



Clanwilliam Dam was raised in 1962 through the installation of 13 crest gates.

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OLIFANTS RIVER – Home to one of South Africa's oldest irrigation schemes

It took two walls across the Olifants River to provide enough water for irrigation farmers in this part of the Western Cape. Lani van Vuuren takes a look at the history of the Bulshoek and Clanwilliam dams.

Known today for its rooibos and wine, the hamlet of Clanwilliam lies at the foot of the Cederberg Mountains in the Western Cape. Regarded as

one of the ten oldest towns in the country, Clanwilliam's beginnings go as far back as 1660 when a team of Dutch explorers sent out by Jan van Riebeeck first reached the Olifants River. The river was named by Jan Danckaert, the Dutch cadet in charge of the party, who, upon entering the valley, saw 300 elephants frolicking on the riverbank.

The first farm in the Olifants River valley was awarded to Pieter van Zyl in 1732, and by the late eighteenth

century small-scale irrigation was well established. Originally known as Jan Disselsvlei (after Jan Dissel, a local pioneer), the area first formed part of the district of Stellenbosch, but was declared a sub-district of its own in 1808 by the Earl of Caledon, then Governor of the Cape. In 1814, Caledon's successor, Sir John Cradock, renamed the area after his father-in-law, the Earl of Clanwilliam.

Originally, farmers planted crops in the fine alluvial deposits on the

banks of the Olifants River. These crops would be irrigated every time the river overflowed (the first flood ever recorded occurred in the Olifants River in 1822). However, vast destruction of riparian vegetation caused the river's banks to widen and deepen, until after a while it rarely overflowed. Between 1822 and 1870 the river had widened from an average 29 m to about 38 m.

THE FIRST SURVEY

On 16 October, 1858, Patrick Fletcher left Cape Town for Clanwilliam on orders from the Colonial Secretary to undertake one of the first surveys for a potential large irrigation scheme in the Cape. He travelled to the Olifants River mouth and surveyed the latter upstream for about 37 km. His report, which included estimates for two possible dams, was submitted in 1860.

Around 120 people were living around the irrigable portion of the Olifants River at that time. According to Fletcher, however, the farmers were not very successful: "The total income of the whole valley could not have exceeded £1 400 per annum during the last nine years. Except when the river overflows they scarcely grow sufficient bread for their own consumption."

In 1883, Hydraulic Engineer to the Cape Colony, John Gamble, suggested the construction of a series of moderately-sized weirs to restore original conditions in the river i.e. resulting in floodwaters once again spilling over its banks. Despite petitions from farmers in the area to the government, Gamble's plans were rejected due to the prohibitive cost of the scheme. Not long after that the post of Hydraulic Engineer was abolished as a result of economic circumstances prevailing at the Cape, and Gamble returned to England.

Meanwhile, local farmers started their own irrigation initiatives, including the use of steam pumps, windmills and bucket pumps (*bakkiespompe*) to boost their

A historic photograph of the Bulshoek Dam, completed in 1920.



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The Bulshoek Dam features 15 hand-operated gates of the Ashford type. These gates, which sit on top of the solid weir, slide in cast-iron grooves of special construction with a patented system of anti-friction rollers. Each gate is 4,6 m high and 6 m wide.

production. During the following decades the farmers would appeal to government time and time again for assistance in various forms without success. Finally, in 1907, the Cape government asked the Director of Irrigation, Francis Edgar Kanthack, to determine the possibility of an irrigation scheme on the Olifants River. His brief was to investigate the possibility of introducing irrigation on a perennial basis by means of a canal system fed from a high weir with 'considerable storage capacity' as much land as possible on both banks of the Olifants River and along the lower reaches of the Doorn and Hol Rivers.

Kanthack was at first sceptical of the possibility of such a scheme. In his 1909 report he writes: "Local opinion as to the suitability of the land for irrigation was very conflicting and it was with some feeling of uncertainty that I authorised a traverse line of levels along the Olifants River...some 20 miles below Clanwilliam down to the mouth."

