

# *Annual Report of the Council for Geoscience*

2005/06



leading  
earth-science  
solutions



**Council for Geoscience**

## Cover:

Elephant and antelope footprints on a wind-rippled aeolianite surface, Stilbaai. (page 21)

An engineering-geological appraisal for dam-safety purposes was conducted at the Roode Elsberg Dam, a 72-m-high double-curvature arch dam near Worcester. (page 29)

Klaas Mohuba of the CGS discusses interesting aspects of the earth sciences with a visitor to the Sammy Marks Square exhibition. Part of the CGS poster displays can be seen in the background. (page 44)

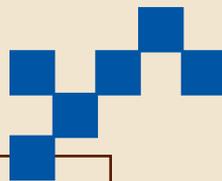
Project leaders and participants of the first Field Mapping School of the CGS in the Limpopo Province. (page 26)

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#### Focus Areas:

- Growth
- Africa Development
- Innovation
- Rural Development and Poverty Eradication
- Regulatory and Stakeholder Compliance
- Transformation
- Skills Development

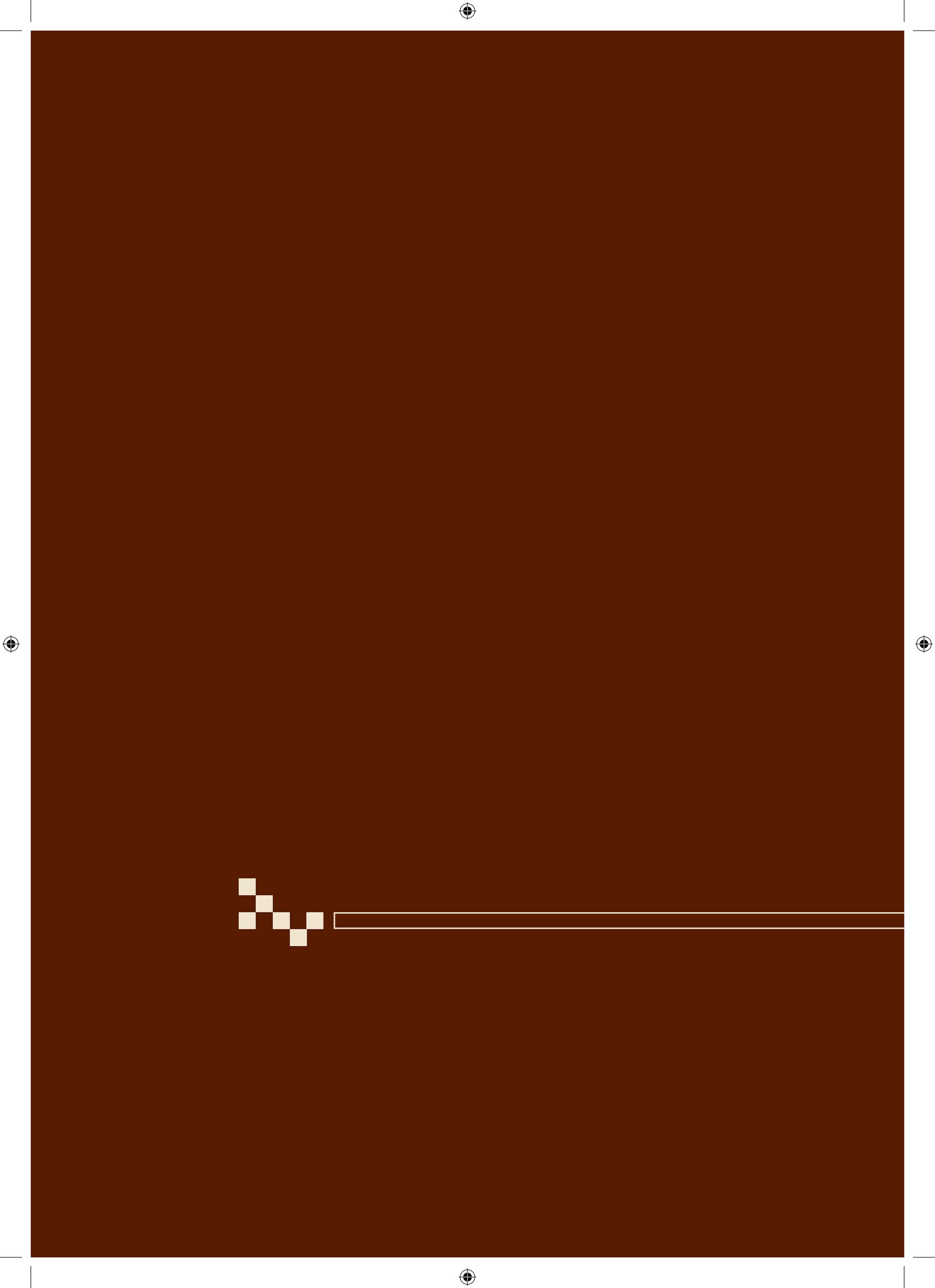
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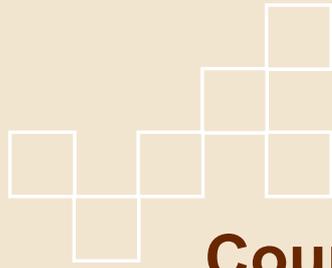
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#### Thrusts:

- Minerals Development
- Geoscience Mapping
- Water Geoscience
- Engineering Geology and Physical Geohazards
- The Environment and Chemical Geohazards
- Education and Information





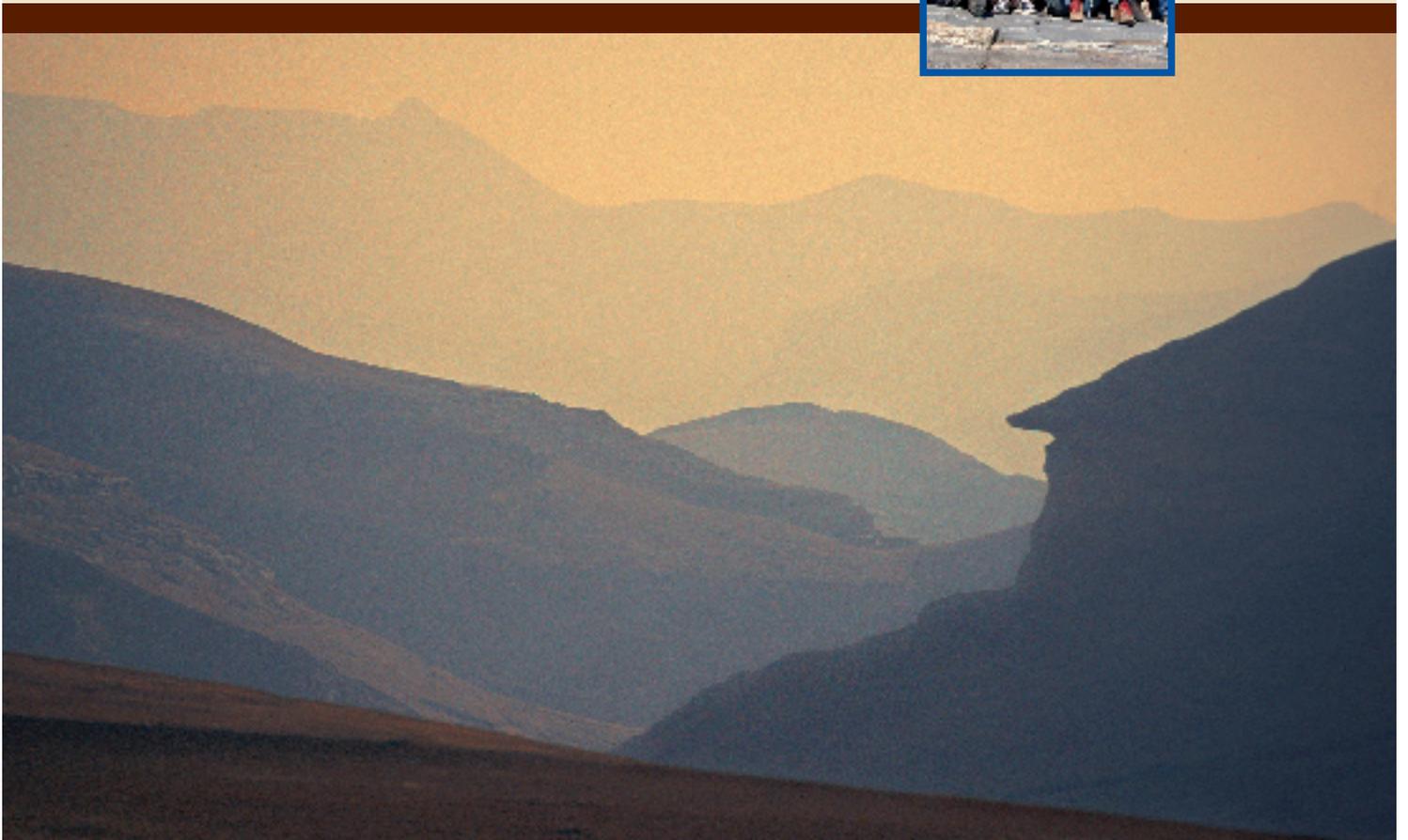
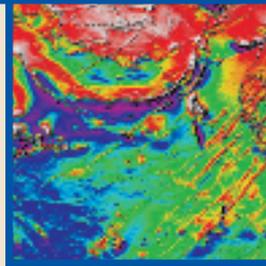
# Council for Geoscience

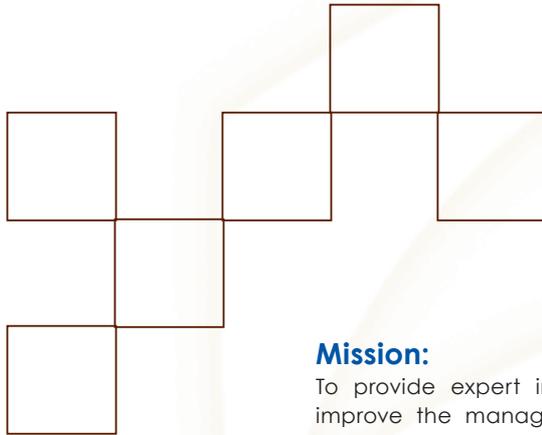


LEADING  
EARTH-SCIENCE  
SOLUTIONS



*Annual Report*  
**of the**  
**Council for Geoscience**  
**2005/06**





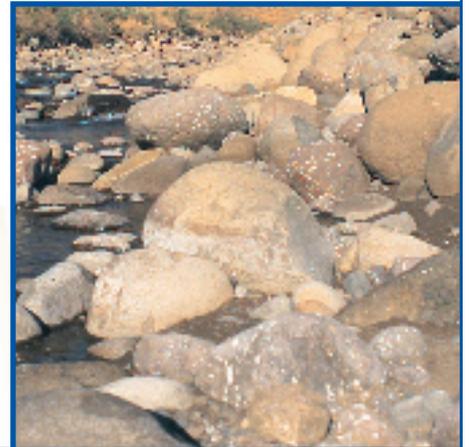
**Mission:**

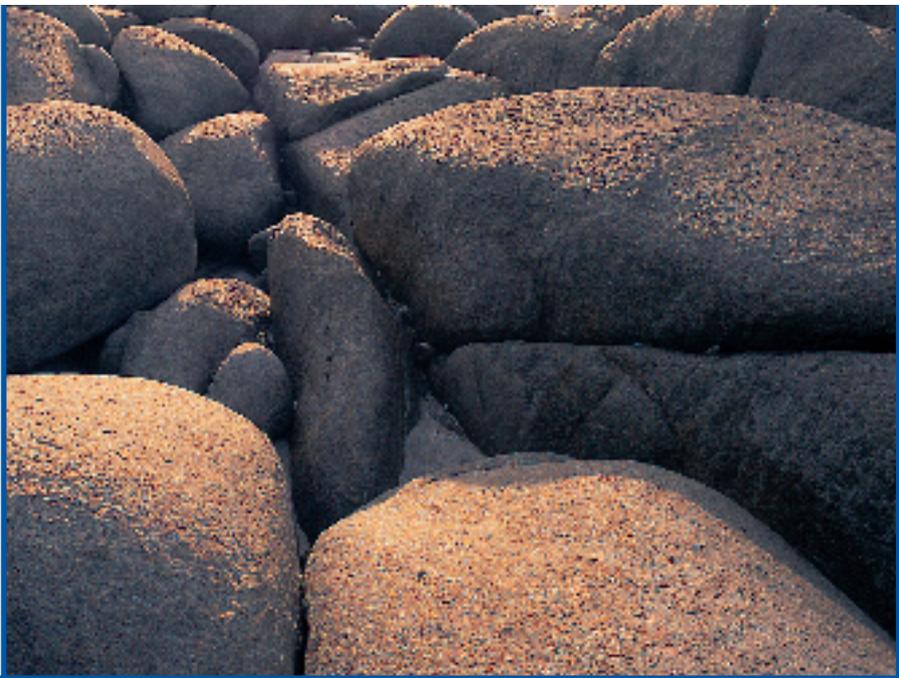
To provide expert information and services to improve the management of natural resources and the environment for the benefit of the society.

**Values:**

The Council for Geoscience will remain firm in its mission through focusing on its values of

- (i) innovating and creating through teamwork;
- (ii) excelling through quality and performance;
- (iii) valuing diversity through trust and respect, and
- (iv) by investing in its people.





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**MANAGEMENT BOARD  
OF THE COUNCIL FOR GEOSCIENCE**



**Prof. P E Ngoepe**  
Chairperson of the Board  
- University of Limpopo



**Mr T Ramontja**  
Chief Executive Officer  
- Council for Geoscience



**Prof. J M Barton (Jr)**  
- Geological Society of South  
Africa



**Mr D G Clarke**  
- Department of Land Affairs



**Mr L L Makibinyane**  
- Export Credit Insurance  
Corporation



## Council for Geoscience



**Ms L McCourt**  
- Department of Environmental  
Affairs and Tourism



**Mr J K Mollo**  
- Chamber of Mines



**Mr A P Nkuna**  
- Mineworkers Investment  
Company



**Ms N D Ntombela**  
- Department of Minerals and  
Energy



**Ms T Xaso**  
- Diebold South Africa

### Alternate Members

**Ms S Bansi**  
*Alternate to Ms N D Ntombela*  
- Department of Minerals and  
Energy

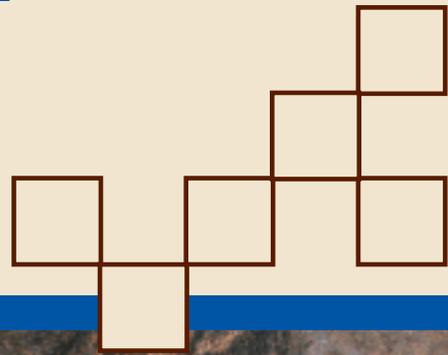
**Ms D de Nooy**  
*Alternate to Prof. J M Barton (Jr)*  
- Mintek

**Mr M Riba**  
*Alternate to Mr D G Clarke*  
- Department of Land Affairs





*EXECUTIVE MANAGEMENT STRUCTURE*  
**OF THE COUNCIL FOR GEOSCIENCE**



# COUNCIL FOR GEOSCIENCE



**Board Administrator**  
Buhle Ndlovu



**Chief Executive Officer**  
Thibedi Ramontja



## Strategic Services

(in the office of the CEO)  
Johan Barkhuizen  
Nico Keyser

Strategy Planning Cycle  
Technology and Innovation Management  
Commercial Project Tender Management  
Annual Technical Programme Management  
Marketing, Communications and Public Relations

## Applied Geoscience

**Executive Manager**  
Fhatuwani Ramagwede



Minerals Development - Mxolisi Kota  
Water Geoscience - Leslie Strachan  
Engineering Geoscience - Gary Davis  
Environmental Geoscience  
- Nompumelelo Molebatsi

## Regional Geoscience and Mapping

**Executive Manager**  
Peter Zawada



Central Regions - Ian Haddon  
Western Cape - Luc Chevallier  
Northern Cape - Luc Chevallier  
Eastern Cape - Greg Botha  
KwaZulu-Natal - Greg Botha  
Limpopo - Nick Baglow  
Marine Geoscience - Sven Coles

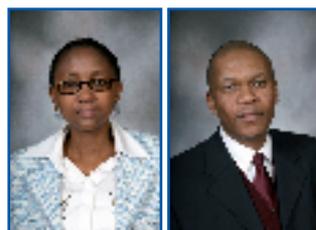
## Scientific Services

**Executive Manager**  
Gerhard Graham



Laboratory - Thinus Cloete  
Information and Collections Management  
- Danie Barnardo  
Regional Geochemical Mapping - Thinus Cloete  
Geophysics - Patrick Cole  
Seismology - Andrzej Kijko  
Spatial Data Management - Ken Wilkinson

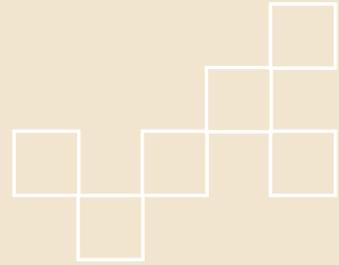
## Corporate Services



Human Resources - Malefshane Kola  
Finances - Leonard Matsepe  
(Acting CFO)  
Information and Communication  
Technology - Peter Mofaung  
Procurement and Logistics  
- De Clerq Botha  
Technical Services - De Clerq Botha



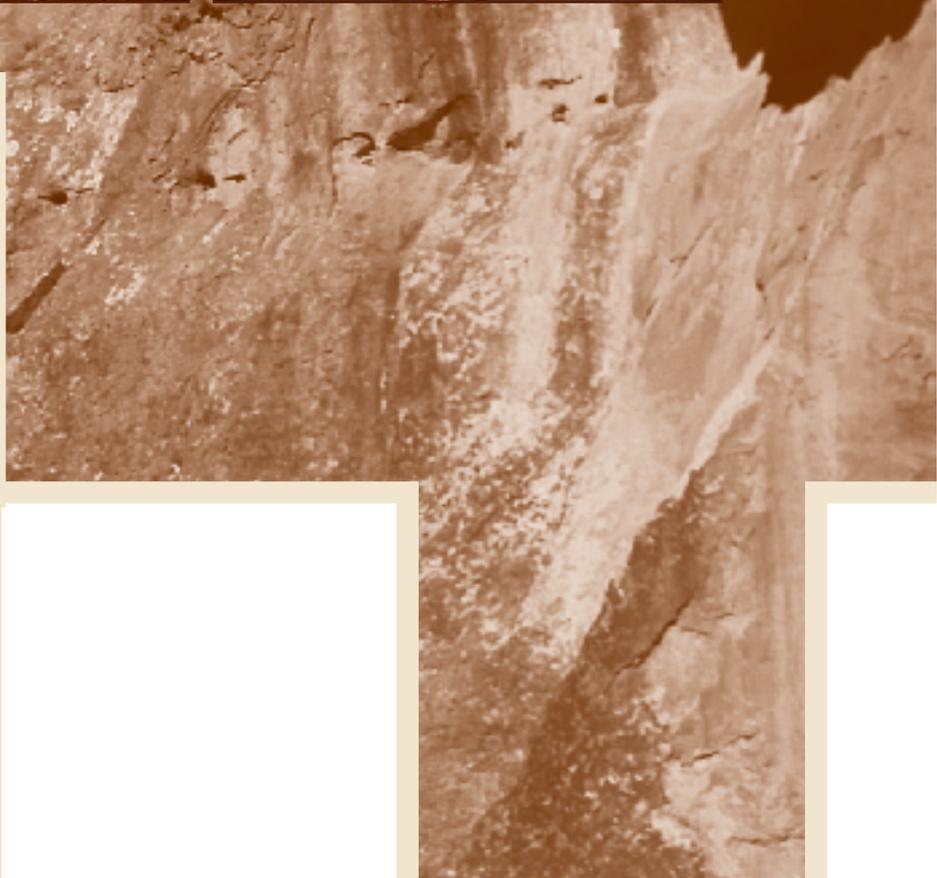
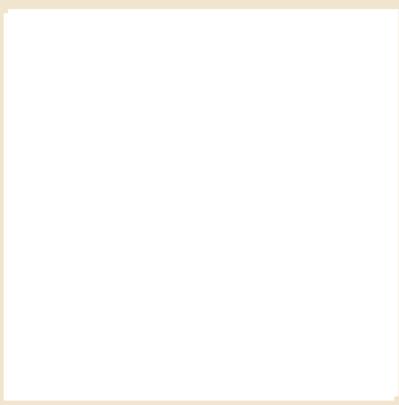
REVIEW BY THE  
**CHAIRPERSON OF THE BOARD  
AND THE CHIEF EXECUTIVE OFFICER  
OF THE COUNCIL FOR GEOSCIENCE**



**Prof. P E Ngoepe**  
Chairperson of the  
Board



**Mr T Ramontja**  
Chief Executive  
Officer



The past year was one of the most successful periods in the existence of the Council for Geoscience (CGS). It is clear that the strategy adopted for the organisation during 2003/04 has reached fruition and has propelled the CGS to new levels of financial and scientific achievements. Many challenges to the Board and Executive Management of the CGS remain. One of the most pressing challenges is the development of a strategy for the economic sustainability of the organisation that would simultaneously reduce the need to rely on commercial projects and allow it to increase its local statutory mapping programme and other geoscientific research programmes.

There is currently a boom in international mapping projects, and the CGS is capitalising on these opportunities. In the past year the CGS has made substantial progress in procuring large Sysmin projects, sponsored by the Economic Development Fund of the European Union. The Sysmin programme focuses, amongst others, on geoscience-related projects in the African-Caribbean-Pacific (ACP) countries. The CGS, in partnership with the BRGM of France, managed to win two Sysmin projects, in Gabon and Ghana, respectively. These medium-term commercial projects involve geological and hydrogeological mapping, GIS-based map production, geochemical and geophysical surveys, as well as the transfer of technologies to and the training of staff within the respective geological surveys, in this case Ghana and Gabon. In Madagascar the CGS is playing a dual role in so far as it is undertaking both geological and geochemical mapping, as well as supervising other consultants involved in this programme sponsored by the World Bank.

Geological mapping represents the cornerstone for most of the other activities in the organisation, and is a key statutory obligation of the CGS. The growing shortage of mapping geologists is reaching a critical level and needs to be addressed as a matter of urgency. In this regard the CGS has initiated a geological-mapping field school to improve the mapping skills of its entry-level geologists, and it is foreseen that this initiative will grow over time.

The CGS has continued to create an awareness of the geosciences amongst children during the year. One of the highlights was the biennial CGS Open Day. Owing to increasing interest, the Open Day was extended to a three-day event. The turnout from schools exceeded the highest expectations, with approximately 1 600 pupils attending the event. The installation of seismographs at selected schools is being used to promote the understanding of both the scientific and technological methodology of recording earthquakes.

The aim of this initiative is to entice learners to choose the geosciences as a future career.

In addition, representatives of the CGS embarked on a University Roadshow and the organisation participated in many career expositions. Resources have been allocated to the fast tracking of young and upcoming geoscientists starting from the bursary stage of their career. The demographic profile of students in the programme consists of 80% Blacks and 20% Whites. In the past year, the CGS absorbed 100% of the students who completed their studies in 2005 into its permanent staff corps. These students included one white and nine black persons.

The need for skills development and retention in the CGS is a prevailing theme in the ten-year strategic planning that the organisation initiated during 2005/06. Through this strategy the CGS is aiming at developing a stronger focus on geoscience for the benefit of South Africa. Part of this process will require the acquisition of capital equipment that will make the organisation attractive to leading geoscientists in the country as an employer. The correct combination of staff and facilities, and the development of modern acquisition and analytical techniques must be employed to establish and maintain an advanced and sound geoscience information base that can truly improve the management of natural resources and the environment.

During the past year detailed geological mapping on a scale of 1:10 000 in and around the metropolitan areas of South Africa continued. The mapping, which is the basis for sound, optimal and cost-effective land-use and urbanisation planning, has now been completed for most of the metropolitan areas and can be extended to some of the fast-developing rural areas in the country.

The CGS, in collaboration with the Department of Minerals and Energy (DME) continued with research into addressing the environmental problems associated with gold mining in the Witwatersrand Basin. The aim of the current project, A Strategic Water Management Plan for the Prevention of Water Ingress into Underground Workings of the Witwatersrand Mining Basins, is to lower the risk to society and Government of having to subsidise the pumping of ground water in gold mines, and to manage and control decant (i.e. outflow to surface) of highly polluted water with its attendant environmental risks, particularly to the health of local communities. Key objectives of the project are to:

- Prevent the ingress of surface water to underground mine voids;
- Establish and recommend management solutions to reduce dependency on pumping



- in order to manage flooding of mines and spillage to surface (decant);
- Predict when and where decant will occur should pumping operations cease;
  - Predict the effects on the environment, and the health risks associated with polluted mine water decanting at surface;
  - Arrive at management options to avoid the uncontrolled decant of polluted mine water onto surface;
  - Develop regional mine-closure strategies and plans.

In view of increasing evidence of global warming, with its attendant problems of potential flooding and dramatic climate change, the CGS has approached the topic of carbon capture and storage (CCS) during the year under review. In order to help reverse this trend, conscious efforts need to be made to reduce the increasing levels of carbon dioxide (CO<sub>2</sub>) gas in the atmosphere. Carbon capture and sequestration in geological environments potentially provide the largest and safest means of reducing atmospheric carbon dioxide and, for this reason, the CGS has commenced with the process of identifying its role in this matter.

