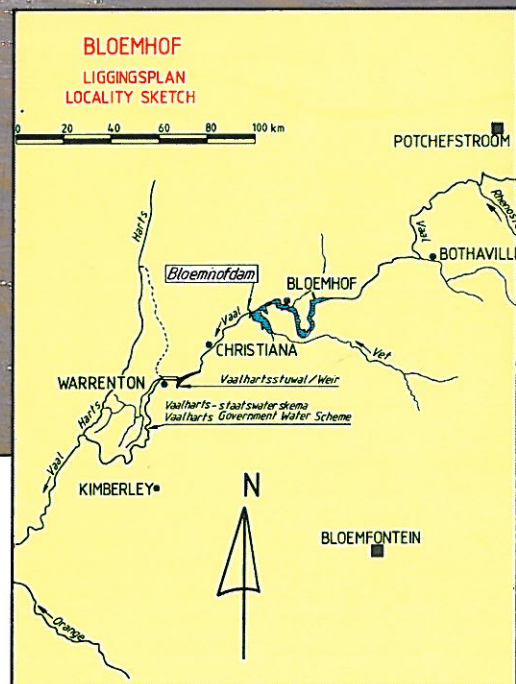
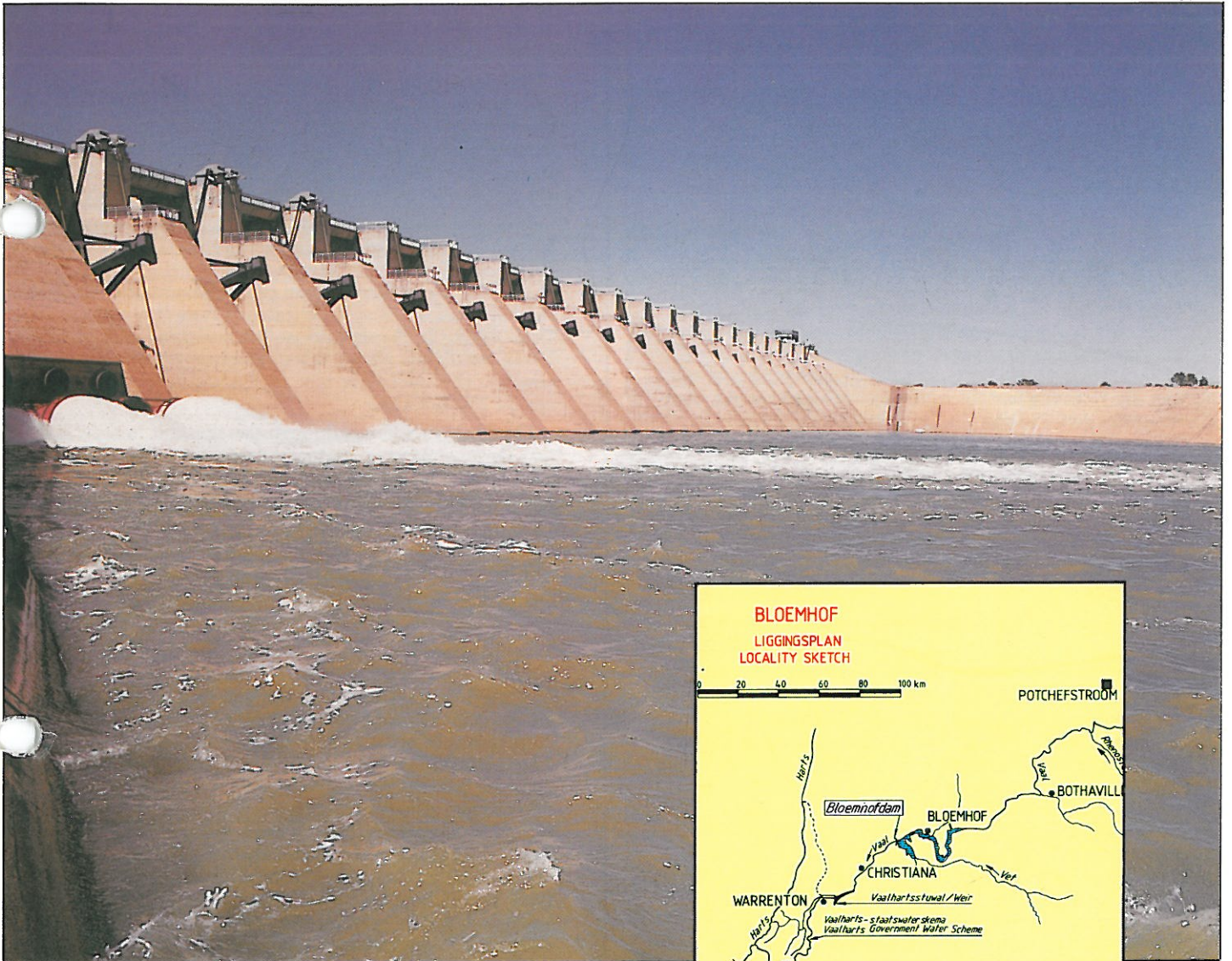


