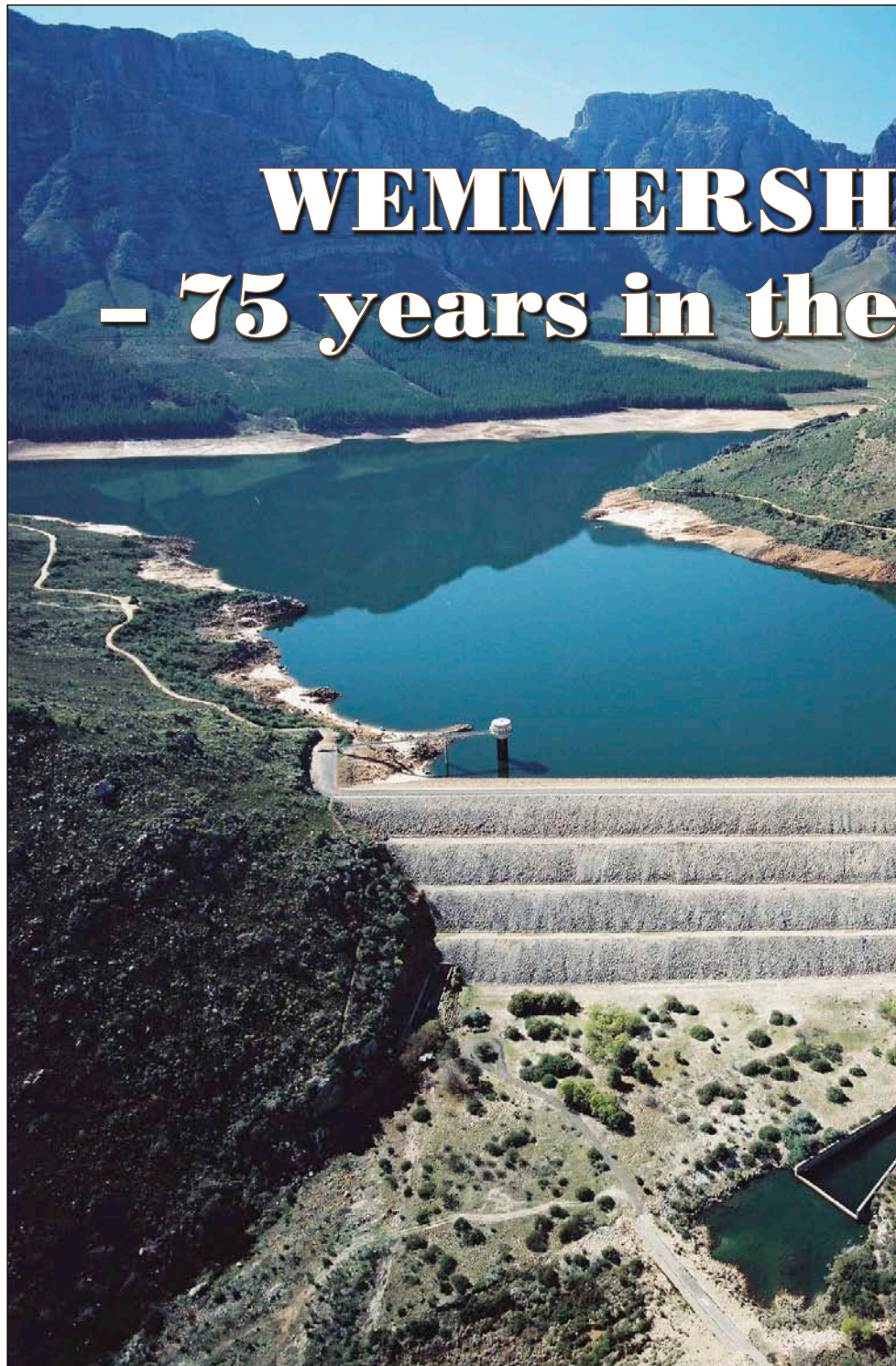
In a report dated 1882 the hydrographic surveyor to what was then known as the Cape Colony drew attention for the first time to the possibility of developing the Wemmershoek catchment. The relatively small, mountainous catchment area, surrounded by spectacular peaks, drew attention particularly due to its abundant winter rainfall.

Water shortages have been an occurring theme throughout the history of the Cape. No sooner had one crisis been averted than the next scheme had to be implemented to meet rising demand. This was again the situation following the Anglo-Boer War. In 1904, John Parker, Chairman of the Joint Water Committee wrote: "The rapid development and expansion not only of the City, but of the neighbouring suburbs in the last decade has placed the need for an increased supply of water in the position of first importance, demanding immediate and serious consideration. An adequate water supply is the most important municipal question at present before the people of the Cape Peninsula; without exaggeration it is a matter of life or death to many of its inhabitants."

INITIAL INVESTIGATIONS BEGIN

In 1899, the Woodstock Municipal Council, following investigations by consulting engineer Thomas Stewart, already started buying up properties in what was then known as Oliphants Hoek (Wemmershoek) with the view of constructing a reservoir there with a capacity of 3 million gallons (13 638 m³).