South Africa does not have emission-reduction commitments yet, but it would be prudent to start with CCS projects aimed at reducing its emission levels, in order to take advantage of the search of industrialised nations for CDM investment opportunities. In November 2005, delegates from the DME, SASOL, Anglo American Coal, Eskom and the CGS met to discuss the way forward for CCS projects in South Africa. The meeting concluded that a CCS Road Map has to be established to coordinate activities on a national level.

The CGS is preparing to take this initiative forward during 2006/07. A high-level workshop on geological carbon capture and storage is planned for 2006. The main aim will be to develop a framework to guide the DME in the future as to how CCS will be handled with respect to the development of legislation, identification of geological research and the potential roles of the science councils, industry and universities.

The CGS, in conjunction with the DME, established the Small-Scale Mining Board (SSMB). This board is responsible for assessing and approving various project proposals. Significant progress has been made during the past year with approximately 15 active projects. The CGS played a major role in compiling project plans and associated budgets for these projects.

A Squirrel B2 helicopter was purchased to expand the capabilities of the CGS to undertake airborne

geophysical and geochemical surveys. As geochemical sampling surveys, in particular, are sometimes undertaken in extreme terrains, it was necessary to fit a sandfilter to the helicopter to make it more robust. Technicians and scientists have been involved in mounting the necessary equipment in the helicopter since early 2006. This platform will greatly enhance the capabilities of the CGS in conducting low-cost, high-density geophysical surveys, and will assist the CGS to re-embark on the national geochemical sampling programme.

During the year under review, the CGS expanded the capabilities of its Analytical Laboratory with the purchase of an XRF spectrometer. This instrument will be used to analyse more elements, at improved detection levels. A new carbon and sulphur analyser was also acquired. This instrument can be used, amongst others, to analyse sulphur in soil samples and is therefore ideal for geochemical and environmental applications.

The destructive tsunami in Indonesia, Thailand, Ceylon, India, Somalia and other countries in the Indian Ocean region that occurred on 26 December 2004 sparked a global debate on the possibility of establishing a tsunami early-warning system for the entire Indian Ocean region. The CGS acted as advisor to the Department of Provincial and Local Government (DPLG) in formulating a strategy for South Africa to monitor tsunamis in the Indian Ocean and in discussions with the United Nations. The CGS operates an advanced network of seismological stations in South Africa, capable of recording earthquakes that could cause tsunamis. Hence, it was proposed to dedicate data from five of these seismological stations to contribute to an Indian Ocean Tsunami Warning System (IOTWS). The CGS was tasked by the National Disaster Management Centre of the DPLG to establish a National Data Centre (NDC) to forward real-time seismic data from the five selected seismograph stations to an International Data Centre (IDC). The implementation of this project will commence during the 2006/07 financial year. It will require an extensive upgrade to the communication capabilities of the South African National Seismograph Network, especially in terms of delivering near-real-time data in continuous mode to the International Data Centre.

The Geosites database, developed in conjunction with the Geological Society of South Africa, will supply information on the locality and characteristics of geological, mining and mining-related heritage sites to scientists, community developers, tour organisers and visitors. The database is in its final stages of design, and data will be supplied by the geological and mining communities, as well as the public and other interested parties.

The Information and Communication Technology (ICT) Unit of the CGS continued to provide the necessary support for geoscience activities. A concerted effort over the past twelve months has resulted in the commissioning of an improved computing infrastructure and environment, with an associated improvement in the provision of supportive services. This effort has included the use of contractual services, the inclusion of support activities in internship programmes, the disposal and replacement of obsolete and redundant equipment, and the refurbishment and standardisation of networking, desktop and data-centre equipment.

Additional open-source technologies were employed where feasible within the strategic and operating context of the organisation, and at the same time an effort was made to align the CGS with the objectives of Government concerning the narrowing of the digital divide and the use of such technologies to achieve this end. This was recently demonstrated in the endeavours to refurbish the private and public websites, utilising contractual services and an open-source content-management system.

Improving information security, utilising open-source software is currently an ongoing process. The intention is to continue with efforts in this regard, including assessing the potential benefits to be derived from outsourcing and/or joint-venture arrangements with sister councils and agencies.

Revenue generated for the year amounted to R157,2 million, a 38,5% growth when compared with the previous financial year. Commercial income, i.e. income derived from consulting work, amounted to R70,4 million and was by far the major contributor to this growth. The figure is almost double that of the previous year, R35,4 million, and resulted in a surplus of R16,3 million. This is more than double the previous year's surplus figure of R7 million. The CGS invested R16,8 million in property and capital equipment, an amount very much comparable to the figure of R16,7 million for the previous year. Plans are in place to improve this figure in the next financial year as the scientific and operational capital equipment at the CGS have aged and need replacement. The total assets have grown by 12,6%.

The Board and Executive Management of the CGS appreciate the dedication and commitment of the staff of the CGS. In rapidly changing circumstances and in a very competitive market, the CGS has again increased its commercial earnings, exceeding expectations. The new strategy of the organisation will introduce a new dimension of service delivery during 2006/07.

The Board and Executive Management would like to thank the Ministers and staff of the Departments of Minerals and Energy, and of Science and Technology for their support over the past year.



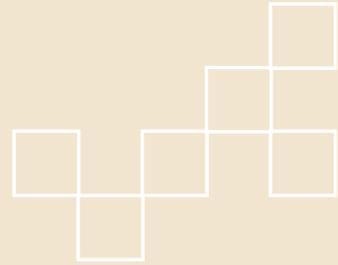
**Prof. P E Ngoepe**  
Chairperson: Board of the CGS



**Mr T Ramontja**  
Chief Executive Officer



## HIGHLIGHTS OF ACTIVITIES OF THE COUNCIL FOR GEOSCIENCE DURING 2005/06



### MAPPING PROJECTS

One of the core functions of the CGS is to generate, gather and interpret geological, geophysical, geochemical and mineral-deposit information and make it readily available to those concerned. Key to gathering and generating geological information is field mapping. Below are brief summaries of some of the geological mapping that has taken place during the year under review.

#### Geological maps

- **1:50 000 scale**

The 1:50 000 mapping scale has been found internationally to be the most appropriate for optimal land-use and urban development in order to mitigate natural hazards such as swelling clays, collapsible sands, sinkholes, etc., to monitor and manage environmental pollution and to ensure optimal mineral, energy and ground-water exploration. Public availability of high-resolution 1:50 000-scale geological, geophysical, engineering-geological and environmental vulner-

ability maps, which are required to ensure optimal land use, could be beneficial in terms of costs to Local Governments because it would eliminate duplication of mapping efforts.

#### Geological mapping in Gauteng

##### *2527DD Broederstroom*

Mapping was conducted in the Broederstroom area in order to obtain base geological and mineralisation information prior to the construction of several new housing and business developments. These developments were the result of renewed mining interest, as well as an increase in tourism in the adjacent area.

The most important scientific findings were the subdivision, for the first time, of the Malmani Subgroup dolomite succession into five formations and five members, and of the Pretoria Group into seven formations and one member. The complex geology of the Witwatersrand Supergroup at Swartkop is highlighted extensively in the accompanying map explanation, and a contribution was made to the

provisional study of the geology of the proposed Pebble Bed Modular Reactor (PBMR) at Pelindaba during site selection.

A number of important conservation areas feature on the Broederstroom 2527DD 1:50 000-scale map sheet, with the Cradle of Humankind World Heritage Site (COH WHS) covering a major part of the mapped area. The COH WHS core area is entirely underlain by dolomite and contains several extremely important cave sites, where some of the earliest and most complete hominid fossil finds have been discovered. The site comprises a band of twelve important palaeo-anthropological sites with seven of these sites situated in the 2527DD Broederstroom 1:50 000-scale map-sheet area. The area is, by far, the richest site of hominid fossils and associated fauna and flora on earth. Because this site is unique not only from a scientific and research perspective, but also from a conservation and environmental perspective, all development needs to take place in such a way as to ensure the protection and preservation of the area for future generations. The new geological map will improve the understanding of the complex geology of the COH WHS and provide valuable guidelines for future development.

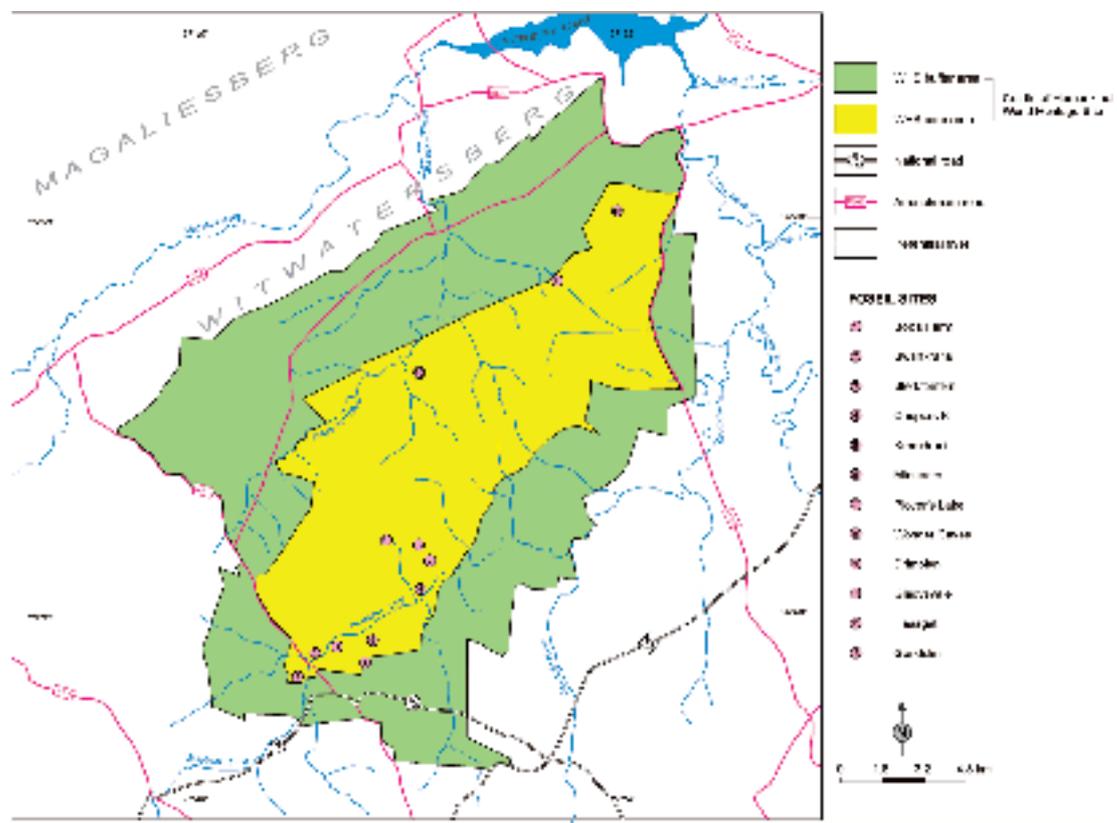
In spite of the excavation of the fossil sites within the COH WHS, which has been undertaken inter-

mittently over 62 years, a large proportion of the deposits in the caves will remain untouched for posterity, as part of the South African heritage record.

In addition to its enormous palaeo-anthropological significance, the Broederstroom site area is situated within easy travelling distance of Johannesburg, Pretoria and Krugersdorp and boasts a number of nature and game reserves, trout-fishing farms, horse and nature trails, arts and crafts venues, and restaurants. One of the most important benefits of the World Heritage Site is the attraction of national and international tourists who contribute to local economic growth.

Remarkably well-preserved and well-exposed sedimentary structures occur at Saartjiesnek on the farm Welgegund 491JQ. The locality is of geological value both for education purposes and visual beauty, and will be proposed as a geosite to ensure it is preserved for future generations.

The development of sinkholes and dolines on land underlain by dolomite is exacerbated by artificial lowering of the water table and it is thought that the incidence and development of these are related to the rate at which the water table is lowered. Sinkholes occur in the Broederstroom map-sheet area, but these are usually fairly small and not very deep. The formation of sinkholes is a small



Locality map of the Cradle of Humankind World Heritage Site.

and controllable risk because the dolomite forms a mostly rugged terrain, the dolomitic area is underdeveloped and geological mapping has delineated areas where sinkholes are likely to develop.

## Geological mapping in KwaZulu-Natal

### *2930DD & 2931CC Durban*

Geological mapping of the greater Durban area was last carried out before 1964. Remapping of the area was necessary to show the significant advances in the lithostratigraphy and structure of this region. Increasing demands have been placed on the provision of construction materials from this area owing to the rapid urbanisation and growth within the eThekweni Municipality.

Much of the Durban Central Business District (CBD) is constructed on saturated, unconsolidated sediments which represent a potential risk for significant damage should a large seismic event occur. Seismic-hazard modelling will be undertaken in the CBD and harbour areas using the isopach maps of unconsolidated sediments based on borehole data. Specialist publications, such as a popular geoscience series publication on aspects of the geology of Durban are planned. Mapping and the compilation of the map were completed and it was submitted for reproduction and publication.

## Geological mapping in the Eastern Cape Province

Some years ago the Government identified several areas of the country where extreme poverty is prevalent and highlighted these in an Integrated Rural Development Strategy (IRDS). One of these areas, known as the O.R. Tambo IRDS, encompasses the coastal portions of the former Transkei. The northeast IRDS also falls within the Eastern Cape Province. In order to align its activities with this poverty-alleviation initiative of the Government, the CGS fast-tracked its basic geological mapping of parts of these areas. The mapping programme was aimed at providing a good geological background to assist in the future planning of development and also at identifying deposits of building and construction materials that could be used in the development phase. The areas mapped are briefly outlined below.

### *3326BC Grahamstown, 3326BD Trappe's Valley, 3326DB Port Alfred, 3326CA Springmount, 3326CB & CD Alexandria and 3326DA & DC Boesmansriviermond*

During the year, field mapping was completed in previously identified problem areas. Dense vegetative cover, a lack of unweathered exposure, as well as difficulties with regard to the interpretation of the structural geology severely hampered the identification and differentiation of lithostratigraphic units comprising similar rock types. The maps were completed and submitted for production and publication. A joint map explanation for the region will be compiled to complement the maps. This is aimed at providing a comprehensive and scientifically sound interpretation of the geology represented on the map sheets.

### *3227DC Berlin, 3227DD Cambridge, 3228CC Gonubie, 3327BA & BC Kidd's Beach and 3327BB East London*

This map set provides geological information on aggregates of the area, and is a significant update of the geoscience data for the area.

### *3227CD King William's Town*

The objective of the mapping was to define the lithostratigraphy, delineate intrusive dolerite contacts and to map the Quaternary cover deposits. Suitable construction materials and potential mineral deposits were identified locally.

Geologically, the map area is underlain by the Permian Adelaide Subgroup

Surveying a raised beach.



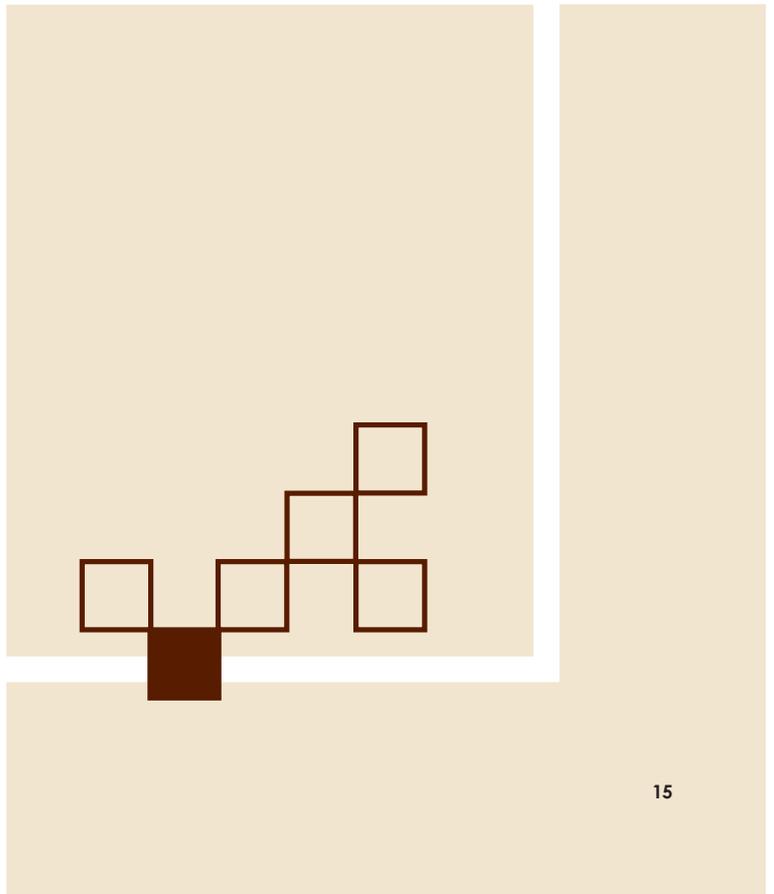
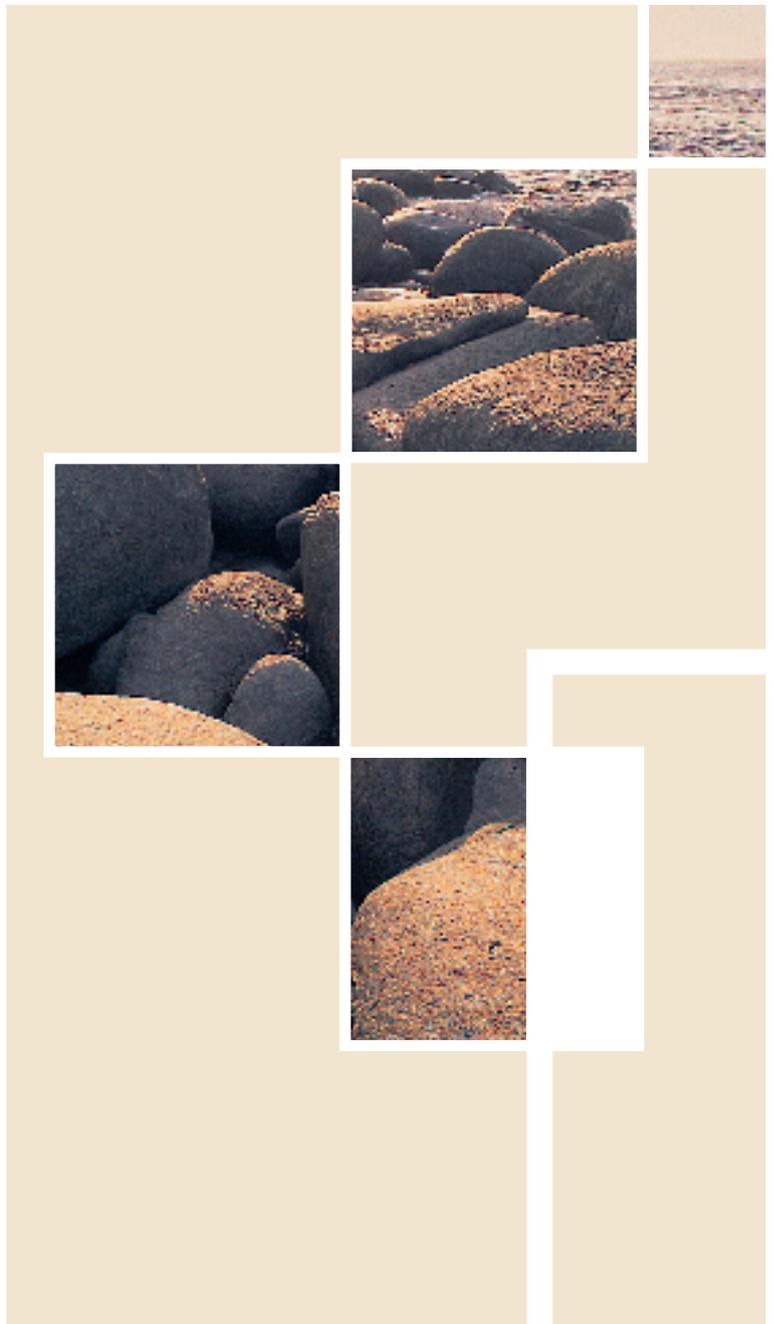


Angular sandstone fragments on the steep scree surface, derived from the cliff above, were reworked into a beach with round cobbles at Coffee Bay; the sea lies to the left. The sandstone in the cliff overlies black shale at the lower left. This sandstone formed as a large sand delta that extended into the Karoo basin from the east.

(Beaufort Group, Karoo Supergroup) which is intruded by Jurassic Karoo dolerite. Alluvium is present in the river valleys. Economic mineral deposits in the map area are limited to construction and road-building materials.

**3129BC Lusikisiki, 3129CB Tombo, 3129CC & CD Coffee Bay, 3129DA Port St Johns**

The beautiful Wild Coast area offers incredible potential for the development of tourism and plans have been made to improve access to the area while at the same time preserving as much of its unique flora as possible. Since the area is poorly developed, the establishment of infrastructure will require construction aggregates of different types. The conservation of the tourist-environmental ambience of the area will need to be taken into consideration before development. The project addresses these and other issues, and has substantially improved the level of geoscience knowledge of the Wild Coast while highlighting potential building- and construction-material deposits.





Mpuze Point near Coffee Bay lies at the mouth of the small Mpuze River. The recurved gravel spit in the river mouth is a typical indicator of the low sand supply to this coast and the vigour of winter storms in the area. In the background are the predominantly rugged, rocky cliffs that contribute to the area being named the Wild Coast.



This travertine exposure at Lutengele near Port St Johns shows evidence of previous extraction by stitch drilling. Owing to poor transport infrastructure, the original venture failed. This site was "rediscovered" in 2001 during the 1:50 000-scale geological mapping of the area by the CGS, when its potential was recognised and it was added to a list of potential poverty-alleviation projects.

- ▼ The Mngazana River winds
- ▼ through the coastal landscape, 13 km southwest of Port St Johns. The wide valley is eroded into the Early Cretaceous Mngazana Formation that weathers easily, allowing the valley to erode laterally into a broad feature that hosts a significant mangrove forest around the estuary. The Mngazana fault lies at the foot of the distant valley slope.



## Metallogenic Maps

- **1:250 000 scale**

One of the principal functions of the CGS is to stimulate the investment in and development of South Africa's mining industry. In order to achieve this goal, geological and metallogenic (mineral-deposit) mapping is necessary to expand the CGS's already impressive mineral-deposits database (SAMINDABA) and to produce and publish maps. These maps can be used by potential investors in the mining industry to guide their exploration programmes. Two of the metallogenic maps that were in production during the year under review are highlighted below.

### Calvinia 3118

The Calvinia metallogenic map area is situated in the Western Cape Province and this project is part of the CGS's metallogenic mapping programme. This project conforms to the CGS thrusts of "Geoscience Research and Mapping" and "Minerals Development and Poverty Alleviation". The objectives are: (i) to delineate metallogenic provinces (including industrial commodities, such as limestone and gypsum), which will highlight the prospectivity of certain areas and stimulate the discovery of new deposits, and (ii) to compile a database of all known mineral deposits within the map area which can be added to SAMINDABA. There have already been several requests by potential small-scale miners for information on diamonds, limestone, marble, granite and gypsum, all of which are present in the area covered by the Calvinia map. In addition, the mineral-deposit information provided by this mapping project is vital in helping to set the boundaries of the proposed Knersvlakte National Park in such a way that important mineral resources are not sterilised by the establishment of the park.

#### *Diamonds*

Diamond deposits are known both in the coastal zone and inland in the area north of Vanrhynsdorp in the Knersvlakte. The coastal group defines the West Coast diamond field, whereas the inland group represents a resource field named the Knersvlakte diamond field. In the West Coast diamond field the diamonds occur in Pliocene to Quaternary raised beaches up to 95 m above sea level, as well as offshore on a series of wave-cut platforms. The diamonds were originally derived from inland kimberlite pipes and were transported to the coast by the Namaqualand rivers prior to being concentrated in the marine placers by northward longshore currents. A total of 25 deposits have been identified, of which only 6 are, or have been, worked intermittently.

The Knersvlakte diamond field is represented by 20 occurrences or deposits, but none are currently being mined. These diamonds occur in gravel placers of the Late Tertiary Quagga's Kop Formation which forms a dissected coastward-inclined, gently tilted sheet. Elevations decrease from 320 m in the north to 80 m in the vicinity of Vredendal. The gravel is thought to have been reworked from an older gravel that had been deposited on the plateau to the east of the Great Escarpment by a palaeo-Orange river. The quality and grade of these diamonds are lower than that of the West Coast diamond field and the potential is therefore limited.

#### *Limestone and dolomite*

The bulk of the Vanrhynsdorp limestone-dolomite field comprises a northwest-trending zone of 50 km long by 30 km wide, with its southern part centred on Vanrhynsdorp and Vredendal. The total estimated resources are huge at  $\pm 2\,000$  million tons, and several deposits have been, or are currently being worked for cement, refractories or stone aggregate. The Vanrhynsdorp limestone-dolomite field also includes two small areas along the coast west and northwest of Koekenaap and a third small field some 25 km east-southeast of Vanrhynsdorp.

Limestone is exploited on the farm Vaderlandsche Rietkuil 308, east of Vredendal, for water purification and powdered calcium carbonate for paper filling. Dolomite is exploited from the same farm for stone aggregate and agricultural purposes. These limestone-dolomite fields have a high economic potential, given their high grades and reserves.

#### *Marble*

As a result of burial and orogenic deformation during the Pan-African Orogeny between 650 and 600 Ma, some of the Widouw Formation limestones and dolomites were metamorphosed to marble in areas northwest and south of Vanrhynsdorp. Marble has been exploited intermittently in this area since the 1920s with the last quarry, 9 km south of Vanrhynsdorp, closing in 1996. The marble is light grey to greyish blue in colour, with black carbonaceous bands and stringers. Several hundred million tons of reserves are present and several enquiries have been received from potential small-scale miners.