# Bloemhofdam

Benede-Vaalrivier-  
staatswaterskema

# Bloemhof Dam

Lower Vaal River  
Government Water Scheme



DEPARTMENT OF WATER AFFAIRS  
DEPARTEMENT VAN WATERWESE



**D**ie Bloemhofdam, wat aanvanklik as die Oppermansdrifdam bekend gestaan het, is in die laat sestigerjare in die Benede-Vaalrivier, ongeveer 2 km stroom op van die dorp Bloemhof gebou.

Reeds aan die begin van die eeu is ondersoek na 'n moontlike damterrein stroom af van Bloemhof naby Christiana by die Kromellenboogterrein uitgevoer met die oog daarop om die Hartsvlei te besproei. Daar is weer in 1925 omvattende opmetings by Kromellenboog gedoen wat gestaak is toe die Vaaldam gebou is. Die fondamentondersoek is in 1948 voortgesit en in 1963 weer eens hervat. Op daardie tydstip is die terrein by Kromellenboog laat vaar en twee terreine by Oppermansdrif ondersoek voordat daar op die een met die geskikste fundamenteienskappe besluit is waar die Bloemhofdam gebou is.

Die fondamentrots by die damterrein bestaan uit 'n dolerietplaat op die linkeroewer wat in die Karoogesteentes ingedring het tot waar die Dwykaformasie bereik word. Dit word deur 'n laag alluviale grond bedek. Op die regterflank van die dam is die Dwykatilliet verweerd en die alluviale afsettings tussen 7,5 m en 15 m diep.

Die Vaalrivier is 1 210 km lank van sy oorsprong tot by die samevloeiing met die Oranjerivier by Douglas. Stroom af van die Bloemhofdam is die Harts-, Modder- en Rietrivier die belangrikste sytakke van die Vaalrivier. Die Vaalrivier se opvanggebied strek van die Drakensberge in die ooste, oor die deinde heuwelveld van die Hoëveldplato tot in die plat grasvlaktes van die westelike gedeelte van die land. Die Bloemhofdam se opvanggebied beslaan 102 383 km<sup>2</sup>.

Die Vaalrivier is in die somerreeënvalgebied geleë en die reënval verminder geleidelik van oos na wes oor die opvanggebied. Die gemiddelde jaarlikse afloop van die rivier is 4 300 miljoen m<sup>3</sup> wat 8% van die totale afloop in Suid-Afrika verteenwoordig.

