above Vereeniging for a distance of 44 miles, and a pumping station could be erected at Vereeniging in the neighbourhood of the collieries.\textsuperscript{18}

The catchment area of the dam was estimated to be in the vicinity of 41 400 sq. km. Officials of the department of irrigation calculated that the scheme could yield 85 M\(\ell\)/d annually.\textsuperscript{19} One problem was that local riparian owners were prepared to accommodate only a limited amount of storage water in the river.\textsuperscript{20} Ingham thus proposed that a wall of 10 m be built to contain the required volumes of water.\textsuperscript{21}

Behind the scenes intensive negotiations were the order of the day. In exchange for the undertaking that the Barrage was to be constructed at Lindeque’s drift, Vereeniging Estates, the company of Lewis & Marks that was responsible for the development of Vereeniging, offered the Rand Water Board a number of valuable facilities. This included free land to build its pumping plant, a cheap supply of coal, as well as the free grant of any land belonging to the company that would be submerged once the Barrage was filled.\textsuperscript{22} For the firm the development of the Barrage implied that their investment in land since 1878 along the Vaal river would at last start paying dividends.

With the larger framework for development in place, the proposed Vaal river scheme was approved at a special meeting of the Rand

\begin{itemize}
\item \textsuperscript{18} RWA, 450/1 Water Supply (Catchment area scheme) (a) Koppiesfontein scheme [Vaal river] (b) Lindequees (sic) (sic) Scheme. 1. General Correspondence, From June 1910 to Sep 1913. Chief Engineer’s Report to special sub-committee re catchment area scheme No. 909. Report on the most suitable water scheme for the Rand, W. Ingham, 1913.02.25, p. 19.
\item \textsuperscript{19} RWA, 450/1 Water Supply (Catchment area scheme) (a) Koppiesfontein scheme [Vaal river] (b) Lindequees (sic) (sic) Scheme. 1. General Correspondence, From June 1910 to Sep 1913. Chief Engineer’s Report to special sub-committee re catchment area scheme No. 909. Report on the most suitable water scheme for the Rand, W. Ingham, 1913.02.25, p. 19.
\item \textsuperscript{20} Ibid., p. 21.
\item \textsuperscript{21} Ibid., p. 22.
\item \textsuperscript{22} RWA Minutes of the Rand Water Board (Hard copy minutes) 182nd – 192 meeting. Minutes 184th meeting 1913.06.26, p. 221; RWA 511. Vaal river Scheme – Monthly progress reports from April 1917 to June 1919.
\end{itemize}
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Water Board on 26 September 1913. Acting on the proposals of a special sub-committee report submitted ten days earlier, the board agreed to the construction of a storage facility at Lindeque’s drift. In the initial plans, accepted with the passing of the board’s private act of 1914, it was estimated that the total cost of the project would not exceed £1 250 000. The anticipated consumption of water from the Vaal river scheme was set at 45 Mℓ/d, with a maximum of 90 Mℓ/d at the Barrage site.

The plans were soon subjected to change. Because of the increased demand for water, the board in 1915 decided to develop the potential for the storage of temporary water supplies further. In March 1916 the board approved of plan to increase the capacity of the Vaal river scheme by 23 Mℓ/d. An additional sum of £758 000 was earmarked for this development. It amounted to a total anticipated cost of £2 008 000. Upon completion in 1923 it transpired that the construction of the scheme in fact cost a mere £1 492 403. Even the addition of £318 000, to pay for the plant and mains for pumping water from the river to the Zwartkopjes pumping station, was well below original estimates.

23. RWA 450/2. Minutes special meeting, 1913.09.26, p. 95.
24. RWA 450/2. Report by the water supply sub-committee to the committee of the whole board, 1913.09.16.
25. UNION OF SOUTH AFRICA (U OF SA), Act No.18 of 1914. Private act to provide for a supply of water from the Vaal River for the Rand Water Board to confer further powers on the said Board and to amend in certain respects the Rand Water Board Statutes 1903 to 1906 (Transvaal) and the Rand Water Board Further Powers Act 1909 (Transvaal).
26. RWA 450/2. Minutes special meeting, 1913.09.26, p. 95; Also see ANON., “Rand water supply: Vaal river Scheme adopted: £1 250 000 loan to be floated” in Rand Daily Mail, 1913.09.27; ANON., “Vaal scheme adopted” in The Transvaal Leader, 1913.09.27.
27. RWA 450/5 Vaal river Scheme. General Reports, March 1919 to Feb 1920. Secretary’s report to the Works and Finance and General Purposes Committee, Nos. 683 and 1328. 1919.05.14.
28. Ibid
Local responses to the Vaal river scheme

The decision to construct the Barrage on the Vaal river had a number of responses in the regional community. Urban centres along the river had a vested interest. The greatest urban beneficiary of the development of the Vaal river scheme was Vereeniging. The small coal-mining town, which had a population of 2000 people in 1911, by 1921, had a population of 5443 residents. The proposed water scheme directly stimulated local commerce, industrial development, farming operations and urban development. In 1917 whilst the Barrage was still under construction, the Pretoria newspaper, *De Volkstem*, informed its readers of the developments taking place. The town was seen as an outstanding central point in the region, as a result of the local railway activities, coalmines, the power station and the new iron and steel factories.

The inhabitants of other urban centres on the banks of the Vaal river envied Vereeniging. The town fathers of Parys, a picturesque Free State hamlet 24 km downstream from the Barrage, were perturbed by the prospects of being excluded from the proposed developments at Vereeniging. In June 1913 the Town Clerk of Parys wrote a letter to the Rand Water Board explaining that his Council had taken note of the fact that a: “certain Company contemplates constructing, in the near future, a Dam across the Vaal river at Vereeniging”.

30. P.J.J. PRINSLOO, Die geskiedenis van Vereeniging, pp. 64-5.
33. RWA 450/1 Water Supply (Catchment area scheme) (a) Koppiesfontein scheme [Vaal river] (b) Lindequees (sic) Scheme. 1. General Correspondence, From June 1910 to Sep 1913. Town Clerk Parys – Rand Water Board, Johannesburg, 1913.06.12.
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Illus. 4.3. The Union Steel Corporation (USCO), started operations in Vereeniging in 1911. Source: UCT

Illus. 4.4. Wagons passing through a drift at Vereeniging prior to the construction of the Barrage. Source: Tvl archives
Rand Water Board Secretary, Major M. McCormack, could only reply that there were no plans to build a dam at Vereeniging. However, it was generally accepted that the greater beneficiary would be Vereeniging.

Further downstream concerns about the Vaal river scheme were directly related to the continued supply of water. The Kimberley Waterworks Company went so far as to oppose the proposed Rand Water Board Supplementary Water Supply Bill tabled in Parliament in 1914. The company, along with other institutions with a stake in the water supply of the Vaal river later participated in the proceedings of an extraordinary water court. Over the long term the result was that an equitable supply of water was secured for consumers, also beyond the Barrage. Ultimately the rate of development on the Witwatersrand was of such importance that the Barrage project on the Vaal river could not be sidetracked by any other considerations.

Many residents of the Vaal river region realized they were faced with outstanding entrepreneurial opportunities. Small companies, both in Vereeniging and Potchefstroom, offered their services as transport drivers and forwarding agents, long before construction work started at the Barrage. Local farmers were quick to see

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34. RWA 450/1 Water Supply (Catchment area scheme) (a) Koppiesfontein scheme [Vaal river] (b) Lindequees (sic) Scheme. 1. General Correspondence, From June 1910 to Sep 1913. M. McCormack, Johannesburg – Town Clerk, Parys, 1913.06.18.

35. RWA 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. Acting Secretary J.H. Stevenson Memorandum to water supply sub-committee, 1914.03.02.

36. U. of SA. Judgment delivered by the Extraordinary Water Court (appointed under section 14 of the Rand Water Board Supplementary Water Supply (Private) Act No. 18 of 1914.) at Johannesburg, on Friday, the 19th May, 1916.

opportunities in the proposed developments. M.G. Christie, of the farm Vlakfontein on the banks of the river, for example, made the somewhat ambitious proposal that if the river was to be dammed up at his farm, he would be prepared to do transport driving with wagon and oxen.\textsuperscript{38} Considering the fact that no less than 21,000 tons of goods were transported between Vereeniging and the Barrage site in the period of 1916-23,\textsuperscript{39} Christie’s proposal made a lot of business sense.

In the construction industry the response to the Vaal river scheme was most marked. In June 1914 a heated exchange of words took place between the Master Builders & Allied Trades’ Association and the chief engineer of the Rand Water Board, W. Ingham. The engineer had earlier proposed to his board that the construction project should be conducted internally, instead of bringing in external contractors.\textsuperscript{40} The strongest argument in favour of his suggestion was that it was the prevailing trend elsewhere in South Africa and England at the time.\textsuperscript{41} Ultimately the construction work at the Barrage did much to promote industrial growth and development. In January 1918, because of the growing need for equipment and building materials, the engineering section at the Rand Water Board was notified that the Hume Pipe Company (South Africa) Limited, had secured a plot of land at Germiston. It was their intention to start up a factory that would produce pipes

\begin{thebibliography}{99}
\bibitem{38} RWA 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. G. Christie, Vlakfontein P.O. Parma, via Weiveld – Rand Water Board, Johannesburg, 1914.03.19; For the Board’s response, see RWA, 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. Secretary Rand Water Board, Johannesburg – Mr M.G. Christie, Vlakfontein, 1914.03.20.

\bibitem{39} ANON., Rand Water Board: Short description of the board’s undertaking …, p. 13.

\bibitem{40} RWA 450/2. Water supply Catchment Scheme. Lindeque’s Scheme 1. General Correspondence from 20 September 1913 to June 1914. J. Thompson, Johannesburg – Secretary Rand Water Board, Johannesburg, 1914.06.02.

\bibitem{41} RWA 450/2. Water supply Catchment Scheme. Lindeque’s Scheme 1. General Correspondence from 20 September 1913 to June 1914. Memorandum W. Ingham – Secretary of the Rand Water Board, 1914.06.05.
\end{thebibliography}
The Barrage 1912-1923

to suit the requirements of the Rand Water Board.\(^{42}\) The construction work brought about a boom in the market for building material. In total 15 748 m\(^3\) of sand,\(^{43}\) and 11 176 tonnes of cement\(^{44}\) were used to construct the Barrage.\(^{45}\) During the war years (1914-1918) there were shortages,\(^{46}\) but this state of affairs improved after the cessation of hostilities.

It was especially in the area of land deals that an interesting sub-culture of “high finance” was the order of the day once it became known that the Vaal river scheme was the hot favourite for selection by the Rand Water Board. In January 1913 George Kent was instructed by the Rand Water Board’s lawyer, W.E. Hudson,\(^{47}\) to visit the Vaal river region and negotiate with the owners of a number of farms, situated on the banks of the river. The board intended purchasing the land from the farmers for an estimated £3:10:0 per 0,86 hectare.\(^{48}\) In his diary Kent gave a vivid description of the effect rumours of development had on local land owners and interested parties. He reported on the competition he experienced from local estate companies\(^{49}\) and property speculators,\(^{50}\) his dealings with the farmers,\(^{51}\) and how he had to make work of

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43. 1 cub. yard = 0,7645 cub. Metres.

44. 1 (long) ton = 1,016 metric tonnes.

45. ANON., Rand Water Board: Short description of the board’s undertaking..., p. 13.


47. W.E. Hudson was of the partnership Hudson & Frames, later to become Hudson and Friel, and still later Webber, Wentzel, Solomon and Friel. It was at the time one of the leading firms of attorneys acting on behalf of the mining companies. Up to the present the firm is still Rand Water’s preferred legal consultants.Disclosure Dr H.T. Ramsden, panel discussion at Rietvlei, 2003.02.07


49. RWA 451/1. G. Kent’s notes re obtaining options on Vaal river farms, p. 1. 14th January 1913.

50. Ibid., p. 1. 14th January 1913.

51. Ibid., p. 1. 15th January 1913.
befriending local land owners, only to find out they were not interested in selling at the prices he had to offer. Some farmers were suspicious of the plans to buy up land on the banks of the river. They thought the land was to be purchased for its mineral potential. When speculators told them the land was needed for other purposes, the farmers were furious. Ultimately reckless speculation in land was the order of the day. Engineer William Ingham was perturbed by this state of affairs. In March 1913 he made a vitriolic attack on

those who have considered it their duty to follow the Board’s Surveyors from scheme to scheme, so as to obtain options on the land required for the various reservoir areas and pipe lines.

He felt the board could, if it was necessary, expropriate land outright. It was, he explained, undesirable for the board to purchase land at high prices “seeing that the offers would, in all probability, be used against the board in the Arbitration Court”. The fact of the matter was that the major real estate role player along the Vaal river was the firm of Lewis & Marks. In June 1914 it was estimated that Vereeniging Estates had a frontage of 104 km on both sides of the Vaal river above and below Vereeniging. In the subsequent process of land acquisitions along the Vaal river between Vereeniging and Lindeque’s drift, after the final scheme had been approved, lengthy negotiations and court cases were the order of the day. As late as 1922 transactions were still to be finalised before a start could be made with damming up water at the site of the Barrage.

52. Ibid., p. 2. 15th January 1913.
53. Ibid., p. 8. 23rd January 1913.
54. RWA, 450/1 Water Supply (Catchment area scheme) (a) Koppiesfontein scheme [Vaal river] (b) Lindequees (sic) Scheme. 1. General Correspondence, From June 1910 to Sep 1913. Chief Engineer’s Report to special sub-committee re catchment area scheme No. 909. Report on the most suitable water scheme for the Rand, W. Ingham, 1913.02.25, p. 32.
55. Ibid., p. 32.
56. RWA, Minutes Rand Water Board Meetings (Hard copy) 182nd – 192 meeting. Minutes 184th meeting 1914.06.26, p. 219.
Rand Water Board and World War I

Although South Africa became a union in 1910 the country was still economically firmly tied to Britain. This was evident in the operations of the board. Not only were most of the materials used by the board imported from Britain, but the necessary support, such as loans to develop the plant, had to be provided from London’s influential financial quarters. The funding was not available outright. In Britain the attention, at the time the construction of the Vaal river scheme was approved, was focused on war clouds over Europe. Consequently there were no funds available for the construction of the Barrage.

The war had a direct influence on the planning and design of the new water scheme. In June 1914 the chief engineer, W. Ingham, and one of the board members, Donald Simson sailed for Britain, the continent and Egypt, where they were scheduled to visit a number of sites where water schemes were being developed. Simson remained behind in Britain, where he joined the forces to serve in the war. Ingham adjusted his plans. Instead of visiting water schemes in Europe, he travelled to Egypt where he inspected the water works of Cairo, the Aswan dam and the barrages of Esna, Zifta and the delta on the Nile river. Then he returned to Britain where he inspected the water works of London and schemes in the west of England as well as the south of Wales. He returned to South Africa in December 1914.

57. RWA, Thirteenth annual report of the Rand Water Board to the Honourable the minister of the interior, Union of South Africa. Financial year ended 31st March, 1918, p. 5.
60. RWA, Tenth annual report of the Rand Water Board to the Administrator of the Province of Transvaal. Financial year ended 31st March, 1915, p. 5.
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The outbreak of war in 1914 reverberated throughout the British Empire. Sympathies were strongly in favour of participation in the war. In South Africa, where the memories of the Anglo-Boer War still gave rise to bitterness, there was division. Some Afrikaner nationalists wanted South Africa to remain neutral. In the rebellion of 1914 there was an attempt at overthrowing the government of the day. However, it was an isolated event and it did not prevent South African troops from taking over German Southwest Africa (now Namibia) and later serving in theatres of war elsewhere in Africa and Europe.

At the Rand Water Board there was substantial support for the Allied war effort. Between 1914 and 1918 a total of 75 per cent of the staff of the head office, 57 per cent of the officials of the chief engineer’s department and 33 per cent of the ordinary employees in the chief engineer’s department served in a variety of roles during the war. With the outbreak of war some members of the board were immediately drawn into active service. In 1914 Donald Simson, mentioned earlier, was drawn into the 2nd King Edward’s Horse. Whilst serving with the New Zealand contingent in Egypt and later the Dardanelles, he was wounded. Other staff members who were drafted into active service were Major H.G.L. Panchaud (1st Imperial Light Horse), Lieutenant J.P. Stark (Transport Corps), and Lieutenant A.S. Reed (Natal Light Horse).

61. See for example RWA, Minutes, 1914-5, pp. 265-6, 286, 317: 187th ordinary meeting, Corner House, Johannesburg, 1914.09.18; 189th ordinary meeting, Corner House, Johannesburg, 1914.11.20; 192nd ordinary meeting, Corner House, Johannesburg, 1915.02.19.


63. RWA, Minutes 1914-5, pp. 212-3. 183rd ordinary meeting, Corner House, Johannesburg, 1914.05.22.

64. RWA, Tenth annual report of the Rand Water Board to the Administrator of the Province of Transvaal. Financial year ended 31st March, 1915, p. 2; RWA, RWA, Minutes, 1914-5, p. 266: 187TH ordinary meeting, Corner House, Johannesburg, 1914.09.18.

Major M. McCormack, the secretary to the board and 12 other employees served in the Union forces within South Africa and in South West Africa. The board’s arrangement with the permanent members of staff was that their posts would be kept open. Persons serving in the war and who were temporary employees were also taken into consideration. The board undertook to find suitable employment for them within the organisation when they were discharged from active military service.

In 1919 it was reported that 25 officials and 30 employees of the board had been on active service. In itself this was a most substantial number. The organisation, in comparison with its growth later in the century, was small in terms of `personnel. The temporary absence of labour meant that work had to stand over. The development of the Vaal river scheme was one example. Construction work was delayed until 1916. The board suffered other setbacks too. Staff members D.C. Francis, N.T. Pretorius, C.S. Watson and D.B. Cook died in the war.

The construction of the Barrage 1916-1923

The Barrage was one of the most ambitious water projects of its kind in South Africa at the start of the twentieth century. It was based on the latest technological developments in engineering. Before plans were drawn up, officials of the Rand Water Board visited Egypt and Europe to become acquainted with the latest

68. Ibid., p. 7.
69. RWA, Fifteenth annual report of the Rand Water Board to the Honourable the minister of the interior, Union of South Africa. Financial year ended 31st March, 1920, p. 5.
70. R. PRINS (Compiler), Rand Water Board: 60 years of meeting a demand, p. 16.
Leading British engineering firms were contracted to supply the necessary mechanical equipment to be used at the Barrage site.

Initially it was anticipated that the construction work on the Barrage would start in 1914. The outbreak of World War I in August of that year put it on hold. The scheme was furthermore held up by the proceedings of an extraordinary Water Court, which gave its judgment only on 19 May 1916. Once work could be resumed it took some time to raise the required loan to help finance the construction of the Barrage. When everything was set, the Rand Water Board on 8 June 1916, gave its approval for the scheme to go ahead. Work on the site started in the same month.

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73. U. of SA., Judgment delivered by the Extraordinary Water Court (appointed under section 14 of the Rand Water Board Supplementary Water Supply (Private) Act No. 18 of 1914.) at Johannesburg, on Friday, the 19th May, 1916.


The Barrage 1912-1923

The Barrage was situated 40 km downstream from Vereeniging. The water for consumption on the Witwatersrand was to be pumped from the Vereeniging pumping station, 2.4 km below the original railway bridge across the river at Vereeniging. In effect the river was to be dammed up over a distance of some 60-70 km with extraction taking place at a point well above the site where the major storage source was located. The dam site at the Barrage was a mere subsidiary in the larger scheme of things. The deep river banks were to be used as a longitudinal storage passage extending from above Vereeniging, at Engelbrecht’s drift, down to the Barrage – a distance of some 70 km.

The Lindeque’s drift area was chosen for a number of reasons. On the site was a solid rock outcrop of amydaloidal-andesite (diabase). The fall of the river – eight feet (2.2 m) from Vereeniging to the Barrage – was such that the necessary quantity of water could be impounded with a depth of only 25 feet (8.1 m) at the barrage. It was in close proximity of the Rietspruit. This stream drained a comprehensive and unpolluted catchment area, which admitted substantial amounts of water into the Vaal river. Moreover, the area at Lindeque’s drift was relatively underdeveloped.

77. ANON., Rand Water Board: Short description of the board’s undertaking..., pp. 13, 16.
80. RWA 450a Confidential. Report by the water supply sub-committee to the committee of the whole board, 1913.09.16, p. 2.
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Illus. 4.6. The Barrage site by December 1916. Source: Rand Water

The construction site at the Barrage soon took on the appearance of a small village. Between 1916 and 1922 an average of at least 300 people were employed. The highest rate of employment at a single point in time was 600 people. Of 49 white workers employed, an average of about one third were carpenters. 82 When construction work started the European employees were accommodated at a co-operative mess established by the board. There was a mess room and kitchen. After a while the mess was dissolved and the majority of men then took up residence with local storekeepers just outside the property of the board. 83 The workers were predominantly accommodated on the Transvaal side of the river. 84 The black workers on the construction site were housed in a compound with their own cooking house. 85 Most were former mine workers. 86


86. Ibid.
Problems experienced with labour on the construction site were related to farming operations. At the end of November 1916 some 50 black workers on the construction site left for their homes to plough their lands. It was anticipated that they would return for work in January. In December a Basotho chief by the name of Moshesh had a discussion with the resident engineer, J.C. Hawkins, and offered to provide him with about 25 workers per month. In exchange for the promised consignment of workers, the chief required a commission. The engineer was hesitant to agree to it.

By June 1917, at the end of a good farming season, there were severe shortages of labour on the site. As a rule about 300 workers were required to work. By the beginning of June 1917 only 265 workers were on duty. Measures were introduced to get labour from Umzimkulu in Natal. Workers on site were asked to write letters to their families at home in which people were asked to report for duty on the construction site. There were also failed attempts at recruiting labour in the Klerksdorp and Herschel districts. Towards the end of 1918 activities on the site had increased substantially. Many war veterans joined the workers.

The increased population at the Barrage made it possible for a school to be opened. At the end of November 1916 the resident engineer reported that there were six children of school age on the construction site. These children had to go to school on the Free State side of the river. They were transported by boat. He feared that they would not be able to cross the river during the flooding season. The nearest school on the Transvaal side was almost 9 km from the site on the farm Zeekoefontein of one Mr Du Plessis.

87. RWA 511. Vaal river Scheme – Monthly progress reports from April 1917 to June 1919. Resident engineer’s report to the chief engineer 1, 1916.12.01, p. 6.
88. Ibid., Resident engineer’s report to the chief engineer 2, 1917.01.05, p. 5.
89. Ibid., Resident engineer’s monthly report to the chief engineer 7, 1917.07.03, p. 2.
90. Ibid., Resident engineer’s report to the chief engineer 26, 1919.08.08, p. 1.
91. Ibid., Resident engineer’s monthly report to the chief Engineer, 20. 1918.07.03, pp. 1-2.
It was anticipated that some 19 children would attend school. They were all part of the construction team’s families. A further 15 children of the vicinity could be accommodated at a school. It seemed to him worthwhile giving attention to the construction of a school on the site. The construction of the school building was completed on 24 July 1917. One Miss Tyrer was the first teacher and 22 children attended school. On 28 July officials of the Potchefstroom school board held a meeting locally. A school committee was then elected with J.C. Hawkins as chairman, L. Blignaut as vice chairman and J.W. Simpson as secretary. The population numbers and the persistent fluctuations in job opportunities affected the school. After the Christmas holiday of 1917 the school did not reopen. Accommodation for the teacher proved to be insufficient. She had meanwhile volunteered to help in the war effort. Local children now had to attend school elsewhere. Hawkins reported to the chief engineer that he would

92. Ibid., Resident engineer’s report to the chief engineer I, 1916.12.01, pp. 6-7.
93. Ibid., Resident engineer’s monthly report to the chief engineer 8, 1917.08.08, pp. 4-5.
94. Ibid., p. 5.
hold talks with the Potchefstroom school board, but it appeared to be unlikely that the Barrage School would reopen.  

