Sheet 2526

1:500 000 Hydrogeological map series of the Republic of South Africa

JOHANNESBURG

1999

10 0 10 20 30 40 50 60 km

Lambert's conformal conic projection, Standard parallels 20° 40' & 33°30', Central meridian 28°, Spheroid Clarke 1880.

Map Author - H.C. Barnard

GIS Specialist - E. Baran

Cartographer - E. Baran

Assisted by:

Mapping Management Team:

P.Seward, P.S. Meyer, N. Mullin, F. Jonck and A.E. Conley

Editorial Board:

E. Braune, W.R.G. Dryen, Z.M. Dziembowski and F. Coetzee (Consultant)

This map was approved by the Director-General of the Department of Water Affairs and Forestry.

The groundwater occurrence and groundwater quality maps, and the schematic cross-sections, were compiled by H.C. Barnard. The lithology was adapted by H.C. Barnard from 1 : 250 000 scale published Geological map series. Permission from the Council for Geoscience to make use of their information is gratefully acknowledged.

E. Baran was responsible for the compilation of the borehole distribution map. Borehole data were obtained from the National Groundwater Data Base (NGDB). Precipitation and elevation data were obtained from the Computing Centre for Water Research, University of Natal, and compiled by N. Mullin. Information of the Digital Chief Directorate 1:250 000 scale topographical data obtained from the Chief Directorate: Survey and Mapping, Department of Land Affairs and edited by the Department of Water Affairs and Forestry.

Principal groundwater occurrence

Borehole yield class (median l/s) (excluding dry boreholes)

Aquifer type	0.0 - 0.1	0.1 - 0.5	0.5 - 2.0	2.0 - 5.0	> 5.0
Intergranular	*	*	*	*	b1
Fractured	*	b2	b3	b4	b5
Karst	*	c2	c3	c4	c5
Intergranular and fractured	*	d2	d3	d4	d5

Borehole yield boundary

Note: Groundwater occurrence depicts the aquifer type(s) with the highest borehole yield which does not always correlate with surface lithology

Surface lithology

- Inland undifferentiated deposits (aeolian sand)
- Predominantly argillaceous rocks (shale, mudstone and siltstone)
- Predominantly arenaceous rocks (sandstone)
- Argillaceous and arenaceous rocks (approximately equal proportions)
- Predominantly carbonate rocks (dolomite)
- Predominantly rudaceous rocks (conglomerate, grit and breccia)
- Predominantly diamictite (tillite)
- Predominantly pyroclastic rocks (tuff, agglomerate and breccia)
- Ultramafic / mafic intrusive rocks (dolerite, diabase, gabbro, norite, carbonatite, anorthosite and pyroxenite)
- Acid / Intermediate / alkaline intrusive rocks (various granitoids)
- Ultramafic / mafic extrusive rocks (basalt and andesite)
- Acid / intermediate / alkaline extrusive rocks (rhyolite, felsite and quartz porphyry)
- Predominantly meta-argillaceous rocks (slate and hornfels)
- Predominantly meta-arenaceous rocks (quartzite)
- Undifferentiated rocks and various mixed lithologies
- Lithological / stratigraphical boundary
- Fault
- Dolerite, syenite and diabase intruded

Large scale groundwater abstraction

> 10 million m³/a	I	Irrigation	
5 - 10 million m³/a	D	Domestic	
2 - 5 million m³/a	X	Mining	
1 - 2 million m³/a	M	Municipal	
0,1 - 1 million m³/a	Δ	Industrial	

Area of large scale groundwater abstraction: Irrigation, Mining, Industrial

- Spring (> 5 l/s)
- Thermal spring (°C)
- Artesian borehole
- Single or more groundwater level recorder
- Single or more groundwater level monitoring points
- Groundwater quality monitoring points
- Primary drainage region boundary
- Primary / perennial river
- Secondary / perennial river
- Non-perennial river
- Dam
- Subterranean Government Water Control Area
- City / town area
- Town
- National road
- Main road; Inset map: National road
- Inset map: Main road
- Provincial boundary
- Not applicable to this map

Chronostratigraphy

1	2	3	4	5	6
1.8	PHANEROZOIC	Cenozoic	Quaternary	Q	Unnamed (Qz)
65			Tertiary	T	
142		Mesozoic	Cretaceous	K	
205			Jurassic	J	Lebombo G. (Jl); Dolerite (Jd)
248			Triassic	Tr	Clarens F. (Trc); Irrigasie F. (Tr-Tv)
290			Permian	P	Ecca G. (Pe); Dwyka G. (C-Pd)
354		Palaeozoic	Carboniferous	C	
417			Devonian	D	
443			Silurian	S	
495			Ordovician	O	
545			Cambrian	€	
900	PROTEROZOIC	Namibian		N	
2050		Mokolian		M	Pienaars Rivier C. (Mpk); Rhenosterrus C. (Mr); Kroddrivier C. (Mkr); Nooitgedacht C. (Mno); Tweerivier C. (Mtw); Waterberg G. (Mwa); Waterberg G. (Mwg)
2650		Vaalian		V	Dullstroom F. (Vdl); Loskop G. (Mlo); Daspoort G. (Mda); Dwarsberg Gneiss G. (Mdg)
3100	ARCHAEOZOIC	Randian		R	Rustenburg Layered S. (Vr); Rashoop Granophyre S. (Vr); Bushveld Complex (Vb); Rooiberg F. (Vbr); Diabase (N-Zd); Pretoria G. (Vp); Crocodile River Fogafront (Vmc); Chuniespoort G. (Vm); Black Reef F. (Vmb); Timeball Hill F. (Vmt); Allanridge F. (N-Va); Bothaville F. (N-Vba)
		Swazian		Z	Rietfontein G. (Rg); Klipheuwel G. (Rk); Central Rand G. (Rc); West Rand G. (Rw); Dominion G. (Rd)
					Hallway House Granite (Zhg); Johannesburg Granite (Zjg); Unnamed Granitoid Rocks (Zz)