## Beskrywing

Die Bloemhofdam is 'n saamgestelde dam wat bestaan uit grondwalle aan weerskante van 'n sentrale oorloopseksie van beton. Aangesien die topografie by die dam plat is, is die damwal baie lank (4 270 m) om in die nodige opgaring te kan voorsien. Die grondwalle word deur 'n betonblad aan die stroomopkant en met vergruisde klip uit die mynhope by Stilfontein aan die stroomafkant teen erosie beskerm. Op die oorloopseksie wat 305 m lank is, is 20 kruinsluise wat 12 m lank en 7 m hoog is, opgerig. Die kruinsluise is hoër as die volvoorraadhoogte van die dam gebou ten einde waterverlies as gevolg van branderaksie te voorkom en om bykomende vloedopgaring te verskaf. Weens die fundamenteietoestand is die betonstruktuur slegs op die doleriet gebou met die gevolg dat dit aan die een kant van die middellyn van die rivier geleë is. Vier rivieruitlate laat water vir stroomafgebruikers los. 'n Skort wat 61 m stroom af in die rivier strek, beskerm die rivierbedding teen erosie. Die dam het 'n netto-voorraadvermoë van 1 269 miljoen m<sup>3</sup>. 'n Groot stilbak is stroom af van die vloedorloope gebou om die energie van die vloedwater wat oorloop, te demp.

Tydens konstruksie is probleme ondervind weens die terugbreking van die verweerde fondamentrots. As gevolg daarvan moes die fundamente tot 20 m diep en die skort groter gemaak word as wat aanvanklik beplan is. Daar is vier miljoen m<sup>3</sup> grond tydens die konstruksie van die dam verskuif.

**T**he Bloemhof Dam, initially known as the Oppermansdrif Dam, was built on the Lower Vaal River during the late sixties and is situated approximately 2 km upstream of Bloemhof.

As early as the beginning of the century investigations were made into a possible dam site at the Kromellenboog site downstream of Bloemhof near Christiana with the irrigation of the Harts Valley in view. In 1925 further extensive surveys were made at Kromellenboog that came to a halt with the building of the Vaal Dam. Foundation investigations were continued in 1948 and resumed once more in 1963. The site at Kromellenboog was abandoned at this point and two sites were investigated at Oppermansdrif before deciding on the one with the most suitable foundation characteristics where the Bloemhof Dam is now situated.

The foundation rock underlying the dam site consists of a dolerite sill on the left bank which is intrusive in Karoo sediments to where the Dwyka formation is reached and is covered by a layer of alluvial soil. The Dwyka tillite on the right bank is weathered and the alluvial deposits are between 7,5 m and 15 m deep.

From its source to the confluence with the Orange River at Douglas, the Vaal River traverses 1 210 km. The Harts, Modder and Riet Rivers are the major tributaries of the Vaal River downstream of the Bloemhof Dam. The catchment of the Vaal River extends from the Drakensberg in the east across the undulating Highveld to the even grass plains of the western part of the country. The catchment area of the Bloemhof Dam covers 102 383 km<sup>2</sup>.

The Vaal River flows through the summer rainfall area and the precipitation gradually decreases from east to west across the catchment. The average annual runoff of the river is 4 300 million m<sup>3</sup> and represents 8% of the total runoff in South Africa.

## Description

The Bloemhof Dam is a composite dam comprising earth bankments to either side of a central concrete spillway section. Due to the flat topography of the area, an exceptionally long embankment (4 270 m) had to be constructed in order to provide for sufficient storage. The earth bankments are protected from erosion by a concrete slab on the upstream side and on the downstream side by crushed stone taken from mine dumps at Stilfontein. Twenty crest gates each 12 m long and 7 m high were erected on the spillway section which is 305 m long. The crest gates were built higher than the full supply level of the dam in order to prevent water loss due to wave action and to make provision for additional flood-control storage. Due to the foundation conditions, the concrete structure was built exclusively on the dolerite with the result that it is situated to the one side of the centre line of the river. Water for downstream users is released through four river outlets. The river bed is protected from erosion by an apron that extends 61 m downstream in the river. The dam has a net storage capacity of 1 269 million m<sup>3</sup>. A large stilling pond was constructed downstream of the flood spillways in order to attenuate the energy generated by overflowing flood water.