Illus. 4.8. An angler with his catch at the construction site of the Barrage.  
Source: Rand Water

The workers on site, apart from fishing, did not have much opportunity for leisure. Many resorted to consuming large amounts of alcohol. In April 1917 the resident engineer introduced a scheme for the production of sorghum beer, particularly for the black workers. They were provided with beer twice a week. Outside sources of alcohol supply however remained a problem. In May 1917 the compound manager and members of the police systematically searched the area in a radius of about 3,2 km for

95. Ibid., Resident engineer’s report to the chief engineer 15, 1918.02.04, p. 2.
96. Ibid., Resident engineer’s report to the chief engineer 5, 1917.05.07, p. 2.
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beer. In the process 2700 ℓ of beer were destroyed. Depression and trauma manifested in a number of ways on site. In July 1918 one of the black workers on site simply walked into the river after a spell of beer drinking. He drowned and his body was found only considerably later. Incidents of this nature led to management taking a dim view of alcohol consumption on site.

The cold Highveld winters affected the health of the workers. In July 1918 problems were experienced with pneumonia. In particular, workers who had previously been on active duty in East Africa were affected by what now was for them extreme climatic conditions. The veterans, apart from still having relapses of malaria, seemed to be suffering from trauma. Between August and September 1918 several of the former soldiers working on site were sent on leave. Others were taken up in hospital. Spanish influenza, a pandemic, which affected the whole population of South Africa in 1918, also influenced the construction work at the Barrage. By October 1918 there was a decline of 217 workers on the site of the Barrage construction as a result of the disease. Other health problems experienced on the construction site included normal occupational accidents, food poisoning and an outbreak of scarlet fever.

97. Ibid., Resident engineer’s report to the chief engineer 6, 1917.06.07, p. 2.
98. Ibid., Resident engineer’s report to the chief engineer 21, 1918.08.08, p. 2; Resident engineer’s report to the chief engineer 22, 1918.09.07, p. 2.
99. Ibid., Resident engineer’s report to the chief engineer 21, 1918.08.08, p. 2.
100. Ibid., Resident engineer’s report to the chief engineer 24, 1918.10.30, p. 2.
102. RWA 511. Vaal river Scheme – Monthly progress reports from April 1917 to June 1919. Resident engineer’s report to the chief engineer 24, 1918.10.30, pp. 2, 5.
103. Ibid., Resident engineer’s report to the chief engineer 25, 1918.11.30, p. 1.
104. Ibid., Resident engineer’s report to the chief engineer 4, 1917.04.12, p. 2.
106. RWA 511. Vaal river Scheme – Monthly progress reports from April 1917 to June 1919. Resident engineer’s report to the chief engineer 2, 1917.01.05, p. 4.
107. Ibid., Resident engineer’s report to the chief engineer 15, 1918.02.04, p. 2.
Upon completion the Barrage, which spanned the Vaal river over a width of more than 400 m, was a veritable monument of engineering skill. More than 210 000 m³ had been excavated in rock. In addition 32 873 m³ had been cast in concrete. By making use of the Duff Abrams method, the steel-reinforced concrete structure was strong and capable of withstanding all types of flooding conditions. There were 36 sluice gates measuring 25 feet x 32 feet x 6 inches (7,5m x 9,6m x 15cm). Each gate weighed 26,4 tonnes. The reward was a storage system that could hold 61 349 Mℓ of water. For the Witwatersrand it meant that one of the major obstacles to development was out of the way. For the country as a whole the Vaal river scheme was a morale booster. On 27 July 1923

Anonymous, Rand Water Board: Short description of the board’s undertaking ..., p. 12.
Ibid., p. 13.
the Governor-General of South Africa, Prince Arthur of Connaught, officially opened the scheme.\footnote{ANON., Souvenir of the opening of the Vaal river Scheme by His Royal Highness Prince Arthur of Connaught, Governor General of the Union of South Africa.}

Illus. 4.10. Inauguration of the Barrage in 1923. Source Rand Water

Quality of water

From 1923 the water of the Rand Water Board was tested in a consistent manner. The South African Institute for Medical Research was responsible for the bacteriological tests. Samples were drawn once a week from the raw water of the Vaal river at the inlets and outlets to the filters and the rising main. Five days a week samples were also drawn in Johannesburg from the Forest Hills and Yeoville mains and the tap at the laboratory of the institute. One weekly sample was drawn from the Leeuwpoort system of the East Rand. The Zuurbekom supply was tested once a month.\footnote{RWA, Minutes 1954-5, p. 194: 671st meeting of the Rand Water Board, Headquarters, Johannesburg 1955.01.28. Report No. 2735, J.P. Leslie, 1955.01.28.} The government’s chemical laboratories conducted the

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chemical and physical tests. As a rule the water was considered to be of outstanding quality.

In 1932 the board reported extensively on tests that had been conducted on the purity of its water. It was pointed out that during the warm summer months the number of potentially virulent organisms in the water was higher than in the winter months. The board’s engineers were however satisfied that by the time the water left the stations for consumption it was adequately purified.

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<td>Number of growing organisms per mℓ</td>
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</tr>
<tr>
<td>Water after sedimentation</td>
<td>59</td>
<td>Not in 10 mℓ</td>
</tr>
<tr>
<td>After filtration. Before chlorine</td>
<td>17</td>
<td>Not present in 10 mℓ</td>
</tr>
<tr>
<td>Water leaving the station</td>
<td>13</td>
<td>Not present in 10 mℓ</td>
</tr>
</tbody>
</table>

In the reports on tests conducted in 1931-2 it was pointed out that the river water always contained algae, both of a phyto- and plankton nature. In order to combat the growth of algae copper sulphate was used. In cases of prolific plankton build-up chlorine was used instead of copper sulphate. The board, particularly as


115. RWA, Twenty-seventh annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1932, p. 35.

* The term B. coli was used in the documentation consulted for this chapter. Preference is nowadays given to E. coli a straight rod-shaped gram-negative bacterium (Escherichia coli of the family Enterobacteriaceae) occurring in various strains that are used in medical and genetic research. It lives as harmless inhabitants of the human lower intestine. It is used in public health as indicators of fecal pollution (as of water or food), or produce a toxin causing intestinal illness. Source: Britannica 2003.

116. Ibid., p. 35.
from 1931, experienced numerous problems with the algae that could not be reduced or properly contained. This was particularly the case at times of low flow in the river.

The prevailing drought conditions at the start of the 1930s were conducive to algae growth. Thorough investigations and testing followed. In 1931 authorities on water in Britain, Germany, Egypt, Canada, Egypt, France, India, the United States, Palestine, Australia, and locally in Cape Town and Durban, were asked for advice on the permissible amounts of *E. coli* in the water. A total of 244 samples of 100 cc were taken from the Johannesburg municipal reservoir at Yeoville. In 241 tests there were no indications of *E. coli*. Experts considered the rate of 98.8 per cent of the water with no *E. coli* outstanding. The chief engineer reported:

> In accordance with world opinion on bacterial quality of potable water, the results obtained during the year must be viewed with great satisfaction.

In the decade of the 1930s the quality of water remained high. Tests were once again conducted and subjected to external perusal with a favourable comment. The demand on the water especially from the Vaal river was high. In October 1938 the abstraction rate from the river for purification was 207 Mℓ on a single day. Tests conducted on the *E. coli* content of the water proved that it was well below the minimum requirements of the London Metropolitan Water Board’s classification of ‘First Class’ water. There were less than five organisms per 100 cc tested by the board’s chemists. This was to change towards the end of the decade. At the time however there was reason to feel proud. The production of water had increased

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substantially within the space of less than two decades. It was now the responsibility of the board’s officials to ensure that the focus remained fixed on producing water of an outstanding quality.

Illus. 4.11. The entrance to the Vereeniging pumping station and purification plant in 1923. Source: Rand Water
Chapter 5

The post-colonial phase - secondary industrial development 1924-1948

In the historiography of Africa the era of colonialism has been subjected to considerable reappraisal in recent years. Historians have for example looked inwards, and instead of blaming all destructive processes on the colonial legacy, have looked at the inherent problems that the newly independent African states encountered in the post-colonial phase. This has opened up new perspectives for our understanding of the complexities of Africa and its peoples. In some respects South Africa passed through the post-colonial period unobtrusively as early as 1910 when it became a union. However, it was only after the conclusion of World War I in 1918 that the trend of post-colonial development in the spheres of economy and society started taking shape. The degree of determination to develop local industries and production processes provided a fertile field of human endeavour for the young state. The developments taking place in the operations of the Rand Water Board in this period may be considered as being symptomatic of the thrust towards self-care and growth in South Africa’s post-colonial era.

The 1920s was a lively period. For the Rand Water Board it was an era of unsurpassed growth. The completion of the Vaal river scheme made it possible to push up the daily supply of water in

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1923 to as much as 68 Mℓ/d. It was not long before the first of a series of additional water supply schemes was undertaken. Then, before the end of the economic depression of 1930-3, it was possible to prepare for a substantial augmentation of the existing water supply. That was when the South African government undertook the construction of the Vaal dam, upstream from the Barrage. The 1920s also marked the start of growth in the secondary industrial sector. As a major service provider the Rand Water Board played an important role in the process.

**The first headquarters**

Hardly two years after the completion of the Barrage project – one of the most ambitious of its kind in South Africa at the time – the board started giving attention to its corporate profile in Johannesburg. What better could be done than to have a flagship in the shape of an impressive building in the central business district? Since its establishment in 1903, Rand Water Board had always made use of rented accommodation. The first meetings of the board were in fact held at the Rand Hotel. In the course of 1903 the head office started operating in a new building of the General Mining

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2. RWA, Nineteenth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1924, p. 5.

3. RW, Rand Water Board minutes, 4th ordinary meeting, 1903.05.01, p. 11.
Real Estate Company in Johannesburg business district.\(^4\) In 1904 the head office was housed at the famous Corner House.\(^5\) Then, in 1925 the board appointed a sub-committee to investigate a new head office complex built specifically to the requirements of the board.\(^6\) The municipal representatives on the board particularly favoured the project. The prospect of a building made sense. The existing office lease agreement was due to expire. Once the board gave its approval for the undertaking two business stands, numbers 23 and 24, were purchased in Commissioner Street (‘Marshall’s Township’) for £9250.\(^7\) At the time the locality formed part of the hub of the city’s central business district.\(^8\)

The major requirement was that the building had to accommodate all the staff of head office in one single block in comfortable offices.

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\(^5\) RWA, Minutes, 1904-6, p. 8: 37th ordinary meeting, Chamber of Mines offices, Johannesburg, 1904.10.28.

\(^6\) RWA, Minutes, 1925-6, p. 27: 315th ordinary meeting, Corner House, Johannesburg, 1925.05.22.

\(^7\) RWA, Minutes, 1925-6, p. 41: Special meeting, Corner House, Johannesburg, 1925.05.29.

\(^8\) RWA, Twenty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1926, p. 3; G-M. VAN DER WAAL, Die boukuns van Johannesburg 1886-1940: van mynkap tot metropolis, p. 183.
Consequently by November 1925 it was decided that the building would be four instead of two storeys. The consulting architect of the project was G.E.G. Leith (1886-1965), a South African-born, but British-trained architect who had worked under Herbert Baker when the Union Buildings were designed at the turn of the century. The contracting firm was Messrs Harper Bros. Construction work on the project started in November 1925. Upon completion the whole project cost £30 000. The new building’s design was in the Beaux Arts tradition and it reminded one of the station building in Pretoria – also a Herbert Baker design. The architect was personally responsible for the design of the curved furniture in the boardroom. The firm of Gurney’s (established 1920) manufactured the tables and Messrs M. Franklin were responsible for the chairs. The new building complex received favourable comment from the board’s chief engineer C.E. Mason, who was of the opinion that it ‘gives ample and up-to-date accommodation for every branch of the Board’s work’. He was particularly impressed with the ‘aesthetic and serviceable design’.

The staff moved to the new building in the course of September 1926. Within the next two years the staff at head office were to

9. RWA, Minutes, 1925-6, pp. 121-4: 321st ordinary meeting, Corner House, Johannesburg, 1925.11.27.
13. RWA, Minutes, 1926-7, p. 65: 330th ordinary meeting, Central House, Johannesburg, 1926.08.27; RWA, Twenty-second annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1927, p. 35.
15. Ibid., p. 35.
16. Ibid., p. 3.
number 47 out of a total of 602 of all the board’s employees.\textsuperscript{17} The indications were that the organisation was preparing for substantial growth. Whereas its employees had increased by little more than one third since 1910, it now on stood the eve of significant growth. By the time World War II broke out the employees had more than doubled.\textsuperscript{18} It was largely the result of the development of the board’s operations at the Vaal river.\textsuperscript{19}

The growth and development of secondary industry in South Africa

Industrial and economic historians generally accept that South Africa’s industrial development moved into a new phase in the period after World War I (1914-8).\textsuperscript{20} In the wake of mining developments since the 1880s, there now followed a phase of secondary industrial growth. Although the depression of 1930-3 dampened development this was only temporarily. Between 1932 and 1939 the national income of South Africa rose by 80 per cent, from £217 million to £396 million. A substantial portion of this

\textsuperscript{17} RWA, Twenty-third annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1928, p. 37.

\textsuperscript{18} RWA, Thirty-second annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1937, p. 59.


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growth was the result of the industrial development on the Witwatersrand.  

In 1924 the Pact government came into power. This government headed by the National Party under the leadership of General J.B.M. Hertzog and supported by the Labour Party under the leadership of Colonel F.H.P. Cresswell, was interested in promoting the interests of the workers and above all the Afrikaners as a cultural community. Little came of Milner’s dreams at the start of the century to have a substantial British population in South Africa. Instead, by the 1920s the settler communities of artisans had either aged or left the country. The new government was less inclined than its predecessor – the governments of General J.C. Smuts and Louis Botha – towards giving unqualified support to the mining industry. Instead the political leadership of the country was now intent on creating job opportunities, especially for whites, and promoting opportunities for diversified industrial development. It was a trend that had already been identified by the Smuts government in 1922 when it created the Electricity Supply Commission (Escom). Like the Rand Water Board, Escom had an important role to play in support of industrial growth. In 1928 the government established the Iron and Steel Corporation of South Africa (Iscor). Along with Union Steel Corporation, founded in 1911 on the banks of the Vaal river at Vereeniging, the country was

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increasingly destined to become self-reliant in terms of its steel requirements.

It was possible for the Rand Water Board to flourish under these circumstances of rapid industrial development. One of the basic objectives that had been set for the board at the time of its founding in 1903, was to be supportive of growth. Laburn observes:

> Adequate supplies of water were not made available primarily for beautification … but rather for the pulsating giant of industry, initially solely the gold mining industry but later other primary industries and a multitude of secondary and tertiary industries ... ²⁷

Water was a scarce commodity and a number of parties vied for control over large portions of the relatively meagre supplies of the ubiquitous commodity in South Africa’s industrial heartland. It led in fact to serious clashes of interest between the Rand Water Board and the electricity service providers at the Vaal river.

Generating electricity

Since the turn of the century the provision of electricity to all parts of the Witwatersrand became an essential service. Some of the larger municipal authorities, such as Johannesburg and a number of private companies, such as Siemens & Halske of Germany and John Hubert Davies, an electrical engineer of Johannesburg, were active in providing electricity to the mining industry and domestic consumers.²⁸ The Rand Water Board, for security reasons, preferred to generate its own electricity by means of coal-fired steam plants. In distant places of operation, for example at Springs on the East Rand, it made use of external electricity service providers.²⁹ In 1906 electricity was generated for the first time at Zwartkopjes when a

²⁷ R.J. LABURN, The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation, p. 34.
²⁹ RWA, Seventh annual report of the Rand Water Board to the Administrator of the Province of Transvaal. Financial year ended 31st March, 1912, p. 29.
360 kW generator was installed as part of the equipment used for providing Johannesburg with water. In 1912, when the board started developing the Zuurbekom supply, power was taken via overhead lines from Zwartkopjes. Consequently, additional equipment was installed at Zwartkopjes to provide more electrical power. In 1933 a further steam turbine centrifugal pump was installed to assist in the demand for more water on the East Rand. In 1937 the power transmission lines between Zwartkopjes and Zuurbekom were upgraded. At the same time new transformers of 500 kW and 2400 kW were installed at Zwartkopjes and Zuurbekom respectively.

Because of its rapid development on the Witwatersrand in the early years of the twentieth century the electricity industry posed a problem to the Rand Water Board, particularly when it wanted to make use of the same supplies of water as the water utility. In December 1906 the Victoria Falls Power Company entered into an agreement with Vereeniging Estates and the firm of Lewis & Marks for the exclusive right to build a steam driven power station at Vereeniging. The power station was built on the banks of the Vaal river in 1912, in close proximity of the Cornelia Colliery at Viljoensdrift. The power was then transmitted to the Witwatersrand. In time to come this development was to have an impact on the Rand Water Board’s Vaal river scheme.

30. RWA, Twenty-eighth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1933, p. 42.
34. Ibid., p. 67.
When the *Rand Water Board Supplementary Water Supply (Private) Act* No.18 of 1914, was passed the board was empowered to impound and store an amount of more than 61 3400 Mℓ of water in the Vaal river. Of this the board could use almost 53 250 Mℓ/p. a. for its own purposes. An amount of 8100 Mℓ/p. a. was earmarked for the owners of land riparian to the board’s storage area. Provision was made in the act that application could be made to the water court in terms of the *Irrigation and Conservation of Waters Act* No 8 of 1912, if and when the riparian consumers wanted to have their share of 8100 Mℓ/p. a. to be stored up by the board. The water court then had to determine how much each owner had to pay towards the costs incurred by the board in respect of storing up the water. It was also determined in section 4 of the act that every owner who obtained a permit to store water had to contribute towards the costs of the board in maintaining the barrage.

When the act was passed in 1914 the Rand Mines Power Supply Co. Ltd, as a riparian consumer, was using the water of the Vaal river to cool by condensation the power station on the banks of the Vaal river. In 1919 the power company promoted a private bill in parliament to contend with the board’s 1914 act. The objective of the bill was to establish its water rights and secure a statutory right to abstract and use water from the Vaal river in order to generate electricity at the Vereeniging power station.

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Post-colonial phase 1924 - 1948

In the company’s *Private Bill* No. 14 of 1919 subsequently passed by parliament, the company was allowed to impound 1350 Mℓ of water in the Vaal river. The one condition was that this amount of water had to be part of the 8100 Mℓ that had been allocated in the 1914 act to riparian users. The 1919 act also determined the places where water was to be extracted and returned to the river. Certain restrictions were also placed on the company in respect of the temperature of the water that was to be returned to the river.\(^4\)

In 1929 the power company submitted an amendment of the 1919 bill in an effort to extract more water following the proposed enlargement of its power station on the banks of the river. The company wanted to step up its power generation from 50 000 to 136 000 kW. To do this it required 2700 Mℓ instead of 1350 Mℓ of water.\(^4\) It also wanted to shift the point where the water was taken from the river, to another place. The water was used for cooling the condensers. After studying the proposals of the electricity utility the board’s experts recommended that the water inlet of the Vereeniging purification plant be moved further downstream in the Vaal river. The existing water intake, close to the proposed operations of the power supply company in the river, could lead to the increasing growth of organisms in the water. The cost of purifying the water was to be higher.\(^4\) Moreover, the board was sensitive to thermal pollution – a spin-off of electricity generation activities.\(^4\)

Consequently, before the amended bill was approved by parliament,\(^4\) the power supply company and the board entered into an agreement and reached consensus on two matters. The

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41. RWA, Twenty-fourth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1929, p. 8.
42. Ibid., p. 8.
43. Ibid., p. 8.
44. R.J. LABURN, The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation, p. 18.
45. Act No. 18 of 1929.
power company was to pay the board a *pro rata* amount of money towards the costs incurred in constructing and maintaining the Barrage scheme. The power company furthermore agreed to pay the board an amount of £3600 annually to improve the water works of the board at Vereeniging. It was necessary to be prepared for changes that might have to be made because of extended activities.\textsuperscript{46} The board intended to make provision for more sedimentation tanks and water-cooling sprays at the Vereeniging pumping station. The board also indicated that if it were deemed necessary the intake plant would be shifted further down river, away from the heated discharge of the power company’s water. If this measure still did not prove to be effective, the power company would construct cascades in the river upstream of the river intake.\textsuperscript{47}

After the agreement had been concluded representatives of the power supply company frequently approached the board with the objective of making alterations. The matter became more relevant as the Vaal dam scheme neared completion. The company argued that the agreement of 1929 no longer applied. It now wanted the terms to be adjusted. The board in turn responded that it had made the necessary adjustments to its system, following the 1929 agreement. It started with the construction of the Vereeniging pumping station’s number 2 intake from the Vaal river. In terms of the agreement the power supply company had to pay for the alteration. Fact of the matter was that all major consumers of Vaal river water were affected by the government’s Vaal dam scheme.

The Rand Water Board now had access to 585 Mℓ/d, whereas in 1929 it could only draw 90 Mℓ from the river. The board and the power supply company consequently reached an agreement in which the annual payment of £3600 was lowered to £2750. Also, the stipulation in the agreement that the power supply company would be held responsible to help pay for all additional equipment after

\textsuperscript{46} RWA, Twenty-fourth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1929, p. 9.

\textsuperscript{47} Ibid., pp. 9-10.
30 years was also scrapped.\textsuperscript{48} It is thus evident that the access of the board to more water and the direct supply of water to the power supply company substantially changed the agreement that the board and the power supply company had reached in 1929. However, it was important for the two service providers to cooperate and make the best use of the available resources. Consequently they increasingly tried to support each other.