#### *Granite*

Granite and granite-gneiss of the Namaqua Metamorphic Province provide dimension stone in two small areas, one of which is 15 km north-east of Lutzville, while the other is 7 km west of Bitterfontein. The former area occurs over biotite gneiss, the Nuwerus Gneiss, which is porphyritic and displays banding. Good-quality stone is limited in areal extent and it was last exploited in the 1960s. The area west of Bitterfontein occurs over

porphyroblastic granodiorite, referred to as the Bloukop granite that was quarried at one deposit until 1990.

#### Gypsum

The Vanrhynsdorp-Vredendal gypsum field is the most extensive gypsum area represented on the Calvinia sheet. Some 50 occurrences and deposits were identified, but only one, Maskam, north of Vanrhynsdorp, is currently being mined. The gypsum consists of powdery gypsum and crystal aggregates in clay, with wind-blown sand or clayey soil as overburden. The arid climate, with long dry seasons, is essential for the formation of gypsum. Several deposits have been exploited in the past, and gypsum grades vary from 65 to 85 per cent.



Dormant quarry of Jumaqua Marble that was operational from 1968 until 1996. Blocks of marble from the Late Precambrian Widouw Formation that were used for the production of floor tiles and cladding were extracted from this quarry. The quarry is located 9 km south of Vanrhynsdorp and 7 km north of the Matsikamma Mountains, which are capped by Table Mountain sandstone.

#### 2426 Thabazimbi

A total of 225 mineral occurrences have been verified in the area covered by the 2426 Thabazimbi metallogenic map sheet. Some of the most significant commodities occurring in the map area include platinum-group metals (PGM), chromite, iron ore, andalusite, and clay called palygorskite. All of the above-mentioned commodities have significant economic value and several of these deposits are continuously exploited. For example, the Union and Amandelbult Sections of the northwestern Bushveld Complex are host to the Union, Amandelbult and Northam Platinum Mines that make a significant contribution to the total platinum production of South Africa. Also worth mentioning are the well-known and high-grade iron-ore deposits, which are synonymous with the town of Thabazimbi. These deposits have been exploited since 1932.

Potentially viable vanadium-bearing magnetite layers, which are exposed in the map area, remain untouched even though similar deposits are being mined in other areas. Geological modifications made to the map during the most recent re-mapping of this sheet have been incorporated into the lithological background of the metallogenic map. The explanation of the metallogenic map, together with the relevant data set, has been substantially modified and improved during the year and the explanation has been approved for publication.

#### Geotechnical Maps

During re-examination of its role in national development conducted a few years ago, and in an attempt to re-align its activities with the needs of the country, the CGS realised that it was not enough to provide only detailed geological information to assist in development planning and resource identification. To help empower regional and municipal planning authorities, a series of 1:50 000-scale maps was designed which would interpret the geological and geomorphological information in such a way that problematic areas for development, and potentially hazardous areas, would be highlighted. This series of geotechnical maps should play a meaningful role in preventing settlement on potentially dangerous areas, and in guiding the location of sewage works and cemeteries in such a way that their impact on ground water is minimised. Work on the following two geotechnical maps was done in KwaZulu-Natal during the year under review.

#### 2730CC Osizweni

Field mapping, collation of geotechnical data and the compilation of these data into a 1:50 000-scale geotechnical map have been completed. Corrections to the GIS compilation map have been addressed and the map explanation has been completed.

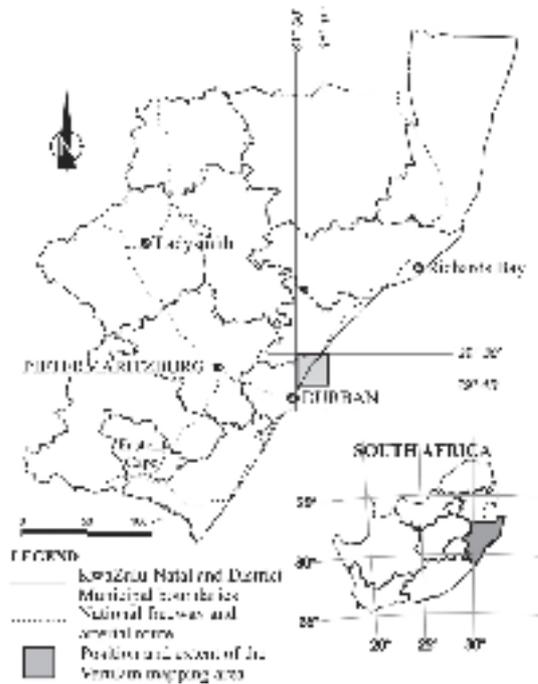
Highly dispersive and erosive soils in the Doornkop area of Osizweni.



A generally shallow soil profile means that excavability is constrained in the area, as is drainage. Expansive clay soils have also been found in some parts of the map area. Coal mining takes place, particularly in the western and southern portion of the sheet area, and acidic soil conditions are frequently associated with the mining areas.

### 2931CA Verulam

A detailed geotechnical map of the 1:50 000-scale sheet 2931CA Verulam that complements the new geological map is currently in progress. Interpretations have been made of the geological map and aerial photographs. Geotechnical reports for the area and other relevant information have been collated. Field mapping and the collation of geotechnical data have been completed and the information has been transferred from the 1:10 000-scale mapping. All geological and geotechnical constraints to development are included on the map, the most important being the risk of inundation, slope instability, difficult excavation conditions and active soils. A detailed explanation of the mapping, including site-specific information will form part of this geotechnical map and is currently being compiled.



Position and extent of the Verulam mapping area.

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Extensional (normal) fault in Vryheid Formation sediments, south of Willard Beach. Note the drag features developed in the footwall.

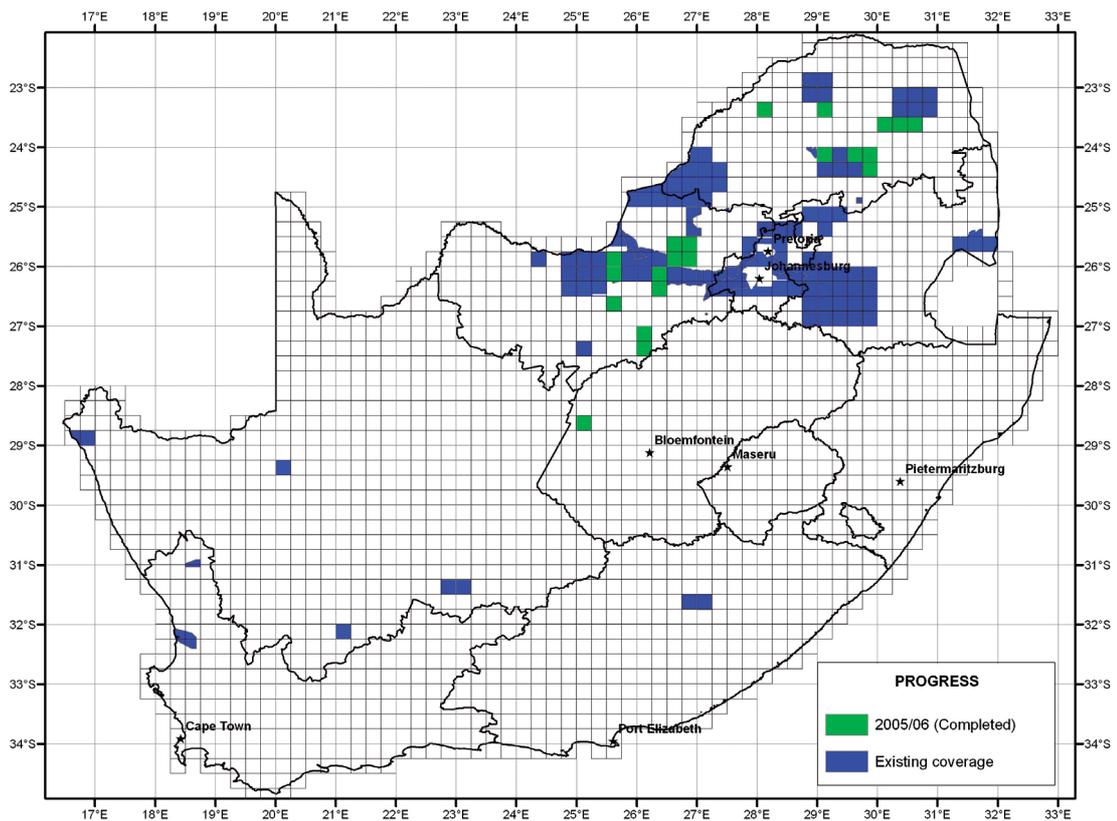


The Mhlasini sill in the New Glasgow area. The hanging wall and footwall contacts with the Pietermaritzburg Shale Formation are clearly visible.



Plan view of slickenside lineations developed on bedding planes in hornfelsed Pietermaritzburg Formation shales, Redcliff area, Verulam. The lineations indicate dip-slip movement along bedding planes. Scale = 10 cm.





Status of high-resolution airborne geophysics.

## Geophysical Maps

Airborne high-density geophysical surveys of fifteen 1:50 000-scale sheet areas were completed during the year.

The purpose of this project is to map the total magnetic-field intensity and radiometrics to produce magnetic, digital-terrain model, potassium, thorium and uranium data sets. These data sets are inexpensive to acquire and contribute significantly to ground-water exploration, geological mapping, environmental projects and mineral-exploration activities.

The map above shows the completion of all high-resolution airborne surveys conducted to date. The maps completed during the year under review are shown in green.

## OTHER PROJECTS

### Pleistocene human and other vertebrate fossil footprints in South Africa

The intense public interest aroused by the finding of the Langebaan fossil human footprints by a CGS scientist includes an article in the National

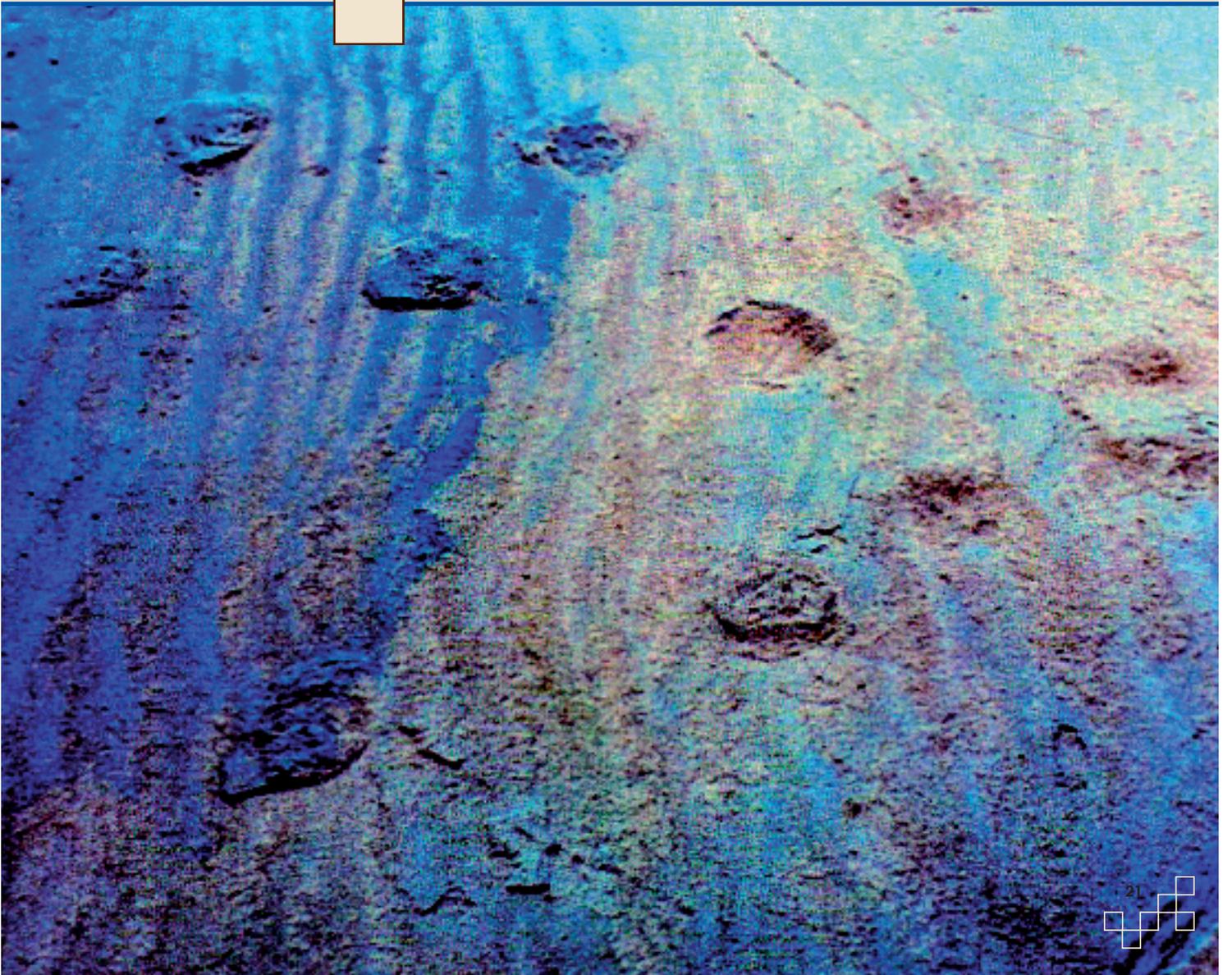
Geographic magazine, numerous local and international newspaper articles, and TV and radio coverage. This shows a huge potential for eco-tourism and education in the area. The palaeo-ecological significance of these footprints is enhanced by the lack of Pleistocene body fossils along the southern coast. The major new discoveries of many species at Still Bay are unique in a global context and merit a systematic, thorough and properly funded study.

Research was carried out at the Addo National Park to determine the size and age of the elephants that produced the proboscidean trackways. Their presence at Still Bay suggests that the climate at the time that the footprints were made (130 000 years ago) was notably more moist than at present, since these animals require a woodland environment. This information casts considerable light on climate variability along the south coast, facilitating predictions for future climate changes. Optically stimulated luminescence (OSL) dates gave a cohesive series of ages for the aeolianites, ranging from ~130 000 to 140 000 years old. A fossil-footprints display was set up at Geelbek, West Coast National Park and at the Bellville Regional Office of the CGS. Assistance was also provided during the establishment of a Fossil Footprint Park at Buffalo City after funding of R6 million was

Sampling the shallow-marine Velddrif Formation near the town of Velddrif for luminescence dating.



Elephant and antelope footprints on a wind-rippled aeolianite surface, Stilbaai.



obtained. A detailed database of fossil footprints at Langebaan, False Bay, Still Bay and Buffalo City was established.

### The petrology of the Trompsburg Complex

The Trompsburg Complex is the second largest layered intrusion in South Africa, with an areal extent of ~2 500 km<sup>2</sup>. The layered intrusions host the bulk of platinum-group element (PGE) and chrome resources in the world, with the Bushveld Complex in South Africa and the Great Dyke in Zimbabwe being important contributors to the world supply of these metals. These elements are commonly trace elements in basaltic magma, but may be sufficiently concentrated by fractional crystallisation processes to permit economic mining.

The Trompsburg Complex is not exposed at surface and is overlain by ~450 m of Karoo Supergroup sedimentary rocks. Its burial at significant depth has precluded detailed study and exploration. The complex is located in the southern Free State Province,

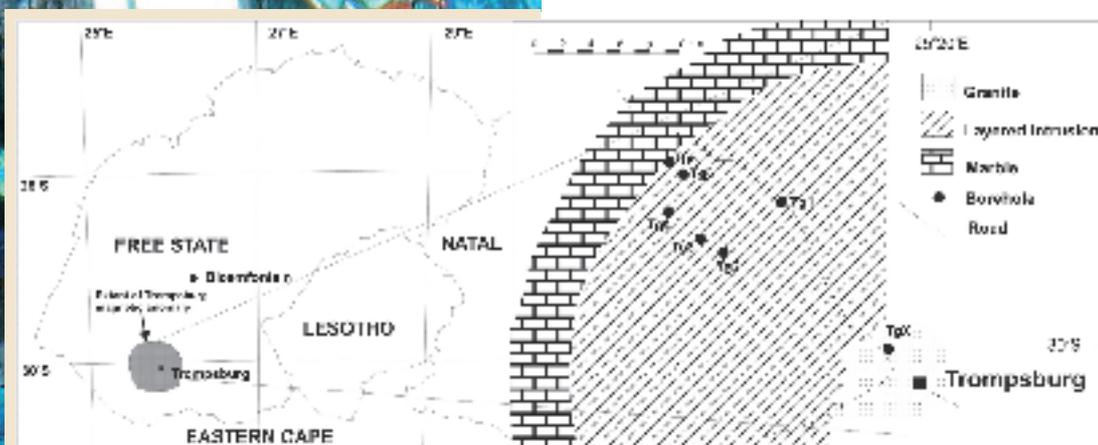
in the vicinity of the town of Trompsburg. Its existence was recognised from magnetic and gravity data, which resulted in six boreholes being drilled in the late 1940s to ascertain the origin of the geophysical anomalies. A recent study of zircons from the original diamond drill core of one of the boreholes drilled into the Trompsburg Complex showed a minimum age for the complex of ~1,9 Ga, similar to the 2 050 Ma age of the Bushveld Complex. Very little detailed geochemical work was conducted on the core because of the limited analytical techniques available during the 1950s and 1960s. With modern analytical techniques, which permit the analysis of a wide range of chemical elements on small sample sizes (~1 g), it is planned that a deeper understanding of the petrogenesis of the complex will provide indications as to the possible presence of mineral deposits, specifically those that are commonly associated with large layered igneous intrusions, such as Cr, Ni and Pt-group elements. These data will permit comparisons with both the geochemistry and stratigraphy of the Bushveld Complex and other layered intrusions. Chrome is used in the production of stainless steels, whereas the platinum-group elements are used significantly in catalytic converters for pollution reduction in vehicle exhaust systems, as well as in jewellery. A recent study of the geophysical (magnetic susceptibility, conductivity and density) properties of the core fragments by staff members of the CGS concluded that the complex probably is thicker and larger than was previously thought.

Photomicrograph of gabbro containing the minerals plagioclase, clinopyroxene and magnetite from the borehole core of the Trompsburg Complex (crossed polarisers).



### Palaeontology and palaeo-ecology of the Elliot and Clarens Formations

Several new dinosaur taxa have been reported during recent palaeontological research of the Elliot Formation in South Africa, which is known to contain some of the earliest dinosaur and mammal fossils in the world. Surprisingly, little is



Locality map of the Trompsburg Complex.



Fossil bone seen in situ at the Senekal fossil site in the Free State Province.

known about its fossil fauna, detailed environments and stratigraphy, especially in the lower part of the formation. The discovery of scientifically important fossils, the possible presence of the Triassic-Jurassic boundary, lack of knowledge on the localised palaeo-environmental conditions and new basin-development theories necessitated this investigation.

Field work in the northern Free State Province continued, but was also extended to investigate the relationship between the Elliot and underlying Molteno Formations in KwaZulu-Natal. The results of palaeontological and taphonomical research were presented at the 12th Gondwana Conference in November 2005 in Argentina. A manuscript documenting mineralogical research was submitted for publication in a national journal. A report detailing the results of the stratigraphic study is currently being prepared.

Stratigraphic data from the eastern exposures of the Karoo Supergroup indicate asymmetrical development of the depositional basin, and resultant sediment deposition patterns during the Late Triassic to Jurassic. Sedimentological data suggest higher-energy, fluvial-overbank environments than was previously thought.

### **Inkaba ye Africa Project on the Margins of Africa – The Agulhas–Karoo onshore–offshore geoscience transect**

Inkaba means "navel" or "source of all energy, material and knowledge" which, broadly translated in the context used here, encapsulates a sense of the interconnectivity of all things. Using Inkaba in conjunction with Africa gives it a regional perspective. The initiation of the Inkaba ye Africa project followed after two years of workshops and proposal writing between representatives of both the German and South African earth-science communities. The project is unique in that it plans to take a holistic interdisciplinary view of the interactions between the solid earth and its fluid envelope. The project aims to use a resource

of more than 100 earth and space scientists from a consortium of 15 government and academic institutions in South Africa (of which the CGS is one) and Germany to help meet the socio-economic needs of South Africa. The overall project has been subdivided into three main sections termed the Heart of Africa, the Margins of Africa and Living Africa.

The Agulhas–Karoo transect project reported on here forms part of the Margins of Africa subgroup which seeks to investigate the causes and consequences of the break-up of Gondwana.

This specific project is a continuation of a long-standing collaboration between the German GeoForschungsZentrum (GFZ) in Potsdam and the CGS and, in addition to its scientific aims, it plans to provide training for local earth scientists in a collaborative environment.

The Agulhas–Karoo geoscience transect stretches from beyond 200 nautical miles offshore of the Agulhas Plateau, across the Agulhas Fracture, the Outeniqua Basin, the Cape Fold Belt and the Namaqua-Natal Belt and continues into the Karoo Province and the southern Kaapvaal Craton near the town of Fraserburg. This transect encompasses unique and, as yet unresolved, deep crustal features at the ocean–continent boundary of southern Africa and could help to increase the understanding of the unique Beattie magnetic anomaly, as well as determine the extent of the Pan-African inliers in the Cape Fold Belt, and the extent and formation of the Cape Fold Belt, amongst others. It is hoped that it will also allow a better understanding of the Agulhas Fracture Zone and its consequences for basin formation and uplift processes relevant to the hydrocarbon-producing provinces of the Outeniqua Basin. Research on this project will facilitate a better understanding of these structures from the surface geology all the way down to the deep geophysical anomalies and deeper crustal tectonic structures.

During work done in 2004 and 2005, various institutions and teams collected data in the onshore and offshore components along the Agulhas–Karoo transect:

- OFFSHORE: Seismic reflection/refraction survey, ocean-bottom seismometers, sediment echo sounding.
- ONSHORE: Refraction seismic survey, magnetotelluric survey (MT), amphibian land–sea experiment.

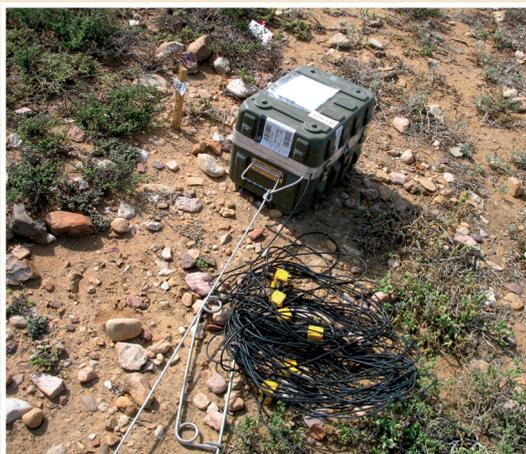


Compressed air-powered drill rig preparing holes to be used in the refraction seismic survey.



Field equipment, from the left: detonation devices, black boxes which receive data about time detonation and a signal-information cable drum.

- Receiver station consisting of data recorder, GPS and battery attached to the geophone array, housed within an ammunition box.



From October to December 2005, a collaborative near-vertical seismic-reflection experiment was conducted by scientists of the CGS, University of Cape Town and the GFZ. This was carried out from the town of Prince Albert to Slingerfontein, some 60 km south of Fraserburg. Two hundred boreholes were drilled, approximately 500 m apart, along a 100 km profile to a depth of 12 m. Fifteen kilograms of explosives were placed in the holes, and resulting shockwaves from the explosions were picked up by an 18 km geophone array, with stations at 100 m intervals.

The results of this survey are currently being interpreted.

## Documenting South Africa's geosites

The Information and Collections Management Unit of the CGS has developed an online database to record information about geologically interesting sites in South Africa. The system can also be used to record the details of geosites elsewhere in the world, and it is intended that the system be extended to cater for geosites located throughout the entire SADC region. In this way, geotourism in South Africa could be boosted, with earth-science tourism adding a new dimension to promoting tourism in the country.

The Barberton Greenstone Belt consists of crustal remnants dated at around 3 500 million years. These rocks are amongst the oldest on earth.





This system was developed using various web-development software packages and is based on the exact map coordinates of the site. This feature will eventually enable the linking of the database to a GIS system and this will make it possible to develop maps of specific parts of South Africa, indicating the geosites. It is possible to record a geosite online and this facility can be accessed by the public, or other interested parties, by using standard Internet web browsers.

The Sheba Gold Mine in the rugged Barberton Mountainland was discovered in 1855. Its upper section, known as Bray's Golden Quarry, produced over 1,4 million tons of ore at a grade averaging 21 g/t.



One of South Africa's interesting geosites, the Tswaing Crater, is 1 100 m wide and is situated within a 2 000 ha natural- and cultural-heritage site and conservation area some 40 km north of Pretoria. This meteorite-impact crater was formed 220 000 years ago.

### Field mapping school

Some years ago a need was identified to enhance the practical mapping skills of young geologists joining the CGS and, in view of its statutory mapping mandate in South Africa and its international mapping activities in Africa and further afield, a mapping field school was seen as the most direct and effective means of addressing this issue.

The Pilanesberg Complex, an almost perfectly circular dissected mountain massif, 25 km in diameter, is one of the largest alkaline ring complexes in the world, and consists of the roots of an ancient volcano that erupted around 1 500 million years ago. The area has been re-stocked with numerous indigenous mammals and is now an excellent game reserve.





Geoscientists learning how to measure and interpret contact relationships.



Project leaders and participants of the first Field Mapping School of the CGS in the Limpopo Province.