In 1904, Cape Town City Engineer, J Cook, submitted a report on various water supply schemes, among others,



It took close on 75 years from the time the thought of constructing a dam in the water-rich Wemmers River Valley, in the Western Cape, was first uttered to finally bringing the project to fruition. Lani van Vuuren takes a peak at how this dam came to be built.



City of Cape Town

More than 50 years after its construction, Wemmershoek continues to be a crucial source of bulk water to the residents of Cape Town, which owns the dam, and surrounding towns.

Steenbras, Palmiet, Twenty-Four Rivers, Wemmershoek and Franschhoek (today known as the Berg Water Project). However, with Woodstock having already 'claimed' the Wemmershoek scheme, Cape Town's attention turned first to Franschhoek and then to Steenbras after it became clear that Table Mountain, from which it was receiving its main water supply at the time, had reached its limits for development.

In 1907, Woodstock and three other municipalities, Mowbray, Claremont and Rondebosch successfully promoted a Private Bill, which gave them the right to construct a relatively small reservoir in the Wemmershoek catchment. Initial investigations kicked off with rainfall and river gauging, and a series of trial pits were dug at the present dam site.

The project, however, was beyond the financial capacity of the interested local authorities. In 1913, the rights to the scheme devolved on the Municipality of Cape Town when it amalgamated with eight surrounding municipalities, including the four Councils that had promoted the original Bill.

At the time of unification recurrent water shortages were already posing a serious problem. Detailed investigations of possible new sources were undertaken as a matter of urgency not only at Wemmershoek but also at Steenbras, which had emerged as its most serious rival as the new source of supply. In 1916, the Board of Engineers recommended that Steenbras be developed.

A referendum among ratepayers between Steenbras and Wemmershoek followed. Steenbras won the poll and the Council of Cape Town adopted the Steenbras Scheme in 1917. This dam was eventually completed in 1921.

WEMMERSHOEK REVIVED

The Wemmershoek Scheme remained on the backburner until after the Second World War when it became apparent that a new water supply would soon be

necessary for Cape Town. Investigation of several possible schemes showed that Wemmershoek would be the most economical source of supply except perhaps Riviersonderend. Since, however, the latter was to be pursued by National Government as an irrigation scheme, it was decided to pursue the Wemmershoek Scheme instead.

Cape Town started taking steps to obtain, through Parliament, amplification of the powers it had originally been granted so as to permit development of the catchment's full potential yield. The Private Bill promoted for this purpose was finally passed by Parliament in 1951. An important requirement of the Act was that the City was not to construct the dam in stages, but was to build it immediately to full height.

A Board of Engineers was appointed to control the project. The Board comprised recently appointed City Engineer Solly Morris and renowned consulting engineer Ninham Shand, assisted by Technical Secretary BD Kark. At the invitation of Shand

WEMMERSHOEK DAM FACTS AND FIGURES

Year of completion: 1957

Catchment area: 84,2 km²

Type: Earthfill

Length of crest: 518 m

Height above lowest foundation: 55 m

Volume content of dam: 2,9 million m³

Full supply capacity of reservoir: 58,6 million m³

Annual yield: 51 million m³ (99% assurance of supply)

Surface area at full supply capacity: 296 ha

Spillway type: Gate-controlled discharge with chute

Maximum discharge capacity of spillway: 1 065 m³/s (controlled)



Ewisa/Dirk van Driel

Wemmershoek Dam was initially designed to be a mass concrete dam, but later a design incorporating a rockfill embankment with a clay core and filters was proposed, saving some half a million pounds in foundation costs.

former head of the US Bureau of Reclamation, Dr John Savage, became the third member of the Board.

Construction of large earth dams had not been customary practice in South Africa at the time, with traditional mass concrete construction being commonly employed. Initially Wemmershoek Dam was designed to be a mass concrete dam, but Shand proposed a rockfill embankment with a clay core and filters – an engineering design that had taken off in the US. Dr Savage supported Shand's proposal, and the design was implemented accordingly, saving some half a million pounds in foundation costs.

Morris had this to say about the design in a paper published in 1959: "With the tremendous advances in earthmoving

equipment and the increased knowledge made available from intensive studies in soil mechanics, there is little doubt that construction of dams in earth will be extended."

RACE AGAINST TIME

The raising of Steenbras Dam during the early 1950s bought Cape Town some time, but it was still a race against time to complete Wemmershoek Dam to avert a major water crisis. The main contract for construction was awarded to George Wimpey & Co of London on April 1953, and work on the site commenced in June of that year. Nearly all the constructional plant – to a value of £784 000 – was purchased new for the project. Most of it was delivered to the site before, or during the first summer of construction. JG Welsh was appointed Resident Engineer on Wemmershoek Dam, while JA Shaw was the Resident Engineer on the Wemmershoek Pipeline, which formed an important part of the overall scheme.

At the peak of construction 1 286 people were employed on the dam site. Work

proceeded day and night in two shifts. Face shovels were used for excavation, except in places where access was unduly difficult; in these areas draglines were used.