In the \textit{Vaal River Development Act}, No. 38 of 1934, Rand Water Board was given permission to dispose of water outside its existing limits of supply.\textsuperscript{49} The law had made provision for the board to extract 315 M\text{ℓ} of water daily from the Vaal river in the Barrage. The permission granted, was of particular importance in the sense that it a) paved the way for the board to provide water to Vereeniging and the industries situated on the banks of the Vaal river; and b) opened up the way for a sensible system of distribution to large consumers who were indirectly linked up with the Witwatersrand. One of the major beneficiaries of the arrangement was to be the Electricity Supply Commission (Escom). During talks that took place between representatives of the board and the government in Cape Town in 1934 special attention was given to providing water from the Vaal river to Escom (29 M\text{ℓ}/d), the Union Steel Corporation (USCO), (3 M\text{ℓ}/d) and Stewarts & Lloyds of South Africa, Ltd (2 M\text{ℓ}/d).\textsuperscript{50}

Particularly, Escom needed a substantial supply of water for its Klip power station, the largest power station in the southern hemisphere at the time.\textsuperscript{51} Escom was eager to get the water from the board. But, it was up to the government to facilitate the process. If

\begin{itemize}
  \item \textsuperscript{48} RWA, Thirty-third annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1938, p. 12.
  \item \textsuperscript{49} See J.M. Murray, W.G. Hoal, W. Pollack and G.N. Cross (Editorial board), The Union Statutes: Classified and annotated reprint 1910-1947 Volume 12, p. 781. Section 8 of \textit{The Vaal river Development Scheme, Act No. 38 of 1934},
  \item \textsuperscript{50} RWA, Minutes 1934-5, p. 59: 424th meeting of the Rand Water Board, Headquarters, Johannesburg 1934.06.22.
  \item \textsuperscript{51} S.R. Conradie and L.J.M. Messerschmidt, \textit{A symphony of power: the Eskom story}, pp. 91-2.
\end{itemize}
the board was unable to supply the water Escom had to make plans for getting it directly from the Vaal river. The board’s representatives at the talks were of the opinion that it was best for the board to supply the water, as it had the necessary skills available. The understanding was that in exchange for the daily supply of 29 Mℓ of non-potable water Escom was to pay £43 875 annually.\textsuperscript{52} Escom also had to pay for the pumping of the water to the power station. In respect of the water that was to be supplied to USCO and Stewarts & Lloyds, the only reservations of the board were that the water the factories used, should not be returned to the river directly.\textsuperscript{53}

Two years later, in 1936, protracted negotiations between the board and Escom took place. Escom was eager to make adjustments to the stipulation that it was limited to using 29 Mℓ/\text{d}. It also wanted greater leniency in respect of putting used water back into the Vaal river. The board maintained that it would require of Escom to adhere to the principle that the water that was returned from the Klip power station was to be of such a nature that the physical, chemical and biological condition was of an acceptable standard.\textsuperscript{54} An agreement to this effect was concluded between Escom and the board on 17 June 1936.\textsuperscript{55} Escom had made an important breakthrough. There was now acceptance on the side of the board that the Klip power station, which originally was scheduled for construction close to Meyerton, was now at Redan,\textsuperscript{56} within a 10-kilometre radius of Vereeniging and somewhat closer to the Vaal river. Moreover Escom now also had permission to extract 45 Mℓ/\text{d}.

\begin{flushleft}
\begin{itemize}
  \item \textsuperscript{52} RWA, Minutes 1934-5, p. 60: 424th meeting of the Rand Water Board, Headquarters, Johannesburg 1934.06.22.
  \item \textsuperscript{53} \textit{Ibid.}, pp. 60-1: 424th meeting of the Rand Water Board, Headquarters, Johannesburg 1934.06.22.
  \item \textsuperscript{54} \textit{Ibid.}, p. 61: 448th meeting of the Rand Water Board, Headquarters, Johannesburg 1936.06.26.
  \item \textsuperscript{55} RWA, Minutes 1936-7, pp. 62-3: 448th meeting of the Rand Water Board, Headquarters, Johannesburg 1936.06.26. Copy of Deed of Agreement between the Rand Water Board and the Electricity Supply Commission, Johannesburg, 1936.06.17
  \item \textsuperscript{56} S.R. CONRADIE and L.J.M. MESSERSCHMIDT, \textit{A symphony of power: the Eskom story}, p. 92.
\end{itemize}
\end{flushleft}
from the Vaal river. This was subsequently increased to 54 Mℓ/d.\textsuperscript{57} Preliminary approval had been given for this measure by the board in committee as early as November 1936.\textsuperscript{58} The final agreement, with some minor adjustment was concluded in 1939. The board was now eligible to receive an annual payment of £81 000 for the water. The payment that was made, once a year, was subject to an interest rate of 3.5 per cent per annum.\textsuperscript{59}

**Sale of non-potable water**

By the second half of the 1930s, because of the incorporation of Vereeniging into its water supply system, the board found itself in a position to dispose of non-potable water. In terms of the *Vaal River Development Scheme, Act No. 38 of 1934*, the board was allowed to sell portions of its water to authorised users.\textsuperscript{60} Because of their geographic locality Vereeniging Estates Ltd, the Union Steel Corporation of South Africa Ltd (USCO), as well as Stewarts & Lloyds of South Africa, Ltd were eager to enjoy certain privileges of acquiring cheap water in large quantities.\textsuperscript{61} The advent of war speeded up the trend to provide non-potable water to certain customers. First in 1939 USCO,\textsuperscript{62} followed by Stewarts & Lloyds of South Africa, Ltd, entered into agreements with the board for the purchase of 7 Mℓ/d. In the same year the board also gave

\begin{itemize}
\item \textsuperscript{57} RWA, Minutes 1939-40, p. 20: 482nd meeting of the Rand Water Board, Headquarters, Johannesburg 1939.04.28.
\item \textsuperscript{58} Ibid., p. 21: 482nd meeting of the Rand Water Board, Headquarters, Johannesburg 1939.04.28.
\item \textsuperscript{59} Ibid., pp. 21-2: 482nd meeting of the Rand Water Board, Headquarters, Johannesburg 1939.04.28. See Recommendation and concept deed of agreement approved by the board.
\item \textsuperscript{60} RWA, forty-fourth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1949, p. 13.
\item \textsuperscript{61} RWA, Minutes 1938-9, pp. 205-9: 477th meeting of the Rand Water Board, Headquarters, Johannesburg 1938.11.25.
\item \textsuperscript{62} RWA, Minutes 1939-40, p. 20: 482nd meeting of the Rand Water Board, Headquarters, Johannesburg, 1939.04.28.
\end{itemize}
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Vereeniging Estates, Ltd, a quota of 5 Mℓ/d. These allocations were made possible by the fact that the board had a surplus; the consumers were close to one of the primary storage areas; and finally the consumers were able to make a contribution to the industrial development of the country at the time. The agreements were ratified in Act 18 of 1944. Especially the industries of the Vaal Triangle made a substantial contribution to the war effort at the time.

During the war years of 1939-45 additional quotas of non-potable water were given to Stewarts & Lloyds and USCO. Some of these allocations were terminated in 1945. It now increasingly became important for the board also to act as a supplier of non-potable water to the numerous industries in the Vaal river basin.

Upgrading the Vaal river scheme

In October 1923, shortly after the Barrage was formally taken into use, the board decided that it would postpone until April 1924 a decision in respect of upgrading the water supply system to the Witwatersrand from the Vaal river scheme. The objective was to determine what the requirements of the board could be, based on actual figures. The plan was fairly simple. For an amount of £496 000 additional equipment would be installed at Vereeniging and Zwartkopjes to provide the board with a daily supply of 23 Mℓ. The finance and executive committee did a preliminary

64. RWA, Thirty-ninth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1944, p. 10.
66. RWA, Twentieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1925, p. 2.
investigation and at its April 1924 meeting a special committee was appointed to look at the anticipated future consumption on the Witwatersrand. At the same time there also had to be an investigation into the board’s water storage capacity. The next month the committee reported back stating that the board did not have sufficient supplies to meet future requirements. The estimates were based on consumption patterns for the months of September to February over a period of several years. The committee felt the available storage facilities of the board were sufficient. Shortly afterwards the board gave its unanimous approval for the introduction of the scheme to upgrade the available water supply system. It was to be called “Portion A”. The second unit of the Vaal river scheme was now estimated to cost £318 000. By the end of the 1925-6 financial year the chairman of the board reported that the project had almost been completed. Furthermore, it was estimated that the completion of the project would amount to between £266 000 and £280 000. This was somewhat lower than the earlier estimates. The work was completed in March 1927.

The board decided on Portion B whilst Portion A was still under construction. The objective with this phase of the Vaal river scheme was to install a pumping plant at Zwartkopjes pumping station capable of delivering water to the Village pumping station in Johannesburg, against a head of some 300 m. The scheme was intended to add a further 18 Mℓ to the existing water supply from the Vaal river scheme. Moreover it was linked directly to the

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67. Ibid., pp. 2-3.
68. Ibid., p. 3.
69. Ibid., p. 4.
70. RWA, Twenty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1926, p. 3.
Yeoville water supply.\textsuperscript{72} The project was to ultimately cost about £165 000.\textsuperscript{73} In July 1931 the board gave the go-ahead for the third unit (Portion C) of the Vaal river scheme. This phase, which started operations in September 1932, was intended to push up the supply from 45 to 68 Mℓ/d.\textsuperscript{74} The fourth phase of the Vaal river scheme was agreed to on 17 March 1933 when the board decided to opt for a plan that could provide it with 131 Mℓ of water daily from the Vaal river.\textsuperscript{75} At the time there were fears that the board would not be able to cope with the growing demand.\textsuperscript{76}

There was a substantial increase in the board’s supply of water. Between September 1934 and March 1935 the available daily supply of water the board had at its disposal rose from 102 to 131 Mℓ.\textsuperscript{77} The general water consumption pattern at the time suggested that the board required on average 108 Mℓ/d if it wanted to provide in the requirements of its consumers. By far the greater portion of the water (87 Mℓ/d) came from the Vaal river.\textsuperscript{78}

\textbf{The Vaal dam water supply}

When in 1933 the Rand Water Board was in the final stages of completing the fourth phase of its Vaal river scheme, the government started with plans for the construction of the dam at

\textsuperscript{72}. RWA, Twenty-third annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1928, p. 3.

\textsuperscript{73}. \textit{Ibid.}, p. 3.

\textsuperscript{74}. RWA, Twenty-eighth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1933, p. 6; RWA, Thirtieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1935, p. 49.

\textsuperscript{75}. RWA, Twenty-eighth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1933, p. 7.

\textsuperscript{76}. \textit{ANON., Rand Water Board Randwaterraad 1903-1953}, p. 25.


\textsuperscript{78}. \textit{Ibid.}, p. 6.
Vaalbank – later to become known as the Vaal dam.\(^79\) Between November and December 1933 the management and the board members were given the opportunity to consider the potential of the scheme. The major advantage for the Rand Water Board was that its rights of abstraction of water from the Vaal river would increase from 90 to 315 M\(\ell\)/d.\(^80\) With the passing of the *Vaal River Development Scheme Act*, No. 38 of 1934,\(^81\) the government paved the way for the enhanced and more effectively organised use of the Vaal river’s water. On the one hand the scheme was intended to provide sufficient water for the Harts River Valley irrigation scheme in the Northern Cape Province. On the other hand it was possible to step up the water supply to the growing industrial region of the Witwatersrand.\(^82\) The Rand Water Board thus from the outset had a stake in the proposed development.\(^83\) It is then understandable why the board was prepared to make a substantial investment in the project. For example, the first phase of the Vaal dam cost £1,7 million to build. Of this amount the Rand Water Board was to pay the government £1,17 million in exchange for the right to extract water for the Witwatersrand from the dam.\(^84\)

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80. RWA, Minutes, 1920-34, Committee of the whole board meeting, 1933.12.22, pp. 892-3; RWA, Minutes 1932-4, pp. 1210-1 Minutes finance and executive committee meeting, 1933.11.17.


The government made a concerted effort from the outset to get the board to participate in the planning of the dam. The minister of lands invited representatives of the board to attend exploratory talks.\textsuperscript{85} The proposed project, which made provision for an estimated 11 storage dams upstream of the Rand Water Board’s scheme in the river, was to have a direct impact on the immediate environment of the river over a distance of more than 570 km.\textsuperscript{86} For the Rand Water Board the development was favourable. It simply could not stay out. In terms of the subsequent agreement concluded between the board and the government it was determined that if the board were prepared to pay £240,000 it would be possible to make use of the proposed government storage dam. In addition to the 90 M\textsuperscript{ℓ} of water the board could extract daily from its existing

\textsuperscript{85} R.J. LABURN, The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation, p. 19.

\textsuperscript{86} RWA, Twenty-ninth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1934, p. 7.
scheme, the new agreement enabled the board to extract 270 Mℓ of water. This was a sound offer and it was noted that:

additional storage and abstraction rights and the safeguards embodied in the Vaal river Development Scheme Act, are regarded by the board as relieving it of the anxiety as to the security of the water supply of the Witwatersrand for many years ahead.

The board’s chief engineer, M. Udwin, was excited by the prospects. He had earlier been instructed to investigate the possibility of further sources of water. After considering the proposed government scheme he was convinced that not only did it secure a more permanent water supply, it also made possible larger quantities of water for the board’s consumers. The advantages were legion. Firstly the board was able to safeguard the interests of its consumers. The lower capacity of the dam, 20 per cent, as well as 10 per cent of the increased capacity of the dam was placed at the exclusive disposal of the board. Secondly the board was given the right to develop any hydro-electrical power that would become available because of the release of water from the Vaal dam. Thirdly, the great variations in the quality of the water in the Barrage were virtually eliminated. The vast storage dam above the barrage could be used consistently to fill up the board’s existing river storage area. Finally the board and the government reached agreement that the level of the Barrage would be kept at a constant 0,3 m below the top.

89. Ibid., p. 48.
90. Ibid., p. 50.
Chapter 5

The department of irrigation (the predecessor to the department of water affairs) undertook the development.\textsuperscript{92} It was estimated that the dam would be able to hold 855 000 M\text{ℓ} of water.\textsuperscript{93} Work on the scheme started in 1934 and it was scheduled for completion in 1938.\textsuperscript{94} With the government project in an advanced stage of completion, the board in 1935 started making projections of its anticipated water future requirements. Principal consumers were asked to draw up estimates and it became evident that by 1940 the daily consumption could be as much as 155 M\text{ℓ} – at least 23 M\text{ℓ} more than the board was capable of supplying without the support of the Vaal dam.\textsuperscript{95}

In 1937 the board entered into an agreement with the government, which gave permission for the extraction of 315 M\text{ℓ} more per day.\textsuperscript{96} This was a direct result of the unabated municipal development and the mining activities on the Witwatersrand.\textsuperscript{97} In total the Rand Water Board now had at its disposal a daily supply of 720 M\text{ℓ}. Of this about 45 M\text{ℓ} could be pumped from the boreholes in the Klip river, a further 90 M\text{ℓ} from the Vaal river, and 585 M\text{ℓ} from the Vaal river development scheme (Vaal dam).\textsuperscript{98} In 1944 a further 293 M\text{ℓ} was added and it led, by 1953, to the board having access to a supply of 968 M\text{ℓ/d}.\textsuperscript{99}

\textsuperscript{92} RWA, Twenty-ninth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1934, p. 49.
\textsuperscript{93} Ibid., p. 49.
\textsuperscript{94} Ibid., p. 49.
\textsuperscript{95} RWA, Thirtieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1935, p. 8.
\textsuperscript{96} RWA, Thirty-second annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1937, pp. 10-12; ANON., Rand Water Board Randwaterraad 1903-1953, p. 27.
\textsuperscript{97} Ibid., p. 10.
\textsuperscript{98} Ibid., p. 11.
\textsuperscript{99} ANON., Rand Water Board Randwaterraad 1903-1953, p. 27.
Consequences of the Vaal river development

Because the development of a water scheme tends to be a static and a very focused project, it is seldom noted how comprehensive its impact can be. In the discussion, earlier on the development of the Rand Water Board’s Barrage project, it was explained how a whole regional society was affected economically by the Vaal river scheme. It even led to prospecting for diamonds at the Barrage in 1926.\(^\text{100}\) The developments of the 1930s, when the Vaal dam project was launched were however far more comprehensive. Some consequences deserve closer consideration.

An environmental crisis? For the greater part of the twentieth century there was among hydrologists worldwide a sense of pride in the accomplishments of modern day dam construction. It was indeed an ancient technology that had been refined to the extent that by the 1960s on an average one dam a day with a wall height of at least 15 m was completed worldwide. About two thirds of the world’s freshwater stream flow passed either through or over manmade dams by the 1990s.\(^\text{101}\) This realisation increasingly forced environmentalists to reconsider the value of dams. Apart from being responsible for the relocation of about 60 million people worldwide, dam construction is often responsible for the destruction of ecosystems. Dams normally bring about higher social and environmental costs than their material benefits.\(^\text{102}\)

In the case of the Vaal dam, primarily intended to supply water to the arid Vaalharts region – ten days’ flow downstream of the Vaal river – a small farming settlement that came into existence as a result of the economic depression,\(^\text{103}\) received as much water for irrigation as was provided to the Witwatersrand. The income

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100. SAB, MNW848, MM2025/26. Acting secretary Rand Water Board, Johannesburg - Secretary for mines and industries, Pretoria, 1926.08.18.


103. See H. Bornmann, *Vaalharts*, pp. 27-33.
generated from farming activities in the Vaalharts region with its high water evaporation rate, was a fraction of the wealth generated on the Witwatersrand.\textsuperscript{104} Towards the end of the twentieth century, as water resources in South Africa increasingly became scarcer, the management of Rand Water\textsuperscript{105} frequently were at loggerheads with the department of water affairs about the disproportionate allocation of water. However, at the time of the completion of the Vaal dam in the 1930s these environmental problems were not as apparent as they were to become towards the end of the century. Other priorities shaped the thinking of an earlier generation.

\textit{Depression and urbanisation:} Construction work on the dam started towards the end of the economic depression – one of the most economically trying times in the twentieth century history of South Africa. The November 1929 collapse of the Wall street stock exchange in New York reverberated all over the world where the capitalist economic system was in operation. In South Africa thousands of people, particularly whites, were left destitute by the depression. Because of the mining and industrial activities people had started drifting to the towns where they took up employment in the mines, factories and the commercial sector. Increasingly they had become estranged from the rural roots of the farming culture and formed a substantial urban proletariat of working class people.\textsuperscript{106} When the effects of the depression became apparent at the start of 1930 these neo-urbanites had to find alternatives to the steady employment opportunities that were rapidly diminishing in all the sectors of the country’s economic activities.

Many thousands of black South Africans who had become part of the urban environment since the nineteenth century were also affected by the depression. Especially in categories of unskilled

\textsuperscript{104} J. CLARKE, \textit{Coming back to earth: South Africa’s changing environment}, p. 128.

\textsuperscript{105} The name of the water utility after 1993.

\textsuperscript{106} For an interesting recent evaluation of the history of the transformation process, see H.B. GILIOEME, “’Wretched folk, ready for any mischief’: The South African state’s battle to incorporate poor whites and militant workers, 1890-1939,” in \textit{Historia} 47(2), November 2002, pp. 601-53.
labour, whites were being given preferential treatment. In an effort to speed up the process of economic recovery the government made extensive use of white labour in the construction of the Vaal dam. There were many local job opportunities. These people performed unskilled manual labour. For example, building materials had to be transported to the dam’s construction site. The nearest station was at Viljoensdprint on the Free State side of the Vaal river near Vereeniging. Transport riders had to convey the material over a distance of almost 30 km. The Rand Water Board also employed a number of unskilled white workers at Vereeniging and Zwartkopjes, sometimes to the disadvantage of black workers, in an effort to stem the ‘serious unemployment position existing locally’.

Illus. 5.4. The sedimentation system at the Vereeniging pumping station in the 1940s. Source: Rand Water

108. RWA, Twenty-ninth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1934, p. 49.
109. Ibid., p. 49.
110. RWA, Twenty-eighth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1933, p. 11.
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Growth of Vereeniging: Perhaps the greatest beneficiary of the new water scheme was the coal-mining town of Vereeniging where the filtration plant and pumping station of the Rand Water Board were situated. The board’s facilities had to be improved to cope with a greater supply of water. The Vereeniging pumping station was originally designed to take a maximum capacity of 90 Mℓ of water daily. This target was reached by October 1934 once the fourth phase of the Vaal river water scheme came into operation.\textsuperscript{111} In 1936 the pumping station was upgraded to pump 158 Mℓ/d.\textsuperscript{112} This development also implied labour intensive activity. In turn it created job opportunities for many people who had settled in Vereeniging in the years following the depression.

Technological innovation - larger pipelines: Once the Vaal dam scheme was underway the plant at Vereeniging had to be enlarged.\textsuperscript{113} This gave rise to substantial development in the local technology of pipeline manufacture. During the 1920s concrete pipes were increasingly being used in the pipelines of the Rand Water Board. They proved to be low on maintenance costs and were free of nodular growth. The discharge of water from these pipes proved to be consistent.\textsuperscript{114} In fact the pipeline between Vereeniging and Zwartkopjes, completed in 1925, was a project undertaken by the Hume Pipe Company, (SA) Ltd, after it had received the contract to manufacture almost 24 000 m of steel reinforced concrete pipes 60 cm in diameter.\textsuperscript{115} At the time the company was unable to provide in all the board’s requirements for pipes. Local technology

\begin{footnotesize}
\begin{enumerate}
\item RWA, Thirtieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1935, p. 42.
\item RWA, Thirty-second annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1937, p. 50.
\item ANON., Rand Water Board Randwaterraad 1903-1953, p. 28.
\item RWA, Twenty-seventh annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1932, p. 38.
\item ANON., The Rand Water Board Vereeniging-Zwartkopjes pipe line, pp. 3-4.
\end{enumerate}
\end{footnotesize}
improved rapidly. In 1931 the board first took locally manufactured steel pipes into use.\textsuperscript{116}

As a rule the economy tended to get overheated and the country’s young industrial sector simply could not supply in all the demands. This was especially the case in the area of pipe manufacture. Local factories were unable to deliver in a short period of time.\textsuperscript{117} In view of the fact that the Vaal dam water supply was to come into operation at short notice, a deputation of the board’s management was sent to Britain in 1935 to negotiate for the purchase of material by tender procedures.\textsuperscript{118} Local factories were also unable to provide in the demand for sophisticated pipe material. Ultimately in 1937 some 37 000 m of 1,1 metre diameter pipes with spun-in bitumen had to be manufactured overseas and imported to South Africa.\textsuperscript{119}

The use of larger pipelines meant that technological innovation was necessary. Consequently, during the 1930s as the size of the board’s pipes increased, it became necessary to make use of mobile cranes. The first were taken into use in 1935. In 1939 a heavier machine was acquired, equipped with caterpillar tracks, a diesel engine and a five-meter boom.\textsuperscript{120}

The new technological advances proved to be a boon. By the end of 1936 the board could supply its consumers with 171 Mt/d.\textsuperscript{121} The trend was to install ever larger pipes. In 1938 the objective was to lay 1,3 metre diameter pipelines between Vereeniging and

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\item \textsuperscript{116} R.J. LABURN, The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation, p. 18.
\item \textsuperscript{117} ANON., “Manufacturers of concrete and steel piping for nearly 40 years” in F. STARK (ed.), \textit{Seventy golden years 1886-1956}, p. 124.
\item \textsuperscript{118} RWA, Thirty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1936, p. 11.
\item \textsuperscript{119} RWA, Thirty-second annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1937, p. 52.
\item \textsuperscript{120} RWA, Minutes 1938-9, p. 306: 481st meeting of the Rand Water Board, Headquarters, Johannesburg, 1939.03.24. Report 1411, M. Udwin, 1939.03.14.
\item \textsuperscript{121} ANON., \textit{Rand Water Board Randwaterraad 1903-1953}, p. 29.
\end{enumerate}
\end{footnotesize}
Zwartkopjes.\textsuperscript{122} Again local pipe manufacturers were unable to execute the whole order and a large part had to be executed overseas. After 1945 the situation changed. Companies, such as Hume Pipe had gained extensive wartime experience in manufacturing pipes that were used in North Africa. It was now possible for the manufacturers to provide in the board’s needs for high quality pipes.\textsuperscript{123}

\textbf{Illus. 5.5.} The Forest Hill reservoir was one of the first of the Rand Water Board to be covered. Source: Rand Water

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Post-colonial phase 1924 - 1948

Roofs for reservoirs: With larger quantities of water available to the board there was a substantial increase in reservoir storage facilities. The first steps were then taken to ensure that the quality of water did not deteriorate because of exposure. The solution was to provide reservoirs with roofs. The project started in 1937. The first roofs to be completed were Forest Hill and Signal Hill in 1938, followed by the Benoni reservoir in 1939.\textsuperscript{124} There were many reasons for the project. The sites available for reservoirs were as a rule not considered suitable. There was the additional problem of pollution, organic growth and evaporation.\textsuperscript{125} Locust plagues were, at the time, still prevalent. Putting a roof on the reservoirs prevented swarms of locusts from polluting the water.\textsuperscript{126} Furthermore, at a time of war, open reservoirs tended to pose a security threat. In 1939 the Johannesburg municipality started with a similar project to cover all its reservoirs with a capacity of more than 142 M\ell. It was anticipated that the project would be completed by 1940.\textsuperscript{127} By that time most of the board’s reservoirs already had roofing.\textsuperscript{128} By 1945 the board’s covered reservoirs could hold more than 404 M\ell, after the Germiston reservoir had been completed.\textsuperscript{129}

\begin{itemize}
\item \textsuperscript{126} Disclosure Dr R.J. Laburn: panel discussion on the history of Rand Water, Rietvlei, 2003.02.07.
\item \textsuperscript{127} RWA, Thirty-third annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1938, p. 36.
\item \textsuperscript{128} RWA, Thirty-sixth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1941, p. 33.
\item \textsuperscript{129} RWA, Fortieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1945, p. 28.
\end{itemize}
Acquisition of more land: The enlarged water supply made it necessary for the board to invest in more land.\textsuperscript{130} Substantial acquisitions were made in the period 1935-6. A few examples substantiate the point. In the 1936 financial year the board purchased a portion of land on the farm Paardeplaats 37 in the Krugersdorp area for a reservoir that could store 23 $\text{M}\ell$.\textsuperscript{131} The land purchased made it possible to store as much as 113 $\text{M}\ell$ in the Johannesburg and Krugersdorp area.\textsuperscript{132} An area of 31.1 hectares\textsuperscript{133} on the farm Leeuwkuil No. 81 in the district of Vereeniging was purchased from the Vereeniging Estates Company. It was to be used as an extension of the board’s increased operations. Also a small piece of land was purchased at the number 2 intake on the banks of the Vaal river.\textsuperscript{134} In Johannesburg the board acquired a portion of the farm Turffontein 19 to construct a covered reservoir at Forest Hill that could hold 90 $\text{M}\ell$.\textsuperscript{135} This reservoir was frequently upgraded. By 1946 it could store 113 $\text{M}\ell$.\textsuperscript{136} The growth rates implied that when plans were made for the acquisition of land, provision had to be made for the potential enlargement of storage facilities.