The first-ever field school of the CGS was held during July 2005 in The Downs area of the northeastern escarpment, east of Polokwane, within the Legalameetse Nature Reserve in the Limpopo Province. This area was selected because of the mapping school leader's thorough knowledge of the area, the reasonable proportion of rock outcrops and the varied nature of rock types, metamorphic grades and tectonic styles encountered in the area.

The field school was attended by six young geologists, and was led by experienced staff from the Limpopo Unit of the CGS. This initiative proved to be extremely successful and will, hopefully, be followed by similar events.



The Legalameetse Nature Reserve in the Wolkberg area where the first field school of the CGS took place.

### Sealing of unsafe mine openings

The Department of Minerals and Energy (DME) has requested the CGS to identify and seal all known unsafe and abandoned mine-related openings (shafts, subsidences, etc.) in the Witwatersrand mining basins. Phase 1 of this project is currently in progress with the key deliverables of locating all the unsafe openings (535 holes to date) and sealing those posing the most danger to local communities. Thirty-six such holes were identified and a contractor was appointed in April 2006 to seal them. Seven holes have been sealed to date and the remainder is due for completion in September 2006. Funds for Phase 2 have

already been supplied by the DME for a further 40 dangerous holes to be sealed in March 2007.

### Infrasound – South Africa

Each state that is a signatory to the Comprehensive Nuclear Test-Ban Treaty (CTBT) undertakes not to carry out, and refrains from causing, encouraging, or in any way participating in any nuclear-weapon test or any other nuclear explosions. The Comprehensive Nuclear Test-Ban Treaty Organisation (CTBTO) is based in Vienna, Austria. South Africa signed the treaty on 24 September 1996 and it was ratified on 30 March 1999.

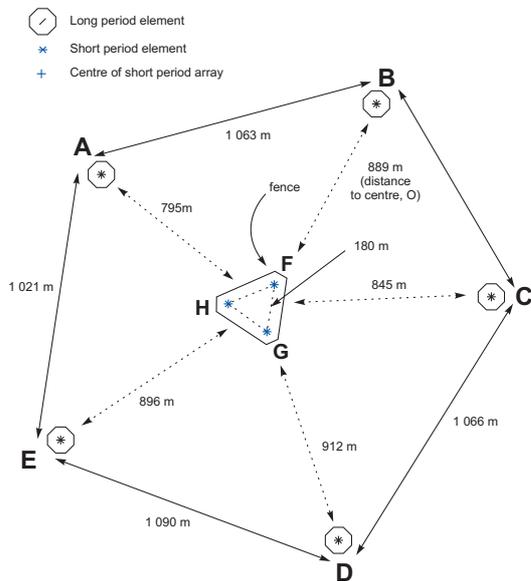
One of the main functions of the CTBTO, after the treaty comes into force, will be the verification of compliance with the treaty's requirements. This will be achieved by a Global Monitoring System (GMS) and an International Data Centre (IDC) that will collect and screen data for events that could possibly reflect non-compliance by a member state. The GMS consists of a network of seismological, radionuclide, infrasound and hydro-acoustic stations and radionuclide laboratories.

Except for hydro-acoustic stations, the CGS and the Nuclear Energy Corporation of South Africa (NECSA) host all of the other verification technologies. One such technology, the recently completed infrasound array, is located close to the town of Boshof in the Free State Province. The CGS was contracted by the Preparatory Technical Secretariat (PTS) of the CTBTO to oversee all civil-engineering

work during the site-construction phase of the infrasound array and, thereafter, to operate and maintain the station that is coded I47ZA.

The station at Boshof is one of 60 infrasound stations deployed worldwide to monitor atmospheric fluctuations. By the application of array techniques it is possible to determine the direction of pressure pulses caused by small explosions in the atmosphere, as well as shock waves caused by supersonic aircraft exceeding the speed of sound, or meteorites entering the earth's atmosphere.

Construction of the I47ZA array officially started on 23 August 2004 and was completed during October 2005. The station was certified on 12 December 2005. This station is the only one of its kind in South Africa.



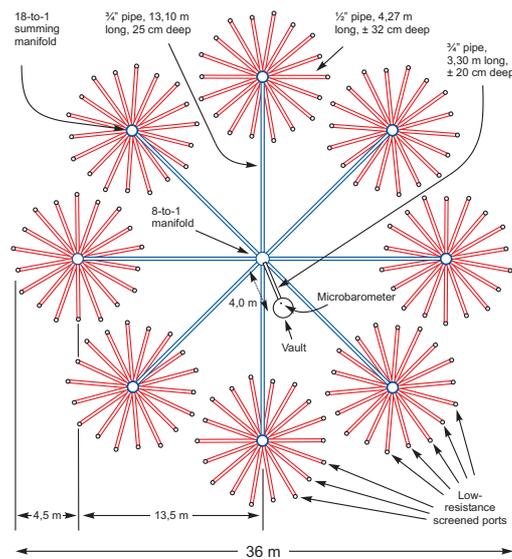
Complete eight-element configuration of I47ZA.



VSAT satellite dishes at the Central Recording Facility (CRF). The closest terminal transmits data in real time to the International Data Centre in Vienna.



Construction of the rosettes for one of the eight elements.



Configuration of each of the eight elements.

The complete array consists of eight elements with each of the elements accommodating eight rosettes. An eighteen-to-one summing manifold at each of the rosettes conveys barometric pressure to an eight-to-one manifold. The atmospheric pressure is measured by a microbarometer, digitised and the information is transmitted via a radio-telemetry link to the Central Recording Facility (CRF) at Boshof. The data is then transmitted directly to the International Data Centre in Vienna via a Very Small Aperture Terminal (VSAT).

Since scientists of the CGS have access to infrasound data from all the other infrasound stations of the International Data Centre, it will create an opportunity for research in atmospheric modelling and the detection of other atmospheric perturbations.

### Seismic-hazard research



An earthquake shook the town of Stilfontein on 9 March 2005 and caused severe damage to several buildings.

A large seismic event, with a magnitude of 5.3 on the local Richter magnitude scale (ML) occurred in the Klerksdorp area at 12:15 SAST on 9 March 2005. The epicentre of the event was determined by the CGS to be located near the town of Stilfontein, where damage to buildings of the Central Business District (CBD) was reported. Scientists of the CGS visited the area on 10 and 11 March 2005 to gather information on the macroseismic effects of the tremor. This information was used to determine the seismic intensity of the tremor at varying

distances from the epicentre. The CGS participated in a working group of the Department of Minerals and Energy tasked with investigating large seismic events in mining areas.

### Development of a national geophysical training site

A project to address shortcomings in the testing and evaluation of traditional geophysical techniques, with respect to their suitability for different applications, was initiated. In the process, the effectiveness of current and new equipment will also be evaluated.

The test site that was chosen is situated at Donkerhoek, east of Pretoria, where the CGS owns land housing the National Core Library.

This project has received considerable interest, both from local universities and from industry. Results and ideas were presented at the 9th Biennial



Training of students in geophysical techniques (Geonics EM-34) at the Donkerhoek geophysical training site.

Conference and Exhibition of the South African Geophysical Association in Cape Town. The site will be used as a training facility for students.

### Projects for the Department of Water Affairs and Forestry

The Engineering Geoscience Unit of the CGS has a very close working relationship with the Department of Water Affairs and Forestry (DWAF), as well as with consultants appointed by that department, and provides the engineering-geological expertise required for the development of the country's water resources.

During the year, scientists of the CGS were involved in a number of major water schemes that are either under construction, or in the detailed planning or design phases. These include the Olifants River Water Resources Development Project (ORWRDP) in the Limpopo and Mpumalanga Provinces, which comprises the raising of the wall of the Flag Boshielo Dam near Marble Hall, the construction of the De Hoop Dam near Steelpoort and the construction of a diversion weir and balancing dam near the town of Steelpoort. There was continued involvement in the construction

of the Berg River Dam near Franschoek in the Western Cape Province, and the proposed raising of the wall of the Clanwilliam Dam has required detailed engineering-geological studies of the dam-founding conditions, as well as the sourcing of potential sites for the provision of construction materials. Engineering-geological investigations have also been conducted at possible dam sites in the Mzimkhulu River catchment, as part of an initiative to improve the water supply for the Ugu District Municipality.

A major focus during the year was the provision of engineering-geological input for the National Dam Safety programme. In the past year some 35 reports were prepared for various dams throughout the country, including the following:

Eastern Cape: Oxkraal, Macubeni, Glen Brock, Shiloh, Mnyameni, Debe and Mhlangu Dams

Western Cape: Roode Elsberg, Poortjieskloof and Ben Etive Dams

Limpopo Province: Makotswane and Piet Gouws Dams

North West Province: Kromellenboog, KleinMaricopoort and Marico Bosveld Dams

Mpumalanga: Tonteldoos, Vlugkraal and Der Brochen Dams

Free State: Knellpoort, Kalkfontein, Rietspruit and Elandskuil Dams

## ENVIRONMENTAL GEOSCIENCE

### Heavy-metal accumulation in peat of the Klip River wetlands, south of Johannesburg

The Klip River wetlands, south and west of Soweto, have been severely impacted upon by human activities. It is essential to assess the current status of these wetlands and to determine whether they would function properly in future in terms of filtering and cleaning water. These wetlands are of particular importance as the Klip River drains into the Vaal Barrage, from where the water supply for the Johannesburg area is extracted. The ability of the wetlands to function correctly is vital in cleaning the water before it reaches the Vaal water-supply system. A study was done in order to better understand the age of the wetlands, and the extent to which human settlement has polluted or destroyed the wetlands, compromising their ability to function correctly as a filter.

During the year under review approximately 50 per cent of the wetlands area has been sampled and the samples have been submitted to the CGS's laboratory for ICP-MS and XRF analyses of their heavy-metal content. Some provisional dating has also been undertaken, using the Carbon-14

An engineering-geological appraisal for dam-safety purposes was conducted at the Roode Elsberg Dam, a 72-m-high double-curvature arch dam near Worcester.





Typical wetland sampling.

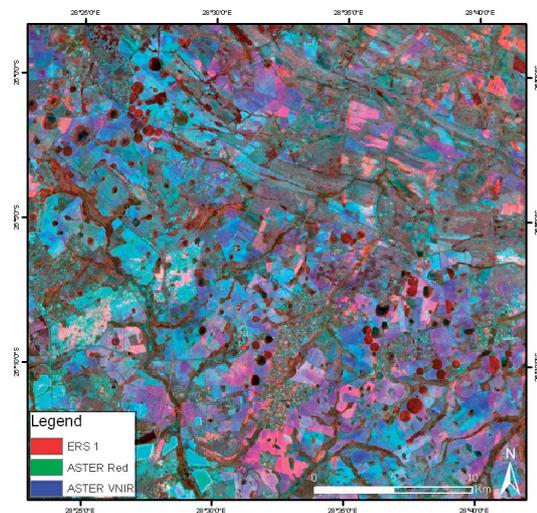
method, and this has revealed initial ages of some 2 500 years. Sample profiles obtained at Kibler Park have clearly revealed the contrast between the pre- and post-development of Johannesburg. The level of contamination rises sharply in the top 1 m of the profile. Initial results (only ICP-MS) at Lenasia show a different profile, which could suggest that the whole 4 m profile has formed since the development of Johannesburg, although this will have to be investigated further.

### Mapping open-water bodies in the Witwatersrand Basin, using radar remote sensing to complement the prediction of mine-water decant

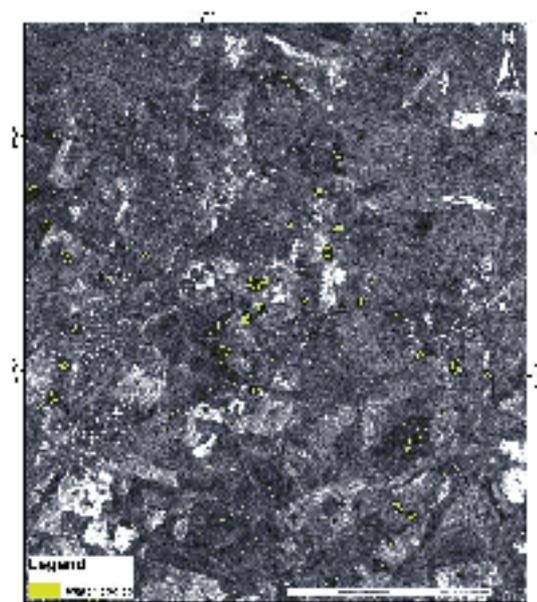
This project will stimulate innovation and development of skills in radar remote sensing for geoscience mapping in the country and in Africa. Optical remote-sensing data is captured in the visible and near-to-thermal infrared regions of the electromagnetic spectrum. The use of such remote-sensing data for geological mapping is severely limited by vegetation and cloud cover. In vegetated areas, information about the vegetation canopy is captured while information about the surface geology is generally lost. Additionally, the visible portions of the electromagnetic spectrum are strongly reflected by clouds, compromising its value for geological mapping. On the other hand, radar remote sensors are unaffected

by cloud cover and, depending on wavelength, can penetrate through vegetation cover and even several centimetres into the subsurface. Thus, many of the problems experienced when using optical remote-sensing data are alleviated. Consequently, as the CGS carries out more mapping projects in densely vegetated parts of Africa, the issue of having capacity to use radar remote sensing for geological mapping becomes more crucial.

Layer stack of ERS 1 and ASTER data, showing water bodies in black, moisture-rich soils in red, and vegetation in variations of blue and green.



First attempt at classifying open-water bodies. The image-enhanced ERS 1 radar scene is in the background with water bodies depicted in yellow.



ERS 1 and 2 radar remote-sensing data were acquired for the years 1995 and 1999 respectively. The data were provided by the European Space Agency (ESA) under the Tiger initiative that aims to encourage research on "Earth Observation for Integrated Water-Resources Management in Africa". Work has commenced on image pre-processing and analysis, and this will be followed by image classification and change-vector analysis.

## INTERNATIONAL AND REGIONAL COLLABORATION

### Seismic-hazard research

The National Research Foundation (NRF), in collaboration with the Swedish Research Council (SRC) and the Swedish International Developmental Agency (SIDA), provided an opportunity for grants under the MENA-Swedish Research Partnership Programme. The objective of the bilateral South African-Swedish Research Links Programme is to encourage research cooperation between researchers in South Africa and Sweden and to contribute to the scientific and socio-economic development of both countries. This programme aims, in particular, at achieving a balanced representation of male and female scientists partici-

physical behaviour to provide meaningful solutions to relevant geological problems. The field of neural networks is evolving continuously because of its tremendous success in diverse areas of specialisation. Efforts must be made to keep abreast of these developments in order to enhance applications incorporating this technology. It is envisaged that many applications employing neural computing will continue to stem from this project, benefiting various parties.

### Earthquake in Mozambique

A large earthquake, measuring 7.3 on the local Richter magnitude scale occurred in the south-western part of Mozambique, at 00:19 SAST on 23 February 2006, in the vicinity of a village named Massangena. The seismic event was recorded by the South African National Seismograph Network (SANSN), operated by the CGS. Seismic waves were recorded at the Silverton (SLR) station within two minutes after the earthquake occurred.

The epicentre location shows that the earthquake occurred at the southernmost extension of the East African Rift System that forms the division between the Nubian Tectonic Plate to the west and the Somalian Tectonic Plate to the east. The East African Rift is a diverging continental margin,



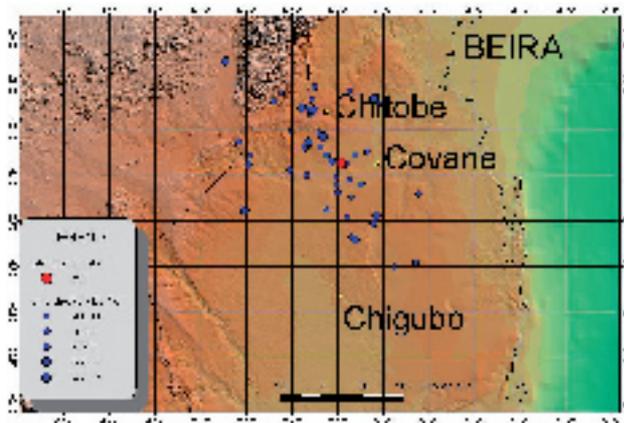
Crack opened in soil as a result of ground movement during the earthquake of 23 February 2006. (Photos: Vigilio de Magalheas, National Directorate of Geology, Maputo).

pating in this research partnership programme. In January 2005 this grant was awarded to Sweden, South Africa and Egypt (the Middle East and North African (MENA)) countries, and it supports a project in which seismic-hazard maps and risk assessments of North Africa are to be produced using two different procedures. Subsequently, the results from the different procedures will be compared.

In an innovative project aimed at developing new technologies, the uses and applications of neural networks in seismology are to be examined. Neural networks have tremendous potential for enhancing current applications and play a prominent role in the development of new, relevant applications. They have proven to be successful when used in addressing non-linear dependencies and complex

which means that the plates are moving away from each other at a rate of a few millimetres per year. Seismicity associated with the East African Rift is not a rare occurrence; however, an earthquake of such a magnitude was not expected as the faulting mechanism associated with diverging plate boundaries, in general, translates into seismic events of smaller magnitude.

The seismic event, being unusually severe for the southern African region, caused alarm and widespread panic in Mozambique and, to a lesser extent in neighbouring countries. In South Africa,



Location of main event, and aftershocks greater than 4.5 on the local Richter magnitude scale.

low-frequency vibrations generated by the earthquake were felt as far as Pretoria, a distance of approximately 750 km from the epicentre. Reports of severe shaking and panic were received from the KwaZulu-Natal Province, where it was reported that earth movement was felt for close on two minutes, and also from the Limpopo Province. Reports from Zimbabwe indicated that the earthquake was felt throughout the entire country. A report was also received from Francistown in Botswana.

It is not uncommon for large earthquakes to be followed by aftershocks. As a general rule, the largest aftershock to be expected after a large earthquake is one magnitude value less than the main quake, thus, in this case, an aftershock with a local Richter magnitude of at least 6.3 could be expected. However, the largest aftershock recorded by the SANSN so far registered 5.3 on the local Richter magnitude scale.

### **AfricaArray – A giant leap towards sustainable development within Africa**

The CGS has recently embarked on an exciting new project that aims to promote sustainability and geophysical capacity by training African geophysicists, and improving scientific infrastructure and facilities throughout Africa. The project has been named "AfricaArray".

*AfricaArray* was established through a public-private partnership of three organisations, the Pennsylvania State University, the University of the Witwatersrand and the CGS.

By assisting with the training of the scientific workforce that Africa needs, the *AfricaArray* training programme will impact directly on the development of Africa's natural-resources sector. This will be accomplished by coupling in situ educational and applied research programmes in geophysics, with the establishment of a set of seismological

recording stations spread across Africa to be known as *AfricaArray*.

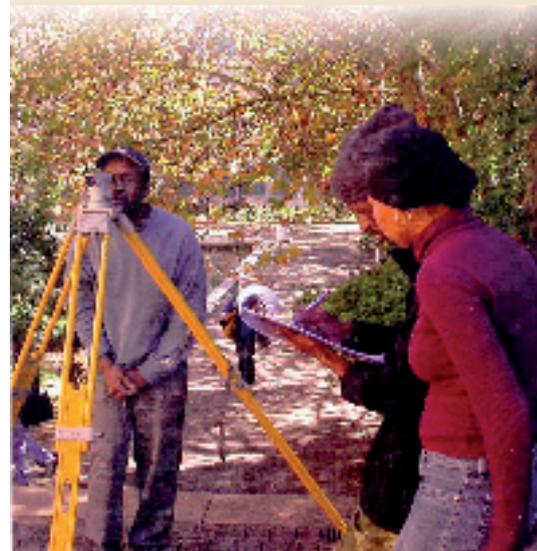
Using such a configuration, *AfricaArray* hopes to achieve the following goals:

- the training of a new generation of African geophysicists towards B.Sc., M.Sc. and Ph.D. degrees;
- the development of facilities within African institutions for conducting and maintaining geophysical education and applied research, and
- the promotion of community building among African geophysicists through education and applied research collaborations and data exchanges.

The CGS will install seismological stations in each participating country to form the array. Technical personnel from each country will be trained by the CGS and taught how to operate and maintain the stations, thus allowing the countries to be self-sufficient in this regard. The CGS will provide laboratory facilities and technical support for the network operations in eastern and southern Africa, and a "home" base for the technical coordinator while working in Africa.

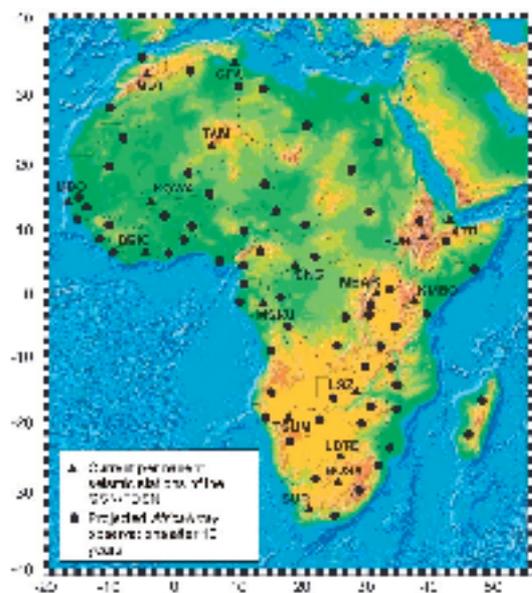
The data from the seismological stations will be utilised in an educational programme developed at the University of the Witwatersrand to provide B.Sc. and M.Sc. degree training in geophysics. This programme will be available to students from participating countries and will thus provide a catalyst for scientific community building. Technical support for training and the operation of seismological stations, as well as specialist input into

A primary goal of the *AfricaArray* programme is to train new geophysicists within Africa. Here some students learn how to use an automatic level, a fundamental instrument used in geophysical surveying.



teaching and research will be provided by the Pennsylvania State University.

Support facilities, such as computer networks and repair shops will also be established in each participating country. The initial five or six countries will be selected by the alliance partners to maximise buy-in from multinational companies and to take advantage of existing seismological stations.

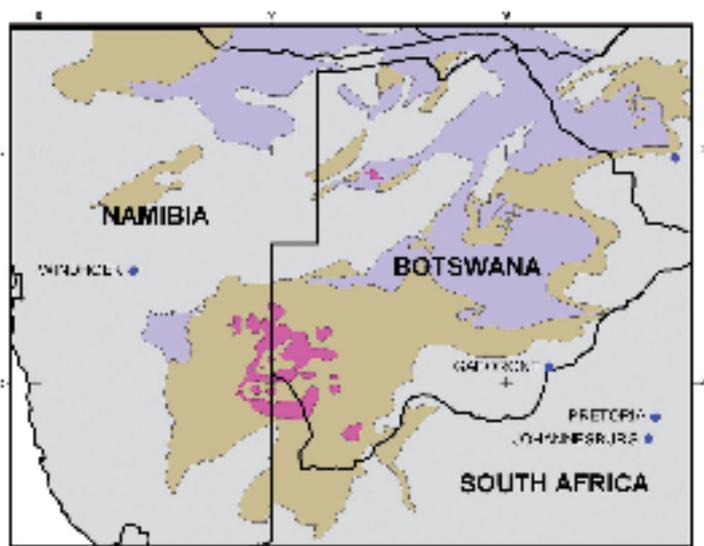


Projected AfricaArray network after 10 years.

### Tri-Nations Karoo Basin Correlation Project

The CGS is dedicated to being involved in improving and stimulating collaborative science research between South Africa and its regional neighbours. The Government of South Africa has signed several Bilateral Scientific Partnership Agreements with the governments of Botswana and Namibia during 2005.

Namibia, Botswana and South Africa share a common geological heritage that includes various Karoo-age rock sequences. During 2005 the CGS conducted a small pilot study, investigating the viability of a collaborative research project correlating the various Karoo sequences in the region. After consultation with the Botswana Geological Survey Department and the Namibian Geological Survey, the CGS proposed a collaborative and correlative study of these rocks. The understanding of the distribution of mineral resources, and the nature of water aquifers, will be improved and scientific ties between the participating countries will also be strengthened. The project which is funded by the Department of Science and Technology will result in three scientists from the respective countries attaining MSc degrees.



Map of the study area for the Tri-Nations Karoo Basin Correlation Project. The brown areas indicate Karoo sediments, the blue areas Drakensberg-equivalent lavas and the pink areas dolerite intrusions.

Science and technology officials from Botswana in the Geoscience Library during their visit to the CGS.



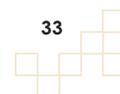
### PROMOTIONS

#### Mining INDABA 2006

This event took place in the Cape Town International Convention Centre from 7 to 9 February 2006.

This major mining exhibition was even more impressive than before and attracted 139 exhibitors, mostly from South Africa, but also from other African countries and abroad. The concurrent conference was attended by over 4 000 delegates and the exhibitions area was a very busy site during the three days of the event.

A large number of people visited the CGS stand and many queries were fielded, especially regarding the activities of the CGS in African countries. Two posters depicted the current international mapping activities of the CGS in Madagascar





Cindy Petersen of the Western Cape Unit at the CGS stand, Mining INDABA 2006.

and Ghana. A number of requests centered on the availability of African geoscience data, specifically the African metallogenic database. Interest was also shown in the geophysical mapping expertise of the CGS, as well as the activities of the CGS in Mozambique, and a large number of orders were received for the new Geology and Mineral Resources of Mozambique Handbook.

### PDAC Exhibition, Toronto, Canada

The CGS participated in the Prospectors and Developers Association of Canada (PDAC) Annual Convention held from 5 to 8 March 2006 in Toronto, Canada. For some years the presence of South Africa at the PDAC has been organised by the Department of Minerals and Energy and the South African Consulate in Toronto.

