

After 150 years PRETORIA'S FOUNTAINS still a source of life



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South Africa's capital city, Pretoria, is still dependent on the crystal clear waters of the fountains that have sustained it since the start of its existence. However, as the early history of the city proves, even a good source of water requires strong municipal governance. Article by Johannes Haarhoff, Petri Juuti and Harri Mäki.

The city of Pretoria was found in the immediate vicinity of an artesian water source. This source (called the Fountains to this day) is an unusually strong and consistent source – the only water source for Pretoria from 1855 until 1935. Moreover, it yielded (and still does today) water of very good quality.

Pretoria was registered as a town on 16 November, 1855. The Commandant-General of the Transvaal Republic, Marthinus Wessel

Pretorius, considered it the ideal location for the establishment of a new capital due to its abundant water supply and the natural contours of the area. His motivation for registration was that it was 'well situated to build a city with large and unlimited available area and water'. The town would be called Pretoria in honour of his father, Andries Pretorius, the Voortrekker leader prominent in South African history after his role in Natal between 1838 and 1848.

The water source was in the form of two springs located in the small Fountains Valley on the farm *Groenkloof*. Although the springs are in the same dolomitic strata, the area is divided into separate compartments by a number of prominent dykes. The two springs in Fountains Valley emanate from separate western and eastern fountain compartments, divided by the Fountains Dyke.

The two springs discharged into the Apies River, which strongly gushed northwards. This added

Water from the Upper Fountain discharges partially into the Apies River. This fountain has been providing the city with water for nearly 160 years.

another strategic reason for the location of Pretoria, as the important wagon trail to Delagoa Bay crossed the Apies River close by. This site, with its abundant water and natural grazing, had been a popular overnight stop for the early transport riders and travellers prior to the formal settlement of the town

EARLY WATER SUPPLY

The two springs in Fountains Valley are about 4 800 m from the current Church Square in Pretoria and the elevation difference is about 50 m. This provides a fairly steep gradient of almost 1% to lead the water by gravitation from the springs to the vicinity of Church Square, where the first inhabitants of Pretoria settled.

The first municipal works of the new settlement was digging of a water furrow from Fountains Valley in the direction of Church Square. The furrow was completed in 1855 followed by a holding dam at the springs. The initial dam and channel must have been rather hastily built, as the government entered into a contract in 1860 to rebuild the dam and the furrows, the latter now being specified to be 900 m wide and 450 m deep.

The local water regulations forbid anyone to take water from the furrow before it entered the town, or to pollute the water by washing or otherwise. By 1864 the maintenance needs of the water system warranted the appointment of a water superintendent and by 1874 the maintenance duties were performed by the water superintendent aided by bandits from the local prison, supplemented by private contractors for larger improvements and extensions.

This was the only service provided to the inhabitants. There was no means for the disposal of stormwater, which rendered the roads impassable during rainy periods. Moreover, the stormwater overflowed in the water furrows and polluted the water supply. Dumping of wastewater and sewage into the furrows were common, causing many people to dig private wells on their properties.

The first public meeting in Pretoria to ask for an own municipality was held in 1864. Permission from central government was almost immediately granted and the first municipal authority took office on 2 May, 1864. When the new municipality requested the central government to pay over all license monies collected from Pretoria residents in order to establish some municipal funding, the central government cynically refused. It left the authority no option to voluntarily disband itself and hand its powers back to the central government on 20 September that year.

CONDITIONS DURING THE FIRST BRITISH OCCUPATION

The independence of the Transvaal republic was interrupted when Theophilus Shepstone proclaimed British authority over the Transvaal on 12 April, 1877. Just 42 months later the British occupation ended abruptly when the main British force was overrun on the mountain top of Majuba on 27 February, 1881.

This short British annexation saw the influx of the military and business opportunists, which resulted in the white population of Pretoria rising sharply from 1 500 in 1877 to 2 000 in 1878. The sanitary conditions of the city, already poor before the British came, got worse. The British military authority started with good intentions by appointing a Pretoria Municipal Board in 1877.

This Board, imposed by an unpopular authority, never got off the ground. A military officer, Colonel Montgomery, took the initiative and cleaned the water furrows and lined some of them with brick. Eventually he had to stop the work as no money was forthcoming from the military government. The failure of the British military authority to improve conditions may be blamed on their relatively short stay in Pretoria, but the conditions actually deteriorated during its stay.