Work on the dam was dealt a significant blow when on 19 May, 1954, the Wemmers River Valley experienced its highest flood ever occurred. The peak flow was assessed at about 453 m³/s. Direct losses were covered by all-risk insurance, but the resulting delay – which was not insurable, was far more serious. The flood also led to a reconsideration of spillway design capacity.

The dam was finally completed in 1957.

MAIN DESIGN ASPECTS

The dam wall consists of an embankment-type structure composed of river gravel and boulders with sloping clay core, rising 55 m above original ground level. The length along the top of the embankment is 518 m and the maximum width at the bottom is 335 m. Interestingly the amount of material handled was more than twice that contained in the Great Pyramid of Egypt. At the time of its construction, the Wemmershoek Dam was the largest dam of its kind in southern Africa.

The central clay core totals a quarter of the volume of the dam and was placed in layers 152 mm in thickness and rolled ten times with 37-t rubber-tyred rollers drawn by tractors. Before placement of the clay could start, it was necessary to prepare a foundation sufficiently strong enough to prevent percolation of water under pressure through the ground.

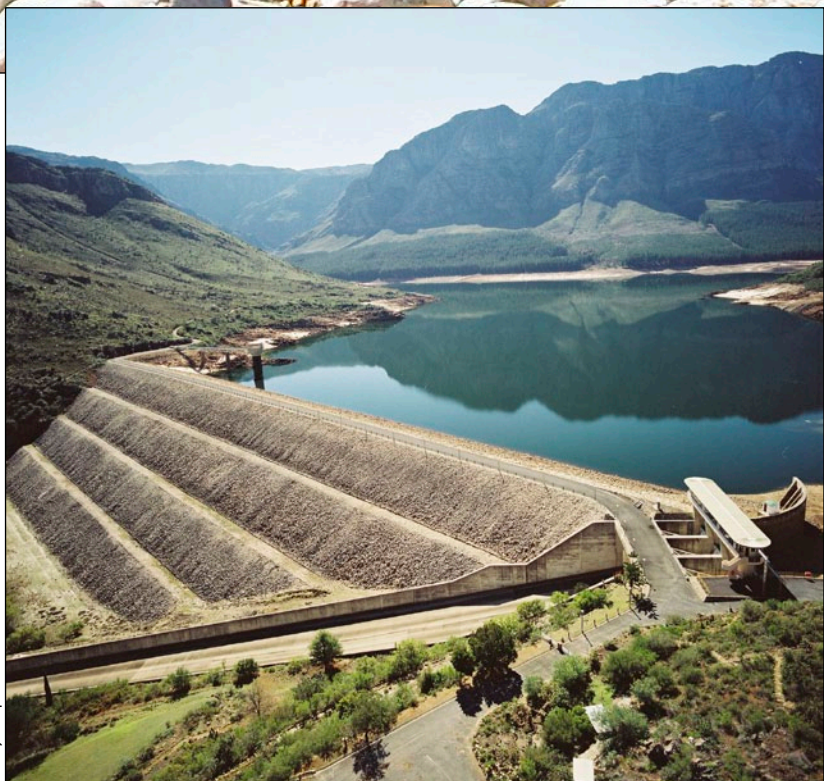
This engineering problem was solved by excavating a trench more than 18 m deep through river alluvium until sound rock was reached. Holes were then drilled to a depth of a further 30 m or more and grout was pumped into them. The cement grout percolated into the surrounding rock and set solid, the rock foundation of the site was thus rendered practically impervious. This screen



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grouting was also extended to each flank of the dam.

The spillway comprises three radial gates, each 8,5 m wide by 8,2 m high, which discharge into a chute channel 30 m wide, 4,6 m deep and 396 m long. At the base of the chute channel is a specially designed bucket which disperses the water through a ski jump during big floods. The spillway gates were originally designed to be hoisted by electric motors, with standby petrol engines provided for each hoist in the event of power failure.



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Top: The intake tower is 7,3 m in diameter and 55 m high. Water is drawn from the intake tower through penstocks at various levels.

Left: At the time of construction in the 1950s, Wemmershoek Dam was the largest in South Africa.



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Above: Wemmershoek has a gate-controlled discharge spillway with a chute. The spillway has a maximum discharge of 1 065 m³/s.

Below: Another view of the spillway. Here the radial control gates can clearly be seen.



Ewisa/Dirk van Driel

SOURCES

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- ◆ *The Future Water Supply of Cape Town and the Cape Peninsula*, 1904 by John Parker
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- ◆ Thanks to eWISA and the City of Cape Town for photographs

The intake tower is 7,3 m in diameter and 55 m high. Water is drawn from the intake tower through penstocks at various levels and supplied to a treatment plant situated at the base of the Wemmershoek Dam through twin pipelines laid in a diversion culvert underneath the dam.

When Wemmershoek Dam was constructed a compensation agreement involving an exchange of water rights for agricultural use, between Wemmershoek Dam and the Riviersonderend/Berg River Government Water Scheme (constructed in the 1980s) was made, and a 10 million m³ annual release is made into the Berg River from the Riviersonderend Scheme in lieu of that from the Wemmershoek Dam.

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