The conference incorporated an "Investing in African Mining" seminar that was organised by the Canada-South Africa Chamber of Business and Mine Africa. This was attended by the former Deputy Minister of Minerals and Energy, Ms Lulu Xingwana.

Mrs Shereen Bansi, Director at the Department of Minerals and Energy and CGS Board Member, Mr Fhatuwani Ramagwede, Executive Manager of the CGS and Mr Manley Barnard from the South African Office of the Department of Trade and Industry in Toronto, at the CGS stand.



Mr Fhatuwani Ramagwede, Executive Manager of the CGS, presented a talk on the small-scale mining and poverty-alleviation programmes of the CGS at the World Mines Ministries Forum, held from 2 to 5 March 2006 at the Metro Toronto Convention Centre. The session was designed to emphasise the concept of sustainable mining, and representative geological surveys were requested to provide geoscience information that could be used by the range of stakeholders in exploration and mining development. The major topics included:

- Mining clusters
- Indigenous people
- Investment attractiveness
- Benefit stream.

### New Cessna Grand Caravan 208B aircraft of the CGS

The CGS launched its new Cessna Grand Caravan 208B aircraft during a function held at the Grand Central Airport on 23 May 2005. This aircraft is a new addition to the current fleet of aircraft (Cessna 206 and 210) used for geophysical surveys.

The former Deputy Minister of Minerals and Energy (DME), Ms Lulu Xingwana, highlighted the goals of the airborne operation at the opening function, namely mineral exploration, ground-water investigations and environmental investigations and monitoring. She also pointed out the commitment of the DME to the CGS with regard to airborne geophysics.

The equipment on board the Cessna 208B will include capabilities for radiometric and magnetic surveys, as well as additional capabilities in near-infrared profiling, electromagnetic data collection, hyper-spectral scanning and seamless digital photography.

The Cessna 208B will enable the CGS to extend its operations into various parts of Africa. The new aircraft is ideally suited for large surveys. It will be utilised to obtain valuable data for use in environmental projects, as well as in mineral, engineering and ground-water exploration projects.

### Representation at exhibitions and other events

The CGS was represented at numerous expositions and mining, geoscience and educational events during the year, including:

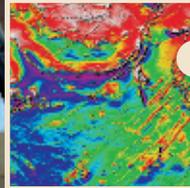
- 14 April 2005. Career Exhibition, Samrec Pty Ltd., Olifantsfontein.
- 7–14 May 2005. National Science Week in the Limpopo Province.
- 18–20 May 2005. Council for Geoscience Open Day 2005, Pretoria.



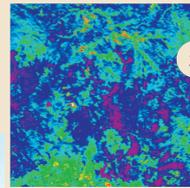
▲ The former Deputy Minister of Minerals and Energy, Ms Lulu Xingwana, cutting the ribbon to launch the Cessna Grand Caravan 208B.

>>> The Cessna Grand Caravan 208B aircraft on display at the launch function.

Geophysical images of the southeastern limb of the Bushveld Complex: aeromagnetics (1), total-count radiometrics (2), ternary image of potassium, uranium and thorium (3), digital terrain model (4).



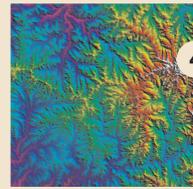
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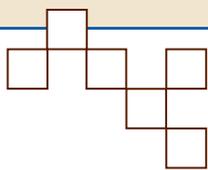
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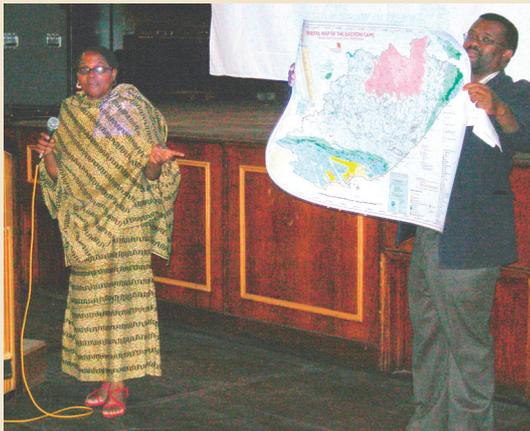


- 13–19 June 2005. Geology Expo in Sunnypark, Pretoria.
- 29 June 2005. Annual Youth Month Celebration Educational Exposition. Create Youth Employment and Fight Poverty, Sammy Marks Square, Pretoria.
- 3–7 July 2005. Learners' Focus Week Career Guidance Programme, Bloemfontein.
- 4–7 July 2005. GEO2005 Trade Exhibition, University of KwaZulu-Natal, Durban.
- 7 August 2005. Women in Development, Johannesburg Metro (Council Chambers), Johannesburg.
- 18 August 2005. Women building a South Africa that truly belongs to all, Sammy Marks Square, Pretoria.
- 24 August–4 September 2005. Participation in the Museum Park stand, Pretoria Show.
- 30 October–4 November 2005. 7th AfricaGIS Conference, CSIR, Pretoria.
- 3–4 November 2005. South African Small-Scale Mining Chamber, Eastern Cape Chapter.
- 7–9 February 2006. Mining INDABA 2006, Cape Town Convention Centre, Cape Town.
- 27–28 February 2006. Career information session, Marulaneng Municipality, Tzaneen (Ga-Sekororo).
- 5–8 March 2006. PDAC 2006, International Convention Centre, Toronto, Ontario, Canada.
- 8 March 2006. Careers Expo, Carleton Jones High School, Carletonville.
- 5–11 March 2006. ScienceUnlimited 2006 (SciTech), Tshwane Events Centre, Pretoria.
- 13–15 March 2006. Career Exhibitions, North West Province, Zeerust.
- 22–24 March 2006. 3rd Annual Disaster Management Summit 2006, Southern Sun Hotel, Johannesburg International Airport.

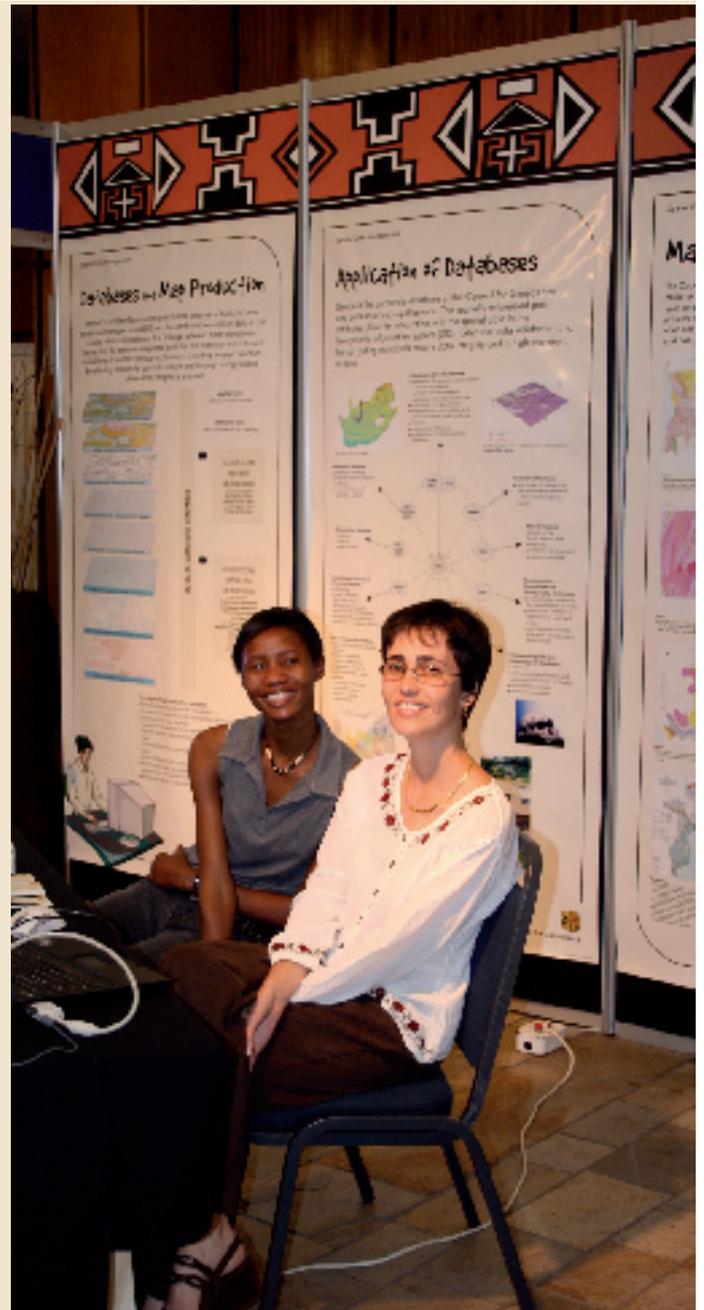


▲ Office bearers and stakeholders of the Eastern Cape  
 ▲ Chapter of the Small-Scale Mining Chamber, from  
 left to right Ms Rose Williams of Mzintlava Quarry, Dr Koos  
 Reddering of the Eastern Cape Unit of the CGS, Mr Temba  
 Gxoliwe, Ms Agnes Mzobotshi of Mzintlava Quarry, Mr  
 Xolile Ngameni, Chairperson and Mr Sipo Dangazelle, an  
 additional member of the Eastern Cape Chapter.

A copy of the mineral map of the Eastern Cape was  
 ▼ presented to the office bearers of the Eastern Cape  
 ▼ Chapter of the Small-Scale Mining Chamber.



>>> Elmi Dixon and Pretty Nkosi at the 7th AfricoGIS  
 Conference, CSIR, Pretoria.





# PUBLICATIONS

## PUBLICATIONS

The following publications were released during the year:

- Meteorite Impact! The danger from space and South Africa's mega-impact the Vredefort Structure (First and Second Editions) by W.U. Reimold and R.L. Gibson with a chapter by A. Pelsler, M. Naudé and K. Balkwill
- Explanation of sheets 2329CD and 2329DC (Scale: 1:50 000). A geological description of sheets 2329CD Pietersburg and 2329DC Mankweng by N. Baglow
- Explanation of sheets 2628AD and 2628BC (Scale: 1:50 000). The geology of the Springs and Endicott areas by R. Opperman, A.W.C. Marais and P.J.A. Bosch
- Explanation of sheet 3318CB (Scale: 1:50 000). The engineering geology of the Melkbosstrand area, Western Cape, South Africa by F.D.J. Stapelberg
- Explanation of sheet 3318CD (Scale: 1:50 000). The engineering geology of Cape Town and environs, Western Cape, South Africa by F.D.J. Stapelberg
- Explanation of sheet 3318DA (Scale: 1:50 000). The engineering geology of Philadelphia and environs, Western Cape, South Africa by F.D.J. Stapelberg
- SACS: Catalogue of South African Lithostratigraphic Units: Volume 8: South African Committee for Stratigraphy by M.R. Johnson
- Seismological Series of the Council for Geoscience 38: Catalogue of earthquakes in southern Africa and surrounding oceans for 2002 by E. Hattingh and D.L. Roblin

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- MAIER, W.D., PELTONEN, P., JUVENON, R. and PIENAAR, C. 2005. Platinum-group elements in peridotite xenoliths and kimberlite from the Premier kimberlite pipe, South Africa. *South African Journal of Geology*, 108, pp. 413–428.
- MARÉ, L.P. and COLE, J. 2006. The Trompsburg Complex revisited: A geophysical perspective. *Journal of African Earth Sciences*, 44(3), pp. 314–330.
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## CONFERENCE ABSTRACTS AND POSTERS

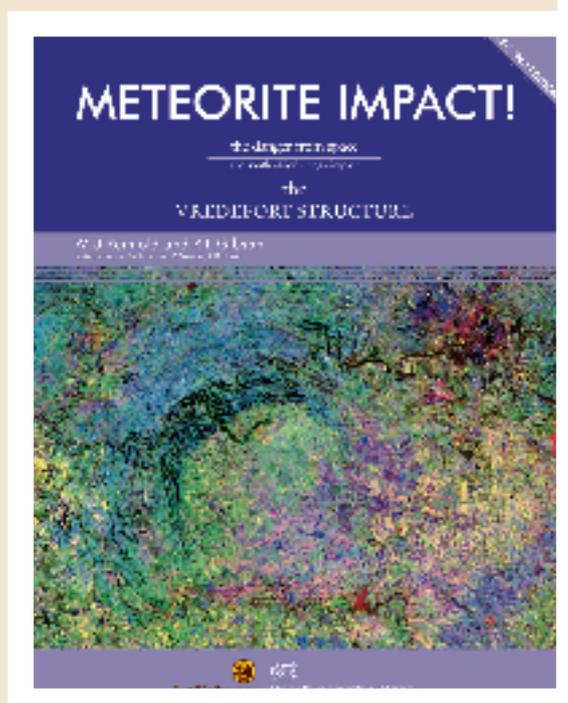
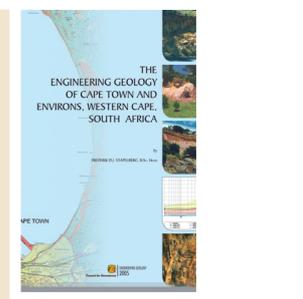
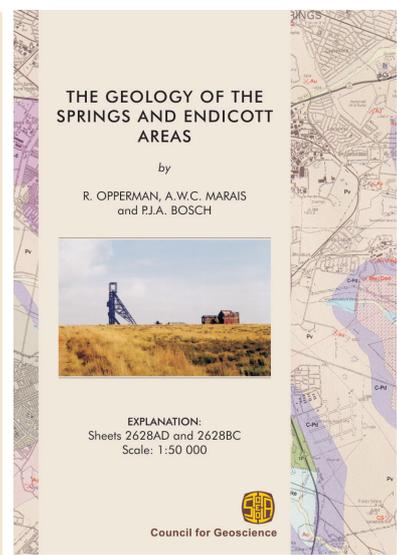
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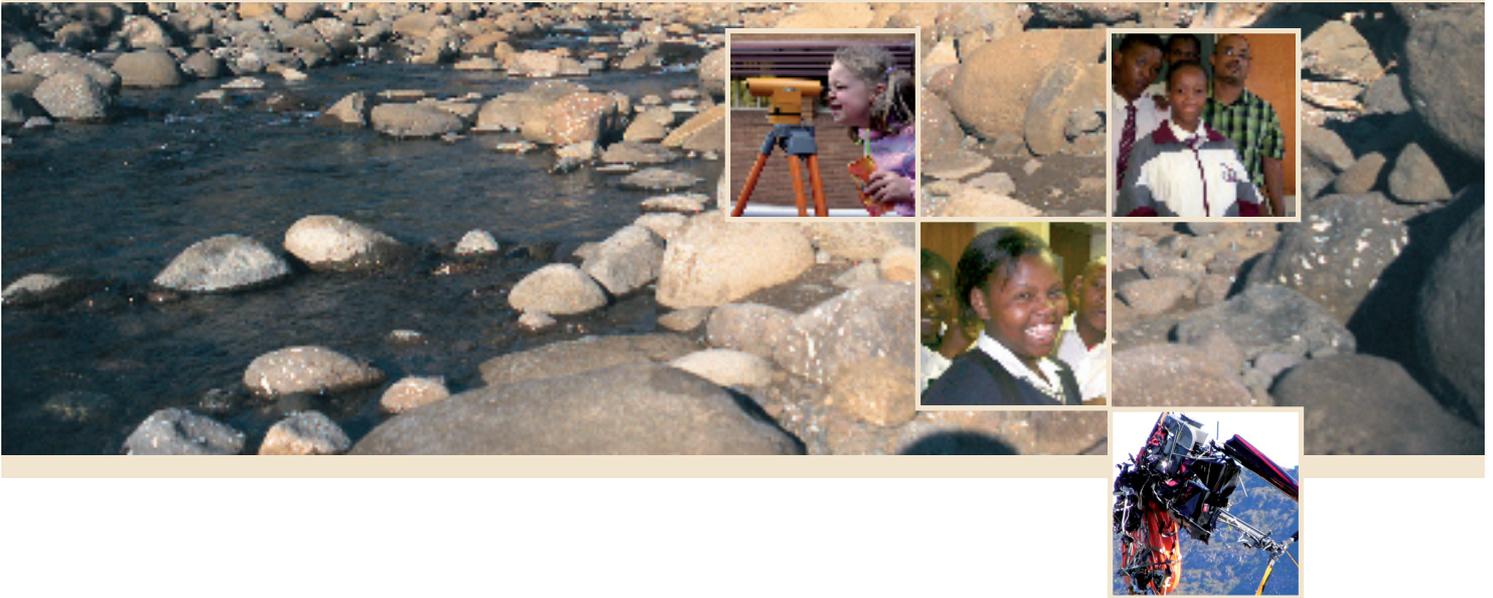
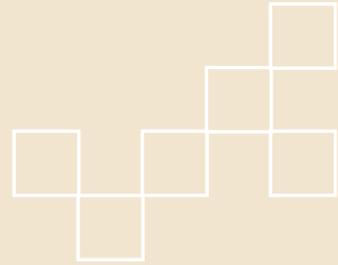
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## SOCIAL RESPONSIBILITY OF THE COUNCIL FOR GEOSCIENCE DURING 2005/06



### Council for Geoscience Open Day 2005

The biennial Open Day of the CGS was hosted at the Head Office in Pretoria from 18 to 20 May 2005. Displays were prepared by all the Business Units based in Pretoria. Staff members of the Information and Collections Management Unit were responsible for the design of the posters and information sheets that formed part of the exhibitions.

Excited visitors to the CGS Open Day 2005.



An impressive amount of effort went into these displays and a model by the Analytical Laboratory displaying several important aspects of the geosciences captured many visitors' attention. Schools from the entire Tshwane area were invited to the event and a marketing

campaign was also launched. The final count for this Open Day was:

- Visiting schools: 40
- Total number of visitors: 1 600

The most impressive outcome of the event was the interest and enthusiasm shown by both the staff of the CGS and the visitors. There were many questions about the earth sciences and geology as a career. Visitors to the Open Day were anxious to know where the wonderful collections of minerals and fossils are found.

It became clear that there is a much wider stakeholder community that could be reached by extending this initiative. Allied to the Open Day, other organisations showed an interest in hosting part of the CGS display of posters and the interactive models of the Analytical Laboratory. The CGS was invited by the Sunny Park Shopping Centre, amongst others, to exhibit its posters there and to talk to the public about the minerals housed at the Geoscience Museum.



The impressive display of the Analytical Laboratory at the CGS Open Day 2005.

## North West Province Career Exhibition

The CGS was invited to take part in this career-guidance event for future scientists. The event was organised by the Department of Education, North West Province Central Region and was held from 13 to 15 March 2006 in Zeerust. The exhibition was attended by about 2 300 learners from twenty-six secondary schools. Although initially there seemed to be confusion amongst some students between geology and geography, they showed considerable interest in the career opportunities offered by geology and its different subdisciplines.

The other interesting aspect of the exhibition was the keen interest shown by a large number of community members in the research being undertaken by scientists of the CGS, especially regarding the identification of opportunities in small-scale mining projects.

## University Roadshow 2005

The CGS has initiated a roadshow to universities with the aim of introducing the geosciences as a career option to university students and to encourage students to consider the CGS as a future employer.

The table below outlines visits to universities during September and October 2005.

University	Date	CGS Representative
Rhodes	29-09-05	F. Ramagwede
Venda	29-09-05	G. Graham
Forte Hare	06-10-05	F. Ramagwede
Free State	11-10-05	P.K. Zawada
KwaZulu-Natal	12-10-05	G. Graham

## Other educational-outreach activities

Geologists of the Information and Collections Management Unit have produced a series of articles on palaeontology and the study of fossils, volcanoes, earthquakes and tsunamis, as well as the mineral wealth of South Africa for publication in *MiniMag*, a magazine aimed at teenage learners.

The CGS was invited by the Department of Minerals and Energy to participate in a programme to empower women to become actively involved in the economy of the country. The event was held at the Indaba Hotel in Pretoria on 22 and 23 August 2005. A CGS poster exhibition was on display, as part of the CGS's contribution towards this initiative.

As part of the CGS collaboration with the Department of Minerals and Energy, the organisation was invited to attend the welcoming function of the new Minister of Minerals and Energy, Minister Lindiwe Hendricks on 18 August 2005 at the Sammy Marks Square in Pretoria.

The CGS was also invited by the Department of Minerals and Energy to the Annual Youth Celebration which was held at the Sammy Marks Square in Pretoria on 29 June 2005. This was aimed at helping to create youth employment and at alleviating poverty. The display of the CGS at this function attracted considerable interest from the visitors.

Staff members from the CGS were invited to give presentations on specific aspects of the geosciences to about 280 learners from all nine



Martin Lekotoko from the CGS explains the intricacies of fossilised wood to some of the visitors to an exhibition at the Sammy Marks Square.



Klaas Mohuba of the CGS discusses interesting aspects of the earth sciences with a visitor to the Sammy Marks Square exhibition. Part of the CGS poster displays can be seen in the background.



Martin Lekotoko of the CGS in discussion with interested attendees at the Bloemfontein Learners' Focus Week held from 3 to 7 July 2005.

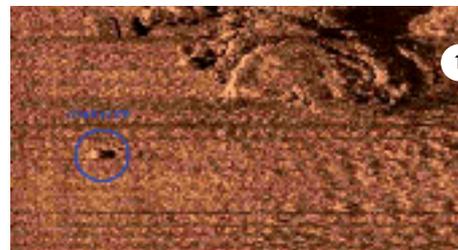
provinces at a Learners' Focus Week that was held in Bloemfontein during July 2005. The Unit Managers from the Spatial Data Management and Mineral Resources Development Units presented talks on geographic information systems (GIS) and economic geology, respectively.

## Marine Geoscience Unit locates wreck of helicopter

The Marine Geoscience Unit in Cape Town assisted the South African Police Service on 18 January 2006 to locate the position of a helicopter that had crashed into the sea off Cape Point in 20 m of water, by using their side-scan sonar equipment. The time needed to recover the wreck and the body of the pilot was shortened considerably by this successful action.

1 Side-scan sonar image of the helicopter wreckage on the sea floor.

2 Staff members of the Marine Geoscience Unit, David Murrell (right) and Sven Coles (left), searching the sonar records for likely "contacts".



The wreckage of a Robinson-22 helicopter being recovered off Cape Point.





Scholars and their geography teacher of the Klerksdorp Secondary School next to their new seismological station.

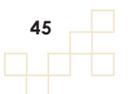
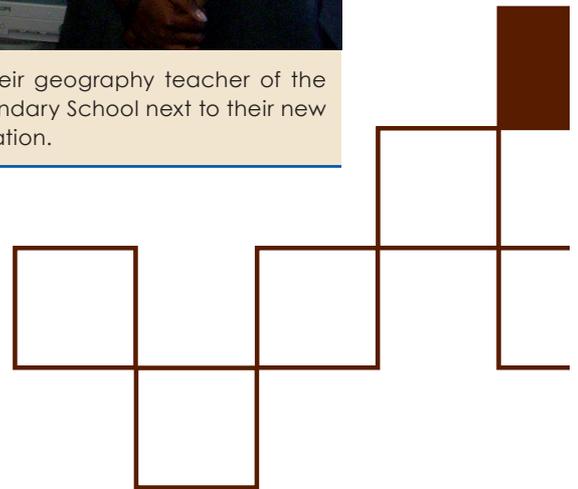
### Increasing the awareness of seismology in schools

The new project to increase the awareness of seismology in schools has been met with much enthusiasm by schools in Carletonville, Klerksdorp and Ceres where seismograph stations were recently installed. The learners and teachers were thrilled to have systems similar to those installed at various stations of the South African National Seismograph Network (SANSN) within the country. The learners tested the systems by continuously jumping up and down in order to simulate earth movement. The schools are eager to cooperate with the CGS in order to have scientific talks presented to the learners. The CGS foresees this project as a ground-breaking venture into increasing the transfer of scientific knowledge to future generations of South Africa.

### Indian Ocean Tsunami Warning System

After the earthquake on 26 December 2004, which caused the catastrophic tsunami that devastated many coastal states in the Indian Ocean and resulted in well over 200 000 deaths, an Inter-Ministerial Committee was established to coordinate South Africa's response to such a natural disaster. It was decided that South Africa must participate in the establishment of an "Indian

Ocean Tsunami Warning System" (IOTWS) in order to establish close links with the United Nations Office for the Coordination of Humanitarian Affairs (OCHA/UNESCO). In addition, since the CGS operates the South African National Seismograph Network, the organisation was designated by the National Disaster Management Centre (NDMC) to establish a National Data Centre (NDC) to forward real-time seismic data to an International Data Centre (IDC). All data will be collated at the IDC in order to act as an early-warning system for future possible catastrophies of this nature. Funds were made available by the Department of Provincial and Local Government early in January 2006 for the CGS to upgrade the communications infrastructure and equipment of five seismological stations for this purpose.





# SUSTAINABILITY REPORT OF THE COUNCIL FOR GEOSCIENCE



## EXECUTIVE REMUNERATION

### Chief Executive Officer

In terms of Section 18(5) of the Geoscience Act (Act No. 100 of 1993), the "Executive Officer shall be appointed on such conditions, including conditions relating to payment of remuneration, allowances, subsidies and other benefits as the Management Board may determine in accordance with a system approved from time to time by the Minister with the concurrence of the Minister of State Expenditure".

### Executive Management Team

The remuneration of the Executive Management team is determined by the Management Board of the CGS and is reviewed from time to time.

## TRANSFORMATION

The CGS adheres to equal opportunity and affirmative action principles as promulgated in the

Employment Equity Act (Act No. 55 of 1998).