Difficulties were experienced during construction because of the overbreaking of the weathered foundation stone and as a result foundations had to be excavated to a depth of 20 m and the apron had to be made larger than originally planned. Four million m<sup>3</sup> of earth was moved during the construction of the dam.

## Doel

Die Bloemhofdam is een van 13 damme in die Vaalrivieropvanggebied en vorm dus deel van die Vaalrivierstelsel. Daar is ook 'n hele aantal ander damme deur middel van wateroordragkemas soos die Usutu-Vaal- en die Tugela-Vaal-staatswaterskema aan die stelsel gekoppel. In die toekoms sal die Lesotho-Hoogland-waterprojek, en die Slangrivier-staatswaterskema in 'n mindere mate, die Vaalrivierstelsel se lewering aansienlik verhoog.

Die Vaalrivierstelsel is die belangrikste watervoorsieningstelsel in Suid-Afrika omrede dit in die ekonomies-aktiefste en digbevolkte deel van die land geleë is. Weens die belangrike rol wat die Vaalrivierstelsel in die volkshuishouding speel, word die stelsel as 'n eenheid beplan en bestuur.

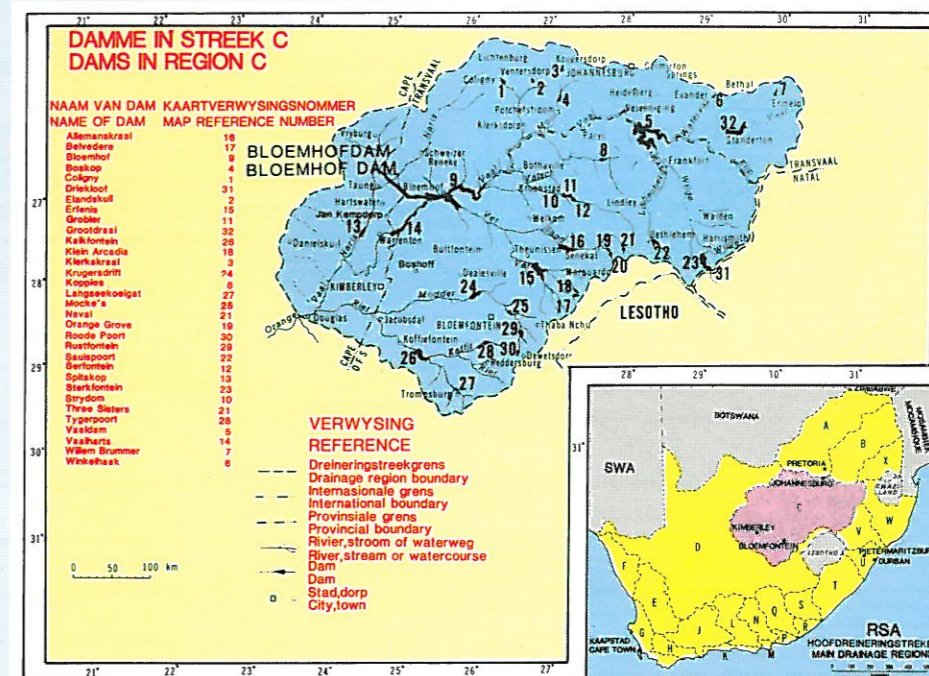
Die Bloemhofdam is gebou om die afloop wat uit die opvanggebied onderkant die Vaaldam afkomstig is, op te gaar om in die gebruikers in die Benede-Vaalriviergebied se behoeftes te voorsien. Die dam voorsien water vir huishoudelike en nywerheidsgebruik aan plaaslike munisipaliteite en besproeiingswater aan oewereindomme waar ongeveer 17 000 ha ingelys is. Besproeiingswater word ook aan die Vaalhartsstuwal wat 97 km stroom af van die dam geleë is, voorsien. Die stuwal lewer water aan die Vaalharts-staatswaterskema en die Taung-besproeiingsgebied waar 'n totaal van ongeveer 37 000 ha besproei word. Die Vaalharts-staatswaterskema is die grootste besproeiingskema in die land en gevolglik die grootste enkele gebruiker van water vanuit die Bloemhofdam.

