Time and the river: observations on the Vaal River as source of water to the Witwatersrand 1903-24

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Cities, like other living things, need water to survive, and even more water to flourish. As they grow, they grow thirstier, and the thirst must be quenched – usually from rivers far beyond their limits.

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Introduction: A history shaped by water

On occasion T.R.H. Davenport made the interesting observation that water has perhaps played a more influential role than land as a scarce commodity in the shaping of South African history.[2] The fact of the matter becomes apparent when one considers that more than 65 per cent of South Africa's surface area has an annual rainfall of less than 500 millimetres.[3] Consequently local and regional conflicts, along with

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1. *Water for Gotham: A history* (Princeton University Press, Princeton, 2000), p. xi.
2. T.R.H. DAVENPORT, "Land use and distribution" in *South Africa International*, 10, July 1979, p. 21.
3. D. BURGER (Ed.), *South Africa Yearbook 1999* (Rustica Press, Cape Town, 1999) p. 61.

the growth and decline of human settlements in many parts of the country, have since time immemorial, been closely linked to the availability and effective consumption of water.

The ever-present shortage of water has put human ingenuity on the subcontinent of Africa to the test. Evidence of creative solutions to the problem can be traced in numerous cultural historical discourses ranging from the phenomenon of the ostrich eggshell water container, used by stone age peoples,[4] to the advanced technology applied by modern day engineers.

For many years innovative planning for water has been at the root of South Africa's industrial development. Ever since the 1860's the mining industry and commerce relied on skilful plans for water extraction in order to mine South Africa's mineral wealth.[5] When operations started on the Witwatersrand goldfields in 1886, Johannesburg did not have any river of substance to provide water for its inhabitants. Soon subsurface water resources were used to ensure that the country's premier gold mines could remain in production – that was before the Vaal River could be put to good use.

In this study attention will be given to the institutional steps that were introduced after the founding of the Rand Water Board in 1903 to provide the Witwatersrand with water in the first quarter of the twentieth century. The focus is however on the way in which the Vaal River was developed in order to accomplish the objective. The demand for water had a remarkable effect on the river environment and region that was later to become known as the Vaal Triangle.

The Vaal River and the Witwatersrand

By comparison with rivers in Europe and North America the Vaal River is small.[6] Even locally it is considerably smaller than the Orange River. Nevertheless the Vaal River was, for the greater part of the twentieth century, the river that provided most of the water necessary for the Witwatersrand. The section of the river running through the industrial city of Vereeniging has over the past century had a close association with the Witwatersrand. Vereeniging was situated about 70 km from Johannesburg – the shortest point of access between the river and the city of gold.

The Vaal (called the *Lekoa* or *Likwa* in the vernacular) has its origins near Lake Chrissie in the Mpumalanga Province from where it flows in

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4. H.J. AND J. DEACON, *Human beginnings in South Africa: Uncovering the secrets of the stone age* (David Phillip, Cape Town, 1999), pp. 109, 118-9, 144.

5. T.R.H. DAVENPORT, *South Africa: A modern history* (Fourth edition, Macmillan, Houndmills, 1991), p. 494.

6. ANON., *Rand Water Board* (Rand Water Board, Johannesburg, 1985), p. 6.

a westerly direction over a distance of 1 210 km before linking up with the Orange River near Douglas in the Northern Cape.[7] In the nineteenth century the Vaal was described as one of the most beautiful rivers in the South African interior.[8] Its flow was consistent at all times of the year. This fact was of vital importance for the rapidly developing centre of Johannesburg. In 1889, within three years of the founding of Johannesburg, the first plans were made to extract water from the Vaal. The politics of the day and high financial estimates forced all plans for the development of the river to a halt before the turn of the century.[9]

Conditions at the start of the twentieth century

The Anglo Boer War (1899-1902) caused considerable disarray in the South African interior. In 1900 British forces took over the South African Republic (Transvaal). One of the major preoccupations of the British authorities was to get the lucrative gold mines of the Witwatersrand back into production. There were also plans to restructure local industry to promote greater efficiency. There was a definite need to improve the Witwatersrand's water supply. Large amounts of water were used in the gold extraction process.[10] Although some mines were able to provide in their own water needs there were persistent rumours of an immanent shortfall. Consequently, in November 1901, six months before the signing of the Peace Treaty of Vereeniging, the British military administration of the Transvaal appointed a commission to investigate the water supply of the Witwatersrand.[11] The objective was to consider the creation of a public body, which *inter alia* could operate as a service provider for water. In this manner they wanted to secure:

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7. *Ibid.*, pp. 6, 8; M.M. Cole, *South Africa* (Second revised edition, Methuen and Co. Ltd., London, 1966), pp. 131, 134.

8. F. JEPPE, *Transvaal book almanac and directory for 1877* (P. Davis & Sons, Pietermaritzburg, 1877), p. 29; F. LION CACHET, *De worstelstrijd der Transvalers: aan het volk van Nederland verhaald* (J.H. Kruyt, Amsterdam, 1882), pp. 333-4.

9. *See* J.W.N. TEMPELHOFF, "On Laburn's mystery query - A prehistory of the Vaal River as water source of the Witwatersrand (1887-99), in *Historia*, 45(1), May 2000, pp. 88-117.

10. CENTRAL ARCHIVES REPOSITORY, Pretoria (CAR). TRANSVAAL ARCHIVES (TA) C4/2. Water Commission W107. Statement of evidence, p. 2. "The Vierfontein Syndicate Limited", R.N. Schumacher, Johannesburg, 1902.01.28.

11. M. MCCORMACK, *Origin and history of the Rand Water Board* (Argus Printing and Publishing Company Co., Ltd, 1912), pp. 4-6.

