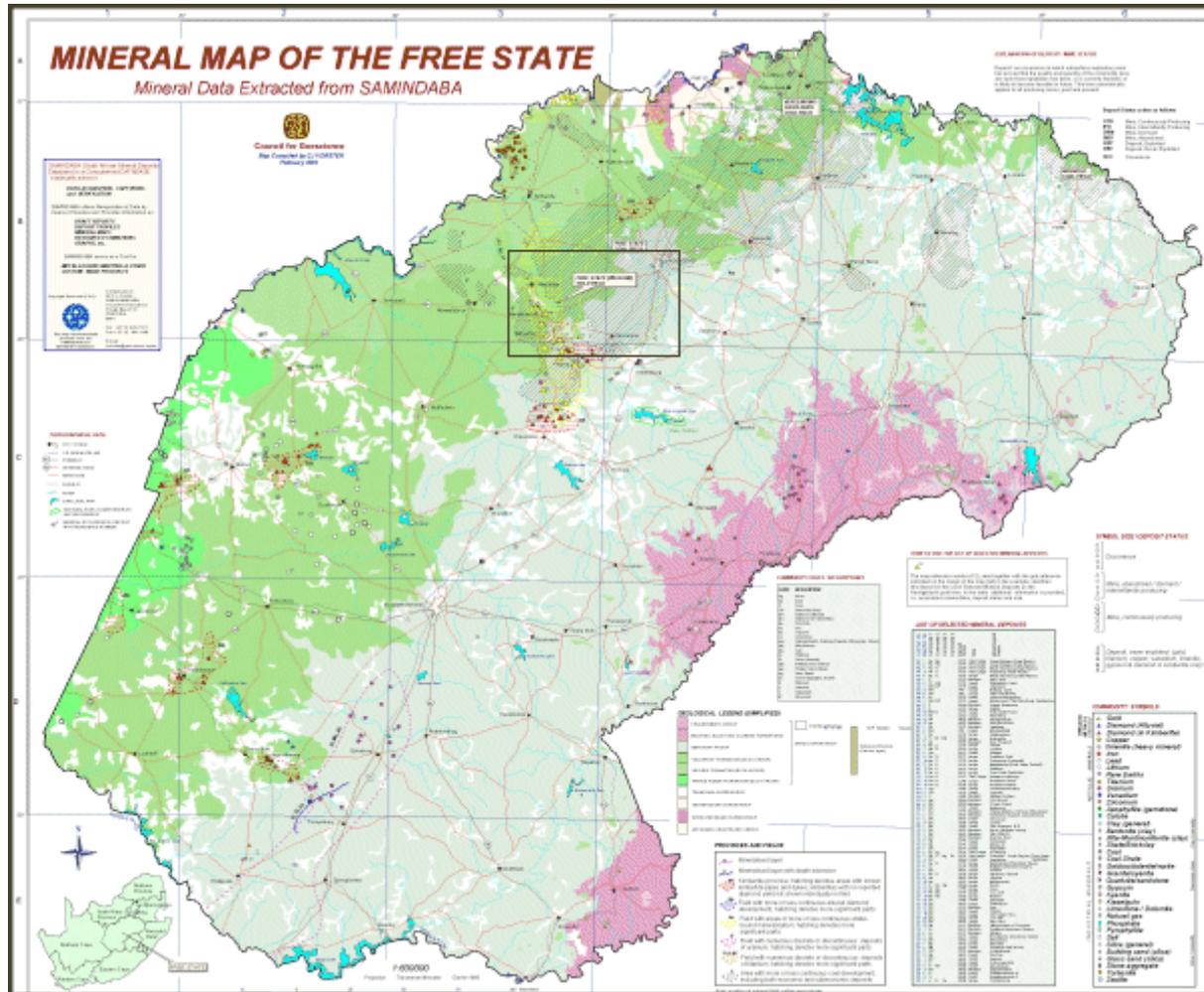


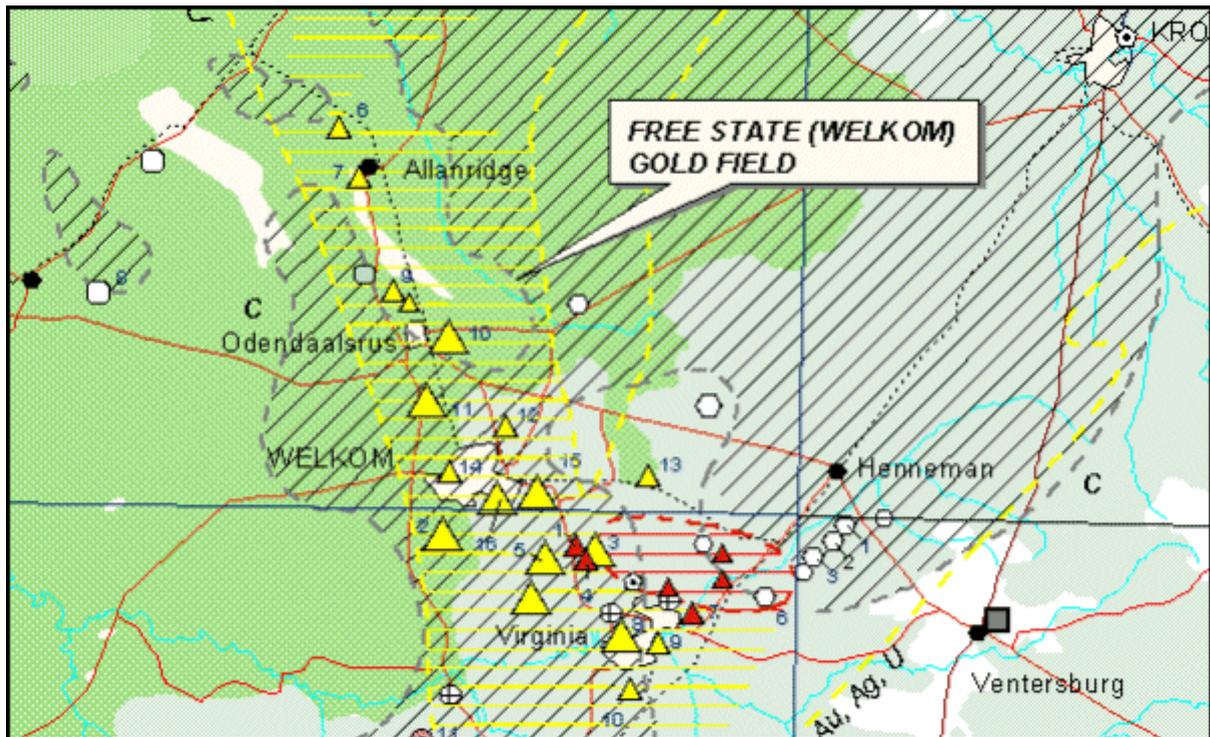
Summary of Economic Geology of Provinces: Free State Province



The map below is a low resolution image for a much larger map (scale 1:750 000), of which an extract is shown below in more detail, and is accompanied by a description of the general economic geology of the province. An example of such detail is shown below. This map can be purchased from the Council for Geoscience. Please contact Cornelis Vorster to place an order.



Free State area: Detailed



A summarised mineral profile of the Free State Province
 By CJ Vorster, Council for Geoscience

INTRODUCTION

A total of nine commodities are currently being exploited in the Free State, of which gold and its by-products (uranium, silver, platinum group metals and sulphuric acid) are by far the most important, followed by diamonds and coal. Ferrous and base metals are not exploited at all, while industrial minerals play an important role. Revenue from the Free State Province's mineral products is the fourth highest within South Africa (after Gauteng-, North-West- and Mpumalanga's Province), with total sales for 1994 being valued at R 7 418 million (R 7 037 million in 2000).

GEOLOGY

Most of the Free State Province is underlain by sedimentary rocks belonging to the Beaufort and Ecca Groups of the Karoo Supergroup. These constitute sandstone, shale and mudstone, which have been intruded by dolerite sills and dykes. They are part of the vast Karoo basin that covers almost two-thirds of South Africa, and were deposited between 200 and 300 million years ago. These rocks are known to host major coal and clay deposits. The former generally occur as fairly thick, flat, shallow-lying coal seams. Of the country's 18 principal coalfields, two occur in the Free State Province, these being the Vereeniging-Sasolburg and Free State fields.

In the northwest of the province the Karoo Sequence overlies rocks of the Witwatersrand and Ventersdorp Supergroups. In the vicinity of Vredefort and Parys, the well-known Vredefort Dome crops out, revealing Witwatersrand sequence rocks on the surface.