Coping with suspended solids: The Vaal river, as the name suggests, is noted for the turbidity of its water. This is caused by a high content

\textsuperscript{130} Through the years a number of properties were purchased, for example at Zuikerbosch, Meyerton, Palmiet, Eikenhof, Weltevrede, Bloemendal and Klipfontein, to name only a few. This was to be an ongoing feature in the development of the board. Additional information supplied by Mr E. Myburgh, during panel discussion, Rietvlei, 2003.02.07.

\textsuperscript{131} RWA, Thirty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1936, p. 18.

\textsuperscript{132} \textit{Ibid.}, p. 18.

\textsuperscript{133} 1 acre = 0.404 hectares.

\textsuperscript{134} RWA, Thirty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1936, p. 18.

\textsuperscript{135} \textit{Ibid.}, p. 18.

\textsuperscript{136} RWA, Forty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1946, p. 7.
of suspended solids in the form of silts. At first the problem was addressed by means of a slow sedimentation process. As the board started pumping larger quantities of water, the need for rapid and effective purification increased. In 1932 the silt content reached a high of 7030 mg/ℓ. A duplicate line of supply was then installed to provide security for the water that was pumped from the sedimentation system.\textsuperscript{137} A carbonation plant was also installed. The gas passed through layers of manganese ore and coke. Water was then introduced into the system by means of spraying nozzles at several points above the level of each bed.\textsuperscript{138} In this manner purification took place.

When the Vaal dam started filling up with water in 1937 turbidity was an outstanding feature of the board’s raw water supply. It remained so, literally until the end of the century when the water from the Lesotho Highlands started diluting the natural supply of the Vaal dam. Once the water supply from the Vaal dam became available, more extensive purification measures had to be introduced. In 1940-1, for example, the 81 048 Mℓ of water extracted from the Vaal river, contained 18 620 tonnes of suspended solid matter (230 mg/ℓ). This had to be removed by means of sedimentation tanks and filters. At the Vereeniging purification plant lime was used throughout the year as primary coagulant. After sedimentation alkalinity was reduced by means of carbon dioxide. Later a secondary form of coagulation was introduced when an aluminium sulphate process was introduced.\textsuperscript{139}

\textit{The changing role of Zwartkopjes:} By 1935 the Zwartkopjes pumping station was ostensibly used for re-pumping water from the Vaal river to the Witwatersrand. In addition water from the Zuurbekom pumping station was taken into the system at Zwartkopjes. In times of high demand the boreholes of the Klip river Valley were used to

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\textsuperscript{137} RWA, Thirtieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1935, p. 42.
\textsuperscript{138} Ibid., p. 42.
\textsuperscript{139} RWA, Thirty-sixth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1941, p. 39.
acquire more capacity.\textsuperscript{140} However, it was a small quantity. In 1938, for example, only 0.03 per cent of the board’s water was pumped from the Zwartkopjes boreholes.\textsuperscript{141} It thus came as no surprise when water extraction from the boreholes was halted. In future Zwartkopjes only served as a booster pumping station.\textsuperscript{142} In 1945 it was decided that Zwartkopjes’ boreholes, with the exception of ‘D’ and ‘H’, would be closed down permanently.\textsuperscript{143}

\textit{The area beyond the limits of supply:} One of the most marked effects of the Vaal dam scheme was discernable outside the existing limits of supply of the Rand Water Board at the start of the 1930s. It had a bearing on the water supply to Pretoria and Vereeniging.

\textbf{The incorporation of Pretoria}

The incorporation of Pretoria into the system of the Rand Water Board was a result of the rapid industrialisation of the 1920s. Since its founding in the 1850s Pretoria had a relatively reliable water supply. It had even been possible to accommodate a number of industries in the capital city of the Transvaal by the early twentieth century. However, with the establishment of Iscor’s plant to the west of Pretoria’s central business district, substantially larger supplies of water were necessary.\textsuperscript{144}

Tentative talks between representatives of the Pretoria city council and the Rand Water Board had taken place in 1928, but little came

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\textsuperscript{140} RWA, Thirtieth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1935, p. 41.
\textsuperscript{141} RWA, Thirty-third annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1938, p. 41.
\textsuperscript{142} RWA, Fifty-first annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1956, p. 43.
\textsuperscript{143} RWA, Minutes 1945-6, p. 37: 556th meeting of the Rand Water Board, Headquarters, Johannesburg 1945.06.22. Report No. 1788, J.P. Leslie 1945.06.12.
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of it.\textsuperscript{145} At the time the findings of a commission of inquiry into the water supply of the city suggested that the city might have sufficient existing sources to provide in its demand.\textsuperscript{146} By 1934, when the Vaal dam project of the government got underway, talks with the Rand Water Board were resumed.\textsuperscript{147} Early in 1935 board secretary J.H. Stevenson indicated to the Pretoria town clerk it was possible to supply Pretoria with water, but there would be considerable expenses in respect of defraying the cost of providing the necessary infrastructure. Preliminary estimates suggested that it would cost at least £500 000. Furthermore, it was expected to take at least 21 months to complete the construction project.\textsuperscript{148} Once again the city council hesitated and delayed taking a decision.

However, it was clear that because of the increasing requirements of Iscor, additional water supplies had to be acquired. Moreover, indications were that the steel giant’s needs far exceeded the supplies available to Pretoria.\textsuperscript{149} With the outbreak of World War II in September 1939 the operations of the factory had to be stepped up. Also domestic consumers were in need of more water. These circumstances made it of quintessential importance for Pretoria’s city fathers to reconsider the matter.\textsuperscript{150} At its September 1939 meeting the city council in committee took note of a report by the

\textsuperscript{145} RWA, Minutes 1942-3, p. 135: 529th meeting of the Rand Water Board, Headquarters, Johannesburg 1943.03.26; Also see ANON., “Steel and water at Pretoria” in \textit{The Star}, 1929.03.27.

\textsuperscript{146} ANON., “Pretoria: new stock issue of £400 000’Pretoria council proposals” in \textit{Rand Daily Mail}, 1929.06.27; ANON., “Cheaper water” in \textit{Rand Daily Mail}, 1929.06.27; ANON., “Sterkfontein scheme: £104 000 for a spring” in \textit{Rand Daily Mail}, 1934.01.17.


\textsuperscript{149} ANON., “Pretoria’s water supply: iron works may need increased quantity” in \textit{Rand Daily Mail}, 1934.03.30; ANON., “Pretoria’s water supply” in \textit{Architect, Builder & Engineer}, April 1934; ANON., “Water for Iscor: average of 2 500 000 gallons a day” in \textit{The Star}, 1937.09.18; ANON., “Iscor’s water needs doubled” in \textit{Rand Daily Mail}, 1937.09.18.

\textsuperscript{150} ANON., “Pretoria water supply robolem” in \textit{Rand Daily Mail}, 1940.08.28.
city engineer.\textsuperscript{151} Again it was argued that the costs required for the development of the scheme were extremely high.\textsuperscript{152} As an alternative measure, the council’s engineers were instructed to see if the existing Loskop and Rietvlei dams could be developed further.\textsuperscript{153}

Illus. 5.6. In the post-World War II era more water had to be distributed. The result was larger pipelines. The pipes in the illustration had a diameter of 1350 mm. Source: Rand Water

By June 1940 Pretoria’s water supply was once again in a critical state and the city council resolved that the matter of a supply from the Rand Water Board had to be considered. A sub-committee of the council, headed by the mayor, Clr A.B. Sidey, was appointed to hold talks with representatives of Iscor and negotiate a charge for

\textsuperscript{151} MPA 3141/1079. Copy minutes of the council-in-committee, City Hall, 1939.09.07.

\textsuperscript{152} RWA, Minutes 1942-3, p. 135: 529th meeting of the Rand Water Board, Headquarters, Johannesburg 1943.03.26.

\textsuperscript{153} MPA 3141/1079. Resolution contained in a copy of the minutes of the council-in-committee, City Hall, 1939.09.07.
the water the municipality supplied to the industry. In some quarters this action was seen as delaying tactics. It was clear that Pretoria – in view of the prevailing local industrial requirements – could not function properly without a reliable water supply from the Rand Water Board. The board meanwhile set aside an amount of 45 Mt/d of its water allocation from the Vaal dam for the use of Pretoria. Subsequently Pretoria city council was notified that their allocation would only be kept until the end of March 1941.

Illus. 5.7. Pipes with a diameter of 700 mm being off-loaded in the 1940s.
Source: Rand Water

154. MPA 3141/1079. Resolution meeting of the Council-in-committee, City Hall, 1940.06.17.

155. MPA 3141/1079. N.M. Murray, Johannesburg – Town Clerk, Pretoria, 1940.09.26; ANON., "Pretoria water reserve" in The Star, 1940.10.16; ANON., "Pretoria has not decided on water scheme: Rand Board’s proposal expires this month" in Rand Daily Mail, 1941.03.10; ANON., “Huge water board area may increase” in Sunday Times, 1941.03.16.
In mid-March a delegation of the council visited Cape Town and held talks with the minister of irrigation. The councillors and officials explained that the cost of the Vaal dam’s water was simply too high. At the same time it was important for Pretoria to get an additional supply of water in view of the industrial requirements to bolster the war effort. They then asked if it would be possible to get water from the Loskop or Hartebeestpoort dams. A final decision was not taken, but it was possible, with the support of the ministry of irrigation, for the city council to postpone a decision on the Vaal dam water until September 1941.

Meanwhile, on 28 March 1941, the board gave the green light for the 1941 additional water supply scheme. This scheme, which was primarily aimed at providing water to the Pretoria region, could not be summarily shelved. Many months of careful planning had gone into the project. To halt it, even temporarily, was tantamount to wasting human resources at a time when the country was in a state of war. Pretoria’s main complaint was that the increased water supply was primarily intended for industrial purposes. The city’s residents had no direct interest in the expensive water. It was only part of the issue. There were other political considerations.

In August 1941 the mayor spelt out that it was important for Pretoria to function independently of the Witwatersrand. It was not in Pretoria’s interest to rely on water from the Rand. He and his fellow councillors were concerned about the stability of the water supply in times of industrial labour unrest. In particular he was of the opinion that the Rand Strike of 1922 was an example of the type

157 MPA 3141/1079. Director of Irrigation A.D. Lewis, Pretoria – City engineer G. Storrar, Pretoria, 1941.03.12.
158 MPA 3141/1079. Telegram: Director of Irrigation, Pretoria – Rand Water Board, Johannesburg, 1941.03.25; ANON., “Pretoria’s water supply” in The Star, 1941.03.31.
159 RWA, Minutes 1940-1, pp. 150, 156: 505th meeting of the Rand Water Board, Headquarters, Johannesburg 1940.03.28. See Report No. 1553, M. Udwin, 1941.03.18.
160 MPA 3141/1079. Minutes of meeting, Council-in-committee, 1941.03.28.
of industrial unrest that could be anticipated.\textsuperscript{161} At the time when Iscor in Pretoria was built, the understanding was that the iron and steel factory would make use of sewage effluent if and when ordinary water was not readily available. By the 1940s Iscor insisted on using good water.\textsuperscript{162}

The council was also of the opinion that the \textit{Hartebeestpoort Act} No. 34 of 1914, which made provision for the development of the scheme, had to be used to the benefit of Pretoria. At the time of the act being passed there had been an understanding that the government would have the right of access to the water. It was now argued that the government’s share of the Hartebeestpoort scheme had to be placed at the disposal of Pretoria.\textsuperscript{163} The water could then, in addition to the existing supply, be provided to Iscor. In the final instance the council was simply of the opinion that the cost of water from the Rand Water Board was too high.\textsuperscript{164} In a last-ditch effort to postpone the link-up with the board, the mayor indicated that his council was prepared to make available an amount of £375 000 for the extraction of water from the Hartebeestpoort Dam.\textsuperscript{165}

The political manoeuvrings were only intended to play for time. Matters worsened when water restrictions were introduced in Pretoria in September 1941.\textsuperscript{166} Moreover it appeared as if consumers tended to ignore the water ban on the watering of gardens.\textsuperscript{167}

\begin{flushleft}
\textsuperscript{161} MPA 3141/1079. Undated memorandum \textit{c} 1941, titled “Proposed augmentation of water supply”.
\textsuperscript{162} MPA 3141/1079. Memorandum by Pretoria city engineer: “Augmentation of water supply”, undated \textit{c} August 1941; Also MPA 3141/1079. Pretoria Town Clerk – Mayor, T.J. Jenkins, G.H. Brink, Z.J.H. de Beer, A.B. Sidey, City Engineer, City Treasurer, 1941.08.29.
\textsuperscript{163} MPA 3141/1079. Memorandum by Pretoria city engineer: “Augmentation of water supply”, undated \textit{c} August 1941.
\textsuperscript{164} MPA 3141/1079. Undated memorandum \textit{c} 1941, titled “Proposed augmentation of water supply”.
\textsuperscript{165} MPA 3141/1079. Memorandum by Pretoria city engineer: “Augmentation of water supply”, undated \textit{c} August 1941.
\textsuperscript{166} Official notice, “Water supply”, in \textit{Rand Daily Mail}, 1941.09.27.
\end{flushleft}
Negotiations with the Rand Water Board now started in all earnest. At one meeting with the minister of lands, the director for irrigation, representatives of the Rand Water Board and the city council of Pretoria, the minister suggested that Pretoria should become a constituent authority of the Rand Water Board. He made his statement on the grounds that Pretoria was destined for substantial growth and development in the near future. The government was furthermore not eager to make use of the Hartebeestpoort Dam scheme for Pretoria. Government wanted to use the water exclusively for irrigation and new settlement plans once the war was over. In view of the talks that had been held the council instructed its executive officials to start with the necessary preliminary negotiations with the Rand Water Board.

In the course of 1942 extended communications took place between officials of the Pretoria city council and the Rand Water Board. By the end of the year it was apparent that the incorporation of Pretoria into the Rand Water Board system of supply would alter the situation of all consumers. Local authorities in particular were set for a more substantial stake in the water supply. For the Rand Water Board the incorporation of Pretoria implied that a daily water supply of at least 14 Mℓ, with a potential increase of up to 45 Mℓ had to be available. The board was also aware that Pretoria had other sources of supply. Consequently provision was made for the potential situation that if the city’s reliance on the board increased, more than 50 per cent of its daily requirement could be

169. MPA 3141/1079. Copy minutes joint meeting of the C.P.C. and the finance committee, 1941.09.05.
170. MPA 3141/1079. Copy minutes joint meeting of the C.P.C. and the finance committee, 1941.09.05; Copy minutes Special meeting of the City Council of Pretoria, 1941.09.05.
171. MPA 3141/1079. N. McMurray, Johannesburg – Town Clerk, Johannesburg, 1942.12.22. See also addendum: Terms on which Pretoria would be admitted as a constituent authority.
supplied. For Pretoria it meant that in the case of a drought, the city would basically have access to five per cent of the board’s available water. In negotiations at the start of 1943, the council once again debated the issue. Then it was announced that the Pretoria city council and Rand Water Board had reached an agreement on the water supply to Pretoria. In March 1943 the town clerk of Pretoria was informed that the board at its monthly meeting considered the incorporation of Pretoria as a constituent member of the board. All that was outstanding was now for the necessary legislation that would admit Pretoria as member of the board.

In the agreement that was subsequently concluded five basic conditions were outlined.

1. The water allocation and the fixed charges of the board were to be: South African Railways (5 per cent); municipalities on the Witwatersrand and Pretoria (50 per cent); and mines (45 per cent).

2. Pretoria would have a vote equal to 10 per cent of the votes of the other local authorities on the board.

3. Pretoria was to pay £150 000 towards the redeemed capital costs of the board in respect of the developments at Signal Hill.

172. MPA 3141/1079. N. McMurray, Johannesburg – Town Clerk, Johannesburg, 1942.12.22. See also addendum: Condition governing supply of water.

173. Now that two different sources of water were coming together, namely that of Pretoria and that of the Rand Water Board, a new provision was introduced. The responsibility of the board for supplying clean water was to cease at the point where the two sources of water were combined. Personal disclosure by Dr H.T. Ramsden, at Panel discussion Rietvlei, 2003.02.07.


175. ANON., “Rand water Board to supply Pretoria” in The Star, 1943.02.05.


177. MPA 3141/1080. N.M. Murray, Johannesburg – Town Clerk, Pretoria, 1943.03.29.
4. The board agreed to pay £280,000 towards the cost of the pipeline from Signal Hill to Pretoria.

5. In view of the fact that Pretoria already had its own separate large water supply, it was agreed that the board’s supply to the city would be subject to certain restrictions in respect of peak loads and increases. This measure was intended to be in the interest of the existing consumers of the board. The conditions were incorporated into the legislation that was tabled in parliament in 1944.

The agreement marked a new trend in the development of the Rand Water Board. Since its inception the board had been responsible to the mining industry and the Witwatersrand. Now, for the first time in its 40-year history, the board was transcending its customary area of supply (the Witwatersrand) and for purposes that were not directly related to the mining industry. The iron and steel industry, which was intended to serve a greater national interest, was now of importance. There was also another political reality. For the first time local government – on the grounds of the amounts of water consumed – wielded more influence than the mining industry on the Rand Water Board. Local authorities by implication had powers to make far-reaching decisions on the water supplies to industries under their jurisdiction.

In practical terms the incorporation of Pretoria into the water supply system of the board meant that more water had to be purified and pumped to different parts of the region to the north of Vaal river. For a start the water of the board gravitated from the Signal Hill reservoir with a 72 cm diameter pipe to a point near Iscor’s factory in Pretoria. The pipeline covering a total distance of 54 km cost £280,000. The total scheme cost £513,249 of which

179. Ibid., p. 8.
Pretoria municipality ultimately paid £251 528. The municipality was responsible for the further distribution of water along about 3333 m of pipe in the capital city. Because of the war it was only possible to proceed with the scheme once hostilities had ended. Contracts were awarded in 1945. On 30 May 1947 the supply of water to Pretoria was put into use.

The incorporation of Vereeniging

In 1934, at the request of Vereeniging Municipality the Extraordinary Water Court investigated the right of the municipality to extract water from the river based on it being a riparian landowner. The board’s amended statute of 1914 stipulated precisely the amount of water the different stakeholders could extract from the river. Following the court case the municipality of Vereeniging and the board came to an agreement that the town could be supplied with 1642 Mℓ of water annually. It was acknowledged that Vereeniging was not one of the constituent authorities of the board. Neither was it situated on the Witwatersrand. Another matter of concern was the fact that if Vereeniging had to be incorporated it could affect the amount of water the board had available to provide to its existing consumers. It was nevertheless acknowledged that it would be possible for the board to supply water to the town at a special tariff of 1s per 4500 litres. The arrangement was contractually confined to a period of 20 years on condition that there would be a satisfactory

182. ANON., Rand Water Board Randwaterraad 1903-1953, p. 33.
184. RWA 766, Copy of minutes of the board 444th meeting, 1936.02.28.
185. RWA, Chief engineer’s memorandum re Vereeniging water supply – 16th March, 1943, p. 3.
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supply of water from the Vaal dam.\textsuperscript{186} This arrangement culminated in a formal agreement between the board and Vereeniging municipality.\textsuperscript{187} Vereeniging’s town fathers however felt it would be more beneficial if the town could become a constituent authority of the board. Consequently the first steps in the direction of full board membership were taken in February 1939.\textsuperscript{188} In effect there were few real advantages for the town in becoming a constituent member. It was already purchasing water from the board at a low rate.\textsuperscript{189} However, the council was adamant and in February 1943 the board was asked to consider constituent membership.\textsuperscript{190} In July 1943 the board approved of the application,\textsuperscript{191} and with the passing of Act 11 of 1944 Vereeniging, along with Pretoria became a constituent member of the board.

Defining a new regional reality

The incorporation of Pretoria and Vereeniging into the limits of supply of the Rand Water Board in 1944 marked a milepost in the regional development of the Transvaal province.\textsuperscript{192} In the 1960s planners frequently started making use of the term ‘PWV’ to describe the Pretoria-Witwatersrand-Vereeniging region, which formed the hub of South Africa economic development.\textsuperscript{193} It is of more than mere passing interest to note that this trend of development already started manifesting in physical terms in 1944.

\textsuperscript{186} RWA, Thirty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1936, p. 10.
\textsuperscript{187} RWA, Thirty-ninth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1944, p. 10.
\textsuperscript{188} RWA 766, Town Clerk, Vereeniging – Secretary Rand Water Board, Johannesburg, 1939.02.13.
\textsuperscript{189} RWA 766, J.P. Leslie, Johannesburg – Town Clerk, Vereeniging, 1939.02.22.
\textsuperscript{190} RWA 766, Town Clerk, Johannesburg – Secretary and Treasurer rand Water Board, Johannesburg, 1943.02.24.
\textsuperscript{191} RWA 766, Copy minutes of board decision 1943.07.23.
\textsuperscript{192} ANON., Rand Water Board Randwaterraad 1903-1953, pp. 31-2
\textsuperscript{193} In an internet investigation conducted on the catalogue service of the PUCHE it appears as if the term “PWV” started gaining currency in the late 1960s.
when Pretoria in the north and Vereeniging in the south formed the north-south axis to the already existing east-west axis of the Witwatersrand. This implies that what planners identified in the 1960s had essentially been defined some two decades earlier in the practical operations of the Rand Water Board in the process of executing its task of supplying this valuable ubiquitous substance to the region.