> an unfailing water supply sufficient to meet the requirements of the towns on the Witwatersrand and the local gold mining industry.[12]

In evidence presented to the commission on the viability of the Vaal River there were two schools of thought. A leading engineer, W. Wilcocks, told the commission the Vaal River was suitable for damming. He did however have a number of reservations on technical grounds.[13] Another engineer, R.L. Cousens, was positive. He had even worked out a scheme to pump water to the Witwatersrand from two places in the river near Vereeniging.[14] Cousens was convinced it would be possible to pump water 400 metres uphill over a distance of some 70 km to the Witwatersrand.[15] It was estimated at the time that the scheme could provide the Witwatersrand with some 45 460 litres of water per day.[16]

In its final report the commission of inquiry was critical of the Vaal River. The members in a pertinacious manner gave preference to the customary extraction of water from available sub-surface dolomite areas – regardless of their anticipated brief life expectancy.[17] Even a guarantee, by the supporters of a Vaal River scheme, that the river could provide as much as 136,4 million litres of water at a relatively cheap price, could not change the commission's mind.[18]

A number of external factors made the Vaal River scheme unattractive at the time. The river was still the *de jure* border between two Boer republics at war with Britain. After the conclusion of the Anglo Boer War in May 1902 the river was the border between two British colonies. It was however only once the unification of South Africa had taken place in 1910 that the politics of geography no longer played an influential role.

A second consideration was that a public water utility for the Witwatersrand had to be established within the framework of the

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12. ANON., *Rand Water Board: Short description of the board's undertaking (Prepared in connection with the visit of the Empire parliamentary delegations to the Board's Vaal River works on the 11th October, 1924)*, (Hortors, Johannesburg, c. 1924), p. 3.
13. T.G. (Unnumbered) Report of the Witwatersrand Water Supply Commission, 1901-1902. With minutes of proceedings and minutes of evidence. Minutes of evidence by Engineer W. Wilcocks, Johannesburg, 1901.11.04, p. 3.
14. The points were: Engelbrecht's Drift (19 km from Vereeniging) and another point some 8,8 km downstream from the town. See T.G. (Unnumbered) Report of the Witwatersrand Water Supply Commission, 1901-1902. With minutes of proceedings and minutes of evidence. (Government Printing and stationary works, Pretoria, 1902). Minutes of evidence, Richard Lewis Cousens 1901.12.16, p. 42.
15. *Ibid.*, p. 42.
16. *Ibid.*, p. 43.
17. *Ibid.*, pp. vii, viii.
18. *Ibid.*, p. viii.

region's existing water infrastructure. In 1902 it was estimated that the existing water resources, operated by a number of private companies, could provide as much as 63,6 million litres of water daily. It was anticipated that only by 1908 would there be a need for additional sources. Preliminary projection set the population at 280 000 inhabitants.[19] The British authorities were intent on addressing the growing need for water in a consolidated manner.

Finally, relations between the firm of Lewis & Marks and many of the Randlords were not of the best prior to the outbreak of the Anglo Boer War.[20] This company, through its subsidiary the Vereeniging Estates Company, had an almost complete control of the Vaal River at Vereeniging. The company also controlled the local coal deposits. Relations between Lewis & Marks, the British authorities and other influential capitalists, were slow to improve after the war.[21] Only once the captains of industry realised precisely what unique prospects the mining town of Vereeniging offered on the banks of the Vaal River, did a change in attitude take place.[22]

Establishment of the Rand Water Board 1903

One of the major developments after the conclusion of the Anglo Boer War was the establishment of the Rand Water Board as a public water supplier in terms of Ordinance No. 32 of 1903.[23] This organisational initiative consolidated the commercial service providers of Johannesburg under the umbrella of a statutory body, which acted in the interest of a number of local authorities on the Witwatersrand and the economically powerful mining companies. Shortly after its formation the board took over the Johannesburg Waterworks Estate and Exploration Company Limited, the Vierfontein Syndicate and the Braamfontein Water Company.[24] The members of the board represented an influential regional constituency. Ten members represented the Transvaal Chamber of Mines. Five represented the Johannesburg

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19. CAR, TA, GOV112 GEN 244/02. Memorandum: Witwatersrand water supply, W.E. Davidson, 1902.04.28.
20. J.W.N. TEMPELHOFF, "On Laburn's 'mystery' query: A prehistory of the Vaal River as water source of the Witwatersrand (1887-1899), in *Historia*, 45(1), May 2000, p. 107.
21. R. MENDELSOHN, *Sammy Marks: 'The uncrowned king of the Transvaal'* (David Philip, Cape Town, 1991), p. 155.
22. UNION OF SOUTH AFRICA (U. Of SA), SC 2-1919. Report of the select committee on the Rand Mines Power Supply Company, Water Supply (Private) Bil). Minutes of evidence: F.E. Kanthack, 1919.02.17, (Government Printers, Cape Town, 1919), p. 31.
23. M. MCCORMACK, *Origin and history of the Rand Water Board*, pp. 6-7; Anon., *Rand Water Board: Short description of the board's undertaking…*, p. 3
24. ANON., *Rand Water Board: Short description of the board's undertaking …*, p. 4.

municipality. The Witwatersrand towns of Krugersdorp, Boksburg, Germiston, Springs and Roodepoort-Maraisburg each had one representative.[25]

Soon after its establishment the board appointed the London based engineering firm of Middleton, Hunter and Duff to launch an independent investigation for viable water supplies to the Witwatersrand. In the firm's report, published in April 1904, the Vaal River again failed to feature prominently. The major problem now was that the Vaal River, at Standerton, was situated too far (160 km) from Johannesburg. Pumping costs would be high. It was also pointed out that although Vereeniging, for example was only 86km from Johannesburg, the water had to be pumped 400 metres uphill.[26] The experts were concerned about the high concentrations of silt washing down the river during the flooding season. The river was also considered as being too shallow in areas where reservoirs could be built.[27]

Interim measures of water supply to the Witwatersrand

At first the Rand Water Board management operated on the assumption that it would be possible to provide water from the existing sources in and around Johannesburg. The major sources were Zuurbekom, Braamfontein, Doornfontein, Natal Spruit, New Doornfontein and Olifantsfontein.[28] Of these, Zuurbekom, a natural underground reservoir of water, supplying as much as 34,09 million litres of water since 1898, was the major source. It was situated southwest of central Johannesburg in the corner of a catchment area of 468 sq. km.[29]

When the Witwatersrand's daily consumption of water rose to 11,36 million litres in 1905 it was possible to cope with the demand. More boreholes were simply sunk at the Zwartkopjes pumping station in the Klip River.[30] However Zwartkopjes' supply soon started dwindling from 25,2 million litres a day towards the end of the rainy season, to

25. RAND WATER ARCHIVES, Johannesburg (RWA), Report of the Rand Water Board to the Colonial Secretary of the Transvaal for the financial year ended 31st March 1906, p. 3.
26. RWA, Report on the Transvaal-Rand Water supply, with the accompanying plates, Middleton, Hunter and Duff, Civil Engineers, Westminster, London, S.W., London, April 1904, p. 11.
27. *Ibid.*, p. 11.
28. RWA, Report of the Rand Water Board to the Colonial Secretary of the Transvaal for the financial year ended 31st March 1906, p. 29.
29. ANON., *Rand Water Board 1903-1953* (Rand Water Board, Johannesburg, 1953), p. 7.
30. ANON., *Rand Water Board: Short description of the board's undertaking*…, p. 4.