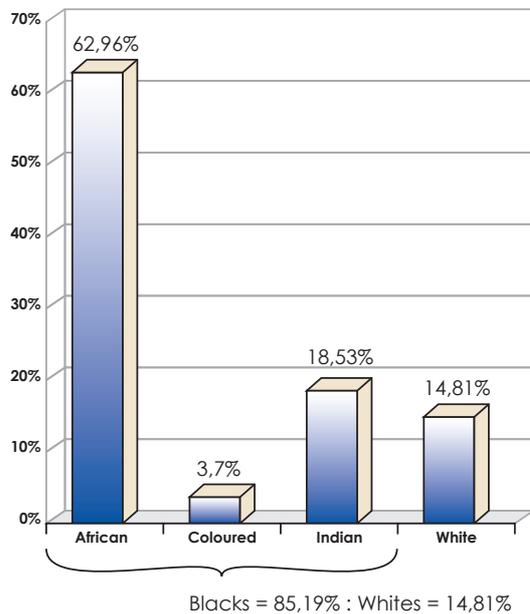
The Personnel, Remuneration and Transformation Committee of the Management Board is responsible for monitoring and evaluating progress on transformation and skills development.

The CGS operates in a labour market characterised by a scarcity of geoscientific skills and a market that is highly competitive. Positive measures are in place to address the attraction of potential scientific skills from designated groupings. A bursary scheme was put in place, and the programme is used as a feeder pipeline to attract potential and developing scientists from designated groups into the field of geoscience.

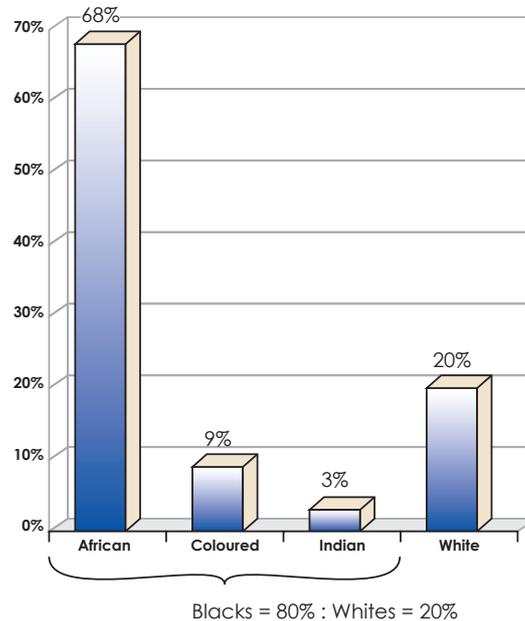
It is worth noting that as at 31 March 2006, the CGS absorbed 100% of the students who completed their studies in 2005 into the permanent staff corps of the CGS. These students include 12,5% Whites and 87,5% Blacks.

The following tables illustrate the demographic composition of the staff and bursars of the CGS.

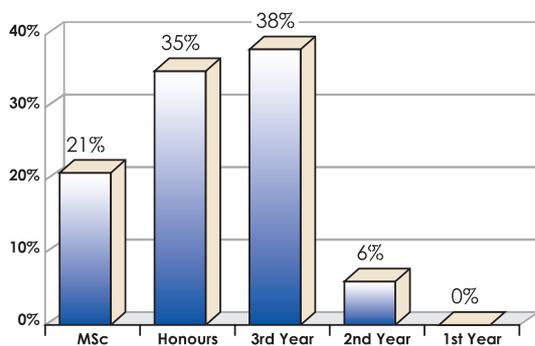
## Overall Appointments – 1 April 2005 to 31 March 2006



## Demographic Composition – Full-time Bursars



## Spread of Qualification of Bursary Holders – Full-time Students



## ETHICAL MANAGEMENT

### Adherence to code of ethics

The CGS has developed and adopted a Code of Conduct for the CEO, Executive Managers and staff. The code of conduct links to the CGS values and requires all employees to maintain the highest ethical standards, ensuring that business practices are conducted in a manner that, in all reasonable circumstances, is beyond reproach.

## SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT

The CGS has a Health and Safety Committee that is established in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993). This committee meets on a quarterly basis to discuss work-related health and safety issues identified at the CGS. Expert advice is given to various Unit Managers regarding health at work and safe working practices. The following policies have been developed by the committee:

- Field Work Policy for Geologists and Technicians
- Smoking Policy
- General Health and Safety Policy.



## **ABRIDGED BOARD CHARTER PER PFMA AND PROTOCOL ON CORPORATE GOVERNANCE**



### **Board Charter**

A Board Charter, which sets out the responsibilities of the Board, was developed and established for the Management Board of the CGS, and includes the Board's code of conduct. The Board is fully committed to maintaining the standards of integrity, accountability and openness required to achieve effective corporate governance.

The charter confirms the Board's

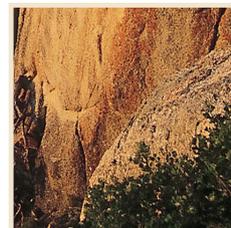
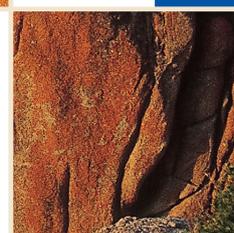
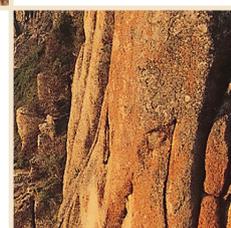
- accountability
- fiduciary duties and responsibilities
- appointment of committees
- governance and meeting procedures
- duty to declare conflict of interests
- responsibility for adoption of strategic plans
- monitoring of the operational performance and management
- determination of policy and processes to ensure the integrity of the CGS's risk management and internal controls
- communications policy
- director selection, orientation and evaluation.

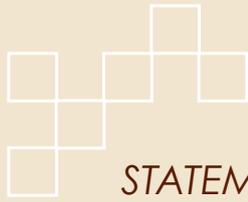
The Board Charter is reviewed when necessary to ensure that it remains relevant to the business objectives of the CGS.

*FINANCIAL REPORT*  
**OF THE COUNCIL FOR GEOSCIENCE**  
**FOR THE YEAR ENDED 31 MARCH 2006**



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## STATEMENT OF RESPONSIBILITY



### COUNCIL FOR GEOSCIENCE

#### MANAGEMENT BOARD'S RESPONSIBILITY FOR THE ANNUAL FINANCIAL STATEMENTS

The Board Members are responsible for the monitoring, preparation and the integrity of the financial statements and related information included in this annual report.

In order for the Board to discharge its responsibilities, Management has developed and continues to maintain a system of internal controls. The Board has the ultimate responsibility for the system of internal controls and reviews its operation primarily through management structures.

The internal controls include a risk-based system of internal accounting and administrative controls designed to provide reasonable, but not absolute assurance that assets are safeguarded and that transactions are executed and recorded in accordance with generally accepted business practices and the Council for Geoscience's policies and procedures. These controls are implemented by trained, skilled personnel with an appropriate segregation of duties and are monitored by Management. It includes a comprehensive budgeting and reporting system operating within strict deadlines and an appropriate control framework.

The external auditors are responsible for reporting on the financial statements. These financial statements are prepared in accordance with South African Statements of Generally Accepted Accounting Practices and incorporate disclosure in line with the accounting philosophy of the company. The financial statements are based on appropriate accounting policies consistently applied and supported by reasonable and prudent judgements and estimates.

The Board Members believe that the organisation will be a going concern in the year ahead. For this reason they continue to adopt the going-concern basis in preparing the financial statements of the Council for Geoscience.

The Board Members are not aware of any matter or circumstance arising since the end of the financial year, not otherwise dealt with in the Council for Geoscience's annual financial statements, that would affect the operations of the Council for Geoscience or the results of its operations significantly.

The annual financial statements for the year 2005/06 were approved by the Accounting Authority in terms of section 51.(1)(f) of the Public Finance Management Act on 31 July 2006 and are signed on its behalf by:



**P E Ngoepe**  
Chairperson: Management Board



**N D Ntombela**  
Member: Management Board

Date: 31 July 2006  
Pretoria

**REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT  
ON THE FINANCIAL STATEMENTS OF  
THE COUNCIL FOR GEOSCIENCE  
FOR THE YEAR ENDED 31 MARCH 2006**

**1. AUDIT ASSIGNMENT**

The financial statements as set out on pages 67 to 88, for the year ended 31 March 2006, have been audited in terms of section 188 of the Constitution of the Republic of South Africa, 1996, read with sections 4 and 20 of the Public Audit Act, 2004 (Act No. 25 of 2004). These financial statements are the responsibility of the accounting officer. My responsibility is to express an opinion on these financial statements, based on the audit.

**2. SCOPE**

The audit was conducted in accordance with the International Standards on Auditing read with *General Notice 544 of 2006*, issued in *Government Gazette* no. 28723 of 10 April 2006 and *General Notice 808 of 2006*, issued in *Government Gazette* no. 28954 of 23 June 2006. Those standards require that I plan and perform the audit to obtain reasonable assurance that the financial statements are free of material misstatement.

An audit includes:

- examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements
- assessing the accounting principles used and significant estimates made by management
- evaluating the overall financial statement presentation.

I believe that the audit provides a reasonable basis for my opinion.

**3. BASIS OF ACCOUNTING**

The entity's policy is to prepare financial statements on the basis of accounting determined by the National Treasury, as described in note 1.1 to the financial statements.

**4. AUDIT OPINION**

In my opinion, the financial statements present fairly, in all material respects, the financial position of the Council for Geoscience at 31 March 2006 and the results of its operations and its cash flows for the year then ended, in accordance with the basis of accounting determined by the National Treasury of South Africa, as described in note 1.1 to the financial statements, and in the manner required by the Public Finance Management Act, 1999 (Act No. 1 of 1999).

## 5. APPRECIATION

The assistance rendered by the staff of the Council for Geoscience during the audit is sincerely appreciated.



**BR WHEELER** for Auditor-General

Pretoria

31 July 2006



A U D I T O R - G E N E R A L



## EXECUTIVE REPORT



### Mandate of the Council for Geoscience

The Council for Geoscience (CGS) is mandated to gather, compile, interpret and disseminate geoscience knowledge for South Africa. This mandate is captured in the Geoscience Act (Act No. 100 of 1993) and includes the following:

- Carry out systematic geological, geophysical, geochemical, marine geoscience, metallogenic and engineering-geological mapping of South Africa and compile and publish this information.
- Conduct basic geoscience research to understand present and past geological processes.
- Curate all geoscience data for South Africa, and facilitate public access to this data.
- Manage a number of geoscience facilities, including the National Geoscience Library, the National Borehole Core Library, the National Geoscience Museum and a National Seismological Network.

In addition to the above, the CGS is also mandated to render commercial geoscientific services.

### Legislative and Corporate Governance Requirements

The CGS was established in terms of the Geoscience Act (Act No. 100 of 1993). This Act also established the mandate and national responsibilities of the CGS. The CGS was listed as a schedule 3A Public Entity in terms of the Public Finance Management Act (Act No. 1 of 1999) as amended by Act No. 29 of 1999.

### Overview of Business Operations

There is currently a boom in international geoscience projects, and the CGS is capitalising on these opportunities. In the past year the CGS has made substantial progress in procuring large international projects, sponsored by the Economic Development Fund of the European Union and the World Bank. The programmes focus, amongst others, on geological and hydrogeological mapping, GIS-based map production, geochemical and geophysical surveys, as well as the transfer of technologies to and the training of staff within the respective geological surveys. The CGS plays a dual role in some of

## Highlights of Financial Results

	2005 R'000	2006 R'000
Government grant – core funding	77,606	86,078
Grant – earmarked funding	-	105
Contracting revenue	35,452	70,401
Publication revenue	483	624
Other operating income and interest	7,303	6,944
Total income	120,844	164,152
Total expenses	113,787	147,862
Surplus for the year	7,057	16,290

these programmes as it executes these as well as supervises other consultants involved in the projects.

The CGS exceeded its commercial income target for the year. This is largely attributed to the implementation of the new CGS strategy, which focuses on enhancing partnerships with government departments, such as the Departments of Minerals and Energy, Science and Technology, and Water Affairs and Forestry. The key objective of the enhanced partnerships is to ensure that the CGS is well positioned to deliver essential geoscientific services to the relevant departments as well as local authorities.

On innovation and geoscience research, major achievements were made in respect of environmental geosciences, seismology, geophysics, geochemistry and mineral-resources assessment. With regard to environmental geosciences, important advances were made in respect of hydrogeological modelling and ground-water pollution research. On seismology, focus was on the modelling of geohazards associated with earthquakes. In geophysics, the CGS completed the final phase of the largest land-based magnetotelluric survey ever conducted in southern Africa. The knowledge generated from the survey will improve the understanding of the emplacement and formation of kimberlites that host diamonds. On the geochemistry front, major advancements were made in respect of the identification of new mineral-potential areas. In addition, the CGS is involved in the assessment of South Africa's mineral resources and is collaborating with the United States Geological Survey to assess unidentified mineral resources in the southern African region.

The CGS, in conjunction with the Department of Minerals and Energy, established the Small-Scale Mining Board (SSMB). This Board is responsible for assessing and approving the various project proposals. Significant progress has been made during the past year with the registration of several new projects.

Geoscience mapping and research programmes of the CGS, which are financed by state funds appropriated by Parliament, have made good progress in terms of

achieving targets and improving performance. In this regard, performance in the past year remained on par with the 2004/05 figure of 79%.

### Strategic Objectives

The CGS developed its current strategy in response to the various mandates it operates under and the primary directive of the State, namely to free the potential of individuals by improving the quality of life of all citizens, assisting in the growth and wealth of South Africa and eradicating poverty, especially in the rural areas of the country.

In realising the urgent need for the CGS to address the national imperatives, its Technical and Social Programmes address the following strategically defined focus areas of the organisation:

- **Growth of the CGS and development of the first economy** (ensuring that the CGS grows as an organisation and also contributes to economic development – people, scientific and financial)
- **Regulatory, systems and stakeholder** (ensuring CGS compliance with legislative requirements, development of CGS regulatory systems and alignment with national mandates)
- **Rural development and poverty eradication** (ensuring that the CGS contributes to the development of the second economy)
- **Innovation** (development of products, systems and services)
- **Africa development** (CGS assistance in the development of Africa and its people by upgrading the continent's geoscience infrastructure)
- **Skills development** (building capacity in respect of scientific, administrative and managerial/leadership skills)
- **Transformation** (business and people).

The CGS's objectives are achieved through continuously improving and enhancing the quality of its geoscience research, products and services. The strategic research

priorities of the CGS are based on the following six scientific and business thrusts:

- ◆ Geoscience research and mapping
- ◆ Geoscience applicable to engineering and construction industries and the mitigation of geoscience-related physical hazards
- ◆ Geoscience applicable to water
- ◆ Geoscience education and information management
- ◆ Mineral and energy resources development and poverty eradication
- ◆ Geoscience research applicable to the environment and chemical hazards.

## Board of the Council for Geoscience

The Management Board of the CGS approves the mission, strategies, goals, operating policies and priorities of the organisation and monitors compliance with the policies and achievements with respect to the scientific, administrative and financial objectives.

The Board is appointed by the Minister in accordance with the provisions of Section 4 of the Geoscience Act (Act No. 100 of 1993). Other than the CEO, all the Board Members are non-executive members. The Board Members are continuously and actively involved in, and bring independent counsel and judgement to bear on all Board discussions and decisions. Board Members are fully conversant with their fiduciary duties as outlined in Section 50 of the PFMA, which, amongst others, requires them to declare their interests when a potential conflict of interest may arise. The Board meets quarterly, in February, May, August and November.

The Board has the following active Committees:

- ◆ Personnel, Remuneration and Transformation
- ◆ Audit and Risk
- ◆ Finance
- ◆ Technical

The composition of the Board during the 2005/06 financial year is given below:

### **Prof. P E Ngoepe**

(Chairperson)

Appointed on 1 October 2003

### **Mr T Ramontja**

(Chief Executive Officer – Ex Officio)

Appointed on 1 November 2003

### **Ms N D Ntombela**

Department of Minerals and Energy

Appointed on 1 October 2003

### **Mr A P Nkuna**

Mineworkers Investment Company

Re-appointed on 1 October 2003

### **Mr L L Makibinyane**

Export Credit Insurance Corporation

Appointed on 1 October 2003

### **Prof. J M Barton (Jr)**

Geological Society of South Africa

Appointed on 1 October 2003

### **Mr D G Clarke**

Department of Land Affairs

Appointed on 1 October 2003

### **Dr G T Willemse**

Department of Environmental Affairs and Tourism

Replaced on 1 February 2006 by Ms L McCourt

### **Ms L McCourt**

Department of Environmental Affairs and Tourism

Appointed on 1 February 2006

### **Mr J K Mollo**

Chamber of Mines

Appointed on 2 November 2004

### **Ms P Molefe**

Department of Public Enterprises

Replaced on 1 February 2006 by Ms T Xaso

### **Ms T Xaso**

Diebold South Africa

Appointed on 1 February 2006

### **Mr M Riba**

Department of Land Affairs

Alternate to Mr D G Clarke

Appointed on 1 October 2003

### **Ms S Bansi**

Department of Minerals and Energy

Alternate to Ms N D Ntombela

Appointed on 1 October 2003

### **Prof. W U Reimold**

Geological Society of South Africa

Alternate to Prof. J M Barton (Jr)

Replaced on 1 February 2006 by Ms D de Nooy

### **Ms D de Nooy**

Mintek

Alternate to Prof. J M Barton (Jr)

Appointed on 1 February 2006

### **Mr L F Ramagwede**

Department of Water Affairs and Forestry

Membership terminated as of 10 May 2005

when he became a member of staff

Board members are appointed for a three-year term of office, which expires on 30 September 2006.

Attendance register of Board meetings

	12 May 2005	15 June 2005	11 Aug 2005	20 Sept 2005	11 Nov 2005	02 Mar 2006
Prof. P E Ngoepe	Present	Present	Present	Present	Present	Present
Mr T Ramontja	Present	Present	Present	Present	Present	Present
Ms N D Ntombela	Present	Present	Present	Apology	Present	Apology
Mr A P Nkuna	Present	Apology	Present	Apology	Present	Apology
Mr L L Makibinyane	Present	Present	Present	Present	Present	Present
Prof. J M Barton (Jr)	Present	Present	Present	Present	Present	Present
Mr D G Clarke	Present	Apology	Apology	Apology	Present	Present
Ms L McCourt	N/A	N/A	N/A	N/A	N/A	Present
Mr J K Mollo	Present	Present	Present	Present	Present	Present
Ms T Xaso	N/A	N/A	N/A	N/A	N/A	Present
Ms S Bansi (Alternate to Ms N D Ntombela)	N/A	N/A	N/A	Present	N/A	Apology
Mr M Riba (Alternate to Mr D G Clarke)	N/A	Apology	Apology	Apology	N/A	N/A
Prof. W U Reimold (Alternate to Prof. J M Barton (Jr))	N/A	N/A	N/A	N/A	N/A	N/A
Ms D de Nooy (Alternate to Prof. J M Barton (Jr))	N/A	N/A	N/A	N/A	N/A	N/A
Mr L F Ramagwede	N/A	N/A	N/A	N/A	N/A	N/A
Dr G T Willemse	Present	Apology	Apology	Apology	Apology	N/A
Ms P Molefe	Apology	N/A	N/A	N/A	N/A	N/A

\* N/A - Not applicable

## Audit and Risk Committee

The Audit and Risk Committee of the CGS evaluates the annual internal and external audit plans, the internal and external audit reports and the financial statements. The Audit and Risk Committee also assesses the effectiveness of the internal audit function and the risk mitigation procedures, which are in place.

In addition, the Audit and Risk Committee, from time to time, assesses its mandate and charter in order to deal with emerging risks.

The composition of the Audit and Risk Committee as at 31 March 2006 was:

Mr B Hawkworth (Chairperson)  
 Ms T Xaso  
 Mr L L Makibinyane  
 Ms N D Ntombela  
 Ms S Bansi (Alternate to Ms N D Ntombela)  
 Mr J K Mollo

### Attendance register of the Audit and Risk Committee

	28 April 2005	24 May 2005	19 July 2005	27 July 2005	24 Oct 2005	15 Feb 2006
Mr B Hawkworth	Present	Present	Present	Present	Present	Present
Ms T Xaso	Present	Present	Apology	Present	Apology	Present
Mr L L Makibinyane	Present	Present	Present	Present	Present	Present
Ms N D Ntombela	Apology	Present	Apology	Present	Apology	Present
Ms S Bansi (Alternate to Ms N D Ntombela)	Apology	N/A	Apology	N/A	Apology	N/A
Mr J K Mollo	N/A	N/A	N/A	N/A	N/A	Present

\* N/A - Not applicable

## Finance Committee

The Finance Committee of the CGS deals with a range of corporate financial issues of the CGS, such as the recommendation for the approval of the Budget, the recommendation for major capital expenditure, the writing off of bad debts and assets and any other financial matters as are referred to it by the Board for recommendations.

The composition of the Finance Committee as at 31 March 2006 was:

Mr L L Makibinyane (Chairperson)  
 Ms N D Ntombela  
 Mr J K Mollo  
 Mr T Ramontja

### Attendance register of the Finance Committee

	28 April 2005	18 July 2005	27 July 2005	24 Oct 2005	15 Feb 2006
Mr L L Makibinyane	Present	Present	Present	Present	Present
Ms N D Ntombela	Apology	Apology	Present	Apology	Present
Mr J K Mollo	N/A	Present	Present	Apology	Present
Mr T Ramontja	Present	Present	Present	Present	Present
Ms P Molefe	Apology	N/A	N/A	N/A	N/A

\* N/A - Not applicable

## Technical Committee

The Technical Committee of the CGS deals with the annual scientific and technical programme of the CGS, evaluates the scientific and technical output, oversees the annual technical audit and recommends on such scientific and technical matters as are referred to it by the Board.

The composition of the Technical Committee as at 31 March 2006 was:

Prof. J M Barton (Jr) (Chairperson)  
Mr L L Makibinyane  
Ms S Bansi  
Mr T Ramontja  
Mr J Blaine  
Ms D de Nooy  
Dr K Pietersen

## Personnel, Remuneration and Transformation Committee

The Personnel, Remuneration and Transformation Committee determines the human resources strategies and policies of the CGS. The Committee approves the remuneration structure and salary changes in the CGS and evaluates and makes recommendations on the payment of production bonuses. The Committee also decides upon the remuneration of the Executive Management.

The composition of the Personnel, Remuneration and Transformation Committee as at 31 March 2006 was:

Prof. P E Ngoepe (Chairperson)  
Prof. J M Barton (Jr)  
Mr T Ramontja  
Ms N D Ntombela  
Mr A P Nkuna  
Mr L L Makibinyane

## Financial and Operational Factors

### *Post-balance-sheet events*

No material facts or circumstances have arisen, between the date of the balance sheet and the production of this report, which will affect the financial position of the CGS as is reflected in the financial statements.

### *Major changes in respect of fixed assets*

A Squirrel B2 helicopter was acquired for geochemical and geophysical surveys. An amount of R7,1m was invested in the acquisition of the helicopter. The helicopter will play an important role in reviving regional geochemical sampling in South Africa. It will also be used for geophysical airborne operations in mountainous terrains. An amount of R5,1m was invested in scientific equipment for airborne operations and an XRF for the laboratory. An Infrasound Array to the value of R2,7m, constructed near Boshof, was also capitalised.

## Losses Incurred or Recovered

### *Material losses incurred*

The Management Board of the CGS has developed a Materiality and Significance Framework for the CGS. The Board has approved that any expenditure in excess of approximately 1% of the annual operating expenditure budget/revised budget, which is an amount of R335 000 for 2005/06, and/or the writing off and disposal of any asset in excess of approximately 2% of the value of property and equipment as indicated in the annual financial statements of the year 2004/05, which is an amount of R2,7m individually or in aggregate, would be deemed material and significant. The CGS has thus accepted the above-mentioned threshold figures of materiality for its financial framework.

In order for the CGS to comply with section 27.3.1 of the Treasury Regulations, the Board, at its meeting held on 17 February 2005, appointed Mr L Matsepe, the Finance Manager, as Acting Chief Financial Officer.



## PERFORMANCE OBJECTIVES



### PERFORMANCE MANAGEMENT CRITERIA AND PERFORMANCE TARGETS OF THE COUNCIL FOR GEOSCIENCE

The CGS has developed a number of measures that are used to evaluate the performance of the organisation against a set of predetermined targets. These measures were designed as a means to evaluate the performance of the CGS with respect to three levels of accountability. These include the measurement of:

- collective scientific and technical output during a specific financial year
- the performance of the different business units
- corporate performance.

The overall evaluation of corporate performance is based on aspects such as business growth, investment into organisational excellence, customer and client relationships, operational best practices, investing into people and stakeholder interaction. All of the above

performance targets are set annually by the CGS and are, at the end of the financial year, audited by a team of external auditors.

In line with the new strategy developed by the CGS Management, the organisation has adopted a Balanced Scorecard (BSC) approach to its performance measurement. The corporate BSC, which measures the performance of the organisation at corporate, business unit and individual level was approved and accepted by the Board of the CGS. The BSC incorporates the current performance measures into the following evaluation perspectives:

- Scientific excellence and human capital development
- Stakeholder and customer satisfaction
- Organisational systems
- Economic growth.

The BSC was implemented on 1 April 2005.

## Corporate performance targets of the Council for Geoscience

In order to evaluate the corporate performance of the CGS, the organisation has developed a range of performance indicators, which cover the entire spectrum of activities within the CGS. The range of performance indicators, together with the performance targets for the period 2005/06 are summarised in the tables below.