**Water for the far West Rand**

The growing supply of water was not only confined to the northern and southern parts of the central Transvaal. Also to the western parts of the Witwatersrand developments were taking place that were to grow rapidly in the years to come. In August 1938 the New Consolidated Gold Fields, Ltd, mining company applied for a supply of water to its Venterspost and Libanon gold mines. The company anticipated that the daily consumption would amount to about 2 Mℓ. The board however stipulated that it could only contemplate providing the service to the Far West Rand if and when consumption amounted to at least 5 Mℓ/ℓ. The existing pipeline, about 22.4 km from the new proposed points of supply, enabled the board to provide as much as 23 Mℓ/ℓ, should the need arise. In view of the available supply of water the mining company agreed to the conditions and was prepared to sign an agreement of 4.5 Mℓ/ℓ for a period of 10 years. In terms of the new scheme that made out part of the 1938 additional water supply scheme of the board, water was to be pumped from Zuurbekom to a new reservoir at Libanon with a capacity of 11 Mℓ. The total cost of the scheme was estimated to be approximately £120 000.194 Already at that time it was anticipated that in the near future more mines would soon start with operations in the vicinity.195 This was not far-

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fetched because by 1948 the board also started making provision to supply smaller mining companies between Libanon and Blijvooruitzicht with water. It formed part of an additional scheme that was introduced in 1946. The project was estimated to cost £165 000. The mining companies were prepared to pay one half of the costs. 196

World War II

When World War II broke out in 1939 the Rand Water Board was in a much better position than at the time of the outbreak of World War I. In 1914 the Witwatersrand was faced with an imminent water shortage because of the fact that the Barrage had not yet been built. When World War II broke out there was more than enough water available and the board could comfortably provide in the wartime needs of the industries on the Witwatersrand. It was generally accepted there would be a drop in water consumption. But the industrial activities caused the demand for water to rise. 197

It was known beforehand that once the war effort started, it would be difficult to secure the necessary chemicals and materials to keep the operations of water supply consistent. Consequently supplies were bought up well in advance. In September 1939 the chief engineer, M. Udwin, informed the board that a number of precautions had been taken in advance in preparation for the war circumstances. Since 1937 stocks of aluminium sulphate and chlorine gas had been stored up. The chemical supplies were considered sufficient to last a considerable period of time. Supplies of copper sulphate and lime had been stockpiled. 198 When shortages did arise, the board was loath to start with production and instead investigated the chances of importing chlorine from the United

197. ANON., Rand Water Board Randwaterraad 1903-1953, p. 29.
States of America. When in 1940 there was a shortage of aluminium sulphate the board’s engineers launched an investigation and made the interesting finding that the price of imported aluminium sulphate had in fact dropped from £18 15s to £10 10s per ton. It was consequently cheaper to buy the product than manufacture it. One problem that remained was the consistency of supplies. In an effort to overcome this obstacle the board’s engineers held talks with representatives of African Explosives and Industries, Ltd. The board was then given the assurance that if large supplies were required it would be possible to supply aluminium sulphate at a consistent price of £10 per ton for the duration of the war in view of the large volumes required.

In this manner local industries, because of the self-evident advantages, received favourable treatment.

At the time of World War II the first apparent comprehensive steps were taken to place the property of the Rand Water Board under secure control. In the annual report it is noted that in “view of the international situation, certain steps were taken for the protection of the Board’s works”. Reference is made to steel paling fences at the pumping stations. In 1942 it was reported that one of the board’s pipelines was damaged by an act of sabotage. The damage was only slight and the water supply was restored within a few hours. It can be safely assumed that the necessary arrangements were then made to prevent similar acts of taking place again.

Within the organisation there was solidarity with the war effort. In June 1940 a gifts and comforts fund was established for board employees on active service. In the first year some £600 was

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200. RWA, Minutes 1940-1, pp. 51-2: 496th meeting of the Rand Water Board, Headquarters, Johannesburg 1940.06.28.


collected and 550 parcels were sent to the different theatres of war. In October 1940 a special Christmas parcel was sent to all the employees on active service. The board donated £75 towards the gifts. In September 1941 the board made available an amount of £100 for the gift fund.\textsuperscript{203}

It was in the area of human resources that the board made a valuable contribution to the war effort. In November 1939 the board agreed that it would encourage employees to report for active service.\textsuperscript{204} Married men who went on active service were to receive half their salaries from the board. Single men without dependants were to receive a quarter of their pay and single men with dependants were to receive funding not exceeding half their pay.\textsuperscript{205} In addition the board was to pay the members’ contributions to the superannuation and provident fund as well as the sick fund.\textsuperscript{206} Soon the matter of absences became crucial. By March 1940 28 officials and employees of the board were already on active service.\textsuperscript{207} By September 1941 78 men had entered active service.\textsuperscript{208} When 92 officials enlisted in 1943 for military service,\textsuperscript{209} there were indications that the shortage of human resources made it difficult to maintain normal operations.\textsuperscript{210}

\begin{itemize}
  \item \textsuperscript{203} RWA, Minutes 1941-2, pp. 77-8: 509th meeting of the Rand Water Board, Headquarters, Johannesburg 1941.09.26.
  \item \textsuperscript{204} RWA, Minutes 1939-40, p. 154-5: 489th meeting of the Rand Water Board, Headquarters, Johannesburg, 1939.11.24.
  \item \textsuperscript{205} RWA, Thirty-fifth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1940, p. 12.
  \item \textsuperscript{206} \textit{Ibid.}, p. 12.
  \item \textsuperscript{207} RWA, Minutes 1940-1, pp. 39-40: 495th meeting of the Rand Water Board, Headquarters, Johannesburg 1940.05.23.
  \item \textsuperscript{208} RWA, Thirty-sixth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1941, p. 13.
  \item \textsuperscript{209} RWA, Thirty-eighth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1943, p. 8.
  \item \textsuperscript{210} \textit{Ibid.}, p. 42.
\end{itemize}
By 1944 the casualties of war were W.D. Birney, L.C. Stanfield, C.G. Hansen, T. Carmichael and P.G. Locker who had been reported dead. L. Damelin had been wounded. N. Anderson was missing and C.G.L. Denempont, W.P. de Kock, H. Goodman, E.D. Gray, H. Karamitas, T.F. Treloar and L.S. Wood had been taken prisoners of war.\footnote{RWA, Thirty-seventh annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1942, p. 7; RWA, Thirty-ninth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1944, p. 12.} The board took active steps to provide support to families, once information of the first casualties came through. It also laid down policy. On 15 March 1941 a bricklayer, T. Carmichael, died whilst on active service in North Africa. He had been in the service of the board for two and a quarter years. His wife had been the recipient of half of his salary. The board had paid his contributions to the sick fund and the provident fund. Legally it was accepted that the board would only have a responsibility to the widow until the end of the month. Yet a decision was taken that in future allowances for deceased employees should be paid out for three months after death. In the case of single employees, the payment of salaries would cease on the date of the notification of death.\footnote{RWA, Minutes 1941-2, pp. 40-1: 508th meeting of the Rand Water Board, Headquarters, Johannesburg 1941.06.27.}

In recognition of the valuable work that was being done and to address the rising cost of living employees of the board received extra remuneration. In December 1940 the board approved the payment of a non-pensionable allowance to all its employees of 15s per month for employees and 7s 6d for apprentices. This measure was in line with similar steps that had been taken by the mining sector and several other larger employers of labour in South Africa at the time. The measure was seen as a savings fund scheme. In theory the principle was that workers would receive 6d per shift.\footnote{RWA, Minutes 1940-1, p. 122: 502nd meeting of the Rand Water Board, Headquarters, Johannesburg, 1940.12.20.} In 1941 the structure of the allowance was adjusted when it was decided that the allowance would be paid to employees who were

\[\text{Post-colonial phase 1924 - 1948}\]
earning less than £480 per annum. It was to be granted to employees of the board who had gone on active service.\textsuperscript{214} The cost of living allowance, as it came to be termed, by 1942 was extended to all employees of the board who earned a maximum of £1000 per annum.\textsuperscript{215} The remuneration for work on Christmas and Good Friday was adjusted to the extent that managers and foremen were excluded from extra payment, as well as all employees earning more than £540 per annum.\textsuperscript{216} In December 1943 the cost of living allowance was adjusted upwards from £4 5s to £5 10s.\textsuperscript{217} Also the non-white workers of the board received more, depending on their seniority. As a rule they received an increase of 20s to 24s per month.\textsuperscript{218} The cost of living allowance was maintained until well after the war.\textsuperscript{219}

Several employees of the board were recognised for their services. Captain H. Goodman was later awarded the MBE for rendering services to his fellow prisoners of war.\textsuperscript{220} Sgt. K.L. Johnston received a military commendation. Captain H.G. Stevenson, Sergeant S. Armstrong, and Corporal K.R. Pieterse had been mentioned in despatches.\textsuperscript{221} In October 1945 the board approved an expenditure of £235 following the return of the soldiers from the war. It was also
pointed out that an official opening party of the new building had not been held when the new headquarters were taken into use in September 1942. Consequently it was decided that an amount of £75 could be used to welcome the officials on their return from the war. Money was also made available at the board’s outside stations to celebrate the return of the veterans.\textsuperscript{222}

**Water supplies to black townships**

Because of shortages experienced in human resources during World War II increasing numbers of black South Africans started moving to the Witwatersrand where they were employed in the secondary industrial sector. The mining industry, with its migrant labour system that provided for compounds close to mining operations, was no longer the only avenue of employment. It was the responsibility of local authorities to provide housing for the new urban residents of the Witwatersrand. In the case of white townships and housing development private companies took the initiative in development. The result was that the developers provided water supplies and electricity connections. Local authorities had the minimum responsibilities. In the case of township development most of the residents were destitute and had to rely on municipalities to provide basic facilities. The municipalities in turn, until they had been forced by legislation, tended to ignore their responsibilities towards the residents.\textsuperscript{223}

In Johannesburg provision was made in the 1890s for small townships to the west of the city centre at Pageview near Vrededorp where blacks and Asians were accommodated. Following an outbreak of bubonic plague in 1904 a total of 600 Asian and 1358 African residents were relocated to the new

\textsuperscript{222} RWA, Minutes 1945-6, p. 91: 560th meeting of the Rand Water Board, Headquarters, Johannesburg 1945.10.26.

\textsuperscript{223} A.J. POTGIETEER, Die swartes aan die Witwatersrand 1900-1933 (D. Litt et Phil, RAU, 1978), p. 126.
townships of Klipspruit and Pimville. A number of small privately sponsored townships were established in Alexandra, Sophiatown, Martindale and Newclare. There were also council hostels for single men at Wemmer, Salisbury and Jubilee. In 1924 the Johannesburg city council started with the development of the Western Native Township. Elsewhere on the Witwatersrand townships had been developed after 1903 in Germiston, Boksburg, Benoni, Springs, Roodepoort, Randfontein and Krugersdorp. Germiston had one of the largest townships on the Witwatersrand because of the mining operations and rapid industrial development. The town was also a major South African railway junction. Conditions in the townships were bad. Roads were not tarred and mud pools were common as a result of rain, bad drainage and used water summarily being discarded into the streets. Taps leaked and sanitary conditions were non-existent. Water supplies were as a rule limited. At Klipspruit a dam had been built to provide water to the township, but residents had to rely on procurement under difficult circumstances of a self-collect communal nature. Essentially the residents of townships on the Witwatersrand were, at least in terms of water supplies, considered to be third-rate consumers. They were only taken into consideration after the white residential areas and industries had received their full quotas of water.

Conditions started changing by the 1940s. Because of the growing black urban population local authorities increasingly made use of the Rand Water Board to help in supplying water to the townships. Since 1941 there had been an arrangement with the provincial authorities that all proposed township developments were to be submitted for the approval of the board. The reason for this was to enable the board to make provision for the necessary supplies to their wholesale consumers, the local authorities.

The board also had the responsibility to control the sinking of boreholes by local authorities. In terms of Section 37 of the *Rand Water Board Private Act*, No. 18 of 1914, local authorities within the limits of supply of the board were not allowed, without written permission, to increase the supply of water in their areas from sources other than the Rand Water Board.\(^{230}\) In June 1920 the board adopted a resolution to the effect that as a rule all requests from local authorities for additional water source facilities would be refused.\(^{231}\) However, the board continued to consider all requests on merit, and permission was granted to numerous local authorities.\(^{232}\)

Because of the growing dangers of pollution, board officials by the 1940s had become hesitant to grant permission for these sources to be used for domestic consumption. The policy was also applied in respect of black consumers. In 1942 the municipality of Maraisburg-Roodepoort submitted a request to the board to sink a borehole in order to cope with the high demand for water which was experienced by the local township. The borehole was considered to be a temporary measure until such time as the municipality was able to acquire sufficient pipelines for the township’s water supply.

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When the matter came up for the consideration of the board it was pointed out that the resolution of 1920 that boreholes could not be used for domestic purposes by municipalities, be upheld. The board also furthermore decided that it would sell some of its 20 cm diameter pipe to the municipality in order to help them cope with the demand for water in the township. In cases where developments were too rapid local authorities were allowed to use borehole water for a limited period of time.

As a rule the board responded quickly to requests by municipalities for water supplies to the townships. In May 1943 the council of Germiston applied for a water connection for the new Natalspruit location. Within a short time the necessary arrangements were made to provide 112,500 ℓ/d. In July 1943 the board also approved the request for a water supply of 2 Mℓ per month to the townships of Nancefield and Kliptown which were being developed by the Johannesburg Municipality. The Roodepoort storage facilities that had been improved the previous year now started showing benefits. It was possible for the board to cope with the demand, although it was accepted that the Zuurbekom pumping station would not be able to continue providing sufficient quantities of water.

Before the end of the decade the development of the townships had reached critical proportions. It directly affected the water supply. In 1947 the board had to urgently make available a supply of water from the Zuurbekom-Paarlshoop pumping main for the Johannesburg municipality that had to supply water to a squatter’s housing camp at Klipspruit. The Meadowlands reservoir was not


yet ready and operational at the time.\textsuperscript{237} Afterwards more co-
ordinated planning came into effect with the construction of the
Diepkloof reservoir capable of supplying 6 Mℓ/d. A further 18 to 23
Mℓ/d became available when another reservoir was built on the
farm Doornkop.\textsuperscript{238} By the 1950s black consumers were completely
absorbed in the white municipal and mining industry’s water
supplies.\textsuperscript{239} This ensured a more accurate reflection of consumption
when estimates for future water supplies were prepared. With the
development of the apartheid system’s Group Areas development
boards, some townships, such as Lenasia in 1958, acquired status as
independent water consumers of the board.\textsuperscript{240}

The board and labour

The rapid development of industries in the 1930s and the
subsequent outbreak of World War II created conditions that were
conducive to trade union activities The working class on all levels
of operations of the board increasingly tended to assert an
influence. In July 1938 representatives of the board and the South
African Engine Drivers’ and Firemen’s Association held talks in
respect of working hours, and wages. This culminated in
November 1938 with certain agreements reached\textsuperscript{241} and
subsequently approved by the board.\textsuperscript{242} The board \textit{inter alia} agreed
that in the case of overtime worked, employees would continue to
receive remuneration for the ordinary time worked. Employees

\textsuperscript{237} RWA, Minutes 1947-8, p. 7: 578th meeting of the Rand Water Board, Headquarters,

\textsuperscript{238} RWA, Minutes 1954-5, p. 55: 664th meeting of the Rand Water Board, Headquarters,

\textsuperscript{239} RWA, Minutes 1958-9, p. 161: 717th meeting of the Rand Water Board, Headquarters,
Johannesburg 1958.11.28.

\textsuperscript{240} \textit{Ibid.}, p. 161: 717th meeting of the Rand Water Board, Headquarters, Johannesburg
1958.11.28.

\textsuperscript{241} RWA, Minutes 1938-9, pp. 240-2: 478th meeting of the Rand Water Board,
Headquarters, Johannesburg 1938.12.23.

\textsuperscript{242} \textit{Ibid.}, p. 242-3: 478th meeting of the Rand Water Board, Headquarters, Johannesburg
1938.12.23.
working on Good Friday or Christmas would still get their bonus pay, but in addition they would be paid one and a half times their existing salary. Employees being called upon to perform a higher rated class of work, would be eligible to receive the salary that goes with it. The board however refrained from providing for certain racially oriented job reservation arrangements that did not serve any constructive purposes.\textsuperscript{243} In December 1938 the board recognised the South African Electrical Workers’ Association and Amalgamated Engineering Union.\textsuperscript{244}

By 1943, because of the growing influence of black workers in related industries, the board gave subdued support for trade union activities amongst its black workers. The first communications between the management and the Rand Water Board African Workers’ Trade Union took place in the course of 1943 by means of correspondence between the secretary to the board and the union’s secretary H. Nkageleng-Nkadimeng. The latter was a leading trade unionist on the West Rand and a member of the Communist Party.\textsuperscript{245} In the course of the year the union proved to be supportive of the situation of black employees of the board.\textsuperscript{246} It also tended to co-operate well with the management.\textsuperscript{247} In November 1943 the board was notified that the union had appointed Messrs A.L. Maoto as chairman, S.M. Mamabolo as treasurer and H. Nkageleng-Nkadimeng as secretary. Additional members were Messrs A. Motsepe, H. Gaarekoe, J. Tshuoung and A. Lekoma. With the exception of the secretary and treasurer, all members of

\begin{footnotes}
\item T. LODGE, \textit{Black politics in South Africa since 1945}, p. 97.
\item RWA, Minutes 1942-3, p. 128: 529th meeting of the Rand Water Board, Headquarters, Johannesburg 1943.03.26. Report No. 1666, J.P. Leslie, 1943.03.16.
\end{footnotes}
the committee were employees of the board. The board was also provided with a constitution of the union that had been approved by the union in October 1943.

At first most of the activities of the union were confined to the Witwatersrand. In February 1944 the chief engineer, J.P. Leslie informed the superintendent of the Vereeniging pumping station that the union had been given permission to hold a meeting at the station. However, the union was refused permission to appoint a shop steward at each of the stations of the board. In a courteous reply the union’s secretary explained to the secretary that in time to come the policy would be revised in view of the fact that the non-recognition of shop stewards was tantamount to the refusal of granting the workers of the board a ‘right and freedom’. It was also considered a fundamental principle of democracy one of those major reasons for which all the forces of democracy are Allies in the present world War for ‘FREEDOM’ [sic]

The union’s representatives were allowed, however, to visit all the stations of the board to address meetings of black workers. The chief engineer was kept posted on the meetings. At the Zwartkopjes pumping station it appears as if the union did not find a keen response from the side of the black workers of the board to join up.

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248. RWA 136/G. H. Nkageleng-Nkadimeng, Johannesburg – Secretary to the Rand Water Board, 1943.11.08.
250. RWA 136/G. J.P. Leslie, Johannesburg – Station superintendent, Vereeniging, 1943.02.10.
251. RWA 136/G. N. McMurray, Johannesburg - H. Nkageleng-Nkadimeng, Johannesburg, 1944.03.25.
252. RWA 136/G. H. Nkageleng-Nkadimeng, Johannesburg – N. McMurray, Johannesburg, 1944.04.05.
254. RWA 136/G. Memorandum: Superintendent, Zwartkopjes – J.P. Leslie, Johannesburg, Undated, but received 1944.05.25.
In 1945 the union stepped in on behalf of its members at the various stations and asked the board to improve the rations to workers and the accommodation at the board’s Brakpan facilities. The union was informed that the limited rations were the consequence of the limited supply of food available. In respect of the conditions at Brakpan the union was informed that it would be improved. Correspondence between the management of the union and the management of the board was conducted up to 1955, when it appears as if the trade union activities amongst black employees were substantially limited because of government intervention.

The politics of race was a definitive factor in the period 1924 to 1948. In May 1939 Die Transvaler published an article in which it was alleged a manager told three employees of the Rand Water Board at Vereeniging “We do not want you Dutchmen here. You can go.” The employee had approached his manager for a promotion. He had been part of the Voortrekker centenary celebrations and had grown a beard for the occasion. The board, subsequent to the information becoming public, instituted an inquiry. It was found to be untrue. The matter was then again taken up with the editor of Die Transvaler. Consequently a report was published in Die Transvaler on 11 May 1939 in which the newspaper apologised for the report. What transpired was that the person who had given the information to the newspaper was later unwilling to disclose the names of the other people mentioned in the report. The board in its media communication accentuated the fact that it did not discriminate against its Afrikaans employees.

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258. RWA, Minutes 1939-40, p. 21: 482nd meeting of the Rand Water Board, Headquarters, Johannesburg 1939.04.28. Translation of news report in Die Transvaler, 1939.05.03.
the Vereeniging pumping station and none of them had ever complained of unfair treatment.\textsuperscript{260}

As far as the black employees of the board were concerned, circumstantial evidence suggests that they were well cared for. The conditions at the board’s compounds were, as a rule of a high standard. In July 1948 the native commissioner of Krugersdorp conducted an inspection at the Zuurbekom pumping station and found the conditions to be sound. He did have some reservations about the fact that only mealie meal porridge was prepared in the compound kitchen. The residents of the compound prepared their rations of meat and vegetables on their own.\textsuperscript{261} The government inspector was concerned about this, but it was considered to be an arrangement that worked for the board’s employees and it was recommended that it not be altered.\textsuperscript{262}

Of the 33 blacks employed at the Zuurbekom station, 14 lived off the property. They took their rations home with them. The employees living in the compound divided themselves into groups and cooked their own food. Each worker’s weekly rations consisted of approximately: 2.25 kilograms of meat, 4.5 kilograms mealie meal, 2.25 kilograms potatoes, 2.25 kilograms pumpkin, 0.56 kilograms beans, 200 grams of onions, 250 grams of coffee, 300 grams of sugar, 150 grams of sorghum meal, and salt as required.\textsuperscript{263}

**Second new head office**

In 1937 chief engineer was instructed by the board to investigate ways and means of addressing the problem a shortage of office space.

\textsuperscript{260} Ibid., p. 49: 482nd meeting of the Rand Water Board, Headquarters, Johannesburg 1939.05.26.

\textsuperscript{261} TA KJB468 N3/12/2. F.H. Cronjé, Krugersdorp – Chief engineer, Rand Water Board, Johannesburg, 1948.07.27.

\textsuperscript{262} TA KJB468 N3/12/2. Director of Native Labour, Johannesburg – Native Commissioner, Krugersdorp, 1948.08.19.

At first plans were made for the addition of one story to the existing building at an estimated cost of £8000. When the plan was proposed to the board it was not accepted and subsequently additional office space was rented in Exploration Buildings in Johannesburg at a cost of £30 per month. In April 1939, at a special committee meeting of the board it was decided that the board would acquire a plot of land in Fraser Street Johannesburg, between Commissioner and Market Street for the sum of £52 500.264

In February 1940 the board accepted a tender to the value of £8450 for the basement structure of the new head office.265 The new building complex was to be four stories high with a basement that served as a parking garage. Excluding the basement the total floor capacity of the

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building was to be 1858.5 sq. m. It was expected to cost £67,500 to build. The existing head office of the board was to be sold to the New Consolidated Gold Fields company for £75,000. Outstanding money necessary to pay for the rest of the costs was to be paid from the board’s redemption fund. The architects of the new building were Messrs Gordon Leith & Partners. Johan Barrow (Pty.) Ltd received the contract for the construction of the building in October 1940. Early estimates suggested that the cost of the project would amount to £140,000 were soon adjusted upwards and by August 1940 the estimate was placed at £165,000. The basement was completed in July 1940 and in November of the same year a contract was issued for the building of the superstructure. The new offices of the board were scheduled for occupation in the second quarter of 1942. The new headquarters were completed September 1942 and were occupied in the course of the same month. The old headquarters of the board were handed over to the New Consolidated Gold

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266. 1 sq ft = 0.092 sq. m.
269. Ibid., p. 84: 485th meeting of the Rand Water Board, Headquarters, Johannesburg, 1939.07.28.
270. RWA, Minutes 1940-1, p. 94: 500th meeting of the Rand Water Board, Headquarters, Johannesburg, 1940.10.25.
271. RWA, Minutes 1940-1, p. 74: 498th meeting of the Rand Water Board, Headquarters, Johannesburg, 1939.08.23.
Chapter 5

Fields, Ltd, on 1 October 1942.\(^{274}\) At the time of its completion the building complex had cost the board a total of £166 785 5 10.\(^{275}\) In the 1970s experts were of the opinion that the building was still one of the outstanding architectural features of Johannesburg.\(^{276}\)

**Dangers of pollution identified**

It was during the early 1940s that the first substantive statement on the phenomenon of pollution was made by a representative of the board when the chief engineer, J.P. Leslie, warned of the imminent dangers of pollution of river catchment areas and the need for the necessary organisational infrastructure to ensure that the country’s freshwater water resources did not deteriorate. In a report entitled ‘Control of river pollution’ Leslie warned that the authorities in South Africa had to give special attention to the danger of pollution.

**Illus. 5.9. Chief engineer J.P. Leslie (1941-1955). Source: Rand Water**

There were basically two laws in the case of the Barrage section of the Vaal river catchment that ensured empowered authorities to take action against potential pollution. These were the *Rand Water*


\(^{275}\) RWA, Minutes 1943-4, p. 133: 539th meeting of the Rand Water Board, Headquarters, Johannesburg 1944.01.28.