6,23 million litres in the spring and early summer.[31] In a desperate attempt to locate sufficient supplies, no less than 20 shafts and boreholes were sunk into the dolomite formation at Zwartkopjes.[32] It all proved futile.

By 1909 the water situation on the Witwatersrand had changed considerably. The mining companies, after the passing of the Further Powers Act of 1909, required more water from the Rand Water Board. They had been obliged by the act to pay a proportionate share of the fixed charges of the Rand Water Board's stock. This was irrespective of the quantity of water they used. The companies now found it convenient to take advantage of the water supply service of the Rand Water Board. Consequently the water consumption rose substantially.[33] A severe drought in 1910[34] prompted the board to take steps in locating more reliable water supplies beyond the confines of its existing water catchment areas.[35]

An even more significant development was the post-war growth in demand for electrical power. The mechanisation of the mining industry increasingly placed a high premium on the provision of cheap electrical power. Large accessible quantities of coal and water were a prerequisite.[36] In view of the fact that private enterprise was firmly in control of the demand for power, a number of strategic developments took place in order to create the necessary dynamics for development. The plans directly affected the Vaal River. 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.[37] The power station was built on the banks of the Vaal River in 1912, in close proximity of the Cornelia Colliery at Viljoensdrift.[38] The electricity was transmitted to the Witwatersrand.[39] In time to come this development was to have an impact on the Rand Water Board's

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31. *Ibid.*, p. 8.
32. M. MCCORMACK, *Origin and history of the Rand Water Board*, p. 33.
33. RWA 450/2. Catchment area scheme. Report (confidential) by the water supply sub-committee to the committee of the whole board, 1913.09.16, p. 1.
34. M. MCCORMACK, *Origin and history of the Rand Water Board*, p. 30.
35. ANON., *Rand Water Board: Short description of the board's undertaking…*, p. 8.
36. TRANSVAAL COLONIAL GOVERNMENT (TG) 13 – 1910. Report of the Power Companies Commission 1901, (Government Printing and stationary office, Pretoria, 1910), p. 24.
37. *Ibid.*, p. 11.
38. R.L. LEIGH, *Vereeniging South Africa* (Courier-Gazette Publishers (Pty) Ltd, Johannesburg, 1968), p. 61.
39. *Ibid.*, p. 67.

activities in respect of developing the river as a source of water for the Witwatersrand.

The search for a suitable catchment area

In an effort to meet the growing demand for water at a time when the supply was diminishing the Rand Water Board instructed its chief engineer, Mr. William Ingham, to launch an investigation to find the most suitable water catchments within a radius of 80 km of Johannesburg. He had to look into the possibility of developing an "entirely new scheme of supply".[40] In the press the matter was described as "urgent". The mining sector was growing at a pace; the development of the railway network on the Witwatersrand was a priority of the government; and since 1903 the number of municipal authorities increased considerably on the Witwatersrand in order to cope with the demand of a rapidly growing urban society.[41] All these developments relied on the availability of water.

Especially Johannesburg's city fathers were more than aware that the existing local supply would not be able to cope with the growing demand for water. They were concerned about the prevailing drought conditions on the Witwatersrand.[42] Irate ratepayers of the city at the time expressed a strong desire for a sustained and reliable water supply for what was rapidly becoming the fastest growing urban centre in Southern Africa.[43]

William Ingham's investigation was intensive. At one point in time there were as many as 21 proposals for schemes with a combined value of £25,3 million.[44] The most important were Kuilfontein on the Zuikerboschrand River in the Heidelberg District, the Mount Arabel Scheme, situated on a site just below the confluence of the Zuikerboschrand River and the Blesbokspruit the Koppiesfontein scheme 75,2 km upstream from Vereeniging in the Vaal River; and the Lindeque's Drift Scheme, below Vereeniging in the Vaal River.[45]

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40. RWA 450. Catchment area scheme. Report (confidential) by the water supply sub-committee to the committee of the whole board, 1913.09.16, p. 2.
41. ANON., "Rand water problem" in *Rand Daily Mail*, 1912.09.19.
42. ANON., "Water supply: To-day's meeting of the Council" in *The Star*, 1912.11.18.
43. ANON., "The water problem" in *Rand Daily Mail*, 1912.09.27.
44. RWA 450/8. Vaal River Scheme. General reports and estimates. From Nov. 1921 to Dec. 1922. W. Ingham and J.C. Hawkins, "Paper on the Vaal River scheme (Argus Printing, Johannesburg(?), 1921), p. 4.
45. RWA, 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. Confidential report by the water supply sub-committee to the committee of the whole Board, 1913.09.16, pp. 3-4.

By 1913 it was apparent that the proposed Vaal River scheme (and particularly the Lindeque's Drift Scheme) offered the best prospects. In a report submitted to a special committee of the board's engineer, W. Ingham, explained in February 1913:

The Lindequees falls site is situated about 24 miles below Vereeniging, and, by building a dam 30 feet high at the Fall, the water would be backed up the river to Engelbrecht's Drift above Vereeniging for a distance of 44 miles, and a pumping station could be erected at Vereeniging in the neighbourhood of the collieries.[46]

The catchment area the dam could serve was estimated to be in the vicinity of 31 600 sq. km. Officials of the department of irrigation calculated the scheme could yield as much as 1,9 million litres of water daily.[47] The riparian landowners posed a major problem. They could only accommodate the water scheme as long as their land on the banks of the river was not swallowed up.[48] Land along the river was sought after for farming purposes. Consequently it was at first suggested that only a 10 metre high wall be constructed to contain the required volume of water.[49] Meanwhile, 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 development operation of Lewis & Marks, offered the Rand Water Board a number of valuable facilities. This included: land free of charge for pumping sites, a cheap supply of coal and also the free grant of any company land necessary to fill the proposed Barrage area.[50] For the firm of Lewis & Marks the development of the Barrage implied that their investments in land since 1878 along the Vaal River would start paying dividends.