Corporate Scorecard for 2005/06

Market (Stakeholder/Customer) Perspective		To drive stakeholder and customer satisfaction by the development of world-class products and services	
Objectives	Measures	Target 2005/06	Performance 2005/06
<b>Develop a Stakeholder- and Customer-Focused Organisation</b>	- Status of Annual Technical Programme throughout the Year	On Schedule	On Schedule
	- % Completion of Annual Technical Programme	65%	79,7%
	- Percentage Satisfied Customers	>85%	82,1%
<b>Dissemination of Information to Users</b>	No. of Maps and Publications published	25	28
<b>Promotion of CGS to Stakeholder/ Customer</b>	- No. of Small-Scale Mining Initiatives	3	15
	- No. of Repeat Clients	210	147
	- No. of New Clients	20	56
<b>To Create Wealth and Ensure Rural and Regional Development</b>	- No. of Geoscientific Projects	17	19
	- No. of Rural Development Projects	17	21
	- No. of Regional and African Development Projects	8	14
<b>Develop Strategic Partnerships</b>	- No. of Partners	12	15
	- No. of Active BEE/HDI Partners	3	4

<b>Economic/Financial Growth</b>		<b>To achieve sustainable revenue and profit growth</b>	
<b>Objectives</b>	<b>Measures</b>	<b>Target 2005/06</b>	<b>Performance 2005/06</b>
<b>Generate Revenue</b>	<ul style="list-style-type: none"> <li>- Total Revenue (Rands)</li> <li>- Government Grant</li> <li>- Contract Revenue (Rands)</li> <li>- Sundry Income</li> <li>- Commercial Surplus</li> <li>- Ratio of Contract Revenue to Total Revenue</li> <li>- Ratio of External Revenue to Total Revenue</li> </ul>	<ul style="list-style-type: none"> <li>R124m</li> <li>R86m</li> <li>R29m</li> <li>R9m</li> <li>R3,6m</li> <li>23%</li> <li>31%</li> </ul>	<ul style="list-style-type: none"> <li>R164m</li> <li>R86m</li> <li>R70,5m</li> <li>R7m</li> <li>R16,2m</li> <li>42,89%</li> <li>47,5%</li> </ul>
<b>Overhead Efficiency</b>	<ul style="list-style-type: none"> <li>- Ratio of Overheads to Total Cost</li> <li>- Ratio of Personnel Cost to Total Cost</li> </ul>	<ul style="list-style-type: none"> <li>62%</li> <li>62%</li> </ul>	<ul style="list-style-type: none"> <li>52%</li> <li>53%</li> </ul>

#### *Notes and Assumptions*

Grant is as per National Treasury appropriation schedule

Contract revenue is at an escalation of 12% each year

Sundry income is as per MTEF (Medium-Term Expenditure Framework)

Surplus is only derived from contract revenue

A mark-up of 30% is applied on all contracts

Contract costs to increase by 14% due to new VAT Act 33

<b>Effective Systems (Organisational)</b>		<b>To develop and maintain effective and streamlined processes, using appropriate tools and methodologies</b>	
<b>Objectives</b>	<b>Measures</b>	<b>Target 2005/06</b>	<b>Performance 2005/06</b>
<b>To Develop and Implement Effective Policies and Procedures</b>	- % Policies reviewed, approved and developed	10%	32,4%
<b>To Drive Preferential Procurement</b>	- Preferential Procurement as a % of Total Procurement	30%	30%
<b>To Implement Corporate Planning and Reporting</b>	Regulatory Compliance - PFMA	Full	Full

<b>World-Class People Perspective</b>		<b>To develop a world-class geoscience organisation where our people can grow and perform</b>	
<b>Objectives</b>	<b>Measures</b>	<b>Target 2005/06</b>	<b>Performance 2005/06</b>
<b>To Attract and Retain a Skilled Workforce</b>	- Turnover (Management) - Turnover (Scientists) - Turnover (Technical Staff)	3% 6% 4%	10% 14% 9%
<b>Promote Scientific and Innovation Excellence</b>	- No. of Innovation Projects - No. of Staff studying - No. of Staff and Students enrolled for MSc and PhD degrees - No. of Papers and Articles published - Proportion of Researchers to Total Staff - % of Scientific Staff with PhD and MSc degrees	4 35 20 62 36% 58%	12 47 21 57 37% 44%
<b>To Build a Positive Organisational Culture</b>	- % Satisfied Staff Members	60%	53%
<b>To Reflect and Embrace RSA Diversity</b>	- Equity Targets (Overall) (W-B-I-C)  - Equity Targets (Scientific/ Technical) (W-B-I-C)	54% 38% 3% 5%  62% 31,5% 2,5% 4%	57% 37% 3% 3%  62% 31% 4% 3%
<b>To Build and Maintain External Relations</b>	- No. of International Key Note Addresses - No. of International Awards won - No. of Projects with External Collaborators - No. of Publications with External Collaborators	2 1 12 18	3 0 34 31



## REPORT OF THE AUDIT AND RISK COMMITTEE



### Responsibilities

The Management Board of the CGS has the overall responsibility to ensure that the organisation has and maintains effective, efficient and transparent systems of risk management and internal control. The responsibility to ensure the adequacy and effectiveness of these systems is delegated to the Audit and Risk Committee. The Audit and Risk Committee is an advisory committee of the Board, operating as overseer with an independent and objective stance.

The Audit and Risk Committee has adopted formal terms of reference, which have been confirmed by the Board, as its Charter, and is satisfied that it has discharged its duties and responsibilities as set out in the Charter. In performing its responsibilities the Audit and Risk Committee has reviewed the following:

- The functioning of the internal control system
- The functioning of the internal audit programme
- The risk areas of the entity's operations to be covered in the scope of the internal and external audits
- The reliability and accuracy of the financial information provided to Management and other users
- The accounting or auditing concerns identified as a result of the internal or external audits
- The entity's compliance with legal and regulatory provisions.

### Governance

The Board appointed the following members of the Audit and Risk Committee:

Mr B Hawsworth (Chairperson)  
Ms N D Ntombela  
Ms T Xaso

Mr L L Makibinyane  
Mr J K Mollo  
Ms S Bansi (Alternate to Ms N D Ntombela).

The Audit and Risk Committee met six times during the period under review.

## Internal Control Systems

The members of the Audit and Risk Committee believe that the system of internal controls is adequately designed to cover organisational risks, financial risks and operational risks. The control system provides reasonable, but not absolute, assurance that the organisation's assets are safeguarded, transactions are authorised and recorded properly, and that material errors and irregularities are either prevented or detected timeously. These controls are monitored throughout the organisation by the Management and employees with the necessary segregation of authority and duties.

The Operational Risk Management Committee, which reports to the Audit and Risk Committee on a quarterly basis, continuously evaluates and monitors the effectiveness of all internal control systems in respect of all areas of risk that have been identified.

Having reviewed the effectiveness of the organisation's system of internal controls, and based on detailed reports provided by the Internal Auditors, the members of the Audit and Risk Committee are not aware of any significant weakness or deficiency in the organisation's system of internal controls.

## Internal Auditing

Internal auditing was outsourced during the year under review and provides a supportive role to Management and the Audit and Risk Committee to achieve their objectives by identifying and evaluating significant exposures to risk and contributing to the empowerment of risk management and control systems.

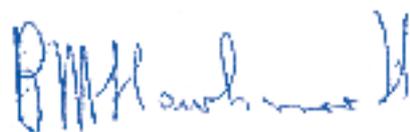
The internal audit function is responsible for independently and objectively evaluating the organisation's system of internal controls at a detailed level and to bring any significant business risks and exposures to the attention of Management and the Audit and Risk Committee through the provision of comprehensive internal audit reports.

## Financial Statements

The Audit and Risk Committee has reviewed and discussed the financial statements of the Council for Geoscience for the year ended 31 March 2006 with the Auditor-General and the Accounting Officer. The Audit and Risk Committee also reviewed the management letter of the Auditor-General and the responses of Management thereto. The members of the Audit and Risk Committee believe that the financial statements comply, in all material respect, to the requirements of the Public Finance Management Act (Act No. 1 of 1999, as amended) and South African Statements of Generally Accepted Accounting Practices (GAAP) and Generally Recognised Accounting Practices (GRAP). The Audit and Risk Committee agrees that the adoption of the going-concern premise is appropriate in preparing the annual financial statements.

The Audit and Risk Committee, at its meeting held on 27 July 2006, recommended the adoption of the annual financial statements by the Board of Directors.

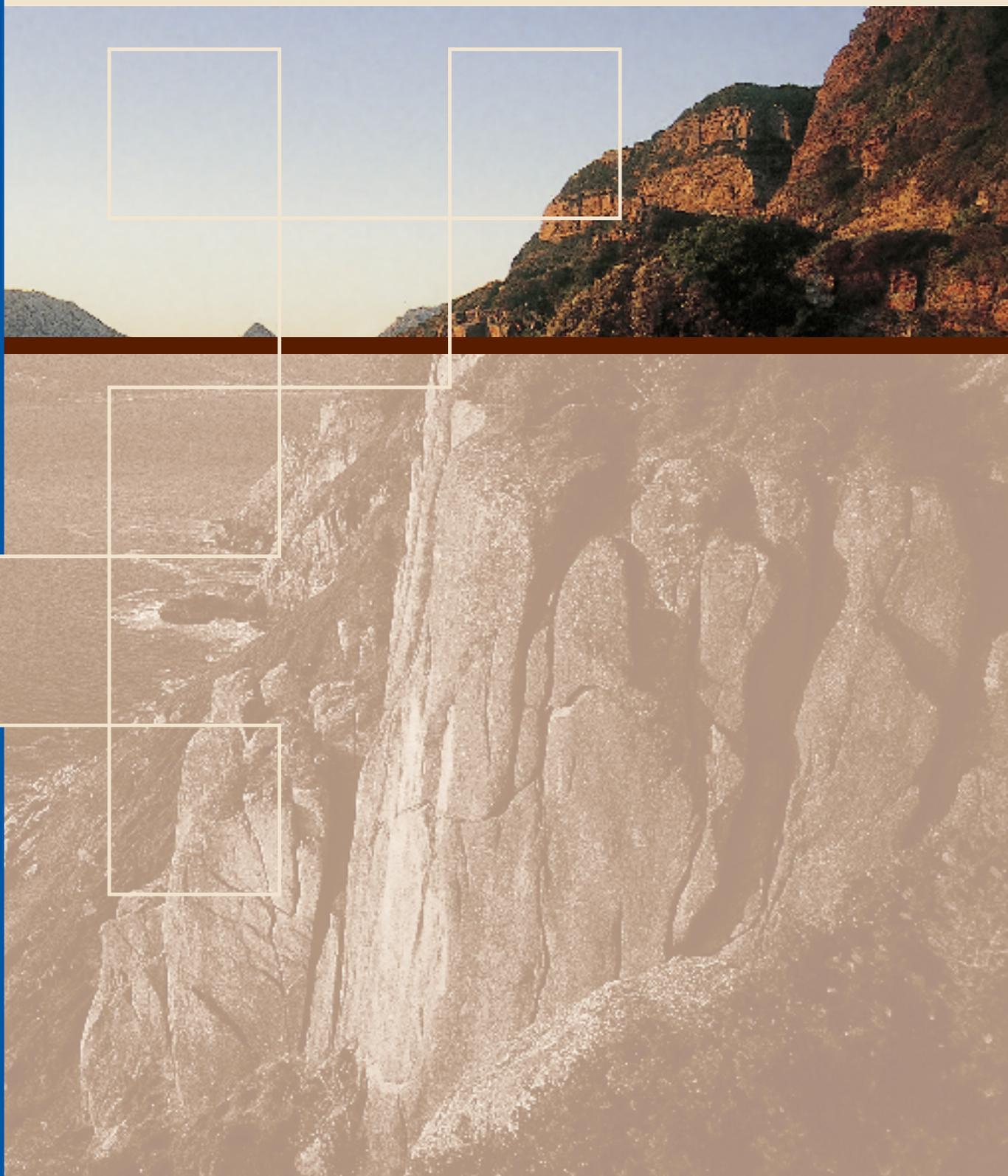
Approved



**Mr B Hawksworth**  
Chairperson: Audit and Risk Committee

Date: 31 July 2006  
Pretoria

*FINANCIAL STATEMENTS*  
**OF THE COUNCIL FOR GEOSCIENCE**  
**FOR THE YEAR ENDED 31 MARCH 2006**



COUNCIL FOR GEOSCIENCE

**STATEMENT OF FINANCIAL PERFORMANCE  
FOR THE YEAR ENDED 31 MARCH 2006**

	Notes	2006 R'000	2005 R'000 Restated
<b>Revenue</b>	2	157,208	113,541
<b>Cost of contracts</b>	2	( 47,740)	( 24,023)
<b>Gross surplus</b>		109,468	89,518
Other operating income	2	1,168	270
Administrative expenses		( 99,808)	( 89,512)
Other operating expenses	2	( 307)	( 244)
Interest earned	3	5,776	7,033
<b>Surplus from operations</b>		16,297	7,065
Finance cost	4	( 7)	( 8)
<b>Net surplus for the year</b>		16,290	7,057

COUNCIL FOR GEOSCIENCE

**STATEMENT OF FINANCIAL POSITION  
AT 31 MARCH 2006**

	Notes	2006 R'000	2005 R'000
			Restated
<b>Assets</b>			
<b>Non-current assets</b>			
Property and equipment	5	68,396	69,903
Retirement benefit	6	5,200	3,480
<b>Current assets</b>		190,661	161,327
Trade and other receivables	7	45,820	21,836
Cash and cash equivalents	8	144,841	139,491
<b>Total assets</b>		264,257	234,710
<b>Net assets and liabilities</b>			
<b>Net assets</b>		175,175	166,107
Accumulated surplus		160,165	143,875
Revaluation reserve		15,010	22,232
<b>Current liabilities</b>		89,082	68,603
Trade and other payables	9	18,503	7,824
Deferred income	10	68,222	53,146
Provisions	11	2,357	7,633
<b>Total net assets and liabilities</b>		264,257	234,710

COUNCIL FOR GEOSCIENCE

**CASH FLOW STATEMENT  
FOR THE YEAR ENDED 31 MARCH 2006**

	Notes	2006 R'000	2005 R'000
			Restated
<b>Cash inflow from operating activities</b>		22,183	36,770
Cash receipts from customers		133,224	111,301
Cash paid to suppliers and employees		( 116,810)	( 81,556)
Cash generated from operations	12	16,414	29,745
Interest earned	3	5,776	7,033
Finance cost	4	( 7)	( 8)
<b>Cash outflow from investing activities</b>		( 16,833)	( 16,760)
Additions to property and equipment	13	( 16,833)	( 16,760)
<b>Net increase in cash and cash equivalents</b>		5,350	20,010
<b>Cash and cash equivalents at beginning of year</b>		139,491	119,481
<b>Cash and cash equivalents at end of year</b>		144,841	139,491

COUNCIL FOR GEOSCIENCE

**STATEMENT OF CHANGES IN NET ASSETS  
FOR THE YEAR ENDED 31 MARCH 2006**

	Notes	Revaluation reserve R'000	Accumulated profits R'000	Total R'000
<b>Balance at 31 March 2004</b>		-	136,818	136,818
Net surplus for the year		-	7,057	7,057
<b>Balance at 31 March 2005</b>		-	143,875	143,875
Revaluation of fixed assets	21	40,274	-	40,274
Amortisation	21	( 18,042)	-	( 18,042)
<b>Restated balance at 31 March 2005</b>		22,232	143,875	166,107
Revaluation of fixed assets	21	486	-	486
Amortisation	21	( 7,708)	-	( 7,708)
Net surplus for the year		-	16,290	16,290
<b>Balance at 31 March 2006</b>		15,010	160,165	175,175

COUNCIL FOR GEOSCIENCE

**VALUE ADDED STATEMENT  
FOR THE YEAR ENDED 31 MARCH 2006**

	2006 R'000	%	2005 R'000	%
<b>Value added</b>				
Government grant - Core funding	86,078	81.8%	77,606	94.0%
Government grant - Earmarked funding	105	0.1%	-	0.0%
Contracting revenue	70,401	66.9%	35,452	42.9%
Publication revenue	624	0.6%	483	0.6%
Revenue	157,208	149.4%	113,541	137.5%
Paid to suppliers for material and services	( 58,930)	-56.0%	( 38,291)	-46.4%
Interest earned	5,776	5.5%	7,033	8.5%
Other income	1,168	1.1%	270	0.3%
	105,222	100.0%	82,553	100.0%
<b>Distributed as follows -</b>				
Employees	75,511	71.8%	67,927	82.3%
- Staff costs	63,757	60.6%	56,704	68.8%
- Employer contributions	9,623	9.1%	9,458	11.6%
- Bursary and training	2,131	2.0%	1,765	2.1%
Finance cost	7	-	8	-
Central and local government	2,296	2.2%	1,152	1.4%
Retention for expansion and growth	27,408	26.0%	13,466	16.3%
- Depreciation	11,118	10.6%	6,409	7.8%
- Retained surplus for the year	16,290	15.5%	7,057	8.5%
	105,222	100.0%	82,553	100.0%
<b>Value added ratios</b>				
- Number of employees	292		304	
- Revenue per employees	538		373	
- Wealth created per employees	360		272	

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 1 Accounting policies

#### 1.1 Basis of preparation

The financial statements have been prepared in accordance with the South African Statements of Generally Accepted Accounting Practices (GAAP) including any interpretations of such Statements issued by the Accounting Practices Board, with the prescribed Standards of Generally Recognised Accounting Practices (GRAP) issued by the Accounting Standards Board replacing the equivalent GAAP Statement as follows:

##### Standard of GRAP

GRAP 1: Presentation of financial statements  
GRAP 2: Cash flow statements  
GRAP 3: Accounting policies, changes in accounting estimates and errors

##### Replaced Statement of GAAP

AC101: Presentation of financial statements  
AC118: Cash flow statements  
AC103: Accounting policies, changes in accounting estimates and errors

The recognition and measurement principles in the above GRAP and GAAP Statements do not differ or result in material differences in items presented and disclosed in the financial statements. The implementation of GRAP 1, 2 and 3 has resulted in the following significant changes in the presentation of the financial statements:

1. Terminology differences:

##### Standard of GRAP

Statement of financial performance  
Statement of financial position  
Statement of changes in net assets  
Net assets  
Surplus/deficit for the period  
Accumulated surplus/deficit  
Contributions from owners  
Distributions to owners  
Reporting date

##### Replaced Statement of GAAP

Income statement  
Balance sheet  
Statement of changes in equity  
Equity  
Profit/loss for the period  
Retained earnings  
Share capital  
Dividends  
Balance sheet date

2. The cash flow statement can only be prepared in accordance with the direct method.

3. Specific information such as:

- (a) receivables from non-exchange transactions, including taxes and transfers;
- (b) taxes and transfers payable;
- (c) trade and other payables from non-exchange transactions; must be presented separately on the statement of financial position.

4. The amount and nature of any restrictions on cash balances are required to be disclosed.

Paragraphs 11 to 15 of GRAP 1 have not been implemented as the budget reporting standard is in the process of being developed by the international and local standard setters. Although the

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 1 Accounting policies (continued)

Inclusion of budget information would enhance the usefulness of the financial statements, non-disclosure will not affect fair presentation.

#### 1.2 Prior-year figures

Prior-year figures were adjusted due to the implementation of IAS16 and errors in the prior financial year.

#### 1.3 Revenue

Revenue comprises the annual governmental grant received, contract income and sales of publications.

#### 1.4 Revenue recognition

##### 1.4.1 Recognition of income

Revenue represents the invoiced value of goods supplied by the Council for Geoscience. The Council for Geoscience measures revenue at the fair value of the consideration received or receivable. Revenue is recognised only when it is probable that the economic benefits associated with a transaction will flow to the Council for Geoscience, and the amount of revenue and associated costs incurred or to be incurred, can be measured reliably.

##### 1.4.2 Government grant received

Government grants are recorded as deferred income when they become receivable and are then recognised as income on a systematic basis over the period necessary to match the grants with the related costs which they are intended to compensate.

##### 1.4.3 Recognition of income from contracts

Income from contracts is recognised by means of progress payments over the duration of the contracts. Income for contracts in progress is recognised when it can be invoiced. When the outcome of a contract can be estimated reliably, revenue is recognised by reference to the stage of completion of the contract activity.

#### 1.5 Interest earned

Interest is recognised on a time proportionate basis with reference to the principal amount receivable and the effective interest rate applicable.

#### 1.6 Property and equipment

Property and equipment are stated at cost and are depreciated on the straight-line basis over their estimated useful lives.

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 1 Accounting policies (continued)

The annual rates used for this purpose are:

Land	Not depreciated
Buildings	30 years
Motor vehicles	5 years
Equipment	5 years
Aircraft - Body	4 years
Aircraft - Engine	Useful hours
Aircraft - Propeller	Useful hours
Office furniture	10 years
Computer equipment	3 years
Computer software	2 years

Gains or losses arising on the disposal or retirement of assets are determined as the difference between the sales proceeds and the carrying amount of the asset and are recognised in the statement of financial performance in the period in which the disposals take place.

Fully depreciated assets that are still in use are revalued and depreciated over the assessed remaining useful life.

#### 1.7 Foreign currency

Transactions in foreign currencies are accounted for at the rates of exchange ruling on the date of the transactions. Gains and losses arising from the settlement of such transactions are recognised in the statement of financial performance.

Monetary assets and liabilities denominated in foreign currencies are translated at the rates of exchange ruling at the reporting date. Unrealised differences on monetary assets and liabilities are recognised in the Statement of Financial Performance in the period in which they occur.

#### 1.8 Research and development

Research and development costs are charged against income as and when incurred.

#### 1.9 Contracts in progress

Contracts in progress are stated at the lower of cost or net realisable value. Net realisable value is calculated as a percentage of the revenue of work completed, after provision for losses relating to the stage of completion and any foreseeable losses to completion of the contract.

#### 1.10 Deferred income

Deferred income is recognised using the accrual basis and accounted for in the statement of financial performance in the period in which it is earned.

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 1 Accounting policies (continued)

#### 1.11 Retirement benefit costs

The Council for Geoscience operates both a defined contribution pension and provident fund and a defined benefit plan in respect of post-retirement medical-aid contributions. For the defined benefit plan, the defined benefit obligation and the related current service cost is determined by using the projected unit credit method. The defined benefit plan is subject to an annual actuarial valuation.

A portion of the actuarial gains and losses is to be recognised as income or expense, provided the net cumulative actuarial gains and losses at the end of the previous reporting period exceeds the greater of-

- 10% of the present value of the defined benefit obligation at that date, or
- 10% of the fair value of any plan assets at that date.

The portion of actuarial gains and losses to be recognised, is equal to the excess calculated using the above limits, divided by the expected average remaining working lives of the employees participating in the plan.

The actuarial gains or losses are further limited to the extent that the net cumulative unrecognised actuarial gains or losses (before recognition of that actuarial gain or loss) exceeds the unrecognised part of the transactional liability. Payments to defined contribution retirement benefit plans are charged to the statement of financial performance in the year to which they relate.

#### 1.12 Provisions

Provisions are recognised when a present legal or constructive obligation arises as a result of past events, and it is probable that an outflow of resources will be required to settle the obligation, and a reliable estimate of the amounts can be made.

#### 1.13 Financial instruments

##### Measurement

Financial instruments are initially measured at cost, which includes transaction costs. Subsequent to initial recognition these instruments are measured as set out below.

##### Trade and other receivables

Trade and other receivables are stated at their nominal value as reduced by the allowance for estimated irrecoverable amounts.

##### Cash and cash equivalents

Cash and cash equivalents are measured at fair value.

##### Trade and other payables

Trade and other payables are stated at their nominal value.



## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 2 Surplus from operations (continued)

#### Administrative expenses include -

Audit remuneration

Audit fees

- Current year

- Prior year

- Fee for other services

Provision for bad debts

Depreciation - on owned assets

- Buildings

- Equipment

- Office furniture

- Motor vehicles

- Aircraft

- Computer software

- Computer equipment

Rentals in respect of operating leases

- Land and buildings

#### Other operating expenses

Foreign currency losses

Staff costs

Included in staff costs are:

Defined benefit plan expense for the post-retirement medical-aid fund

Current service cost

Interest cost

Expected return on plan assets

Recognised actuarial loss

- Defined contribution plan expenses for the pension and provident fund

#### Fruitless and wasteful expenditure

Fruitless and wasteful expenditure

	2006 R'000	2005 R'000
		Restated
	308	344
	49	37
	193	300
	66	7
	5,028	340
	11,118	6,409
	953	649
	4,870	2,610
	47	39
	693	266
	1,518	242
	1,246	1,367
	1,791	1,236
	340	275
	307	244
	307	244
	77,639	69,241
	1,267	1,120
	1,122	1,069
	1,881	1,726
	( 1,852)	( 1,752)
	116	77
	3,385	3,093
	30	12
	30	12

The matter giving rise to fruitless and wasteful expenditure was as follows:

Settlement of a claim by an ex-employee in respect of interest lost on his provident fund due to an investment option change in 2003 not being effected. Due diligence was given to the investigation of this incident and internal procedures were followed in addressing it.