\(^{276}\) ANON., “Goudstad – geboue 24” in Beeld, 1977.08.22.
Private Act, No. 18 of 1914 and the Public Health Act, No. 36 of 1919.\footnote{277}

Leslie was of the opinion that the existing legislation was sufficient. However, it was necessary to establish the essential administrative measures to ensure that pollution was kept under control. An option that he favoured was to create a system of river boards that would be responsible for protecting local river catchment areas. These boards would have the responsibility to consider all applications for discharges into rivers. They were also to report to the national government regularly.\footnote{278} Leslie’s frame of reference was the measures that had been taken in Britain in an effort to prevent the pollution of rivers. At the time a comprehensive plan to combat pollution had been drawn up and implemented, following the findings of a government commission of enquiry.\footnote{279}

At its meeting of 10 December 1943 Rand Water Board’s finance and executive committee received Leslie’s report. It was then decided to adopt the report and also forward a copy to the minister of welfare and demobilisation.\footnote{280}

Leslie’s observations on the need to combat pollution were timely. Shortly afterwards E.H. Crogan wrote in the journal Public Health:

> In South Africa the pollution of rivers and streams is rapidly becoming a menace, the pollution taking many forms, from the washing of clothes, stormwater sewage overflow, to trade effluents of varied description, some of very noxious nature productive of public nuisance and detrimental to fish life.\footnote{281}

In February 1944 the Transvaal provincial administration announced that it was to create an inland rivers fisheries board that amongst others had the responsibility to prevent pollution from

\begin{footnotes}
\footnote{277}{RWA 515/A/3. J.P. Leslie, ‘Control of river pollution’ December 1943, pp. 10-11.}
\footnote{278}{Ibid., p. 14.}
\footnote{279}{Ibid., pp. 7-10.}
\footnote{280}{RWA 515/A/3. Copy Minutes finance and executive committee meeting, 1943.12.10. No. 1703 Control of water pollution.}
\footnote{281}{E.H. GORGHAN, “Sewage disposal and river pollution” in Public Health, April 1944, pp. 20-1.}
\end{footnotes}
having an adverse effect on the fish colonies in the rivers of the province.\textsuperscript{282} In June 1944 the Union’s department of health announced that a committee of enquiry had been appointed to investigate ‘bacterial and chemical pollution of water supplies used or which may be used for domestic purposes, including livestock, in both urban and rural areas’.\textsuperscript{283} Fresh water pollution control was still in its infancy at the time and the authorities were in a learning curve. Evidence of this was to be found in a newspaper report of July 1944 in which it was reported that fish in the Vaal river were dying in large numbers in the vicinity of Oranjeville after the river water had been ‘sprinkled with blue vitriol in an attempt to combat the poisonous alga (sic)’.\textsuperscript{284}

It is more than likely that the British ecologist, Edgar Worthington, who was at the forefront of inland water research in Africa and Britain in the first half of the twentieth century, influenced Leslie’s thinking. In a recent study the Scandinavian historian, Peder Anker, briefly outlined the history of British imperial water research. It is interesting to note how information on the ecologies of inland lakes, rivers and fish were used as a barometer of the condition of freshwater.\textsuperscript{285} J.P. Leslie would have been aware of these trends. As a young engineer at the Rand Water Board in the early part of the 1920s he would probably have been exposed to Worthington’s thinking on African inland freshwater that started gaining prominence in British ecological circles. In the years to come Leslie was to play an important role in measures used to establish a system of control aimed at preventing pollution, especially in the Barrage area of the Vaal river. His early identification of the threat posed by pollution was visionary and of great value to the board’s efforts in securing a good water supply.

\textsuperscript{282} ANON., “Inland rivers fisheries board: establishment in Transvaal” in \textit{The Star}, 1944.02.28.

\textsuperscript{283} Notice No. 871, Department of Health, 1944.06.02 in \textit{Government Gazette of the Union of South Africa}, 1944.06.02.

\textsuperscript{284} ANON., “Fish dying in Vaal” in \textit{The Star}, 1944.07.10.

for its consumers. Leslie’s predecessors had also introduced pollution control measures. But his accomplishments stood out. He, more than any before him, made the government of the day aware of the threat of river pollution. This sensitivity played a decisive role in important decision-making before the end of the 1940s. It came at a time when a new Vaal river water purification plant was necessary to cope with the growing demand for water.
Chapter 6
A South African water utility of substance 1948-1959

After World War II there was renewed vigour in the operations of the Rand Water Board. The wartime economy and industrial activity once again made way for the economy of peace. It was a time when swords were turned into ploughshares. The rapid rate of industrial development in South Africa continued.¹

Illus. 6.1 An aerial view of the Vereeniging pumping station shortly after World War II. Source: Rand Water
At the Rand Water Board it was an era in which the tempo of life speeded up. Cyril Glass, a board employee, on occasion explained that after the war the term ‘urgent’ became a byword in the

corridors of the institution. Many of the technological innovations of the war were now being put to good use in civilian society.

Illus. 6.2. The Barrage from the air in 1945. Source: Rand Water

Some of the examples within the field of operations of the Rand Water Board were improved telecommunications and the introduction of computer technology. For all intents and purposes the board was a progressive undertaking prepared to invest substantially in innovative means of securing a reliable and sustainable water supply for its consumers. In 1946 the board gave its approval for a new additional water supply scheme designed to increase the capacity of the board’s water supply from 409 to 500 Mℓ/d. This was followed by further schemes in 1949, 1953,

Chapter 6

and 1959. With the war effort something of the past, the materials necessary for construction once again became readily available. Because of the constant demand, orders for material however had to be placed well in advance.

Illus. 6.3 The members of the board visited Vereeniging in 1950. Source: Rand Water
The board had an impressive track record at mid-century. Throughout the war period it had never once faltered in its supply to consumers. Moreover, a proud board chairman, S.A. van Lingen, could note that it had been possible to supply water for 27 years without having to introduce restrictions in the board’s supply area. But then, it was an easy task, with the water of the Vaal dam coming available within little more than a decade after the


completion of the Barrage scheme in 1923. In the years to come the scarcity of the ubiquitous substance – water – was to increase, despite numerous measures introduced by the board to combat potential water shortages.

Perhaps the definitive accomplishment in the first half century was the fact that, contrary to the trend of most consumption goods, the tariff of the Rand Water Board’s water had in fact dropped since it started with operations in 1903. The average inclusive charge for water to all consumers on average was as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>1905</th>
<th>1910</th>
<th>1915</th>
<th>1920</th>
<th>1925</th>
<th>1930</th>
<th>1935</th>
<th>1940</th>
<th>1945</th>
<th>1950</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennies</td>
<td>9.1</td>
<td>7.8</td>
<td>5.2</td>
<td>4.3</td>
<td>5.6</td>
<td>4.6</td>
<td>3.7</td>
<td>2.5</td>
<td>2.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>

During this period the consumption of water increased substantially.

<table>
<thead>
<tr>
<th>Year</th>
<th>1910</th>
<th>1920</th>
<th>1930</th>
<th>1940</th>
<th>1950</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mℓ</td>
<td>18</td>
<td>50</td>
<td>70</td>
<td>209</td>
<td>407</td>
</tr>
</tbody>
</table>

At the root of the increased water supply was the growing population. By 1950 66 per cent of the total white population of the Transvaal province were resident in the area served by the board. Forty per cent of the province’s people of colour were resident in the region. A total of 30 per cent of the total white population and 15 per cent of the total black population of the Union were resident in the area served by the board. In 1960 the estimated population of the area in which the board distributed water, was estimated to

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be 2 825 000. Of this number 2 150 000 people were resident within the municipal boundaries of the board’s constituent authorities.¹²

Illus. 6.4. Vehicle used in the early 1950s for the repair and maintenance of the pipelines. Source: Rand Water

The fact of the matter was that the process of urbanisation had gained substantial momentum by the time World War II ended. By 1946 almost 40 per cent of South Africa’s population had moved to the urban centres of the country.

Among whites the statistics suggested that 75,6 per cent had become urbanised. This was a considerable increase from 1911 when 53 per cent of the whites in the country lived in towns and cities.¹³ It would not falter in the years to come. From a planning perspective urbanisation became unobtrusive because of the development of peri-urban areas. What started happening in the 1940s was that the rural areas of the Witwatersrand, especially to the north of Johannesburg, gradually became urban areas. This

¹². RWA, Fifty-fifth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1960, p. 52.

placed greater pressure on the Rand Water Board to supply water to developing areas not yet as densely populated as established townships on the Witwatersrand.

**Positioning the institution**

In the period after the war the political landscape in South Africa changed markedly. The National Party (NP) under the leadership of Dr D.F. Malan came into power in 1948. Although the Rand Water Board was an apolitical institution it was indirectly affected by the political transformation. Since its founding the organisation was noted for its strong British sentiments. After World War II this frame of mind too was subject to change. Not only was the global political balance of power now divided between an East and a West bloc of global political power, but also the concept of colonialism had become suspect. The British Empire was no longer perceived in the same manner as at the start of the twentieth century.\(^{14}\) This was of particular significance in Africa as a whole. The continent was preparing for decolonisation. These were political forces that shaped the whole of South African society. It also had an effect on the Rand Water Board. In the country a new sense of destiny was taking shape. Its aim was to promote a ‘typical’ South African identity in all institutions of state. The Rand Water Board was one such organisation.

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Chapter 6

The symbolism of a new South African identity was evident in one of the major developments of the board in the 1950s – the Zuikerbosch pumping station. The station’s name, ‘Zuikerbosch’, (Sugar bush in English) was derived from the Zuikerboschrand river that was adjacent to the station. However the name, Zuikerbosch, (the Dutch name for the Afrikaans Suikerbos or protea) was by the 1950s increasingly associated with what was to become the national floral symbol of the country. How strong this flower, also immortalised in popular folk music, was rooted in the culture of predominantly white South Africans by mid-century, is evident from the following. Shortly after unification in 1910, the office of the prime minister recommended that the sweet thorn tree (Acacia karroo) be used as the official floral symbol of the Union of South Africa. However, in 1962 the giant or king’s protea (Protea cyneroides) was suggested as the national floral emblem of South Africa by a government commission. It received official recognition only in 1975. By naming its pumping station Zuikerbosch the Rand Water Board in fact gave recognition to the burgeoning South African spirit that was beginning to take root at the time.

The alternative political discourse of the day was that of the congress alliance in which trade unionism and strong sentiments in favour of a socialist state were strong currents amongst black South African nationalists and those who were not in favour of the current government. The spirit of the time in Johannesburg’s townships, according to Dubow, was one of confidence and glamorous cosmopolitanism. The African National Congress (ANC) was able to continue with operations after the government in 1950 had banned the Communist Party of South Africa (CPSA). The state in turn was intent on combating communism and in the process trade unions experienced opposition in the workplace.

15. The song ‘Suikerbos’/‘Sugar Bush’.
However, this did not prevent a statement of solidarity being made on the Witwatersrand on behalf of all South Africans with the Congress of the People that was held at Kliptown near Johannesburg in June 1955. It was attended by some 3 000 delegates with the objective of debating the proposed Freedom Charter. In the final document the country’s people were assured of opportunities and rights. Provision was made for a welfare state that provided for health, housing and education. It also called for the nationalisation of certain sectors of the country’s economy and the maintenance of specific workers’ rights. The sentiments expressed in this realm of South African society were not acceptable to the government. In the institutions of state such as the Rand Water Board, there was no sympathy for these sentiments.

In 1955 S.L. van Lingen, who had been chairman of the Rand Water Board for 27 years, retired. This former Germiston town councillor was to be the longest serving chairman in the history of the board. He chaired his last meeting on 26 August 1955. His successor was Dr A.J. Bruwer B.A. (Cape), M.A. (Harvard), Ph. D. (Penn.), a former government economic advisor. It was in the era of Bruwer that a greater degree of parity in linguistic preference was introduced in the staff composition of the board. More Afrikaans officials were appointed towards the end of the 1950s and within the next decade they were promoted to senior management positions within the organisation. The engineering section however maintained a strong English character and until the 1980s an English speaking South African had always held the position of the chief engineer to the board.


20. RWA, Fifty-first annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1956, p. 4.
The board also expanded its membership, thereby giving preference to a numerical increase in the number of local authorities represented on the board. In the process the water utility became more representative of the civil society in whose interest it operated. At the time of its establishment in 1903 the constituent authorities of the board were the local authorities of Johannesburg, Krugersdorp, Germiston, Boksburg, Roodepoort-Maraisburg and Spring and the Transvaal Chamber of Mines. In 1914 the South African Railway administration became a constituent authority. In the course of the first half of the century Benoni, Brakpan, Randfontein, Nigel, Pretoria and Vereeniging also became members. These formed the base of the constituent authorities of the board by 1950.

There were also a number of non-constituent authorities. They made use of the services of the board, but did not have representation when it came to making board decisions. One implication was that they were subject to the payment of higher water tariffs than constituent members. In 1950 the non-constituent members (local authorities and townships) of the board were Alberton, Alexandra, Berdfordview, Edenvale, Elsburg, Heidelberg, Irene, Kempton Park, Lyttelton, Meyerton, Vanderbijlpark, Venterspost and the peri-urban health board. By 1950 the board’s

21. RWA, Forty-fifth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1950, p. 3.
22. Rand Water Board supplementary water supply (Private), Act No. 18 of 1914.
23. Rand Water Board extended powers amendment, Ordinance No. 21 of 1906.
25. *Rand Water Board Statutes 1903-1914 amendment (Private)* Act No. 10 of 1920; See also Administrator’s Proclamation No. 704 of 31 October 1928.
membership stood at 34 representatives of the constituent authorities and the government.\(^{30}\) It was made up as follows:

Chairman of the board – appointed by the Governor General

*Local authorities*

<table>
<thead>
<tr>
<th>Authority</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johannesburg</td>
<td>5</td>
</tr>
<tr>
<td>Krugersdorp</td>
<td>1</td>
</tr>
<tr>
<td>Germiston</td>
<td>1</td>
</tr>
<tr>
<td>Boksburg</td>
<td>1</td>
</tr>
<tr>
<td>Roodepoort-Maraisburg</td>
<td>1</td>
</tr>
<tr>
<td>Springs</td>
<td>1</td>
</tr>
<tr>
<td>Benoni</td>
<td>1</td>
</tr>
<tr>
<td>Brakpan</td>
<td>1</td>
</tr>
<tr>
<td>Randfontein</td>
<td>1</td>
</tr>
<tr>
<td>Nigel</td>
<td>1</td>
</tr>
<tr>
<td>Pretoria</td>
<td>1</td>
</tr>
<tr>
<td>Vereeniging</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

*Institutional membership:*

<table>
<thead>
<tr>
<th>Institution</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transvaal Chamber of Mines</td>
<td>16</td>
</tr>
<tr>
<td>Railway Administration</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total membership</strong></td>
<td><strong>34</strong></td>
</tr>
</tbody>
</table>

The representatives of each of the constituent authorities of the board had very specific voting powers. The chairman of the board had a casting vote.\(^{31}\) In the case of Johannesburg, each of the five members representing the city had a vote equal to one-fifth of the rateable value of the property within the municipality of Johannesburg. Local authorities, other than Johannesburg and Pretoria, each had a vote equal to the rateable value of the property within the municipal boundaries. In the case of Pretoria the representative had a vote equal to 10 per cent of the total rateable property value of the local authorities other than Pretoria. The Chamber of Mines’ 16 representatives each had a vote equal to one-sixteenth of the aggregate value of the votes of the members representing the local authorities. Finally, the railway administration had a vote equal to five per cent of the aggregate of

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31. Ibid., p. 4.
the votes of the members representing the local authorities and the Chamber of Mines.\textsuperscript{32}

Membership of the board implied that the price paid for water would be more favourable. It also secured an avenue for making sure that water would be supplied on a preferential basis to stakeholders with vested interests. This arrangement increasingly became problematic. The identity and requirements of the board’s consumers were at the time in the process of change. By 1950 there were in place special arrangements respectively between the board and the public works department, the department of defence, some coal mines, as well as a number of industries.\textsuperscript{33} Consequently, after the approval of the act to amend the statutes of the Rand Water Board,\textsuperscript{34} provision was made for the special rate to ‘other consumers’ to be calculated on the basis of the total fixed charges divided over the sales of water to all consumers. Previously only the sales to consumers were taken into account. Because of this adjustment the special rate to ‘other consumers’ was lowered from eight pennies (8d) to 7,5d per 4 500 litres (1000 gallons).\textsuperscript{35} The board also made special provisions to the local authorities that were not constituent members of the board. A rebate of 3d per 4 500 litres was granted to the local authorities of Alberton, Alexandra, Bedfordview, Edenvale, Elsburg, Kempton Park, Meyerton, Vanderbijlpark, Venterspost and Heidelberg, as well as the peri-urban areas health board.\textsuperscript{36} In later years, as autonomous black local authorities came into existence, this classification also posed numerous problems.

\textsuperscript{32} Ibid., p. 4.
\textsuperscript{34} Rand Water Board statutes 1904-1945 amendment (Private) Act No. 11 of 1949.
\textsuperscript{35} RWA, Forty-fifth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1950, p. 7.
\textsuperscript{36} Ibid., p. 7.
Consolidation of the statutes

In an effort to align itself with the changing post-war operational environment, the legal position of the Rand Water Board came under scrutiny by legal experts and management. It had become necessary to consolidate the statutory enactments because there were many cross-references to the various provincial ordinances and parliamentary acts. This made it difficult for anyone unfamiliar with the statutes of the board to know precisely how it fitted together. By having consolidated legislation approved by parliament, it was possible to set out the law governing the board in one comprehensive and coherent act. Furthermore it had become essential to remove the conflicting sections within the statutes. It was also necessary to simplify and modernise accounting and other practices. In view of the rapid progress and growth the board had undergone, it was necessary to make what was considered to be structural and legal theoretical adjustments.

The first steps were taken when the board in July 1947 gave its approval for the consolidation of its statutes. Subsequently, at the board meeting of April 1948, 11 proposals were tabled. It was proposed firstly that section 22 of the ordinance of 1903, which had a bearing on the preparation of the annual accounts, be reformulated. As a rule the date of submission was 31 March. It also provided the financial section with the opportunity to prepare the accounts of the board within two to six months. It was now proposed that a greater number of disciplined timescales be introduced to deal with finances in a more consistent manner.


Secondly, Section 7 of the 1904 ordinance stipulated that the members of the board had to be appointed during January of each third year. However, there was no indication of the date upon which the new members took their seats on the board. It had been practice that the new members took up their responsibilities on 1 February. It was now decided that this date be stipulated in the statutes.\(^{41}\)

In the third place, Section 8 (d) and (e) of the 1904 ordinance (as amended) had a bearing on determining the value of the mining and railway votes on the board. This arrangement came into effect in the 1944 Act. It was realised that in the case of a municipality not appointing a representative, the value of the votes of the railway and the mines once again fluctuated. The board’s advisers were of the opinion that this section needed to be revised.\(^{42}\)

Fourthly, Section 10 (a) of 1904 gave the board the right to maintain buildings and machinery and ‘any other works’ that it deemed necessary. By 1948 it was considered that it would be sensible specifically to outline matters that had a bearing on the laying of electrical cables and power lines.\(^{43}\) Section 10 (c) gave the board the right to expropriate private land necessary for the development of the undertakings vested with the board. The early arrangement gave the board the right to expropriate land with underground water supplies. In the acts of 1934, as amended in 1937 and 1944 the board acquired the right to extract water from the Vaal river. It was now, in the proposed amendment, considered that the board seek the right to expropriate land, which could have an influence on the amount and volume of the water it wished to extract from the Vaal dam.\(^{44}\)

\(^{41}\) RWA, Minutes 1948-9, p. 9: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.

\(^{42}\) Ibid., p. 9: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.

\(^{43}\) RWA, Minutes 1948-9, p. 9: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.

\(^{44}\) Ibid., pp. 9-10: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.
Other proposed amendments had a bearing on the valuation of the property of constituent authorities of the board at a specific time;\(^{45}\) the payments that the board had to make to the redemption fund;\(^{46}\) the board’s rights issue of bills of £100 000 to £1 000 000;\(^{47}\) stipulations in respect of the minimum special rates that the board could levy on ‘other consumers’;\(^{48}\) stipulations in respect of the 1904 ordinance’s framework in respect of issuing stock;\(^{49}\) and the application of the statutes outside the borders of the Transvaal

\(^{45}\) Section 59 of 1904 Ordinance. RWA, Minutes 1948-9, p. 10: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.

\(^{46}\) Section 71 of 1904 Ordinance. RWA, Minutes 1948-9, p. 10: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.

\(^{47}\) Section 90 of the 1904 Ordinance. RWA, Minutes 1948-9, p. 10: 590th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.04.23.


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Province. In August 1948 a draft of the proposed consolidating bill was submitted to the board. By 1949 it was completed.

Illus. 6.7. Zwartkopjes pumping station in the 1950s. As the water supply from Vereeniging and Zuikerbosch increased, this pumping station’s capacity had to be increased. Source: Rand Water

The process implied that an amendment bill in which the intention of the board was spelt out, first had to be passed by parliament. Once this bill was passed by parliament as *Private Act* No. 11 of 1949 it was possible to introduce the consolidating bill to


51. RWA, Minutes 1948-9, pp. 73-6: 594th meeting of the Rand Water Board, Headquarters, Johannesburg 1948.08.27.
parliament at the start of 1950. It was subsequently passed as the *Rand Water Board Statutes (Private) Act* No. 17 of 1950.

**The state, the Vaal river and the water board**

Within three months of the board’s statutes being passed by parliament the government took the initiative to have all the laws in respect of water in South Africa reconsidered. In April 1950 a commission of enquiry into the water laws of South Africa was appointed under the chairmanship of Justice C.G. Hall. Ultimately this was to lead to the *Water Act* No. 54 of 1956, which along with its amendments, literally up to the end of the twentieth century, determined government policy in respect of water.

On 26 May 1950 the board responded favourably to a suggestion by chief engineer J.P. Leslie that the board, at the request of the commission, should submit a memorandum and give evidence before the commission. The plan was to give an overview of the past and anticipated future development of the board’s undertaking. In particular attention was to be given to the potential socio-economic development of the region served by the board. In his report Leslie addressed a number of issues dealing with population growth, the membership of the board, the manner in

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53. RWA, Forty-fifth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1950, p. 3; *Private act to consolidate the Rand Water Board statutes 1903-1949*, Act, No 17 of 1950 in U OF SA, Statutes of the Union of South Africa 1950 with table of alphabetical contents and table of laws etc., repealed or amended by these statutes, pp. 73-181.

54. RSA, DEPARTMENT OF WATER AFFAIRS, Management of the water resources of the Republic of South Africa, Chapter 8.8.


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which large industrial consumers were accommodated, and the existing arrangements between the board and the government in respect of water supplies. While he was aware of the pollution threat to the region, Leslie was convinced that in future the Vaal river basin would have to be put to more effective use. He explained:

The Vaal river basin is the natural economic and industrial centre of South Africa. The artificial restriction of its population and of normal development of its resources and markets is economically unsound when weighed against the small benefits to be derived from such restriction.