PUBLIC HEALTH AND CONCESSION POLICY

After the Transvaal Republic regained its independence in 1880, the municipal management reverted to that before the annexation by the British, namely a city under the control of a magistrate, reporting to central government. Pretoria continued to grow and complaints regarding the water supply and water furrows mounted. The attempts to improve matters were

FAST FACTS ABOUT PRETORIA'S WATER

- The original name of Pretoria's fountains were Zubuhlungu, meaning 'that which hurts', on account of the sharp dolomitic stones from which the water used to spring. It was later named 'Bronkhorstfontein' after the first white family that settled there.
- The original name for the Apies River is Mbibana or Tshwane.
- The original town of Pretoria, established in 1855, only had nine families, all living around the present-day Church Square.
- While Pretoria's Upper and Lower Fountains are less than 500 m apart, they are completely independent of each other, being separated by a dyke.
- Together, the Upper and Lower Fountain still supply close to 40 ML/day to the central business district. The water is of such good quality that no treatment is required, however, the water is chlorinated prior to reticulation.



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Left and below: The monument in Pretoria's Fountains Gardens which is dedicated to this historically important water source.

minor and peripheral – certainly not the deep reforms required.

In 1882, for example, the major improvement was only to allocate a dedicated cart and oxen to assist the bandits with the maintenance of the water system. These were supervised by a prison warden who reported to a part-time health inspector.

In 1886, gold was discovered in Johannesburg about 90 km to the south of Pretoria, leading to an immense gold boom with explosive population growth. This new settlement, also operating in a legal vacuum as far as legislated municipal structures were concerned, suffered its own share of problems regarding its water supply, sanitation and public health. Inevitably, some of the new economic activity spilled over to Pretoria, where a similar jump in population was experienced.

The central government responded to Pretoria's problem (and also that of Johannesburg) by mobilising the resources of the private sector through a concession policy. The concession for water supply was granted in 1889 to LG Vorstman. This was ceded six months later to the Pretoria Water Works Company Limited, at the exact time of an enteric fever outbreak.

The concession was awarded to supply clean water to Pretoria for



Gerit Burger

Above right: Water from Grootfontein is pumped to the Rietvlei Water Treatment Plant from where it is mixed with treated water from the plant and distributed to residents in the area. Despite being several metres deep, the water is so clear that one can see to the bottom.

Below: The Grootfontein collection chamber is an inconspicuous building which gives away little of the treasure it houses.

the next 50 years. It was, however, subject to cancellation after 10 years, and thereafter every three years. The concessionaire started by building a collection chamber in Fountains Valley into which the two springs discharged, to form one combined water source. From the collecting chamber, the water was led with a steel pipeline with a diameter of 304 mm and 380 mm to the town.

Once in town, the pipe fed into a reticulation network made of cast iron pipes. It was soon found that pipes in the reticulation network were too small and they were gradually replaced with larger ones. It is

interesting to note that all these pipes had to be transported by wagon from Charlestown in Natal, the nearest railhead to Pretoria in 1889.

The activities of the Company met the expectations. The public seemed to be content with the level of service provided by the concessionaire and the few complaints were not serious enough to endanger the concession. This attitude changed rapidly when the Pretoria Water Works Company decided in 1898 to install a few meters for individual consumers, to enter into individual contracts with the owners and to raise the price of water.

The public responded en masse by means of a petition with 1 060 signatures. The resulting commission of enquiry recommended that the concession should be cancelled and by December 1898 negotiations were started about the transfer of the assets and the re-employment of key personnel. As these negotiations were proceeding, war clouds began to gather over the Transvaal again and when war was declared with Britain on 11 October 1899, the transfer had not yet taken place.

The Pretoria Water Works Company remained responsible for the supply of water to Pretoria and the company was instructed to appoint eight men to guard the springs in Fountains Valley.



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SECOND BRITISH OCCUPATION 1899-1902

Before the British forces occupied Pretoria on 5 June 1900, it had already been decided by the British that the occupied cities should get 'genuine municipalities' as soon as possible. When Pretoria was occupied, Lord Milner lost no time to describe the conditions in the city, with predictable political opportunism, as scandalous.