BULSHOEK DAM

This was followed by a contour survey and a soil survey, and, in September 1908, Kanthack himself visited the district. He must have cut quite the scene in his motorcar,

the first to visit the area. He visited the upper portion of the valley from Clanwilliam to the Olifants River mouth during September 1908 to 'get a clear idea of the nature of the area.'

When the plans were sufficiently advanced, in June 1909, Kanthack laid down the final alignment for the main canal and branches, fixed the site of the headworks and designed the weir. This proved a difficult task as a result of the irrigable land being only available on the left bank with distributaries crossing over to the right bank. The headworks were thus designed to compensate for this fact.

While it was the Director's original intention to keep the weir as low as possible (to save costs), to keep grades as steep as possible and allow for the irrigation of the greatest amount of irrigable land, it was decided to construct the weir with a maximum height of about 7 m above the riverbed.

In 1911, an irrigation district was proclaimed and Parliament approved the sum of £155 000 for the construction of the weir and the associated (unlined) irrigation canals, which were to extend down the Olifants River valley for about 80 km. The site originally selected for the weir and offtake was at the head of a rocky rapid named Oshoek, on the farm Rondeberg. The original design was for a solid masonry weir (in Roman style) with falling shutters, each 1,8 m wide and 0,9 m high.

However, when the project was initially prepared little or nothing was known of the flow of the Olifants River at the proposed weir site. Observations by the Cape Irrigation Department between 1909 and 1912 indicated that if the original design were to be carried out, the flow would not be sufficient to



fill the irrigation canals at periods of greatest demand. It also showed that storage above the solid weir crest originally proposed (about 1,8 m) would not be sufficient.

As a result it was decided to increase this storage by erecting gates 4,6 m high above the solid weir. These 15 hand-operated gates are of the Ashford type, which consists of gates sliding in cast-iron grooves

A full Bulshoek Dam in 2004. The weir was originally supposed to be constructed at a rocky rapid in the Olifants River known as Oshoek, but was later moved to the farm Bulshoek, a few kilometres downstream of the original site.

of special construction with a patent system of anti-friction rollers. The gates, each 6 m wide, are capable of being raised clear of flood by lifting gear mounted on an overhead superstructure and is supported by 2 m wide sandstone masonry pillars. (Each gate has since been provided with a sand-filled counterweight to ease operation). A 16th gate of 6,9 m clear span, but 5,7 m high, was placed on the extreme left flank near the head gates of the canal to act as a scour, the sill being considerably lower than that of the other 15 gates. The final design was undertaken by the firm Glenfield & Kennedy of

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which time materials (particularly cement) and equipment were extremely scarce and expensive. Many labourers also left to join the war effort. During October 1918, construction halted for a third time as a result of an outbreak of Spanish Influenza as those who remained unaffected were left taking care of the ill.

By 1920, the canal on the left bank was completed up to Baklei-plaas and the masonry of the 143,3-m-long weir and headworks as well as the erection of the steel gates and superstructures were practically finished by 31 March of that year. The entire scheme was eventually completed in 1924 at a total cost of £601 569.

CLANWILLIAM DAM

Despite the construction of Bulshoek Dam water demand soon again outstripped supply, especially during the hot summer months. In 1927, a start was made to line the canals with concrete, and by 1932 nearly £89 000 was spent on this endeavour. Meanwhile, the Union Irrigation Department undertook surveys along the Olifants River and its tributary, the Doorn River, in search of a suitable site for a new storage dam. It was hoped that this new dam would not only store enough water for the existing irrigation scheme, but allow for the expansion of agricultural activities.

A suitable site was found just outside Clanwilliam. Work started with the construction of staff housing and the erection of machinery in September 1932. As with many water infrastructure schemes at the time, only white workers were employed on the construction of the dam. However, as the new dam would inundate part of the Clanwilliam-Piketberg Road, a new bypass had to be created, and here use was made of 'coloured' labour.