Leslie was, at the time, contextualising a process that had already started to manifest itself. In the Vaal Triangle region, in particular, industrial development started taking place at a rapid rate. Up to 1939 Vereeniging had been the major industrial town in a predominantly rural environment in the Barrage section of the Vaal river. Two new towns were subsequently founded in the region. At the new town of Vanderbijlpark, situated on the banks of the Vaal river Barrage, Iscor established a modern iron and steel factory where flat steel products were manufactured. On the other side of the river, was the northern Orange Free State where the town of Sasolburg was established to provide in the housing needs for the

61. See RWA985, Chief engineer’s report, no. 1691 to the finance and executive committee, 1943.09.14, “Vanderbijlpark township”.
62. For details on the works of Iscor and the implication for the water supply, see RWA 985, F. Kanthack, Johannesburg – Chief engineer Rand Water Board, Johannesburg, 1942.11.04.
first synthetic fuel manufacturing plant in South Africa.\textsuperscript{63} Within a short space of time a number of related industries were established in the region that came to be known as ‘South Africa’s Sheffield’ – an ideal that Sammy Marks had set for the region more than a half a century earlier.\textsuperscript{64} One of the major reasons for these developments was the availability of a substantial water supply. It was in this era that the Vaal river became one of the hardest-working rivers in South Africa.\textsuperscript{65}

In the development of the Vaal Triangle the water laws commission was supportive of the plans of the board to boost the supply of water to the region’s burgeoning industrial sector. But there were conditions. The commission was adamant about the effective use of water. Economics was placed at the forefront in all considerations in respect of conservation. It was therefore important, the commission explained, that a balance be struck between agricultural development on the one hand and urban and industrial development on the other.\textsuperscript{66}

**The Vaal river and its other consumers**

In view of the developments taking place in the Vaal Triangle region there was increasing concern amongst water consumers further down the Vaal river that they would be affected by a shortfall in time to come. This was particularly of concern when the

\begin{itemize}
  \item \textsuperscript{63} J. MEINTJES, *Sasol 1950-1975*, Chapters 2, 4, 5 and 6.
  \item \textsuperscript{64} R. MENDELSOHN, *Sammy Marks: The uncrowned king of the Transvaal*, pp. 6, 50-1.
  \item \textsuperscript{65} T.C. ROBERTSON, *Die riviere van Suid-Afrika*, p. 7.
  \item \textsuperscript{66} SAB, GES2156, 153/33. UG11-1952, Report of the commission of enquiry concerning the water laws of the Union, p. 13.
\end{itemize}
Free State goldfields were opened up after World War II. On 15 November 1949 a conference on the Vaal river was held at Kimberley. It was organised by the Northern Cape and Adjoining Areas Regional Development Association in conjunction with the Natural Resources Development Council. At the conference a number of projections were made of future water needs. Representatives of the Rand Water Board indicated that the daily consumption would be 788 Mℓ by 1955, 1 058 Mℓ by 1965 and 1575 to 1800 Mℓ by 2000. The Chamber of Mines in turn envisaged a need for 306 Mℓ/d by 1958. The department of agriculture envisaged for the near future a daily consumption of between 945 and 1080 Mℓ. The Kimberley municipality needed 101 Mℓ/d, and the Northern Cape Electrification Board required 405 Mℓ/d.

It was apparent that in time to come there would be more pressure on the Vaal river to provide for the needs of its consumers in other parts of the country. Representatives of the department of irrigation at the conference warned that serious water shortages would be the order of the day in the near future. One of the recommendations was that industries had to be attracted to the Vaal Basin where ample water supplies were available. For the Rand Water Board it meant that the threat of pollution would increasingly shape planning. In the light of an apparent need for greater coordination, the board’s chief engineer, J.P. Leslie, agreed at the conference for

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the board to be represented on a special committee to communicate with the Natural Resources Development Council. The attention was to focus on future water needs.\textsuperscript{71} In many respects this paved the way for more co-ordinated planning. It did however not take away the fear that in time to come the Vaal river would be unable to cope with growing demand. There were also other considerations. By 1950 there was a marked decline in gold mining operations on the Witwatersrand. The consumption patterns of a number of local authorities on the Witwatersrand, as well as the non-crushing mines dropped significantly in this period.\textsuperscript{72} These available water supplies could be used elsewhere.

**Water supply to Sasol**

Particularly in the Vaal Triangle there were developments that required special attention, and more water, in the interest of the country as a whole. One such project was the manufacture of petroleum from coal under the auspices of Sasol,\textsuperscript{73} the South African Coal, Oil and Gas Corporation. The planning for Sasol got underway in 1946 when the Rand Water Board considered the possibility of supplying 95 M\(\text{ℓ}/\text{d}\) of non-potable water from the Vaal river to the Vacuum Oil Company. Shortly afterwards the Anglo-Transvaal Consolidated Investment Company also communicated with the board on the possibility of extracting 34 M\(\text{ℓ}/\text{d}\) of non-potable water from the river at Vereeniging.\textsuperscript{74} In June 1947 Act No. 49 of 1947 for the manufacturing of oil and fuel from coal was published in the *Government Gazette*.\textsuperscript{75} The

\begin{itemize}
\item \textsuperscript{72}. RWA, Minutes 1950-1, p. 19: 615th meeting of the Rand Water Board, Headquarters, Johannesburg 1950.05.26.
\item \textsuperscript{73}. The name Sasol is an acronym for South African Synthetic Oil.
\item \textsuperscript{75}. Act to regulate and control the manufacture of liquid fuel and oil from coal and to provide for matters incidental thereto, No. 49 of 1947. See U. OF SA, Statutes of the Union of South Africa 1946-47 with table of alphabetic contents and table of laws etc. repealed or amended by these statutes, pp. 484-91.
\end{itemize}
government shortly afterwards notified the board that it had been
decided that a site close to Vereeniging on the Orange Free State of
the river had been identified for the construction of a factory. Water
was needed at the new development site for cooling towers, steam
generation, general and domestic purposes.\footnote{RWA, Minutes 1949-50, p. 130: 608th meeting of the Rand Water Board, Headquarters, Johannesburg 1949.10.23.}

For the Rand Water Board the allocation of a large amount of raw
water for the manufacture of synthetic oil posed a number of
problems. It was pointed out in 1947 that if all the water requested
by the industry had to be provided, it would absorb the whole
supply of raw water that the board had at its disposal. This could
detrimentally affect other industries. The board then communicated
matter was addressed on the level of a government commission of
enquiry into the water laws.\footnote{SAB, GES2156, 153/33. UG11-1952, Report of the commission of enquiry concerning the water laws of the Union, p. 6.} A number of recommendations were
made so that by 1953 the first pumping station was completed and
ready to supply Sasol with 36 000 cubic metres of water per day. Of
this 1/16 was intended for consumption by the 476 houses built in
the first development phase of the town of Sasolburg. The rest was
scheduled for the factory where it was used to cool the plant and
generate steam.\footnote{J. Meintjes, Sasol 1950-1975, p. 68.}

**Zuikerbosch**

The development of the Zuikerbosch filtration plant and pumping
station was one of the most comprehensive undertakings by the
board since the completion of the Barrage in the 1920s. The author
and architect of the project was the chief engineer, J.P. Leslie, who
had been in the service of the board since the 1920s.\footnote{RWA, Minutes 1955-6, p. 93: 677th meeting of the Rand Water Board, Headquarters, Johannesburg 1955.07.22.} After
becoming chief engineer in 1941 he conducted extensive...
investigations into the question of pollution and the way in which the board could improve the quality of the water. It shaped his thinking in planning. The potential threat of pollution also shaped his thinking in the planning of the Zuikerbosch project. He argued that the Klip and Zuikerbosch rivers, the two tributaries of the Vaal river between the Vaal dam and the Barrage, were severely polluted. In 1943 he already informed the board of the state of affairs.

Illus. 6.8. The Zuikerbosch inlet from the Vaal river under construction in 1951. Source: Rand Water

The Klip river drained the West Rand, Johannesburg and Germiston region. Over a number of years the natural salinity of the Klip river had been increased by the pollution that flowed into the stream from the Central Rand region. Where the water of the Vaal river had a natural hardness of 60-70 mg/ℓ, that of the Klip river could go as high as 210 mg/ℓ in the dry season.81 The deterioration of the Zuikerboschrand river, he explained, started in

about 1938. It coincided with the industrial development of the Far East Rand.\(^{82}\)

Leslie argued that water had to be extracted at a point in the Barrage where the water from the Vaal dam could be extracted without mixing with the water from the tributaries.\(^{83}\) In June 1946 the board approved of Leslie’s proposals,\(^{84}\) and in December 1946 it accepted an offer by the Vereeniging Estates, Ltd., to sell portions of the farms Klipplaatdrif No. 83, Uitvlugt No. 84 and Panfontein No. 86, as well as a servitude across the farm Uitvlugt No. 84 for an amount of £45 000. This property of about 400 acres was situated above the confluence of the Zuikerboschrand and Vaal rivers.\(^{85}\) This was to become the site of the Zuikerbosch pumping station. The Zuikerbosch scheme was approved in 1949 as part of an additional water supply scheme to cope with an anticipated increased demand from 500 to 682 Mℓ/d.\(^{86}\)


85. RWA, Forty-fifth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1950, p. 47.

Leslie felt that the existing Vereeniging filtration and pumping station should not be extended further. By situating the station 1.5 km upstream from the Zuikerboschrand river it would be possible primarily to extract water for the board from the Vaal river. There would then be no problem with the high saline content and pollution of the tributary further downstream. In time to come this was to become the most important purification and pumping station of the board.

For all intents and purposes, Leslie considered, the Vereeniging plant had reached its capacity of 554 Mℓ under normal conditions. If the board wanted to extend the Vereeniging works further it could be expensive. It was also an open question as to whether

88. RWA, Minutes 1946-7, p. 45: 568th meeting of the Rand Water Board, Headquarters, Johannesburg 1946.06.28.
water would be obtained at less cost. On the site that had been identified for the future Zuikerbosch plant, it was predicted, it would be possible to produce 360 Mℓ/d.\(^{90}\) For a start the objective was to produce 180 Mℓ/d at the plant estimated to cost £1,35 million.\(^{91}\)

Before the plan was approved the best possible treatment system for the water at Zuikerbosch was considered. In his report, proposing the scheme, Leslie explained that the water at Zuikerbosch was more turbid and required more sedimentation. On the other hand, an advantage was that the electrical conductivity of the water at Zuikerbosch was considerably lower than at Vereeniging. At the new plant aluminium sulphate was to be added at a second stage of sedimentation. Alternatively, there would be an addition of lime as a primary process, followed by aluminium sulphate as a secondary process.\(^ {92}\) Compared to lime the price of aluminium sulphate was high. Its advantage was that small quantities of the substance went a long way towards providing the desired effect.\(^ {93}\)

Zuikerbosch was to be one of the largest operations of its kind undertaken by the board up to that point. Several hundred black workers and a substantial numbers of skilled white workers were to be accommodated at the plant. Because Vereeniging was at the time situated about 20 km from the new plant, comprehensive housing was provided at the plant.\(^ {94}\)

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Illus. 6.10. The inauguration of the Zuikerbosch pumping station in 1954. Source: Rand Water

The Zuikerbosch pumping station was brought into operation on 15 July 1954 providing 90 Mℓ/d on a continuous basis. There were a number of minor problems. The delivery manifold had to be sealed off properly in an effort to prevent leaks. Trouble was also experienced with the lime burning plant that *inter alia* had to provide carbon dioxide to the carbonation tanks. There was moisture in the gas. Because of a lack of carbon dioxide the pH-level of the water was high. Overall Zuikerbosch appeared to fulfil all the expectations and the proud chief engineer, J.P. Leslie could report:

(P)hysically and chemically, the water produced at Zuikerbosch is better than the Vereeniging water.\(^{95}\)

However, he did make the board aware of the fact that the objective of the works was to create a uniform quality standard:

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It is desirable that the chemical and physical condition of the water be as uniform as possible, particularly during the summer months, when the difference between the two waters will be more pronounced.\textsuperscript{96}

Zuikerbosch featured a number of innovative trends. It was the first pumping station of the board that entirely relied on electricity from Escom.\textsuperscript{97} One of the problems of an external power supply was that it be cut off at unexpected times. At a plant such as Zuikerbosch this could cause a serious dislocation in the board’s system. Another problem with an external power supply was also that electricity transmission lines were vulnerable during times of war. It implied that if a power station were to be out of order, it would not be possible to provide water.\textsuperscript{98}

The operations also became more sophisticated in that the plant calcined its own lime for water purification.\textsuperscript{99} By doing this it was possible to provide sufficient quantities of carbon dioxide for the pH correction of the water in the lime coagulation process.\textsuperscript{100} The plant was upgraded several times and by 1958 the vertical gas-fired shaft kilns were capable of producing 9420 tons of lime. The average percentage of calcium carbonate contained in the raw stone was 96.7 and the calcined material produced had an average of 82 per cent available calcium oxide.\textsuperscript{101} The board generated producer


\textsuperscript{97} R.J. Laburn, The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation, p. 25; Anon., Rand Water Board: short description of the board’s works issued on the occasion of the opening of the Zuikerbosch station, 14th April 1955, p. 8.


\textsuperscript{99} Anon., Rand Water Board: short description of the board’s works issued on the occasion of the opening of the Zuikerbosch station, 14th April 1955, p. 10.

\textsuperscript{100} R.J. Laburn, The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation, (Rand Water Board, Johannesburg February 1979), p. 25.

\textsuperscript{101} RWA, fifty-third annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1958, p. 56.
gas as fuel for the kilns from Natal anthracite. Sometimes gas coke was used. The Johannesburg municipality supplied it.\textsuperscript{102}

Attention was also given to the environment. In 1949 the board set aside £2,000 for the planting of trees at Zuikerbosch. The work was executed in three stages. The first was general tree planting; the second dealt with the formal layout of shrubbery on the banks of the river and finally attention was given to gardens adjoining the houses. Otto Brandmuller was appointed to oversee and execute the job. At that point in time the Brandmuller Nursery, Arboretum and Floral Nurseries, as the business was known, was situated at De Deur. Brandmuller had an outstanding knowledge of local conditions and the type of trees that could be planted Zuikerbosch.\textsuperscript{103} He was responsible for the first tree planting projects initiated by Sammy Marks in the Vaal Triangle in the 1890s.\textsuperscript{104} In 1951 a total of 13,000 trees were planted under his guidance at Zuikerbosch.\textsuperscript{105}

The governor-general, Dr E.G. Jansen, officially opened the Zuikerbosch pumping station on 14 April 1955.\textsuperscript{106} As one of the largest plants of its kind in the southern hemisphere, Zuikerbosch was a visionary scheme. It was proof of the fact that the Rand Water Board conducted its operations with the future in mind. Leslie’s successor as chief engineer, C.P. Robinson, noted in 1956 that thanks to Zuikerbosch the board’s water supply would be sufficient for the next decade.\textsuperscript{107} A major advantage of Zuikerbosch

\begin{thebibliography}{99}
\item\textsuperscript{102} Ibid., p. 56.
\item\textsuperscript{103} RWA, Minutes 1950-1, p. 65: 616th meeting of the Rand Water Board, Headquarters, Johannesburg 1950.06.23.
\item\textsuperscript{104} R.L. Leigh, \textit{Vereeniging South Africa}, p. 35; R. Mendelsohn, \textit{Sammy Marks: 'The uncrowned king of the Transvaal'}, p. 53.
\item\textsuperscript{105} RWA, Forty-sixth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1951, p. 46.
\item\textsuperscript{106} R.J. Laburn, \textit{The Rand Water Board 75 1903-1978: a treatise on the Rand Water Board with specific reference to its responsibilities achievements and policies during 75 years of operation}, (Rand Water Board, Johannesburg February 1979), p. 25.
\end{thebibliography}
was that it had the capacity to be developed as the demand for water rose. In terms of the 1949 additional water scheme Zuikerbosch was to provide 180 Mℓ/d to Zwartkopjes pumping station. In terms of the 1953 additional water supply scheme, plans were already made to step up the potential water supply from this station by a further 182 Mℓ/d. By 1959, when planning an additional water supply scheme for the Eastern Transvaal was approved, the capacity of Zuikerbosch was stepped up to 1046 Mℓ/d.

**Water supplies to new consumers**

The most significant increases in water consumption during the 1940s came largely because of the consumption through the Pretoria pipeline, through which was channelled as much as 32 Mℓ/d. At the same time there were also a number of mines that each consumed almost 5 Mℓ of water daily following the abandonment of their independent water supply system. As a consequence the daily water consumption rose from 209 Mℓ/d to 406 Mℓ/d. By the 1950s there were additional demands on the water supply.

*Peri-urban development:* The peri-urban areas health board was established in 1943 in terms of Ordinance 20 of 1943 (Transvaal). It had similar powers to that of local authorities, but with the specific task of controlling areas outside the boundaries of existing municipal authorities. The Rand Water Board consequently in


111. RWA, Forty-first annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1946, p. 11.
May 1945 decided to regard the health board as a local authority in terms of Act 22 of 1909. The implication was that the Rand Water Board undertook always first to consult with the health board if and when it provided water to consumers outside the existing municipal areas.\textsuperscript{112} By following this procedure the board secured for itself the right to provide a limited number of points of delivery of water in bulk. From these points it would be the responsibility of the peri-urban board to secure further deliveries. The board also agreed to grant the peri-urban health board a rebate on the water charges of 3d per 4 500 litres. This was similar to the tariff for non-constituent authorities.\textsuperscript{113}

The peri-urban health board was consequently one of the first government offices officially to take note of the urban sprawl that was the order of the day in the area to the south, west and north of Johannesburg after World War II. In 1949 a report by Stewart, Sviridov & Oliver, a firm of consulting engineers, was submitted to the health board dealing with the issue of the water supply for the region from Florida in the west to Edenvale in the east.\textsuperscript{114} In the report it was pointed out that there were already more than 40 established townships in the region in various stages of development. A disconcerting trend was that few of these townships had a communal sanitary service or water supply. The residents in the region primarily relied on rainwater, private wells and boreholes for water.\textsuperscript{115} The engineers had held discussions with the board’s engineers who indicated that it would be possible to provide water to the region from Edenvale and also from Maraisburg. At the time it was estimated, based on the 1946 census, that the population of the region stood at about 15 000, which was ultimately to increase to 175 000 people within the next 15 years. The increase was estimated to be between three and five per cent.

\textsuperscript{112} Ibid., p. 11.
\textsuperscript{113} Ibid., p. 11.
\textsuperscript{115} Ibid., p. 1.
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per annum. Consequently, at that point in time, the engineers did not appear to be too concerned about rapid growth.

In the 1956 report of C.P. Robinson on the future of water consumption it was pointed out that there would be a rise in the consumption of water in the peri-urban areas. It was anticipated that peri-urban consumption could rise to as much as 32 Mℓ/d. These estimates were based on data provided by the peri-urban areas health board and the municipalities that were at the time providing water to smallholdings in the Witwatersrand area.

In 1950 the board made provision for the incorporation of the Klip river valley region as part of the peri-urban areas south of Johannesburg to be provided with water. It included Henley-on-Klip township, Witkop Township, a portion of Highbury township, a portion of the Valley settlements No. 3 and Pendale agricultural holdings. The region was expected to consume about 405 000 litres daily. In December 1951 the board took note of the fact that a portion of the farm Zuurbekom 9 ha had been laid out as agricultural holdings. It was situated on the land to which the board had the underground rights to extract water for its Zuurbekom pumping station. The board was asked to give permission for the step that was intended to pave the way for the development of West Rand agricultural holdings extension 1. The board agreed to this, provided that its rights to water supplies were respected.

In October 1953 the Zuurbekom Estates Limited was granted permission obtain a daily supply of 2 Mℓ of water from the board off the Zuurbekom-Libanon pumping main. This decision was interesting considered from the perspective that earlier the board

116. Ibid., p. 4.
threatened to take steps when farming operations were conducted near the Zuurbekom pumping station. It is also interesting in view of the fact that, more or less in this period, the board appeared to be more focused on applications for any developments on the Witwatersrand that were submitted for the board’s approval. This was evident, especially in the 1952 pollution report of J.P. Leslie.

However, the region to the north of Johannesburg was the most dynamic area of development. This was evident in the severe shortages of water before the end of the 1950s. In November 1957 restrictions had to be introduced when it became apparent that the water storage facilities that had been completed shortly before were unable to cope with peak demand. The peri-urban health board, had by that time already started with the construction of a number of 9 Mℓ reservoirs in the Northern Johannesburg local committee area. Already at the start of the 1960s it was necessary to introduce severe restrictions on water consumption in the area.

Alexandra: The township of Alexandra was also a beneficiary of the rapid developments taking place to the north and east of Johannesburg. In 1938 a pipeline was installed from the Signal Hill Reservoir to the northern portion of Edenvale, the Modderfontein dynamite factory, the Rietfontein Lazaretto, the Chronic Sick Home, and the Germiston municipality. Provision was made for the Alexandra Health Committee to receive a daily supply of 675 000 litres of water for distribution in the township. This township was situated on the farm Cyferfontein No. 2, which had been registered in 1875 in the name of G.J. Labuschagne. In 1905 Labuschagne sold part of the land to Alexandra Township Ltd. The property was surveyed and subdivided into 338 stands, a town square and two parks. Originally it was intended for white settlement, but because it was situated so far from Johannesburg


city centre, the stands were later sold exclusively to black people after the Alexandra Township Ltd. added a servitude to its transfer document. Eventually the township was to have 2 185 stands. At first the stands sold for as little as £35 each, later fetching prices of up to £100. It was one of the only townships on the Witwatersrand that offered land for sale to black residents.\textsuperscript{123} It was to become one of the major black residential urban centres on the Witwatersrand in the twentieth century.\textsuperscript{124}

The request for a water supply from Rand Water Board came at a time of poverty. The water supply was to cost the health committee £3 750. The town fathers did not have the necessary funds. In view of the low income of the residents of the township, the board in February 1939, agreed to lower the cost of the water scheme to the township to £2 500.\textsuperscript{125} By the late 1940s when plans were made for the water supply to the region to the north of Johannesburg, Alexandra was not considered as being a responsibility of the peri-urban health board.\textsuperscript{126} Consequently the township with its population of 50 000 people was at first practically excluded from a regional water supply system planned under the auspices of the provincial authorities. In 1950 a firm of consulting engineers hired by the peri-urban health board recommended that the Alexandra health committee be brought into the planning for a water system to the northern areas. The advantage was that a larger supply pipeline could be laid and all parties with a vested interest could share the costs involved in the construction work.\textsuperscript{127} In the years to


\textsuperscript{124}  See www.alexandra.co.za; A. Cox, “Residents celebrate Alexandra’s history as it turns 90” in The Star, 2002.11.27.

\textsuperscript{125}  RWA, Minutes 1938-9, p. 283: 480th meeting of the Rand Water Board, Headquarters, Johannesburg, 1939.02.24.


A South African utility 1948-1959

follow Alexandra was to become a major consumer of water of the board and it was allowed to grow in terms of water demand at least, in line with the region to the north of Johannesburg.

Pretoria region: By the 1950s, urban expansion in Pretoria and surroundings was taking place at a rapid rate. The board was frequently asked to allow the City Council of Pretoria to provide water to new townships that were being developed. In November 1957 the board considered, at the request of the railways authorities to extend the limits of supply to the east of Pretoria so that Eerste Fabrieken en Denneboom could be incorporated. The board’s representatives took up the matter with the department of water affairs. It was indicated that in the near future there would be substantial expansion in the area, with a black township and hospital scheduled for construction locally. The extension of the limits of supply implied an expansion of the service of the board in the peri-urban areas of Pretoria. In February 1959 approval was given for Sinoville and Queenswood townships to be supplied with water. In July 1959 the supply was extended to Murrayfield. By October 1960 Pretoria City Council prepared itself to provide water also to Ashlea Gardens.