The guiding principle during the military occupation was that only the minimum municipal improvements were to be made. The war was anticipated to be over within a few months, but the occupation turned out to last for two years.

The Pretoria Water Works Company, whose water supply concession was on the verge of being terminated when the war started, continued to supply water throughout the war. The population continued to grow during the war and water supply remained a critical issue.

Some improvements had to be made due to their urgency. At Fountains Valley, the collecting chamber was expanded and a new steam-powered pump station was built to supply the military barracks in Roberts Heights. An additional pipeline, 600 mm in diameter, was laid by the military from Fountains

Valley to supplement the first pipeline laid in 1890.

PRETORIA TRANSFORMS INTO A MODERN CITY

By the middle of 1902, peace was finally reached and Pretoria found itself under British rule. No time was wasted to establish a 'genuine municipality' promised before the war. A city council was proclaimed in 1902 with the powers to levy taxes on the residents to provide an own municipal income base.

The councillors, however, were not elected, but nominated by the

Governor from a list of prominent citizens. It was clear from the start that the views of the nominated councillors were not adequately taken into account. In a strong measure of protest, the council resigned on 1 May 1903. Hereafter the process to constitute a properly elected, democratic town council was started and the first elections were held on 28 November, 1903.

Almost 50 years after its birth, following much effort and misery, Pretoria finally had its own elected town council to guide it on a new path of municipal development and improvement. After the war the population of Pretoria continued to grow steadily. The inexorable growth in population and the spread of its municipal area, while trying to catch up with the service backlog inherited from the previous authorities, presented a formidable challenge to the town council during the first few decades of the 20th century

In 1902, the central government resumed negotiations with the Pretoria Water Works Company regarding the ending of their concession and the transfer of the water supply infrastructure to the town. After finality had been reached, the agreement was presented to the town council for ratification. The town council, having decided earlier as

This pump station in Fountains Valley was erected by British Forces during the South African War to pump water from the Fountains to Voortrekkerhoogte. The original steam pumps could deliver 0,9 ME/day of water.



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HIGH PER CAPITA USE OF WATER

The springs of Fountains Valley provided, at first, a super-abundance of water to the town. The public fully exploited this luxury, evidenced by a brochure from 1903: "Pretoria is one of the prettiest towns in Africa. Today water runs down every principal street, and is used to irrigate the town... There could be no better watered town in the world than Pretoria."

The first reliable measurements of the actual water use was made by August Karlson, an exceptionally well qualified engineer who became the manager of the Pretoria Water Works Company in 1898. The per capita water use in Pretoria around 1901 was 358 l/pp/day. Of this volume, 26 l/pp/day were taken from the modest pipe reticulation which was started a few years earlier, with the balance taken from the furrows.

WATER DEMAND MANAGEMENT

From the above, it is obvious that the high per capita water demand of Pretoria was a concern long before the limits of the springs in Fountains Valley had been reached. If the demand could be curtailed, the capital needs for bulk supply pipelines and storage reservoirs could be postponed. Ways were therefore sought to reduce the demand.

While Karlson was a strong advocate of the idea that proper water supply and water metering go hand in hand, the town council did not pursue metering with vigour after it took over the services of the Pretoria Water Works Company. By 1922, there was practically no restriction of domestic consumption and the only meters were installed for government institutions, hotels, large business premises and recently incorporated suburbs.

A total of 1 500 meters were in use in 1923, as opposed to 2 500 in

Pretoria's main river, the Apies, so named for the historical presence of bands of monkeys frequenting its banks, was canalised in 1909 following a series of drownings.

a matter of principle to revoke all concessions to bring the provision of services under its direct control, ratified the agreement after some conditions had been added

The transfer took place some time after May 1903, bringing the water concession, planned for 50 years, to an end after only 14 years. After the war, the water system was in a sad state. Although the two springs in Fountains Valley provided more water than required, the other components were lacking.

The bulk conveyance system from Fountains Valley, already enlarged during the war as an emergency measure, was enlarged in 1907 with a new pipeline of 250 mm,

and again in 1911 with a concrete pipeline with diameter of 914 mm across two concrete arch bridges. The water mains were empty for part of the day due to insufficient storage, which prompted the building of new reservoirs.