The proposed Vaal River scheme was approved at a special meeting of the Rand Water Board on 26 September 1913.[51] Acting on the proposals of a special sub-committee report submitted ten days earlier,[52] the board agreed to the construction of a storage facility at

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46. 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.
47. *Ibid.,* p. 19.
48. *Ibid.,* p. 21.
49. *Ibid.,* p. 22.
50. RWA Minutes of the Rand Water Board (Hard copy minutes) 182nd – 192 meeting. Minutes 184th meeting 1913.06.26, p. 221.
51. RWA 450/2. Minutes special meeting, 1913.09.26, p. 95.
52. RWA 450/2. Report by the water supply sub-committee to the committee of the whole board, 1913.09.16.

Lindeque's Drift. In the initial plans, accepted in 1914 with the passing of Act No. 18 of 1914, it was estimated the total cost of the project would not exceed £1 250 000.[53] The anticipated daily consumption of water from the Vaal River Scheme was set at 40,5 million litres, with a maximum of 80 million litres at the Barrage site.[54]

The plans were soon subject to change. As a result of the increased demand the board in 1915 decided to further develop the potential for the storage of temporary water supplies. In March 1916 the board approved a recommendation to increase the capacity of the Vaal River Scheme by 22,7 million litres per day. An additional sum of £758 000 was earmarked for this development.[55] 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.[56]

Responses to the Vaal River Scheme

The decision for the construction of the Barrage on the Vaal River had a number of responses in the regional community. Urban centres along the river had a vested interest in what was happening to the river. The greatest urban beneficiary of the development of the Vaal River Scheme was Vereeniging. This coal mining town which had a population of 2 000 people in 1911, by 1921 had a population of 5 443 residents.[57] The proposed water scheme directly stimulated local commerce, industrial development, farming operations and urban development.[58] In 1917 whilst the Barrage was still under construction, the Pretoria newspaper, *De Volkstem,* informed its readers on the

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53. 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.

54. 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.

55. *Ibid.*

56. *See* ANON., *Rand Water Board: Short description of the board's undertaking…,* pp. 23-4.

57. P.J.J. PRINSLOO, Die geskiedenis van Vereeniging (Research Institute for Vaal Triangle History, Vanderbijlpark, 1992), pp. 64-5.

58. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Newspaper clipping. Anon., " 'An historic occasion': Vaal River Scheme: Education value of the work" in The Rand Daily Mail, 1916.06.09;.M. Willemse, Die vestiging en uitbouing van munisipale bestuur en voorstedelike ontwikkeling in Vereeniging tot 1992 (MA, PUCHO, 1999), pp. 73-4, 97; C.W. Guest, Die ontwikkelingsgeskiedenis van die Unie-Staalkorporasie van Suid-Afrika (USKO), 1911-1996 (MA, PUCHO, 1999), p. 52.

developments taking place in Vereeniging. It was considered to be an outstanding strategic urban hub in the region. The important north-south railway line crossed the Vaal at Vereeniging. Moreover there was dynamic industrial growth. The local coal mines, a power station, and the operations of the country's first iron and steel factory (Union Steel Corporation) augured well for the future.[59]

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 24km downstream from the Barrage site, were perturbed by the prospects of being excluded from the potential developments. 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.[60]

Rand Water Board Secretary, Maj. M. McCormack, could only reply that there were no plans to build a dam at Vereeniging.[61]

Further downstream there were concerns about the Vaal River's water coming declining. The Kimberley Waterworks Company went so far as to oppose the proposed Rand Water Board Supplementary Water Supply Bill tabled in Parliament in 1914.[62] The company, and other institutions with vested interests in Vaal River water 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.[63] Circumstantial evidence suggests that the development of the Witwatersrand was considered so important that the macro plans of the region simply prevented the Barrage project on the Vaal River from being sidetracked.

Some residents of the Vaal River region realized there were outstanding entrepreneurial opportunities. Small companies and

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59. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Newspaper clipping. Staff reporter, "De dam voor die W.W. Rand: Rechten van oevereigenaars"in De Volkstem 1917.09.17.

60. 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.

61. 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.

62. 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.

63. 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.

individuals, both in Vereeniging and Potchefstroom, offered their services as transport riders and forwarding agents, long before construction work started at the Barrage.[64] Especially local farmers were quick to seek opportunities. Mr. M.G. Christie, of the farm Vlakfontein on the banks of the river, for example, made a somewhat ambiguous proposal that if the river was to be dammed up on his farm, he would be prepared to do transport riding with wagon and oxen.[65] Considering the fact that no less than 21 000 tons of goods were transported between Vereeniging and the Barrage site in the period 1916-23,[66] Christie's proposal made a lot of practical business sense.

The initial response to the Vaal River scheme was most marked in the building industry. 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, Mr. W. Ingham. The engineer had earlier proposed to his board that the construction project should be conducted internally.[67] The strongest argument in favour of his suggestion was that it was the prevailing trend elsewhere in South Africa and England at the time.[68]

Ultimately the construction scheme promoted industrial growth and development. In January 1918, as a result 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 with the intention of starting up a factory which would produce pipes to suit the

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64. RWA 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. S.S. Scorgie of Pienaar & Gericke, Potchefstroom – Secretary Rand Water Board, 1914.03.18; RWA, 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. F. Oosterlaak, Potchefstroom – Rand Water Board, Johannesburg, 1914.03.30; RWA, 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. Acting Secretary Rand Water Board, Johannesburg – Messrs. W. Young Cutting, Vereeniging 1914.03.11.

65. 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.

66. ANON., *Rand Water Board: Short description of the board's undertaking* …, p. 13.

67. RWA 450/2. Water supply Catchment Svcheme. Lindeque's Scheme 1. General Correspondence from 20 September 1913 to June 1914. J. Thompson, Johannesburg – Secretary Rand Water Board, Johannesburg, 1914.06.02.