Large industrial consumers: In 1950 the board had special arrangements with the Electricity Supply Commission Escom), African Explosives and Chemical Industries, as well as Klipfontein Organic Products for water supplies. The demand for non-potable water supplies furthermore continued to increase. All the

consumers of non-potable water supplies were situated in the Vaal Triangle. They included Escom, Iscor, USCO, Stewarts & Lloyds and the Vereeniging municipality.\textsuperscript{133} By 1950 the board entered into agreements to sell a total of 131 Mℓ/d. Of this allocation, about 46 per cent was being consumed.\textsuperscript{134} The agreements with USCO and Stewarts & Lloyds of SA Lt., was renewed in 1959. In terms of the agreement with USCO, provision was also made to bring in the other Vereeniging factories that relied on the USCO works at the time. They were S.A. Bolts and Nuts (Pty) Ltd, and McKinnon Chain (S.A.) Ltd. The agreement that the board had earlier entered into with African Disc Co. (Pty) Ltd was taken over by McKinnon.\textsuperscript{135} As late as 1979 the board once again renewed its agreement with USCO and Stewards & Lloyds for a period of 20 years, with effect from April 1979, to supply non-potable water to the factories.\textsuperscript{136} It is interesting to note that whilst the need for potable water supplied by the board to consumers on the Witwatersrand was to increase moderately, the demand for raw water was scheduled to increase substantially. In projections by chief engineer C.P. Robinson, it was pointed out in 1956 that by 1961 the board would have to provide consumers with 695 Mℓ/d, and with 1120 Mℓ/d by 1976.\textsuperscript{137} In terms of the agreement with the department of water affairs, it was anticipated that the board would cope with the demand only up to 1963.\textsuperscript{138}

\begin{itemize}
\item \textsuperscript{133} Ibid., p. 67: 615th meeting of the Rand Water Board, Headquarters, Johannesburg 1950.05.26. “The supply of water within the area served by the Rand Water Board and its relation to social and economic development”, June 1950. (Author J.P. Leslie).
\item \textsuperscript{134} Ibid., p. 67: 615th meeting of the Rand Water Board, Headquarters, Johannesburg 1950.05.26. “The supply of water within the area served by the Rand Water Board and its relation to social and economic development”, June 1950. (Author J.P. Leslie).
\item \textsuperscript{135} RWA, Minutes 1958-9, p. 251: 721st meeting of the Rand Water Board, Headquarters, Johannesburg 1959.03.26.
\item \textsuperscript{136} RWA, Minutes 1978-9, p. 558. 961st ordinary meeting, headquarters, Johannesburg, 1979.01.26. Secretary’s report, no. 7116. A.J. de Witt.
\end{itemize}
Technology

*Computerisation:* For the greater part of the twentieth century engineers at Rand Water did not have access to the luxury of computer technology. The engineering slide rule was the golden key to doing all the intricate calculations on multi-million pound projects. Many years later Dr R.J. Laburn recalled how he, like his predecessors in the engineering offices of the board, had worked out the whole distribution system of the board with a basic slide rule. In the 1950s the first computers enabled engineers to do complex calculations with great ease. From the 1960s onwards computers represented revolutionary technology that would change the face of Rand Water’s operations.

However, it was in the accounting division of the board that the first steps were taken to make use of the computer. In November 1954 the board was requested to approve an amount of £12 000 for the purchase of a Burroughs ‘Sensimatic’ style F503½ accounting machine. A total of six keyboard machines were purchased, which were used at the headquarters, Zwartkopjes, Vereeniging and Zuikerbosch.

Six years later, in 1960, as preparations were made for the introduction of the decimal (rand) monetary system, the board was once again asked to grant its approval for accounting machines. The board’s secretary was sent overseas to investigate the market and see what was available. The accent was however still on providing the basic accounting function. Consequently when consideration had to be given to the introduction of a punch card system (ideal for stores and supplies), non-multiplying machines did not enjoy much support. It was reported that ‘small computers’ were available, but these were expensive and cost up to £40 000.

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Instead the board was asked to give its approval for the purchase of an Exacta Multitronic machine with “3 cross footers and 20 registers” that had an automatic front feed, fan-fold stationery feed, an electronic memory of 12 digits, as well as typewriter facilities.\footnote{RWA, Minutes 1960-1, p. 82: 740th meeting of the Rand Water Board, Headquarters, Johannesburg 1960.10.28.} However, the manufacturers of the machines in October 1960 informed N. McMurray, the board’s secretary, that the manufacture of the machines had been discontinued. It would only be possible to supply the board with new machines in two to three years time. Consequently it was decided that some of the old machines, which had been scheduled for trade-in, would be kept, until such time as it was possible to purchase new and improved models, suitable for the purposes of the board.\footnote{RWA, Minutes 1961-2, pp. 179-80: 752nd meeting of the Rand Water Board, Headquarters, Johannesburg 1961.10.27. Secretary’s report No. 4647, N. McMurray.}

\textit{Communications technology:} In 1946 plans were made to introduce an automatic telephone system at Vereeniging because the various communication points at the works were so widespread. In May 1947 the board approved the expenditure of £1036 11s that the system was to cost.\footnote{RWA, Minutes 1947-8, p. 17: 579th meeting of the Rand Water Board, Headquarters, Johannesburg 1947.05.23. Report No. 1920, J.P. Leslie 1947.05.13.} Before too long a more comprehensive system was planned. When in November 1948 the chief engineer, J.P. Leslie requested a radio transmission licence from the department of telecommunications he explained that it was necessary to maintain communications between the board’s reservoirs at Libanon in the west, Brakpan in the east and the central depot in Johannesburg. It was also necessary to maintain communications between the pumping stations of the board. At that point in time the board required two frequencies. The first one, which was already in use, was used to transmit information about reservoir levels between Libanon and Brakpan automatically. The second frequency was intended control the flow of the Vaal river and the pumping of
water into supply by maintaining continuous contact with the Barrage and the main pumping stations.\footnote{RWA, 292/A. J.P. Leslie, Johannesburg – Under-secretary telecommunications, Pretoria, 1948.11.06.}

In October 1950 the chief engineer, J.P. Leslie submitted a report to the board in which he recommended to the board that a far more comprehensive radio communications and telemetering system be introduced. It was based on an investigation that had been conducted a year before to determine precisely what the requirements of the board were.\footnote{RWA, 292/A. Report: Radio telemetering of reservoir levels and emergency communication system, October 1949.} He pointed out that it was rapidly becoming a standard item of use at Johannesburg municipality. For the board the system could be a special significance in the sense that made provision for a more effective form of security management. It was considered a good form of communication between the different stations and along the pipelines of the board. At that time the licence fee for the £8000 system was laid down as £2 per annum.\footnote{RWA, Minutes 1950-1, p. 124: 620th meeting of the Rand Water Board, Headquarters, Johannesburg 1950.10.27.}

By 1959 the communications system was well established. The communications headquarters was the central depot in Johannesburg, which was linked to all the pumping stations by means of a radiotelephone. Similar links existed with the headquarters and the Barrage works. In addition four mobile radio stations were used when the pipelines were being repaired.\footnote{RWA, Fifty-fourth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1959, p. 49.} In 1961 Zwartkopjes was provided with an automatic telephone service.\footnote{RWA, Minutes 1961-2, p. 148: 751st meeting of the Rand Water Board, Headquarters, Johannesburg 1961.09.22. Chief engineer’s report No. 3584, C.P. Robinson.}

Telecommunications also paved the way for co-ordinating the water supply system of the board. The control centre was situated
at the central depot in Johannesburg. A radio telephone was used to maintain communications between all the pumping stations, the head office and the Barrage. District inspectors reported on the state of the pipelines by means of four mobile radio stations.\(^{150}\)

**The rising tide of pollution**

One of the outstanding features in the history of the Rand Water Board was the constant improvement of sophisticated methods to check up on the quality of its water supplies. By 1949 a total of 2185 bacteriological examinations and more than 10 000 chemical and physical control tests were conducted annually on the water the board supplied. In addition samples were submitted to the government’s chemical laboratories and to the South African Institute for Medical Research.\(^ {151}\) The board’s own independent chemical tests had always been conducted at the Johannesburg municipal laboratory, while the South African Medical Institute was responsible for the bacteriological tests. This was an arrangement that was maintained for more than 40 years.\(^ {152}\) Securing the high quality of its water made the board also more sensitive to pollution.

The board also had the responsibility, in conjunction with several government departments, of checking on potential causes of pollution in the region it supplied with water. Consequently its officials had to investigate the implications of developing new townships, agricultural holdings, locations, roads, railways, sewers and gas mains, reservation of ground for various purposes, proclamation or de-proclamation of areas, municipal boundaries

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150. RWA, Fifty-second annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1957, p. 55.

151. RWA, Forty-fourth annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1949, p. 43.

and a host of other activities in the catchment area. Between July 1939 and December 1951 a total of 2880 applications were scrutinised and it was considered necessary in 156 cases for the board to impose special conditions in order to reduce potential threats of pollution. Because of the intervention by the department of health, the board received a lot of assistance from all local authorities, the peri-urban areas health board, and by the 1950s also the support of the provincial government of the Orange Free State. The health department was particularly strict on all sewage disposal works.

In 1952, eight years after he submitted his first report on pollution to the board, J.P. Leslie once again made the board aware of the problems experienced, particularly in the vicinity of the Vaal river. Leslie reported that the Klip river had a high saline content. From records covering more than 40 years it was evident the natural salinity had been greatly increased because of the mineralised water flowing into the river from the Witwatersrand region. The Klip river essentially drained the southern slopes of the central and western Witwatersrand region. The Zuikerboschrand river’s water was derived from the run-off of the water of the East and Far-East Rand. The water above its confluence with the Blesbokspruit near Heidelberg was of a good quality. The problem was that the Blesbokspruit drained the East

156. See previous chapter.
Chapter 6

Rand area. Since the 1940s this region had undergone substantial industrial development. In consequence the river, because of mining and industrial activities, was severely polluted. By 1952, according to Leslie, it had deteriorated to the same extent as the Klip river.\(^{161}\)

The gold mining industry still appeared to be the major culprit. Leslie pointed out:

> The main cause of chemical pollution of the waters of these tributaries is the presence of pyrite in the rock brought to the surface by mining operations, which on weathering give rise to soluble sulphates. The presence of sulphates in the water, particularly calcium and magnesium sulphates, is most objectionable; the hardness of the water is increased, deposits form in mains and boilers, the corrosive power is raised and softening is difficult and costly.\(^{162}\)

The good water that flowed into the river from the Vaal dam as a rule diluted the polluted water that flowed into the Barrage.\(^{163}\) The prevailing situation posed a threat in many areas. In 1952 the population in the Vaal river catchment area was predominantly orientated towards the farming industry.\(^{164}\) However, the water from the river was however consumed in diverse sectors of the regional economy. In addition to supplying water to the board and a number of industrial consumers in the Vereeniging area, the Vaal river’s water was used by the Klerksdorp and Orange Free State goldfields, the Vaalharts irrigation scheme and the city of Kimberley.\(^{165}\)


\(^{165}\) RWA, Fifty-fourth annual report of the Rand Water Board to the His Excellency the Governor-General, Union of South Africa. Financial year ended 31st March, 1959, p. 48.
One of the startling findings of Leslie was that the most dangerous pollution at the time occurred in the Vereeniging region. It also proved the most difficult to combat. He explained:

This stems from the fact that all drainage discharges directly above the intake stations, there is no time factor to effect self-purification and the controlled flow of the Vaal for the greater part of the year is insufficient to dilute the water abstracted.\(^\text{166}\)

The problems experienced in the Vereeniging area were diverse. Apart from problems with water hyacinth, there were complaints about the coal dust coming from the Springfield Collieries. It was not dangerous, but objectionable. Stewarts & Lloyds removed oil wastes and spent pickle liquor by skimming and discharge to an ash dump.\(^\text{167}\) The Vereeniging Milling Company deposited damaged molasses in the storm water drains.\(^\text{168}\) One of the reasons for the transfer of pumping activities from Vereeniging to Zuikerbosch was the fact that in the Vaal there was a high degree of electrical conductivity. For example in 1947 it was reported that the electrical conductivity in reciprocal megohms per cubic centimetre at 20º Celsius varied from 130 to 450. This implied that the dissolved electrolyte varied between 90 and 300 mg/l.\(^\text{169}\) It had a negative effect on the water the board had to process for its consumers.

There were also attempts at trying to address the problems of pollution. Escom, which had been responsible for pollution by the early 1950s, started taking steps to dispose of compound wastes by means of discharge into sewers. At the Klip power station ash and ferrous waste were removed from the water by means of settlement.


\(^{169}\) RWA, Forty-second annual report of the Rand Water Board to the Honourable the minister of public health, Union of South Africa. Financial year ended 31st March, 1947, p. 42. I am grateful to Mr E. Myburgh and prof. J. Haarhoff for advice on the conversion to milligrams.
and aeration.\textsuperscript{170} The Vereeniging municipality had also earlier been on the wrong side of the board. In order to restore good relations, the areas of the old black township, the pound and the latrines of the local abattoirs were improved. Trenching strategies were implemented to prevent the run-off from the municipal sewage farm from flowing into the river. Domestic and wild animals were prevented from coming close to the water treatment area of the board. In addition the municipality took steps against the seepage from a garbage dump at Peacehaven that flowed into the Houtkop spruit and from there into the Vaal river.\textsuperscript{171}

A particular source of concern for the board remained the large local industrial concerns. USCO at the time discharged industrial wastes into the Houtkop Spruit. The major pollutants were pickle liquor containing large quantities of ferrous iron, copper sulphate, mineral oils, animal fats and phenols. All attempts by the board to put an end to the pollution by communicating with USCO proved to be ineffective. J.P. Leslie was of the opinion that if they refused to respond in the foreseeable future the board should stop their supply of raw water.\textsuperscript{172} In 1952-3 the board placed its supply of raw water to USCO on hold. The first steps were to allow the iron and steel company a maximum of 3 M\textsuperscript{ℓ}/d, instead of 5 M\textsuperscript{ℓ}/d. The permission was also granted for only three months. This forced USCO to give the board the undertaking that it would install suitable plant to reduce the discharge of trade wastes into the river.\textsuperscript{173} The arrangement was still the order of the day by December 1953.\textsuperscript{174} In March 1954 it was reported to the board that USCO had installed a suitable plant to reduce the discharge of


\textsuperscript{173} RWA, Minutes 1953-4, p. 59: 652nd meeting of the Rand Water Board, Headquarters, Johannesburg 1953.06.26.

trade wastes into the river. What was still outstanding was an acid neutralising plant. This plant was at the time under construction.\textsuperscript{175} By the time the plant was completed in July 1954 it was no longer necessary for the iron and steel factory to use raw water. Its existing supply of water was purified in the treatment plant and re-used. In the case of a potential emergency, the board was requested to have a supply of 3 M\ell/d available should an emergency arise.\textsuperscript{176}

Further down the Barrage there were more problems. The Rietspruit in the early 1950s drained a relatively clean area to the south of the Witwatersrand before joining the Vaal river close to the Barrage. The board had seen to it that the effluent of Vanderbijpark was discharged into the Rietspruit before flowing into the Vaal. It had also determined at an early stage that all effluent had to be treated before it could flow into the Vaal.\textsuperscript{177} By the 1960s the situation had deteriorated. In a report to the board on the supply of water to the Vaal Triangle, the chief engineer, R.J. Laburn explained, that the Rietspruit was now being fed with water from the mining areas of the West Rand. In its lower reaches the Rietspruit received effluent from Vanderbijlpark and especially the SA Iron and Steel Industrial Corporation Ltd, the Vanderbijlpark municipal sewage works as well as the storm-water run-off from the rapidly developing Sebokeng township.\textsuperscript{178}

Not all industries were guilty of pollution. At the outset of the planning for what was to become Sasol the threat was addressed in advance.\textsuperscript{179} In fact, it was envisaged that, apart from natural drainage, there would be little pollution. The major pollution threat

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\textsuperscript{175} RWA, Minutes 1953-4, p. 238: 661st meeting of the Rand Water Board, Headquarters, Johannesburg 1954.03.26.
\textsuperscript{179} J. MEINTJES, Sasol 1950-1975, p. 144.
\end{flushleft}
was considered to be the drainage of ash dumps. Plans were then put into place to halt it. In an effort to cope with other forms of pollution, the developers made provision for catchment sumps and traps in areas where oil was processed. In 1954 the irrigation department gave permission for the effluent of the Sasol works to be discharged into the Vaal river below the Barrage. Special plans had been made earlier to ensure that the quality of the effluent would be of an acceptable standard.

After industrial pollution, sewage was considered to be a major cause of pollution in the Vaal river in the early 1950s. Leslie explained:

Nearly the whole of the Witwatersrand area is now provided with waterborne sewage systems and more than one-half of the effluent discharged eventually finds it was way into the Vaal river catchment ... The danger arises ... from the presence of living organisms ... and suspended organic debris. Fortunately most of the effluent is completely treated, is carefully controlled and the time taken for the diluted water to flow from the Witwatersrand to Vereeniging and the storage provided by intervening swamps and vleis with their abundant vegetable growth provides some form of self-purification.

Leslie gave a timely warning. Pollution could cause the deterioration of the Barrage. There was little that could be done to stem the tide of industrial development and urban growth. The board simply had to contend with the consequences. He gave the board the assurance that it was possible to remove pollution from the water with suitable treatment. But the costs, he warned, were

181. Ibid., p. 130: 608th meeting of the Rand Water Board, Headquarters, Johannesburg 1949.10.23.
prohibitive. Increasingly planners in the PWV region were faced with the choice of either accepting and living with bearable standards of pollution, or dampening all forms of industrial activity that would promote pollution. There was no question about the need for development. Consequently pollution, which was not yet such an issue of concern in the public realm, was downplayed. This was despite the fact that in future standard pollution checks had to make provision for potential nuclear fission fallout.


The process of African decolonisation started in 1957 with the independence of the Gold Coast (Ghana) and gained momentum with the colonies of the leading European powers, particularly Britain and France, becoming independent within the space of less than a decade.\textsuperscript{1} African nationalism had become a dominant force on the continent. It was under these conditions that at the start of 1960 the British premier, Harold Macmillan, visited South Africa after an African tour and informed parliament that the ‘winds of change’ were blowing throughout Africa and that South Africa had to adapt to the new circumstances. In particular he seemed to urge the government to make provision for the recognition of the political rights of its entire population.\textsuperscript{2} The government instead, responding to the wishes of its white electorate, chose to take a stronger stand on policies aimed at maintaining white authority to the detriment of the basic human rights of black, Asian and coloured South Africans. The country was also no longer under any obligation to adhere to the wishes of Britain. It had left the British Commonwealth shortly before. In an era when the international community of liberal democracies worldwide was increasingly subscribing to the principles of the Universal Declaration of Human

\begin{itemize}
  \item W. Freund, \textit{The making of contemporary Africa: the development of African society since 1800}, pp. 167-209.
\end{itemize}
Rights, South Africa found itself heading for international political isolation.

Illus. 7.1. The Sharpeville massacre of 21 March 1960 reverberated around the globe. It also affected the operations of the Rand Water Board in Vereeniging. Source: Franken

The political tensions prevalent in South African society at the time were intense. The government since the early 1950s had thwarted hopes of African liberation in South Africa by acting strongly against trade union and political activists. All it needed to do by the start of the 1960s was to suppress protest. It was under these conditions that a state of political animosity prevailed. Consequently when the anger reached fever pitch with the massacre at Sharpeville on 21 March 1960 it was an event that

reverberated throughout the world.5 A total of 69 people were killed and a further 180 were wounded in a hail of police gunfire. Sharpeville marked the start of a phase of internal resistance and international criticism on the grounds of human rights abuses. It marked definitive changes in the political constellation of South Africa. The government, in an effort to protect white minority rights, became more authoritarian in its system of governance. The administration of state institutions became more rigid and intent on promoting the government’s policies of decentralisation and the development of the Bantu homelands. At the same time greater participation in the processes of political decision-making were fragmented and reduced in the interest of maintaining a strong sense of central government control. These developments had a marked effect on developments at the Rand Water Board.

The effects of Sharpeville

The fact that Sharpeville was situated within a short distance of the Rand Water Board’s Vereeniging and Zuikerbosch pumping stations was of particular significance. The events of resistance and violence in the black township had a direct bearing on the board’s operations in the Vereeniging region. After March 1960 the board became aware of how reliant it was on its black workers. One of the first responses was to resort to a stepped up program of mechanisation in terms of its operations. Since the 1930s the growth of the Witwatersrand had been rapid. Between 1935 and the 1960s the board’s capacity to supply water had increased by almost 800 per cent.6 The board’s diverse operations were conducted over a wide spectrum. The plants were already old. Consequently they were seldom upgraded to accommodate the most effective modern

5. For an outstanding and highly readable recent history of the township see P. Frankel, An ordinary atrocity: Sharpeville and its massacre, (Witwatersrand University Press, Johannesburg, 2001).

mechanised systems. One result was that large numbers of unskilled labourers were employed to do this work. As increasingly more water was required, higher production rates were the order of the day at the pumping plants of the board. This had the effect that in some areas of production mechanisation hardly took place in accordance with existing needs. In the early 1930s, for example, when about 305 tonnes of coal were necessary to monthly generate power for pumping water to the different storage reservoirs on the Witwatersrand, the coal was delivered to the power station at the Zwartkopjes pumping station by means of hopper bottomed trucks which discharged the coal directly into bunkers. During World War II (1939-45), as the production of power increased, coal was delivered by means of flatbed trucks that had to be unloaded manually. Large numbers of unskilled black labourers were used to do the work.

Only in 1960 was it recommended that the system be mechanised. At the time it cost the board £200 per annum for one black labourer in the coal division. The work could have been done much cheaper if machinery had been used earlier. The mechanisation of the coal supply division was a sensitive area of operations at the time. In the case of strikes coal delivery to the steam boilers could be halted. It was also unlikely that sufficient white labourers could be brought in to do the work.\(^7\) This had the effect that the overall number of black workers at Zwartkopjes was gradually reduced. Also in the construction section of the board steps were taken to mechanise the existing plant and make the section less reliant on unskilled black labour.\(^8\)

In certain strategic areas it was impossible to phase out black labour overnight. So instead, in order to eliminate potential external influences facilities for black employees were improved at the pumping stations. At Zwartkopjes in 1960 a total number of 290

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black workers were accommodated in the compounds at the pumping station. In order to secure a reliable supply of labour additional compound facilities were established for 98 workers.\(^9\) It was explained:

\[\begin{align*}
(I)t \text{ is the board’s policy that as far as possible all employees directly engaged on water supply should be housed on the stations.}^9
\end{align*}\]

It was essential to keep the operations of the board uninterrupted under all conditions. By providing accommodation to key workers at the pumping stations it was possible to realise that objective. Moreover, for as long as organisations such as the ANC’s military wing, *Mkontho we sizwe* (MK), *Pogo* of the Pan Africanist Congress (PAC), and the National Committee of Liberation of the African Resistance Movement posed a threat to civil society,\(^11\) all institutions of state, such as *inter alia* the Rand Water Board, were protected with sound security.

Circumstantial evidence suggests that security considerations prevailed when the decision was taken to close down the Barrage vehicle bridge across the Vaal river in 1963. In its place a low water bridge over the Vaal river was then constructed just below the Barrage.\(^12\) It was only replaced in December 1977 when the new bridge of the N1-highway over the Vaal river was opened to traffic.\(^13\) This bridge was situated well below the Barrage. Many years later employees of the board recalled how the security arrangements affected the autonomy of the organisation. According to G.J. van der Westhuizen special arrangements had to be made when the government questioned the right of the board to be in control of a strategic installation such as the Barrage. The Chamber of Mines, on the other hand, was adamant that the government had

\[^9\text{RWA, Minutes 1960-1, p. 167: 740th ordinary meeting of the board, Johannesburg, 1960.10.28.}\]
\[^10\text{RWA, Minutes 1960-1, p. 167: 740th ordinary meeting of the board, Johannesburg, 1960.10.28.}\]
\[^11\text{T. LODGE, *Black politics in South Africa since 1945*, pp. 231-60.}\]
\[^12\text{ANON., “Brug net betyds klaar” in *Vaalweekblad*, 1978.01.27.}\]
\[^13\text{ANON., “New bridge over Vaal completed” in *Vereeniging and Vanderbijlpark News*, 1977.12.09. The bridge cost R1,2 million to build and was completed within one year.}\]

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