## Purpose

The Bloemhof Dam is one of 13 dams in the Vaal River catchment and is therefore part of the Vaal River System. A number of other dams are linked to the system by means of water transfer schemes such as the Usutu-Vaal and the Tugela-Vaal Government Water Schemes. In future the Lesotho Highlands Water Project and, to a lesser extent, the Slang River Government Water Scheme will contribute to increasing the yield of the Vaal River System considerably.

The Vaal River System is the major water supply system in South Africa as it is situated in the most economically active and most densely populated part of the country. Because of its important role in the national economy, the Vaal River System is planned and managed as a unitary system.

The Bloemhof Dam was built in order to impound runoff water from the catchment below the Vaal Dam to meet the needs of users in the Lower Vaal River area. The dam supplies water for domestic and industrial use to local municipalities and for irrigation to riparian land of which approximately 17 000 ha has been scheduled. Irrigation water is also supplied to the Vaalharts Weir which is situated 97 km downstream of the dam. The weir supplies water to the Vaalharts Government Water Scheme and the Taung irrigation area, totalling approximately 37 000 ha under irrigation. The Vaalharts Government Water Scheme is the largest irrigation scheme in the country and consequently the largest single user of water from the Bloemhof Dam.



Opgaring in die Bloemhofdam stel die Departement van Waterwese in staat om die Vaalrivier se water in sy geheel beter te benut. Die dam verminder die druk op die waterleweringspotensiaal van die Vaaldam waar die wateraanvraag die hoogste is en verlig die afhanklikheid van die Benede-Vaalriviergebied van die waterbronne van die Bo-Vaalrivier-opvanggebied.

Die bestendige waterlewering uit die Bloemhofdam word op 435 miljoen m<sup>3</sup> per jaar beraam. Die Bloemhofdam sal 90% van die tyd in die waterbehoefte van die Benede-Vaalrivier kan voorsien. Bestaande besproeiing in dié gebied sal nie uitgebrei kan word nie omdat daar nie bykomende water vir die doel uit die

Impoundment in the Bloemhof Dam enables the Department of Water Affairs to utilise water from the Vaal River as a whole to best advantage. The dam alleviates the demands on the water supply potential of the Vaal Dam where the water demand is the highest and lessens the dependency of the Lower Vaal River area on the water resources of the Upper Vaal River Catchment.

The dependable water yield from the Bloemhof Dam is estimated at 435 million m<sup>3</sup> per annum and will be able to meet the water needs of the Lower Vaal River for 90% of the time. It will not be possible to extend existing irrigation in the area as no additional water from

Bloemhofdam beskikbaar is nie.

Afhangende van die stand van die dam en die omvang van 'n vloed, vervul die dam ook 'n vloedbeheerfunksie soos in Maart 1988 die geval was. Ten einde die maksimum vloedabsorpsie te bewerkstellig, is die Bloemhofdam se sluise so lank as moontlik toegehou om vloedskaad laer af, veral by Douglas, te beperk.

## Omgewing

Die gemiddelde sliklading van die rivier word op 0,43% beraam.

Weens die hoë verdamping op die binnelandse plato, word die Vaalrivierstelsel op so 'n wyse bestuur dat verdampingsverliese beperk word. Ten tye van lae vloei en droogte word water vanuit die Vaaldam na die Bloemhofdam losgelaat en word die damvlak laag gehou om verdampingsverliese te verklein.