68. RWA 450/2. Water supply Catchment Svcheme. 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.

requirements of the board.[69] The construction work also brought about a boom in the market for building material. In total 16 480 cubic metres of sand, and 9 900 tonnes of cement were used to construct the Barrage.[70] During the war years there were shortages,[71] 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 Mr. George Kent was instructed by the board's lawyer, W.E. Hudson, 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 morgen (0.86 hectare).[72] In his diary Mr. 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[73] and property speculators,[74] his dealings with the farmers,[75] and how he had to make work of befriending local land owners,[76] 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.[77]

Irresponsible speculation in land became the order of the day. Engineer William Ingham was perturbed by this state of affairs. In March 1913 he made a vitriolic attack on

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69. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Ale. Aiken & Carter, Johannesburg – W. Ingham, Johannesburg, 1918.01.09. Contained in Chief Engineer's Report rto the Works Committeee, No. 1421, 1918.01.16.
70. ANON., *Rand Water Board: Short description of the board's undertaking…*, p. 13.
71. 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*, (Johannesburg 1979), p. 13.
72. RWA 451/1. G. Kent, Johannesburg – W.E. Hudson, Johannesburg, 1913.02.13, p. 1.
73. RWA 451/1. G. Kent's notes re obtaining options on Vaal River farms, p. 1. 14th January 1913.
74. *Ibid.*, p. 1. 14th January 1913.
75. *Ibid.*, p. 1. 15th January 1913.
76. *Ibid.*, p. 2. 15th January 1913.
77. *Ibid.*, p. 8. 23rd January 1913.

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.[78]

He felt the board could, if and when it was necessary, expropriate land outright. It was 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".[79] 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 104km on both sides of the Vaal River above and below Vereeniging.[80] 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 some transactions still had to be finalised before the Barrage area could be filled with water.

Pollution and environmental change

In the twentieth century the interpretation of pollution as an environmental phenomenon was subject to substantial change. In the case of the Vaal River pollution took on different guises. From the outset the Rand Water Board presented itself in the public sphere as an environmentally friendly undertaking. Consequently there was in society at large a sense of trust in the board to secure clean water and a clean environment. The pressures of industrial and urban development still did not pose a direct threat.

At first the board was vague on the issue of pollution. It was only necessary to make sure to ensure that pollution did not threaten the board's water supply.[81] This soon changed. In the 1914 law that spelt

78. 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.

79. *Ibid.*, p. 32.

80. RWA, Minutes Rand Water Board Meetings (Hard copy) 182nd – 192 meeting. Minutes 184th meeting 1914.06.26, p. 219.

81. *See* The Rand Water Board Status 1903 to 1909, (Adlington & Co., Johannesburg, 1909), p. 13. The first mention of pollution occurs in Section 19 of 48 of 1904.

out the proposed development of the Vaal River scheme the first steps were taken to legally pin down the potential threat of pollution.[82]

The board however found itself in an ambiguous position. It had the task of supplying both domestic and industrial consumers with water. Both groups were represented on the board. Domestic consumers required an unlimited supply of good drinking water. In the first phases of development it was easy for the board to comply. Preference was given to the exploitation of pristine sources of potable water (such as underground supplies).[83] With the deterioration of these sources other alternatives had to be sought. The problem was exacerbated by the industrial sector which proportionately required a larger supply of water in order for development and progress to take place. Ultimately the price for growth could be measured in the steps that had to be taken to secure clean water.

The recent history bore testimony to the sense if imminent danger. In the 1890's experts saw the Vaal River as an unpolluted source of water. The river was situated at a considerable distance from the Witwatersrand.[84] It also regularly came down in flood and could consequently replenish itself with "clean" water. At the turn of the century there were fears that the pristine state of the river was under threat. Earlier the river had been polluted by cyanide solutions remaining in the tailing dumps on the Witwatersrand.[85] These claims were disputed,[86] but the rapid rate of development of the Witwatersrand soon put an end to the optimism.

In 1910 there were reports that certain tributaries of the Vaal River were polluted. It was directly related to urban sanitary pollution. In a report of February 1914 William Ingham referred to the problems in the Zuikerboschrand River – one of the tributaries of the river was the Blesbokspruit. A number of burgeoning towns such as Benoni, Springs and Heidelberg were situated on the banks of the Blesbokspruit. In the face of the threat Ingham recommended that the water of the Vaal

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82. See Section 18 "Penalty for pollution of water" in *The Rand Water Board supplementary water supply (Private) Act, No. 18 of 1914*, in J.M. Murray (Editorial chairman), The Union Statutes 1910-1947 Classified and annotated reprint, Vol. 12, (Government Printers, Pretoria, 1952), p. 501.

83. T.G. (Unnumbered) Report of the Witwatersrand Water Supply Commission, 1901-1902. With minutes of proceedings and minutes of evidence. Minutes of evidence by Engineer W. Wilcocks, Johannesburg, 1901.11.04, p. 3.

84. CAR, TA, ARCHIVE OF THE STATE SECRETARY (SS) 4383, p. 48. R7961/94. Rapport in sake watervoorziening – Johannesburg. (Commissie van 1895), Augustus 1895.

85. T.G. (Unnumbered) Report of the Witwatersrand Water Supply Commission, 1901-1902. With minutes of proceedings and minutes of evidence. (Government Printing and stationary works, Pretoria, 1902). Minutes of evidence, Richard Lewis Cousins 1901.12.16, p. 47.

86. *Ibid.*, p. 47.

River be sterilized before it was delivered to the board's consumers.[87] Comprehensive measures were also introduced to ensure that the threat of pollution be addressed long before the Vaal River Scheme came into production. In May 1914 the board considered the compilation of an inventory of the

existing buildings, kraals or other structures in the vicinity of the reservoir, which might cause contamination of the water….[88]

Plans were also set in motion to conduct a sanitary survey over the whole length of the Vaal River and its principal tributaries.[89]

A more important issue than pollution, in the early years, was perceived to be the loss of water from the Vaal River. This was ultimately closely linked up to the power station at Vereeniging. In June 1914 Mr. F.E. Kanthack, the director of irrigation of the Union, informed the board that investigations conducted by his department had brought new facts to light in respect of the flow of the Vaal River. He was of the opinion that it would be against the interests of the riparian owners on the river if the board did not take into consideration a site further upstream that he had originally proposed for the construction of a dam in the Vaal River.[90] Intense negotiations followed with the Rand Water Board secretary, Major M. McCormack, visiting Cape Town and holding talks with the director of irrigation. Kanthack was sceptical of some of the findings of Mr. A. Karlson, the government's hydrographical surveyor in June 1914. The point at issue was that there was a serious loss of water between Engelbrecht's Drift and Lindeque's Drift.[91] He did however indicate to McCormack that he would act in the interests of the board when he held talks with the government on the matter.[92]

It transpired, according to a report in the press, that one of the major culprits was the Victoria Water Falls Power station at Vereeniging. In July 1914 the power station used a large quantity of water in the

87. 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. 10.