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 2 Surplus from operations (continued)

#### Emoluments

Executive Managers	2005/2006				2004/2005			
	Pensionable salary R	Provident fund contributions R	Other contributions R	Total R	Pensionable salary R	Provident fund contributions R	Other contributions R	Total R
Mzimba M S				-	421,757	30,865	134,604	<b>587,226</b>
Meyer B				-	71,840	7,548	43,096	<b>122,484</b>
Matsepe L D	307,111	23,033	74,878	<b>405,023</b>	50,834	7,707	34,951	<b>93,492</b>
Ramagwede L F	476,922	36,555	84,672	<b>598,149</b>	-	-	-	-
Ramontja T	685,335	51,400	179,396	<b>916,131</b>	529,386	41,908	226,700	<b>797,994</b>
Graham G	514,927	38,620	118,419	<b>671,966</b>	430,549	31,750	140,390	<b>602,689</b>
Zawada P K	497,750	37,331	110,915	<b>645,996</b>	447,263	30,660	77,062	<b>554,985</b>

Management Board Member - T. Ramontja

#### Management Board Emoluments

#### Non-executive Board Members

	2006 R	2005 R
Molefe P J	-	8,938
Nkuna A P	15,215	8,453
Barton J M (Jr)	35,639	15,284
Makibinyane L L	55,339	22,631
Ngoepe P E	41,433	17,042
Mollo J K	23,668	-
Xaso T	8,453	-
	<b>179,747</b>	<b>72,347</b>

Details regarding Management Board Members service contracts:

Management Board Members representing government departments are not included above as they received no emoluments.

The current term of office of the non-executive Management Board Members expires on 30 September 2006.

### 3 Interest earned

	2006 R'000	2005 R'000
Interest earned		
- Interest income on investments	5,421	6,827
- Interest income on current accounts	355	206
	<b>5,776</b>	<b>7,033</b>

### 4 Finance cost

Interest	<b>7</b>	<b>8</b>
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COUNCIL FOR GEOSCIENCE

**NOTES TO THE FINANCIAL STATEMENTS  
FOR THE YEAR ENDED 31 MARCH 2006**

**5 Property and equipment**

<b>2006</b>	<b>Land R'000</b>	<b>Buildings R'000</b>	<b>Equipment R'000</b>	<b>Office furniture R'000</b>	<b>Aircraft R'000</b>	<b>Motor vehicles R'000</b>	<b>Computer equipment R'000</b>	<b>Computer software R'000</b>	<b>Total R'000</b>
Gross carrying amount	3,081	29,592	59,198	12,453	6,391	6,543	13,776	3,746	134,780
Accumulated depreciation at the beginning of the year	-	(3,519)	(37,481)	(7,819)	(242)	(5,195)	(8,794)	(1,827)	(64,877)
<b>Opening net carrying amount at 31 March 2005</b>	<b>3,081</b>	<b>26,073</b>	<b>21,717</b>	<b>4,634</b>	<b>6,149</b>	<b>1,348</b>	<b>4,982</b>	<b>1,919</b>	<b>69,903</b>
Movements during the year:									
Revaluation			147	72			122	145	486
Acquisitions	-	2,770	5,086	23	7,102	-	1,073	779	16,833
Disposals	-	-	-	-	-	-	-	-	-
Amortisation on revaluation reserves			(4,427)	(2,145)	-	(2)	(954)	(180)	(7,708)
Depreciation	-	(953)	(4,870)	(47)	(1,518)	(693)	(1,791)	(1,246)	(11,118)
<b>Closing net carrying amount at 31 March 2006</b>	<b>3,081</b>	<b>27,890</b>	<b>17,653</b>	<b>2,537</b>	<b>11,733</b>	<b>653</b>	<b>3,432</b>	<b>1,417</b>	<b>68,396</b>
Gross carrying amount	3,081	32,362	64,431	12,548	13,493	6,543	14,971	4,670	152,099
Accumulated depreciation	-	(4,472)	(46,778)	(10,011)	(1,760)	(5,890)	(11,539)	(3,253)	(83,703)

<b>2005</b>	<b>Land R'000</b>	<b>Buildings R'000</b>	<b>Equipment R'000</b>	<b>Office furniture R'000</b>	<b>Aircraft R'000</b>	<b>Motor vehicles R'000</b>	<b>Computer equipment R'000</b>	<b>Computer software R'000</b>	<b>Total R'000</b>
Gross carrying amount	3,081	24,857	32,378	483	-	6,533	7,430	2,984	77,746
Accumulated depreciation at the beginning of the year	-	(2,870)	(23,972)	(213)	-	(5,903)	(5,861)	(1,607)	(40,426)
<b>Opening net carrying amount at 31 March 2004</b>	<b>3,081</b>	<b>21,987</b>	<b>8,406</b>	<b>270</b>	<b>-</b>	<b>630</b>	<b>1,569</b>	<b>1,377</b>	<b>37,320</b>
Movements during the year:									
Acquisitions	-	4,735	3,717	11	6,391	-	1,360	546	16,760
Revaluation			23,103	11,959		10	4,986	216	40,274
Amortisation on revaluation reserves			(10,899)	(7,567)	24	951	(1,698)	1,147	(18,042)
Depreciation	-	(649)	(2,610)	(39)	(266)	(243)	(1,235)	(1,367)	(6,409)
<b>Closing net carrying amount at 31 March 2005</b>	<b>3,081</b>	<b>26,073</b>	<b>21,717</b>	<b>4,634</b>	<b>6,149</b>	<b>1,348</b>	<b>4,982</b>	<b>1,919</b>	<b>69,903</b>
Gross carrying amount	3,081	29,592	59,198	12,453	6,391	6,543	13,776	3,746	134,780
Accumulated depreciation	-	(3,519)	(37,481)	(7,819)	(242)	(5,195)	(8,794)	(1,827)	(64,877)

The transfer of the following land and buildings as stipulated under section 26 of the Geoscience Act (Act No. 100 of 1993) has not yet been completed.

The Council for Geoscience is currently awaiting the transfer of the Head Office building in Pretoria from the Department of Public Works to the Council for Geoscience.

COUNCIL FOR GEOSCIENCE

**NOTES TO THE FINANCIAL STATEMENTS  
FOR THE YEAR ENDED 31 MARCH 2006**

**5 Property and equipment (continued)**

Location	Management Valuation
280 Pretoria Street, Silverton, Pretoria	R 80,000,000
474 Carl Street, Town Lands 351JR, Pretoria West	R 600,000
Portion of stand 110, 21 Schoeman Street, Polokwane	R 100,000

The carrying amount of land and buildings at 31 March 2006 does not include the above-mentioned properties.

Details regarding land and buildings are kept at the Council for Geoscience head office and will be supplied upon written request.

2006 R'000	2005 R'000
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Restated

**6 Retirement benefit**

**6.1 Medical-aid scheme**

The Council for Geoscience has made provision for the medical-aid scheme covering substantially all employees. All eligible employees are members of the defined benefit scheme administered by the Council for Geoscience. The assets of these schemes are held in administered trust funds separated from the Council for Geoscience's assets. Scheme assets primarily consist of listed shares and property trust units, and fixed income securities.

The defined contribution scheme administered by the Council for Geoscience is valued actuarially using the projected unit credit method. The scheme was last actuarially valued during the year ended 31 March 2006. At that time the scheme was certified by the reporting actuary as being in a sound financial position. In arriving at his conclusion, the actuary took into account the following assumptions at reporting date (expressed as weighted averages):

Key assumptions		
Discount rate	8.00%	8.75%
Expected return on plan assets	6.00%	8.75%
Future salary increases	N/A	N/A
Medical inflation rate	6.00%	6.75%

The actual return on plan assets are:

Expected return on plan assets	1,823	1,752
Actuarial gain on plan assets	2,493	186
Actual return on plan assets	4,316	1,938

The amount included in the Statement of Financial Position arising from the Council for Geoscience's obligation in respect of the post-retirement medical-aid contributions to staff members is as follows:

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 6 Retirement benefit (continued)

	2006 R'000	2005 R'000
		Restated
Present value of fund obligations	20,919	21,727
Fair value of plan assets	( 27,716)	( 20,832)
Unrecognised actuarial loss/(gain)	1,597	( 4,375)
Asset recognised in the Statement of Financial Position	<u>( 5,200)</u>	<u>( 3,480)</u>
Movements in the net liability in the current period were as follows:		
Net liability at the beginning of the year	( 3,480)	( 2,050)
Amounts charged to income	1,267	1,125
Contributions paid to the Post-Retirement Medical-Aid Fund	( 2,987)	( 2,555)
Net asset at the end of the year	<u>( 5,200)</u>	<u>( 3,480)</u>

The post-retirement medical-aid benefit was found to have a funded actuarial projected asset totalling R5,200,000 (2005: R3,480,000). The Council for Geoscience will stop contributions until such time that the existing assets have been absorbed by the liability.

### 6.2 Pension and Provident fund benefits

The Council for Geoscience and its employees contribute to a defined contribution plan. The assets of the scheme are held separately from the Council for Geoscience in funds under the control of trustees. The total cost charged to income of R3,385,151 (2005: R3,092,951) represents equal contributions of 7.5% by the employer and employee.

### 7 Trade and other receivables

Trade receivables	32,691	12,973
Trade receivables - Retention	629	-
Contract customers	11,526	5,978
Other receivables	1,508	3,346
Prepaid expenses	6,087	197
SARS - VAT	-	788
Personnel loans	150	297
	<u>52,591</u>	<u>23,579</u>
Less - Provision for bad debts	( 6,771)	( 1,743)
	<u>45,820</u>	<u>21,836</u>

The Management Board Members consider that the carrying amount of trade and other receivables approximates to their fair value.

### 8 Cash and cash equivalents

Cash and cash equivalents comprise cash on hand and deposits held on call with banks. The carrying amount of these assets approximates to their fair value. Cash and cash equivalents at the end of the year are represented by the following balances:

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

	2006 R'000	2005 R'000
		Restated
<b>8 Cash and cash equivalents (continued)</b>		
Cash at bank	42,161	18,636
Cash investments	102,680	120,855
Cash and cash equivalents at the end of the period	<u>144,841</u>	<u>139,491</u>
<b>9 Trade and other payables</b>		
Trade payables	2,757	3,416
Advance clients' billing	2,394	2,486
Advance European Commission	9,147	-
Other payables	4,205	1,922
	<u>18,503</u>	<u>7,824</u>
<p>The Management Board Members consider that the carrying amount of trade and other payables approximates to their fair value.</p>		
<b>10 Deferred income</b>		
<p>Deferred income arising as a result of an agreement entered into with the Department of Minerals and Energy to develop and implement various measures to mitigate the effect of mining-induced contamination of the groundwater in the Witwatersrand area.</p>		
Carrying amount at the beginning of year	23,135	29,256
Interest earned	963	1,679
Amounts used during the year	( 19,257)	( 7,800)
Carrying amount at the end of year	<u>4,841</u>	<u>23,135</u>
<p>Deferred income arising as a result of an agreement entered into with the Department of Minerals and Energy to develop and implement Small-Scale Mining programmes.</p>		
Carrying amount at the beginning of year	15,355	-
Amounts received	5,465	15,100
Amounts used during the year	( 1,792)	-
Interest earned	490	255
Carrying amount at the end of year	<u>19,518</u>	<u>15,355</u>
<p>Deferred income arising as a result of an agreement entered into with the Department of Minerals and Energy to develop and implement the closing of mine holes.</p>		
Carrying amount at the beginning of year	13,253	-
Amounts received	15,638	13,253
Amounts used during the year	( 1,012)	-
Interest earned	735	-
Carrying amount at the end of year	<u>28,614</u>	<u>13,253</u>

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 10 Deferred Income (continued)

Deferred income arising as a result of a contract entered into with the Lesotho ARF Project.

	2006 R'000	2005 R'000
Carrying amount at the beginning of year	1,298	1,298
Amounts used during the year	( 589)	-
Carrying amount at the end of year	<u>709</u>	<u>1,298</u>

Restated

Deferred income arising as a result of an agreement with the Department of Minerals and Energy in terms of the Sustainable Development Through Mining project.

Amounts received	8,050	-
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Deferred income arising as a result of an agreement with the Department of Science and Technology in terms of the Madagascar Geological Mapping project.

Amounts received	3,880	-
Amounts used during the year	( 658)	-
Interest earned	123	-
Carrying amount at the end of year	<u>3,345</u>	<u>-</u>

Deferred income arising as a result of an agreement with the Department of Provincial and Local Government to establish a SA Tsunami Early Warning System.

Amounts received	1,950	-
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Deferred income arising as a result of an agreement with the Department of Science and Technology to establish an international collaboration research project on the Karoo sequences in South Africa, Botswana and Namibia.

Amounts received	1,195	-
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Deferred income arising as a result of a contract undertaken in terms of the equipment placement programme administered by the Department of Science and Technology in respect of amounts received in cash not yet accounted for in the Statement of Financial Performance.

	-	105
	<u>68,222</u>	<u>53,146</u>

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

	2006 R'000	2005 R'000
		Restated
<b>11 Provisions</b>		
<b>Provision for leave pay</b>		
Carrying amount at the beginning of year	7,633	6,429
Provision current year	782	1,754
Amounts used during the current year	<u>(6,058)</u>	<u>(550)</u>
Carrying amount at the end of year	<u>2,357</u>	<u>7,633</u>
The leave pay provision relates to the estimated liabilities as a result of leave days due to employees.		
<b>12 Reconciliation of net surplus for the year to cash generated from operations</b>		
Net surplus for the year	16,290	7,057
Adjustments for -		
Interest	7	8
Depreciation on property and equipment	11,118	6,409
Increase in provision for bad debts	5,028	340
Interest earned	(5,776)	(7,033)
Provision for post-retirement medical-aid benefits	<u>(1,720)</u>	<u>(1,430)</u>
Operating cash flows before working capital changes	24,947	5,351
Working capital changes -		
(Decrease)/Increase in provision for accumulated leave pay	(5,276)	1,204
Increase in trade and other receivables	(29,012)	(2,580)
Increase in trade and other payables	10,679	2,784
Increase in deferred income	15,076	22,986
Cash generated from operations	<u>16,414</u>	<u>29,745</u>
<b>13 Additions to property and equipment</b>		
Land and buildings	2,770	4,735
Equipment	5,086	3,717
Office furniture	23	11
Aircraft	7,102	6,391
Computer equipment	1,073	1,360
Computer software	<u>779</u>	<u>546</u>
	<u>16,833</u>	<u>16,760</u>
<b>14 Contingent liability</b>		
Performance bonds and bid bonds issued for contract work to various financial institutions	<u>9,607</u>	<u>177</u>
<b>15 Taxation</b>		
No provision for income tax was made as the Council for Geoscience is exempted in terms of section 10(1)(Ca)(i) of the Income Tax Act.		

**NOTES TO THE FINANCIAL STATEMENTS  
FOR THE YEAR ENDED 31 MARCH 2006**

2006 R'000	2005 R'000
---------------	---------------

Restated

**16 Operating-lease commitments**

At the reporting date, the outstanding commitments under non-cancellable operating leases, which fall due are as follows:

Up to 1 year	389	286
1 to 5 years	70	48
Total lease commitments	459	334

The Council for Geoscience is leasing office premises from Eksteen, Van Der Walt and Mouton for a period of 6 years, effective from 1 June 2000. The average lease payments are R21,041 per month with an extension option.

The Council for Geoscience is leasing four photocopiers from Stannic on a monthly basis for a period of 6 years. The lease payments are R4,360 per month with no contingent lease payments. The lease expires end September 2006.

The Council for Geoscience is leasing office premises and services from the University of Natal on a monthly basis. The lease payments are R4,023 per month with no contingent lease payments.

**17 Financial instruments**

Financial instruments consist of cash and cash equivalents, investments with financial institutions, trade and other receivables, and trade and other payables.

**17.1 Credit risk**

Financial assets, which potentially subject the Council for Geoscience to concentrations of credit risk, consist principally of cash, short-term deposits and trade receivables. The Council for Geoscience's cash equivalents and short-term deposits are placed with high credit quality financial institutions. Trade receivables are presented net of the allowance for doubtful debts. Credit risk with respect to trade receivables is limited due to the large number of customers being dispersed across different industries and geographical areas. Accordingly the Council for Geoscience has no significant concentration of credit risk.

The carrying amounts of financial assets included in the Statement of Financial Position represent the Council for Geoscience's exposure to credit risk in relation to those assets.

Trade and other receivables are controlled by well established policies and procedures which are reviewed and updated on an ongoing basis. The Council for Geoscience does not have any significant exposure to any individual customer or counterparty.

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

### 17 Financial instruments (continued)

#### 17.2 Interest rate risk

The organisation's exposure to interest rate risk and the effective interest rates on the financial instruments at reporting date are:

31 March 2006	Weighted average effective interest rate %	Weighted average effective interest rate %
<b>Assets</b>		
Cash	5.50%	6.00%
Short-term investments	7.03%	7.41%

#### Investments

The risk is perceived to be low due to the following factors:

- Funds are only invested with approved financial institutions according to the policy of the Council for Geoscience as was approved by the Management Board.
- Investments are only reinvested or invested with Executive Management approval.

#### 17.3 Foreign currency risk

The Council for Geoscience undertakes certain transactions denominated in foreign currencies, hence exposures to exchange rate fluctuations arise. It is not policy for the Council for Geoscience to take out cover on these outstanding foreign currency transactions due to the fact that these transactions take place on an ad-hoc basis. The Council for Geoscience's exposure at 31 March 2006 is disclosed in note 19.

#### 17.4 Airborne operations risk

Risk in respect of the airborne operations of the Council for Geoscience has been identified and transferred to a third party.

#### 17.5 Fair value of financial instruments

At 31 March 2006 the carrying amounts of cash and short-term investments, accounts receivable, accounts payable approximate to their fair values due to the short-term maturities of these assets and liabilities. The net fair value of the Council for Geoscience assets and liabilities are stated below -

	2006 R'000	2005 R'000
		Restated
<b>Assets</b>		
Cash and cash equivalents	144,841	139,491
Trade and other receivables	45,820	21,836

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

	2006 R'000	2005 R'000
		Restated
<b>17 Financial instruments (continued)</b>		
<b>Liabilities</b>		
Trade and other payables	18,503	7,824
<b>18 Capital commitments</b>		
Commitments for the alterations of property and equipment		
- Approved and contracted for Donkerhoek	-	53
	-	53
<b>19 Foreign currency exposure</b>		
<b>19.1 Trade receivables</b>		
Trade receivables - Foreign amount	6,966	8,885
Exchange rate - Moroccan Dirham	0.6961	0.7363
Total receivable	4,849	6,542
Trade receivables - Foreign amount	867	174
Exchange rate - US\$	6.2175	6.2750
Total receivable	5,390	1,092
Trade receivables - Foreign amount	502,358	-
Exchange rate - Ghana Cedi	1,525.3900	-
Total receivable	329	-
Trade receivables - Foreign amount	418,331	-
Exchange rate - Madagascar Ariary	366.3810	-
Total receivable	1,142	-
Trade receivables - Foreign amount	1,496	-
Exchange rate - Euro	7.5288	-
Total receivable	11,263	-
<b>19.2 Banks</b>		
Foreign funds - Moroccan Dirham	1,162	1,420
Exchange rate	0.6961	0.7363
Cash equivalent	809	1,046
Foreign funds - Madagascar Ariary	34,643	-
Exchange rate	366.3810	-
Cash equivalent	95	-
Foreign funds - Ghana Cedi	528,171	-
Exchange rate	1,525.390	-
Cash equivalent	346	-

## NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2006

	2006 R'000	2005 R'000
		Restated
<b>19 Foreign currency exposure (continued)</b>		
Foreign funds - Euro	1,034	-
Exchange rate	7,5288	-
Cash equivalent	7,785	-

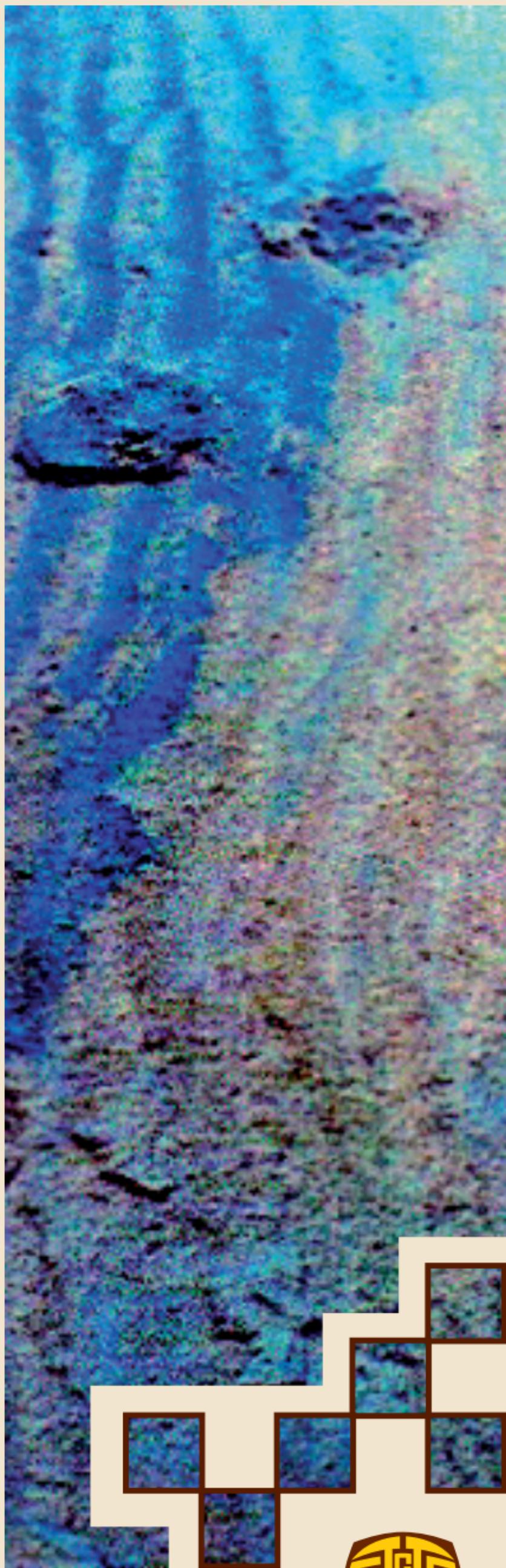
### 20 Related-party transactions

During the year, the following related-party transactions took place between the Council for Geoscience and the Department of Minerals and Energy:

Deferred income Refer to note 10 for further details regarding this transaction	61,023	51,743
Government grants Revenue	86,078	77,606

### 21 Prior-period error

	2006 R'000	2005 R'000	Prior years R'000
<b>21.1 Foreign currency losses in the 2005 financial year that have been recorded in the 2006 financial year</b>	-	117	-
<b>21.2 Adjustment to aircraft depreciation due to the implementation of IAS16. Aircraft are now split into their identifiable components and each component is depreciated separately</b>	-	24	-
<b>21.3 Revaluation of fully depreciated assets</b>			
Cost price	486	40,274	364
Accumulated depreciation	( 7,708)	( 18,042)	( 154)
Revaluation reserves	( 7,222)	22,232	210



**Council for Geoscience**

**CGS**  
Council for Geoscience

**ACP**  
African-Caribbean-Pacific

**BEE**  
Black Economic  
Empowerment

**BRGM**  
Bureau de Recherches  
Géologiques et Minières

**BSC**  
Balanced Scorecard

**CBD**  
Central Business District

**CCS**  
Carbon Capture and  
Storage

**CDM**  
Clean Development  
Mechanism

**COH WHS**  
Cradle of Humankind World  
Heritage Site

**CRF**  
Central Recording Facility

**CTBT**  
Comprehensive Nuclear  
Test-Ban Treaty

**CTBTO**  
Comprehensive  
Nuclear Test-Ban Treaty  
Organisation

**DME**  
Department of Minerals  
and Energy

**DPLG**  
Department of Provincial  
and Local Government

**DWAF**  
Department of Water  
Affairs and Forestry

**EEZ**  
Exclusive Economic Zone

**ESA**  
European Space Agency

**GAAP**  
Generally Accepted  
Accounting Practices

**GFZ**  
GeoForschungsZentrum

**GMS**  
Global Monitoring System

**GRAP**  
Generally Recognised  
Accounting Practices

**HDI**  
Historically Disadvantaged  
Individual

**ICP-MS**  
Inductively Coupled  
Plasma-Mass Spectrometry

**ICT**  
Information and Commu-  
nication Technology Unit

**IDC**  
International Data Centre

**IGES**  
International Geochemical  
Exploration Symposium

**IOTWS**  
Indian Ocean Tsunami  
Warning System

**IRDS**  
Integrated Rural  
Development Strategy

**MENA**  
Middle East and North  
Africa

**MT**  
Magnetotelluric Survey

**NDC**  
National Data Centre

**NDMC**  
National Disaster  
Management Centre

**NECSA**  
Nuclear Energy  
Corporation of South Africa

**NRF**  
National Research  
Foundation

**OCHA/UNESCO**  
United Nations Office  
for the Coordination of  
Humanitarian Affairs

**ORI**  
Oceanographic Research  
Institute

**ORWRDP**  
Olifants River Water  
Resources Development  
Project

**OSL**  
Optically Stimulated  
Luminescence

**PBMR**  
Pebble Bed Modular  
Reactor

**PDAC**  
Prospectors and  
Developers Association of  
Canada

**PFMA**  
Public Finance  
Management Act

**PGE**  
Platinum-Group Elements

**PGM**  
Platinum-Group Metals

**PTS**  
Preparatory Technical  
Secretariat

**SAMINDABA**  
South African Mineral-  
Deposits Database

**SANSN**  
South African National  
Seismograph Network

**SAWIMA**  
South African Women in  
Mining Association

**SIDA**  
Swedish International  
Developmental Agency

**SRC**  
Swedish Research Council

**SSMB**  
Small-Scale Mining Board

**VSAT**  
Very Small Aperture  
Terminal

**XRF**  
X-Ray Fluorescence