The most important occurrences of gold, both in the Province and South Africa, are found in conglomerates of the upper division of the Witwatersrand Supergroup and the basal formation of the overlying Ventersdorp Supergroup. The gold is preserved in fan and delta deposits where it was deposited by fluvial systems. This great basin stretches

over 300 kilometres from the Welkom area to the Klerksdorp area, and from there eastwards to the present Springs-Nigel region, east of Johannesburg. The Witwatersrand was deposited over a time span of some 250 million years, commencing about 3 000 million years ago and is up to 7 500 metres thick.

South Africa's gold production dropped from 672,9 tonnes in 1985 to 579,9 in 1994 (and 428,2 tonnes in 2000). There are currently seven gold fields exploited in the Witwatersrand Basin of which the Free State gold field is the second most important, having produced 157,37 tonnes in 1994 (98,6 tonnes in 2000) valued at R 6,768 billion. Total sales of silver amounted to 45 021 kg (R 5 937 570).

LARGER PRODUCING MINES

Gold

The Free State gold field falls entirely within the Free State Province. Many big mines, some of them also producing uranium, are active here. Though a substantial quantity of gold remains in the field, the generally lower grades and weak gold prices, combined with increasing production costs in real terms, as the deposits are mined at ever-deeper levels, mean that some of the gold mines have become marginal to sub-economic and face closure in the near future.

A total of 16 gold mines are still active in the Free State goldfield, namely the Beatrix, Matjhabeng, Free State Saaiplaas, HJ Joel, Harmony, Loraine, Oryx, President Steyn, ARM, Tshepong, Masimong, Target, Jeanette, President Steyn, St Helena and Unisel mines. Although exploration confirmed gold reefs in the area between Bothaville and Odendaalsrus, development has been delayed because of structural problems and low gold values.

Coal

The Vereeniging-Sasolburg coalfield ranks third in South Africa in order of importance, while the Free State supplies a saleable output of 10,5 per cent of the national coal output. Two mines are producing, namely the New Vaal Colliery and Sigma Mine, both exploiting bituminous coal. Sixteen years ago some 5 000 Mt of low grade coal, suitable for power generation and the possible production of liquid fuel, was proven by exploration.

Total coal (bituminous) produced during 1994 amounted to 18 717 604 Mt with total sales of 18 987 621 Mt valued at R 556 079 120.

Diamonds

Diamond production has been important in the Free State Province for decades. The well known Jagersfontein and Monastery mines have been closed, but four mines are currently producing diamonds from Kimberlite rock, namely the Samada, Koffiefontein, Salene (Star) and Sonnenberg (Loxton).

Total diamond production during 1994 amounted to 198 564 carats with total sales 101 727 carats valued at R 31 155 986.

SMALLER PRODUCING MINES

Clay

Bentonite occurs in the Koppies District of the Free State. The deposits are flat-lying and lenticular, occupying embayments in pre-Karoo metasediments and are overlain by Ecca shales. The clay consists of a very pure montmorillonite with only small amounts of quartz, and is probably formed through the in situ weathering of volcanic

ash.

Well known here is the Oceaan deposit in the Koppies District, which in 1980 produced 80 per cent of South Africa's production. At that stage reserves were more than 700 000 t and were sufficient for two decades at these production levels.

Limestone

Calcrete is present in the western parts of the Free State Province and limestone reserves are substantial. Agricultural- and dolomitic limestone is being produced in opencast workings in the Henneman and Viljoenskroon Districts.

Salt

Salt is produced from salt pans in the Western Free State where it has been precipitated by the evaporation of brines. Production is concentrated around the Florisbad salt pan, north-northwest of Bloemfontein. Salt is being produced from some 20 localities.

During 1994 a total of 31 433 mt salt was produced and 32 822 t sold valued at R3 990 672.

Gypsum

Gypsum is produced from an opencast working in the Boshof district.

Granite

Rough granite blocks are extracted in the Parys district for use as dimension stone.

Sand and Stone Aggregate

Sand and stone aggregate are produced from various quarries in the Province. A quantity of 3 622 065 t aggregate and sand was sold during 1994, with a value of R 41 997 109.

COMMODITIES WITH POTENTIAL FOR FUTURE MINING

Titanium, zircon, rare earths and thorium are known to occur in fossil beach sands north of Bothaville. Reserves were estimated at 82 Mt ore, including 18,3 Mt ilmenite and 1,9 Mt zircon. Development is hindered by high recovery costs and the fact that the deposit lies in high-potential agricultural soil.

Uranium mineralisation occurs in the Beaufort Group in the south western part of the Province, and also in the Elliot Formation near Ficksburg. The deposit on Mooifontein, near Edenburg, is the only occurrence with possible economic potential.

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