88. RWA, 450/2 Water supply Catchment scheme. Lindequees (sic) scheme. 1. General correspondence, from 20 September 1913 to June 1914. Extract from minutes Board meeting in Council 1914.05.08 in Chief engineer's report to the Works Committee, No. 1020, 1914.05.12.

89. *Ibid.*

90. RWA 450/3, Vaal River scheme. General correspondence July 1914 to Jany 1916. H. Kanthack, Cape Town – Chief Engineer, Johannesburg, 1914.06.30.

91. RWA 450/3, Vaal River scheme. General correspondence July 1914 to Jany 1916. Minutes of special meeting of the Works Committee, Corner House Board Room, 1914.07.08, p. 2.

92. RWA 450/3, Vaal River scheme. General correspondence July 1914 to Jany 1916. Telegram: M. McCormack, Passenger on the 6 up – Water Board, Johannesburg 1914.07.04.

process of generating as much as 60 000 horsepower to run operations. About 9 to 18 million litres of water passed through the condensers of the power station per hour. The newspaper pointed to the problem:

This, in the dry season, is a large portion of the total flow of the river. It comes out of the condensing plant much hotter than it goes in. The rise in temperature may be as much as 20 degrees or more, and this is enough to increase the river's evaporation loss very materially.[93]

The threat of environmental degradation became apparent. In a test conducted by board member J.W. O'Hara, and engineer W. Ingham on 17 September 1914, it was established that the water in the mid-stream, immediately above the weir of Lewis & Marks, and about 400 metres below the outlet of the power station at Vereeniging the temperature of the water was 31,6° Celsius at 14h00 in the afternoon.[94] Ingham was of the opinion that the high temperature of the water in the Vaal River would be something of the past once the Barrage had been built. He explained to the board that the effect of the discharge from the condensers of the power company on the temperature of the water would be considerably lower when the condensing water mixed with the greatly increased amount of storage water in the river.[95]

In 1919 the issue in terms of water loss was resolved. The Rand Water Board and the power supply company agreed that the power station could annually circulate 1 363 million litres of water in the river.[96] The environmental degradation of the river's ecology was however not a matter for discussion. From the evidence presented to the committee it was evident the power station did affect the temperature of the river's water at Vereeniging. It seems as if this factor was neutralised by the argument that once the river was flooded at the Barrage, the problem would diminish. Up to that point in time the power station only relied on a small weir constructed in 1905 at Vereeniging by Mr. T.N. Leslie.[97] Once the Vaal River scheme was in full operation the problem did indeed diminish. Later this particular threat of pollution was to come under more intensive scrutiny and the subject of greater scrutiny. Overall pollution did not pose a very distinct threat to the

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93. Special correspondent, "Rand water scheme: Grave doubts of its success" in Rand Daily Mail, 1914.07.21.

94. RWA 450/3, Vaal River scheme. General correspondence July 1914 to Jany 1916. Minutes of the Board in committee, Corner House Boardroom, 1914.09.18, p. 2.

95. RWA 450/3, Vaal River scheme. General correspondence July 1914 to Jany 1916. Minutes of the Board in committee, Corner House Boardroom, 1914.09.18, p. 4.

96. U. OF SA, SC 2-1919. Report of the select committee on the Rand Mines Power Supply Company, Water Supply (Private) Bil). Minutes of evidence: F.E. Kanthack, 1919.02.17, (Government Printers, Cape Town, 1919).

97. R.L. LEIGH, *Vereeniging South Africa*, pp. 59, 61

Vaal River in the early decades of the twentieth century. It was only in 1943 that the first formal reports hinted at a "problem in its infancy".[98]

The physical landscape along the Vaal River was influenced significantly by with the rising level of the river once a start was made with the damming process. It had a marked effect on the changing natural landscape.

Prior to the construction of the Barrage, it was estimated that the water level of the river would rise by 3,3 metres.[99] Early photographs suggest that the level of the river rose substantially more than was forecast originally. This process affected soil erosion in certain places along the banks of the river. It also had an impact on farming operations. In many cases the soil on the old banks of the river, had a high clay content. Farmers preferred conducting planting operations in more sandy soil. Consequently, once sufficient water had flowed into the catchment area, farming operations were conducted on more favourable lands with a substantial supply of water at hand.

At the start of the twentieth century Vereeniging was synonymous with "a summer resort on the Vaal River … (with) good boating & fishing".[100] The town as a result of its river environment was a favourite tourist destination for residents of the Witwatersrand in search of a water rich environment suitable for boating[101] and even exotic hunting conditions.[102] The completion of the Vaal River scheme enhanced the tourist potential of the region. In the period after 1923, as the prospects for an increased water supply improved, strategic choices had to be made. The river in the vicinity of Vereeniging could either be developed for tourism or industrial activity. Creating a balance between the two was to prove problematical in years to come.

The construction of the Barrage 1916-1923

The practical value of the Vaal River for society was enhanced with the development of the water scheme. From an environmental

98. The report was complied by J.P. Leslie. *See* R.J. Laburn, "Problems resulting from the discharge of sewage effluents and industrial effluents from the Witwatersrand into the Vaal River Barrage (Reprint of a paper delivered at a symposium of the Institute of Water Pollution Control, East London May 1968), p. 7.

99. RWA 450(b) Lindequesdrift Scheme. General correspondence, from June 1910 to September 1913. Chief Engineer's report to the special sub-committee re catchment area scheme, No. 893, 1912.12.28, p. 1.

100 . ANON., *The general directory of South Africa for 1909* (Dennis Edwards and Co, Cape Town, n.d.), p. 950.

101 . RWA 452/1. Minutes of a meeting of the Vaal River joint committee, Johannesburg, 1917.12.04.

102 . R.L. LEIGH, *Vereeniging South Africa* (Courier-Gazette, (Pty) Ltd, Johannesburg, 1968), p. 117.

perspective it would today be possible to criticise many aspects of the project. Overall though, it proved to be a boon at a time when the industrial and financial development of the Witwatersrand reached a peak. The Barrage, built in the years 1916-23, is a symbol of the Vaal Rivers role in the process.