Weens die Bloemhofdam se ligging stroom af van die hoogsontwikkelde PWV-gebied, vorm gesuiwerde uitvloeielsels wat teruggeplaas word in die Vaalrivier om watervoorrade aan te vul, 'n aansienlike persentasie van die rivier se afloop. Dit, sowel as die hoë verdamping, dra daartoe by dat die Benede-Vaalrivier se water 'n geleidelike styging in die peil van mineralisasie toon. Die Departement van Waterwese het in 1988 'n studie oor die bestuur van die watergehalte in die PWV-gebied uitgebrei om ook die Middel- en Benede-Vaalrivier in te sluit. Die studie het ten doel om die verslegting van die watergehalte in daardie gebiede betyds te stuit en 'n aanvaarbare watergehalte te handhaaf. Versnyding met water uit ander bronne wat van hoë gehalte is, is 'n opsie om in die toekoms die Benede-Vaalrivier se watergehalte te verbeter.

## Algemeen

Die Bloemhofdam is tans die sesde grootste dam in die land.

Die terrein rondom die dam aan weerskante van die rivier is onderskeidelik aan die Transvaalse en Oranje-Vrystaatse Provinsiale Administrasie oorgedra vir die oprigting van ontspanningsgeriewe en bewaring van die fauna en flora.

the Bloemhof Dam is available.

Depending on the water level of the dam and the extent of a flood, the dam also fulfils a flood control function, as was the case in March 1988. In order to effect the maximum flood absorption, the sluice gates of the Bloemhof Dam were kept closed for as long as possible in order to limit flood damage lower down, especially at Douglas.

## Environment

The average silt load in the river is estimated at 0,43%.

Due to the high evaporation rate on the inland plateau, the Vaal River System is managed in such a manner as to limit evaporation losses. During periods of low flow and drought, water is released from the Vaal Dam to the Bloemhof Dam and the water level is kept low in order to minimise loss of water caused by evaporation.

As the Bloemhof Dam is situated downstream of the highly developed PWV area, treated effluents that are returned to the Vaal River to supplement the water supply, form a large percentage of the river's runoff. Together with the high rate of evaporation this contributes to water in the Lower Vaal River showing a gradual increase in mineralisation levels. In 1988 the Department of Water Affairs extended a study into the management of water quality in the PWV area to include the Central and Lower Vaal River. The object of the study is to timeously contain the deterioration of water quality in that area and to maintain an acceptable level of water quality. A possible means of improving the quality of water in the Lower Vaal River in future would be its blending with water from sources of a high quality.

## General

The Bloemhof Dam is at present the sixth largest dam in the country.

The areas surrounding the dam on either side of the river have been transferred to the Transvaal and Orange Free State Provincial Administrations, respectively, for the establishment of recreation facilities and the conservation of the fauna and flora.

## DATA

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| Jaar van voltooiing<br>Year of completion  | 1970   |
| Doel<br>Purpose  | Besproeiing/huishoudelik/nywerheid/vloedbeheer<br>Irrigation/domestic/industrial/flood control                   |
| Rivier<br>River  | Vaal   |
| Naaste dorp en provinsie<br>Nearest town and province                                | Bloemhof, Transvaal  |
| Tipe<br>Type   | Massabeton met grondvulflanke<br>Concrete gravity with earthfill flanks  |
| Bruto opgaarvermoë<br>Gross storage capacity   | 1 269 miljoen/million m <sup>3</sup>   |
| Walhoogte bo laagste fondament<br>Wall height above lowest foundation                | 35,20 m  |
| Kruinlengte<br>Crest length  | 4 270 m  |
| Volume materiaal in damwal<br>Material content of dam wall                           | Beton/Concrete: 0,205 miljoen/million m <sup>3</sup><br>Grondvul/Earthfill: 2,760 miljoen/million m <sup>3</sup> |
| Tipe oorloop<br>Type of spillway   | Kruinsluise (beheerd)<br>Crest gates (controlled)  |
| Oorloopvermoë<br>Spillway capacity   | 14 300 m <sup>3</sup> /s   |
| Oppervlakte van dam by volvoorraadhoogte<br>Surface area of dam at full supply level | 22 270 ha  |
| Eienaar, ontwerp en konstruksie<br>Owner, design and construction                    | Departement van Waterwese<br>Department of Water Affairs   |

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