At the height of construction (1934) an average of 428 whites and 366 coloured workers were

Scotland in cooperation with engineer WM Watt. The firm also oversaw the construction of the weir. The site selected was now on the farm Bulshoek, a few kilometres downstream of the original site.

Floods as well as an apparent lack of labour prevented construction of the weir and canals from starting until March 1913. The project mainly employed white workers, who earned two shillings and eight pennies a day. Cement was imported from England, while the sandstone was obtained from a nearby quarry. Work was disrupted again by the First World War (1914-1919), during



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Top: The Clanwilliam Dam shortly after its completion. The original dam was a mass concrete gravity structure with a centrally situated overspill section.

Bottom: The outlets of the Clanwilliam Dam in 1936.

employed. White workers earned 4 shillings and eight pennies a day, while their coloured counterparts earned two shillings and 6 pennies a day. In his 1934 report, Director of Irrigation Alfred Lewis complains about the productivity of the white workers. Recruited by the Department of Labour, many of these workers probably had no construction skills (in subsequent reports the aversion of many of these workers to hard, physical labour is also noted).

Staff housing comprised wood houses with tin roofs, along with a combined mess hall and entertainment area. Meals were supplied to workers daily at a cost of one shilling, and the mess hall was managed by the farmer on whose farm the dam was being built.

By December 1933, the foundations had been completed and placing of concrete started in January 1934. Clanwilliam Dam was completed in March, 1935. The original dam was a mass concrete gravity structure with a centrally situated overspill section, 117 m long.

By 1962 the Olifants River valley



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was inhabited by about 13 000 people. The ever increasing need for water resulted in the dam being raised between 1962 and 1964. The overspill crest was increased in length, remodelled and raised by the addition of 3,05 m of mass concrete on top of the crest, and the installation of 13 crest gates, each 7,77 m wide and 3,05 m high.

In addition, the non-overspill flanks were raised by 4,88 m by means of mass concrete. A bridge superstructure was constructed across the dam to provide access for the operation of the gates. For stability, the dam was tied to its foundations by means of post-tensioned cables positioned along the centre line of the dam. Clanwilliam Dam has a present height of 43 m, and a capacity of around 122 million m³.

FUTURE PLANS

At present, plans are being finalised to raise the dam by another 13 m. This dual-purpose

Canals filled with water from the Bulshoek Weir and Clanwilliam Dam supply water to the members of the Lower Olifants River Water Users Association. The area is especially renowned for its viticulture and rooibos tea-growing activities.

project will not only see the increase of storage capacity of the dam, but also aims to upgrade and strengthen the wall to ensure its safety and long-term viability, especially during flood events. This will entail increasing the width and height of the wall and spillway. A new multi-level outlet structure will also be constructed.

A portion of the N7 national road will be affected by the raised water level and will be re-aligned by the South African National Roads Agency. Minor roads, property developments and cultivated land surrounding the dam basin will also be affected by the raised water level.

According to the National Water Infrastructure Branch of the

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Department of Water Affairs, the raising of the dam will increase the yield of water supplied from the dam by 70 million m³/year. "This will stabilise the current irrigation development and provide an opportunity to establish resource poor farmers to promote food security and decent employment through inclusive economic growth."

At least 75% of the additional water is earmarked for the development of resource poor farmers. The project has the potential to create about 3 800 jobs and provide tax revenue, including about R700-million on wine produced on the scheme.

In addition to the raising of the dam, the existing conveyance infrastructure needs to be improved and new conveyance infrastructure

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Clanwilliam Dam has a present height of 43 m although plans are afoot to raise the dam another 13 m.

needs to be provided for land allocated to resource poor farmers. These actions, in parallel to construction work on the dam, will be required from the relevant agencies, such as the Lower Olifants River Water Users Association, and responsible government departments, such as the Western Cape Department of Agriculture. A coordinating mechanism has been established to clarify roles and responsibilities in this regard.

Environmental authorisation for the project was received in February and, at the time of writing, Ministerial approval for the implementation of the project as a government waterworks was being sought. Construction of the project is scheduled to start during April 2012. □

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