In many respects the Barrage was part of a novel and pioneering endeavour of farsighted engineers who were cognisant of the leisure and aesthetic significance of the river. It was one of the most ambitious water projects of its kind in South Africa at the start of the twentieth century.[103] 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 engineering technology.[104] Leading British engineering firms were contracted to supply the necessary mechanical equipment to be used for the Barrage.

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.[105] The scheme was also delayed by the proceedings of an extraordinary Water Court, which only gave its judgment on 19 May 1916.[106] Once work could be resumed there were loans to raise to finance the construction work.[107] When all things were in place the Rand Water Board, on 8 June 1916, gave its approval for the scheme to go ahead.[108] Work on the site started in the same month.[109]

The Barrage site 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.[110] The plan was

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103. R. PRINS (Compiler), *Rand Water Board: 60 years of meeting a demand* (Rand Water Board, Johannesburg, 1965), p. 16.

104. R.J. LABURN, *The Rand Water Board 75 1903-1978: A treatise on the Rand Water Board with specifric reference to its responisibilities achievements and policies during 75 years of operation*, p. 13.

105. ANON., *Rand Water Board: Short description of the board's undertaking* …, p. 8.

106. 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.

107. T.A.R. PURCHAS, "From Bucket to Barrage: Evolution of the Rand's water supply" in *Municipal Magazine*, February 1927, p. 14.

108. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Newspaper clipping. Anon., " 'An historic occasion': Vaal River Scheme: Education value of the work" in *Rand Daily Mail*, 1916.06.09.

109. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Newspaper clipping. Staff reporter, "De dam voor die W.W. Rand: Rechten van oevereigenaars"in *De Volkstem*, 1917.09.17.

110. ANON., *Rand Water Board: Short description of the board's undertaking…*, pp. 13, 16.

essentially to dam up the Vaal River over a distance of some 60-70 km. The water would then be extracted at a point well above the site where the major storage source was located. The Barrage was thus 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, to the Barrage.

The Lindeque's Drift area was chosen for a number of reasons.[111] On the site was a solid rock outcrop of amydaloidal-andesite (diabase).[112] The fall of the river – 2,2 metres from Vereeniging to the Barrage[113] – was such that the necessary quantity of water could be impounded with a depth of only 8,1 metres at the barrage.[114] It was in close proximity of the Rietspruit. This stream served as 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 under-developed.

The construction site at the Barrage overnight took on the appearance of a small village. Between 1916 and 1922 an average of 300 people were employed. At one point in time there were as many as 600 people working on the site. Of the 49 white workers about one third were carpenters.[115] When construction work started the Europeans employees were accommodated at a co-operative mess established by the board. Later the mess was dissolved and the majority of men then took up residence with storekeepers and farmers whose businesses were just outside the property of the board.[116] The workers were predominantly accommodated on the Transvaal side of the river.[117] The black workers

111. RWA 450/8. Vaal River Scheme. General reports and estimates. From Nov. 1921 to Dec. 1922. W. Ingham and J.C. Hawkins, "Paper on the Vaal River scheme (Argus Printing, Johannesburg(?), 1921), p. 6.

112. RWA 450b Confidential. Chief Engineer's report to the special sub-committee re catchment area scheme, No. 893, 1912.12.28, p. 4a.; The specific rock type was described as a hard and brittle rock weighing "about 142lbs per cubic foot". See RWA 450/8. Vaal River Scheme. General reports and estimates. From Nov. 1921 to Dec. 1922. W. Ingham and J.C. Hawkins, "Paper on the Vaal River scheme (Argus Printing, Johannesburg(?), 1921), p. 6.

113. RWA 450a Confidential. Report by the water supply sub-committee to the committee of the whole board, 1913.09.16, p. 2.

114. RWA 450/8. Vaal River Scheme. General reports and estimates. From Nov. 1921 to Dec. 1922. W. Ingham and J.C. Hawkins, "Paper on the Vaal River scheme", (Argus Printing, Johannesburg(?), 1921), p. 6.

115. RWA 450/8. Vaal River Scheme. General reports and estimates. From Nov. 1921 to Dec. 1922. W. Ingham and J.C. Hawkins, "Paper on the Vaal River scheme …, p. 14.

116. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Acting Secretary of the Rand Water Board – Messrs Webber, Wentzel, Solomon & Friel, Johannesburg, 1918.04.09.

117. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Newspaper clipping. Staff reporter, "De dam voor die W.W. Rand: Rechten van oevereigenaars"in *De Volkstem*, 1917.09.17.

on the construction site were housed in a compound with their own cooking house.[118] Most were former mine workers.[119]

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.[120] In December a Basuto chief by the name of Moshesh had a discussion with the resident engineer, Mr. 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 however hesitant to agree.[121] By June 1917, at the end of a good farming season, there were once again labour shortages. Plans were made to recruit workers from Umzimkulu, Klerksdorp and Herschel.[122] The management even urged the workers on site to write letters to their families at home asking the men to report for duty on the construction site.[123]

Towards the end of World War 1 in 1918 activities on the site increased substantially as returned war veterans joined the workforce.[124] There were at one point in time indications of proto-urban development in the wake of the building boom on the river. This was evident in the local educational demand. At the end of November 1916 the resident engineer reported there were six children of school going age on the construction site. They attended school in the Free State, crossing the river by boat daily. The nearest school on the Transvaal side was almost 9km from the Barrage. It was estimated that ultimately there would be 19 children of construction workers. The population of local farming had about 15 children. This seemed to justify the construction of a school at the construction site.[125] The building was completed on 24 July 1917 and one Miss. Tyrer started teaching 22 children.[126] Soon a school board was appointed.[127] Population fluctuations, as a result of limited job opportunities

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118. RWA 450/4 Vaal River Scheme. General Reports, correspondence, etc., from Jany 1916 to March 1919. Newspaper clipping. The Cherub, "The Cherub visits the Vaal River" in *Sunday Times*, 1916.10.01.

119. *Ibid.*

120. RWA 511. Vaal River Scheme – Monthly progress reports from April 1917 to June 1919. Resident engineer's report to the Chief Engineer I, 1916.12.01, p. 6.

121. *Ibid.*, Resident engineer's report to the Chief Engineer 2, 1917.01.05, p. 5.