1 = Million years before present (Council for Geoscience, 1997)
2 = Erathem (Era)
3 = Erathem (Era)
4 = System (Period)
5 = Symbol
6 = Complex (C), Suite (S), Group (G), Formation (F) [with symbol]

Schematic cross-sections to illustrate typical groundwater occurrence

Not to scale

Groundwater occurs in:

1. Basins of weathering occurring mostly in igneous rocks
2. Joints and fractures in competent arenaceous rocks related to tensional or compressional stresses and off-loading
3. Solution channels and fractures occurring in the carbonate rocks of the Chuniespoort Group
4. Joints and fractures occurring in contact zones related to the heating and cooling of country rock, caused by the intrusion of dykes and sills
5. Fractures in transitional zones between weathered and unweathered rocks
6. Along sedimentary or sedimentary / igneous rock contacts. A contact may either be open, weathered or fractured due to it being an unconformity or fractured due to movement along the contact, or fractured due to heating and subsequent cooling related to large extrusive or intrusive events.
7. Faults and associated shear zones

Weathered zone: Predominantly decomposed

Note: For additional information concerning groundwater occurrence refer to accompanying brochure.

The general hydrogeological map is part of the 1 : 500 000 Hydrogeological map series of the Republic of South Africa.

This map is not to be used for the purpose of local borehole siting. Simplified lithology may be considered as guidelines only. Digital data, copies of this map and accompanying brochure are obtainable from the Council for Geoscience. The map series is produced with ArcInfo software.

Digital data, copies of this map and accompanying brochure are obtained from:

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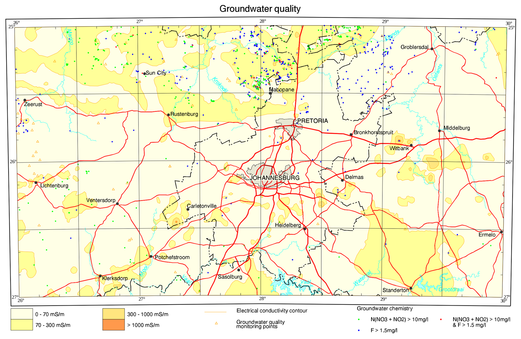
Groundwater quality



0 - 70 mS/m; 70 - 300 mS/m; 300 - 1000 mS/m; > 1000 mS/m

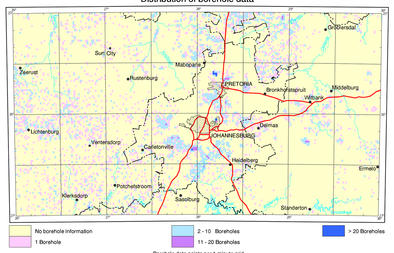
Electrical conductivity contour

Groundwater quality monitoring points

Groundwater chemistry:
- N(NO3 + NO2) > 10mg/l
- F > 1.5mg/l
- N(NO3 + NO2) > 10mg/l & F > 1.5 mg/l

1:1 500 000

Distribution of borehole data

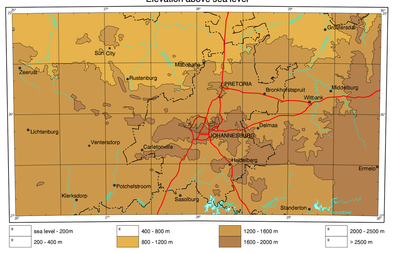


No borehole information; 1 Borehole; 2 - 10 Boreholes; 11 - 20 Boreholes; > 20 Boreholes

Borehole data points per 1 minute grid

1:2 000 000

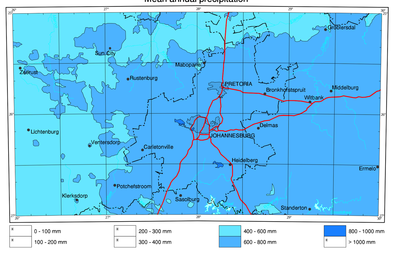
Elevation above sea level



sea level - 200m; 200 - 400 m; 400 - 800 m; 800 - 1200 m; 1200 - 1600 m; 1600 - 2000 m; 2000 - 2500 m; > 2500 m

1:2 000 000

Mean annual precipitation



0 - 100 mm; 100 - 200 mm; 200 - 300 mm; 300 - 400 mm; 400 - 600 mm; 600 - 800 mm; 800 - 1000 mm; > 1000 mm

1:2 000 000

Provincial boundaries Feb 1996

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