In 1907 three storage reservoirs of 227 m³ each were built, and the much larger Findlay reservoir with capacity of 11 382 m³ was completed in 1916. The reticulation did not extend to all areas of the town and some dwellings had to be served by water cart. The extension of the reticulation system became an ongoing project. During 1907, water mains were installed at a remarkable monthly rate of 1 030 m.



The Sterkfontein water source is located within an industrial area, yet provides ultraclean water to the residents of Centurion.

WRC PROJECT TO CAPTURE HISTORY OF PRETORIA'S FOUNTAINS

A new Water Research Commission (WRC) funded project, led by the University of Pretoria (UP) aims to record the capital city's early water history.

Pretoria is one of several cities and towns in South Africa fully or partially dependent on groundwater. The two springs in the Fountains Valley immediately to the south of the city were certainly the reason why the early white settlers, the Bronkhorst brothers, selected this site to establish their farm and eventually, why the ZAR decided to move its seat of government here. Yet, few Pretoria residents are even aware of the importance of this unobtrusive source.

"Through this project we hope to illustrate the role groundwater can play in meeting not only rural water demands but also urban demands," reports WRC Research Manager, Dr Shafick Adams. "While groundwater development has been placed high on the list of future water supply options for many areas, it remains underappreciated by the public and policy-makers alike."

The Hydrological Heritage Overview project, as the WRC project is known, is recording Pretoria's development around its groundwater sources, including historical abstraction volumes and water quality, where available. "Pretoria is an excellent example of the use of groundwater for urban water supply," notes project leader Matthys Dippenaar, of UP's Geology Department. "For the people of Pretoria we hope that this project will create some awareness and appreciation, that they will realise just how important water is in our lives. For fellow scientists, we aim to provide improved access to historical data. Additionally, this project may help create awareness in the field of groundwater science and help secondary and

tertiary institutions with valuable study material."

In addition to the Fountains, which supply around 40 Mℓ/day to the central business district, Pretoria has two other springs delivering water to its residents. Water (7,2 Mℓ/day) from Grootfontein, by far the most impressive fountain, is pumped to the Rietvlei Water Treatment Works and mixed with treated water from the works. On the other end of the city, Sterkfontein provides 9,7 Mℓ/day to the residents of Centurion. All of the springs are still providing water of the highest quality, despite development mushrooming around them and, as a result, do not need to be treated prior to reticulation (although chlorine is added to the water before being piped).

The City of Tshwane has graciously agreed to supply all available historical data and maps for inclusion into the project. In addition to site visits, the project team is also visiting archives, museums, and libraries for additional information.

With groundwater usually being a hidden resource, Pretoria's springs offer a rare visual glimpse of the Cinderella of waters resources in South Africa. An interesting aspect of the project is the use of multimedia to record the sight and sound of the fountains.

"The young generation is much more likely to be fascinated by video material – think of social media, like Facebook and YouTube for example, than hard copy reports or technical talks. The idea behind using videography is therefore to make the interesting case study of Pretoria's springs accessible to the younger generation while simultaneously creating an awareness of hydrological science," notes Dippenaar.

Once the project has been completed, the material will be made available to as wide an audience as possible. The project is expected to be completed in the first quarter of next year.

1902. It was clear that comprehensive metering was not a priority since the election of an own municipality. The prevarication of the town council on the question of water metering can be somewhat excused while the springs in Fountains Valley were coping with Pretoria's demand. Sooner or later, however, it was evident that the yield of water from Fountains Valley, which had served the town so admirably since 1855, would fail to meet the growing demand.

The overexploitation of the springs had thus started by around 1920. This time, the need for demand management was much more serious and water metering returned as a cheaper and more attractive option than developing a new supply to cater for the unbri-dled water demand. Pretoria finally introduced comprehensive water metering during February 1927. The installation of the meters was carried out over 18 months and completed in July 1928. On the positive side, the introduction of metering gave rise to little or no complaint from the residents of Pretoria, very different from the uproar of 1898.

The water demand immediately dropped by 15% but not nearly as much as some of the early hopefuls had predicted. This meant that the savings by water metering brought very little or no time for authorities and water shortage remained acute. The development of additional water supply for Pretoria was inevitable and urgent. During November 1927 the municipality continued with the planning of a supplementary water scheme at Rietvlei. This scheme, which solved the water problem, was commissioned in 1934.

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