122. *Ibid.*, Resident engineer's report to the Chief Engineer 26, 1919.08.08, p. 1.

123. *Ibid.*, Resident engineer's monthly report to the Chief Engineer 7, 1917.07.03, p. 2.

124. *Ibid.*, Resident engineer's monthly report to the Chief Engineer, 20. 1918.07.03, pp. 1-2.

125. *Ibid.*, Resident engineer's report to the Chief Engineer I, 1916.12.01, pp. 6-7.

126. *Ibid.*, Resident engineer's monthly report to the Chief Engineer 8, 1917.08.08, pp. 4-5.

127. *Ibid.*, p. 5.

affected the school. After the Christmas holiday of 1917 the school did not reopen.[128]

There were few facilities for leisure time. Consequently the workers consumed large amounts of alcohol. In April 1917 the resident engineer, in an effort to control consumption, introduced a scheme for the production of sorghum beer. Workers were provided with beer twice a week.[129] Outside sources of alcohol supply however remained a problem. In May 1917 the compound manager and members of the police systematically searched for illegal beer in a radius of 3,2 km of the site. In the process 2 727 litres of beer were destroyed.[130]

Depression and trauma manifested in a number of ways amongst the workers on site. In July 1918 a black worker simply walked into the river. He drowned and his body was only recovered much later.[131] Diseases also affected the workers. In July 1918 many labourers contracted pneumonia. Those who had previously been on active war duty in East Africa were affected by what now was for them extreme climatic conditions. Malaria relapses were the order of the day.[132] Between August and September 1918 several war veterans on site were sent on leave. Others were taken up in hospital.[133] Spanish influenza, a pandemic, which affected the whole population of South Africa in 1918,[134] also influenced the construction work.[135] By October 1918 diseases were responsible for a drop of 217 workers on the site.[136] Other health problems experienced[137] included food poisoning,[138] and an outbreak of scarlet fever.[139]

Upon completion the Barrage, which spanned the Vaal River over a distance of about 400 metres, was a veritable monument of engineering skill. More than 275 000 cubic metres had been excavated

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128. *Ibid.*, Resident engineer's report to the Chief Engineer 15, 1918.02.04, p. 2.
129. *Ibid.*, Resident engineer's report to the Chief Engineer 5, 1917.05.07, p. 2.
130. *Ibid.*, Resident engineer's report to the Chief Engineer 6, 1917.06.07, p. 2.
131. *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.
132. *Ibid.*, Resident engineer's report to the Chief Engineer 21, 1918.08.08, p. 2.
133. *Ibid.*, Resident engineer's report to the Chief Engineer 24, 1918.10.30, p. 2.
134. B.J. LIEBENBERG and S.B. SPIES (Eds.), *South Africa in the twentieth century* (JL van Schaik Academic, Pretoria, 1993), p. 122.
135. 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.
136. *Ibid.*, Resident engineer's report to the Chief Engineer 25, 1918.11.30, p. 1.
137. *Ibid.*, Resident engineer's report to the Chief Engineer 4, 1917.04.12, p. 2.
138. *Ibid.*, Resident engineer's report to the Chief Engineer 2, 1917.01.05, p. 4.
139. *Ibid.*, Resident engineer's report to the Chief Engineer 15, 1918.02.04, p. 2.

in rock of which 43 000 cubic metres had been cast in concrete.[140] By making use of the Duff Abrams method the steel reinforced concrete structure was strong and capable of withstanding all types of flooding conditions.[141] There were 36 sluice gates measuring "25 feet x 32 feet 6 inches". Each gate weighted 90 tons.[142]

The reward in exchange for a lot of hard work and perseverance amid setbacks under difficult working condition, was a water storage system with a capacity of 61 975 million litres.[143] 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 the governor-general of South Africa, Prince Arthur of Connaught officially opened the scheme.[144] At the time the country was in need of cheer. Politically the Transvaal was still reeling under the social and economic consequences of the 1922 Rand Strike – one of the worst labour uprisings, in the early phases of the country's industrial history. The water scheme was a development that could make the country's people proud of being South African.

Conclusion

The Vaal River Scheme in many respects brought about a tumultuous change in the environment along the Vaal River between the Barrage and Vereeniging in the first quarter of the twentieth century. Without this source the development of the Witwatersrand and the economic progress of South Africa would have taken longer to materialise. The growth of the Rand, created a demand for industrial support in the form of water, coal and electricity. The Vaal River, between Vereeniging and the Barrage played a crucial role in satisfying the need. The Rand Water Board as institution made it possible to supply the infrastructure for a reliable source of water. For the future Vaal Triangle the river would become the silent hard working witness to rapid industrialisation. In time to come the river would serve as a visible reminder of the functional and aesthetic role of water in society.

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140. ANON., *Rand Water Board: Short description of the board's undertaking …*, p. 13.

141. W. INGHAM and J.C. HAWKINS, "Paper on the Vaal River scheme", pp. 8, 11.

142. ANON., *Rand Water Board: Short description of the board's undertaking …*, p. 12.

143. *Ibid.*, p. 13.

144. 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* (Rand Water Board, Johannesburg, 1923).

Johann Tempelhoff

Opsomming

Tyd en die river: waarnemings oor die Vaalrivier as waterbron van die Witwatersrand 1903-24

Die Vaalrivier in Suid-Afrika het in die tydperk 1903-24 ‘n bepaalde proses van verandering ondergaan. Die omgewing tussen Engelbrechts- en Lindequesdrif op die grens tussen die Vrystaat en die Gauntengprovinsie was aan verandering onderhewig nadat die Rand Waterraad in 1903 gestig is en planne in werking gestel is om die Vaalrivierskema te ontwikkel.

In die artikel word verduidelik hoe industriële en stedelike ontwikkeling op die Witwatersrand die vraag na water verhoog het. Teen 1913 was die Vaalrivier prominent in all planne om ‘n volhoubare watervoorraad daar te stel.

Die Vaalrivierskema het voorsiening gemaak vir ‘n groot waterstoringsfasiliteit oor ‘n afstand van 70 km in die rivier. Teen die tyd dat die Barrage (1916-3) voltooi is, was dit duidelik dat die veranderde rivier en sy onmiddellike omgewing ‘n bepalende invloed op die lewenswyse van die streek se landelike en stedelike inwoners gehad het.