ANNUAL REPORT

2020/21

'Geoscience is the fulcrum of human development'

Council for Geoscience

mineral resources & energy

Department:
Minerals Resources and Energy
REPUBLIC OF SOUTH AFRICA

‘Geoscience is the fulcrum of human development’ – Mosa Mabuza, 2019

PUBLIC ENTITY’S GENERAL INFORMATION

REGISTERED NAME:	Council for Geoscience
PFMA NATIONAL PUBLIC ENTITY:	Schedule 3A
PHYSICAL ADDRESS:	280 Pretoria Street Silverton, Pretoria South Africa
POSTAL ADDRESS:	Private Bag X112 Pretoria, South Africa 0001
TELEPHONE NUMBER:	+27 (0)12 841 1911
EMAIL ADDRESS:	info@geoscience.org.za
WEBSITE ADDRESS:	www.geoscience.org.za
EXTERNAL AUDITORS:	Auditor-General South Africa
BANKERS:	Nedbank and ABSA in Silverton, Pretoria
BOARD SECRETARY:	Ms Nomkhosi Cele

*Cover Image: The drill rig at the official launch of the second phase of Karoo Deep Drilling, also known as Geo-environmental Baseline Project in Beaufort West, Western Cape Province.

Photo credit: Mr Justyn Davies

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ADSL	Asymmetric digital subscriber line
AEMFC	African Exploration, Mining and Finance Cooperation
AI	Artificial intelligence
APP	Annual performance plan
BBBEE	Broad-based black economic empowerment
CAR	Central African Republic
CCUS	Carbon capture utilisation and storage
CEO	Chief Executive Officer
CGS	Council for Geoscience
COVID-19	Coronavirus disease 2019
CTBT	Comprehensive Nuclear Test Ban Treaty
CTBTO	Comprehensive Nuclear Test Ban Treaty Organisation
DMRE	Department of Mineral Resources and Energy
DPME	Department of Planning, Monitoring and Evaluation
EME	Exempted Micro Enterprise
ENGEODE	Engineering-geological database
ERP	Enterprise Resource Planning
Exco	Executive committee
GEMMAP	Geological Mapping and Mineral Assessment Project of Malawi
GGB	Giyani Greenstone Belt
GRAP	Generally Recognised Accounting Practice
GSN	Geological Survey of Namibia
GTP	Geoscience Technical Programme
HVAC	Heating, ventilation and air conditioning
ICT	Information and communications technology
IMMP	Integrated and multidisciplinary mapping programme
IRP	Integrated resource plan
IS	Infrasound

KDD	Karoo Deep Drilling
MDP	Management Development Programme
MEWMP	Mine and Environmental Water Management Programme
MPRDA	Mineral and Petroleum Resources Development Act
MT	Magnetotelluric
MTSF	Medium-term strategic framework
NDP	National Development Plan
NNMP	Namaqua-Natal Metamorphic Province
OAGS	Organisation of African Geological Surveys
ORGEM	Office of Geological Research and Mining
PDAC	Prospectors & Developers Association of Canada
PFMA	Public Finance Management Act
PPPFA	Preferential Procurement Policy Framework Act
PS	Primary station
QSE	Qualifying small enterprise
RAPS	Reducing and alkalinity-producing system
REE	Rare-earth element
RTP	Reduced to pole
SAMINDABA	South African Mineral Deposits Database
SANS	South African National Standard
SANSN	South African National Seismograph Network
SEDEX	Sedimentary exhalative
UNISA	University of South Africa
US	United States
VMS	Volcanogenic massive sulphide

PART A:
General Information

CGS geoscientists viewing the borehole cores of the Karoo Supergroup in the Karoo Deep Drilling site in Beaufort West

COUNCIL FOR GEOSCIENCE

The Geoscience Act, Act No 100 of 1993 as amended, established the Council for Geoscience (CGS) as, *inter alia*, the national custodian of geoscientific data, information and knowledge in South Africa.

The CGS has evolved into a modern institution with specialised facilities, assets and expertise. The scientific focus areas of the organisation include, albeit not limited to, geoscience mapping, economic geology, geophysics, analytical services, marine geoscience, as well as environmental, groundwater and engineering geosciences. The CGS has six regional offices in South Africa, with a head office in Silverton, Pretoria (Figure 1).

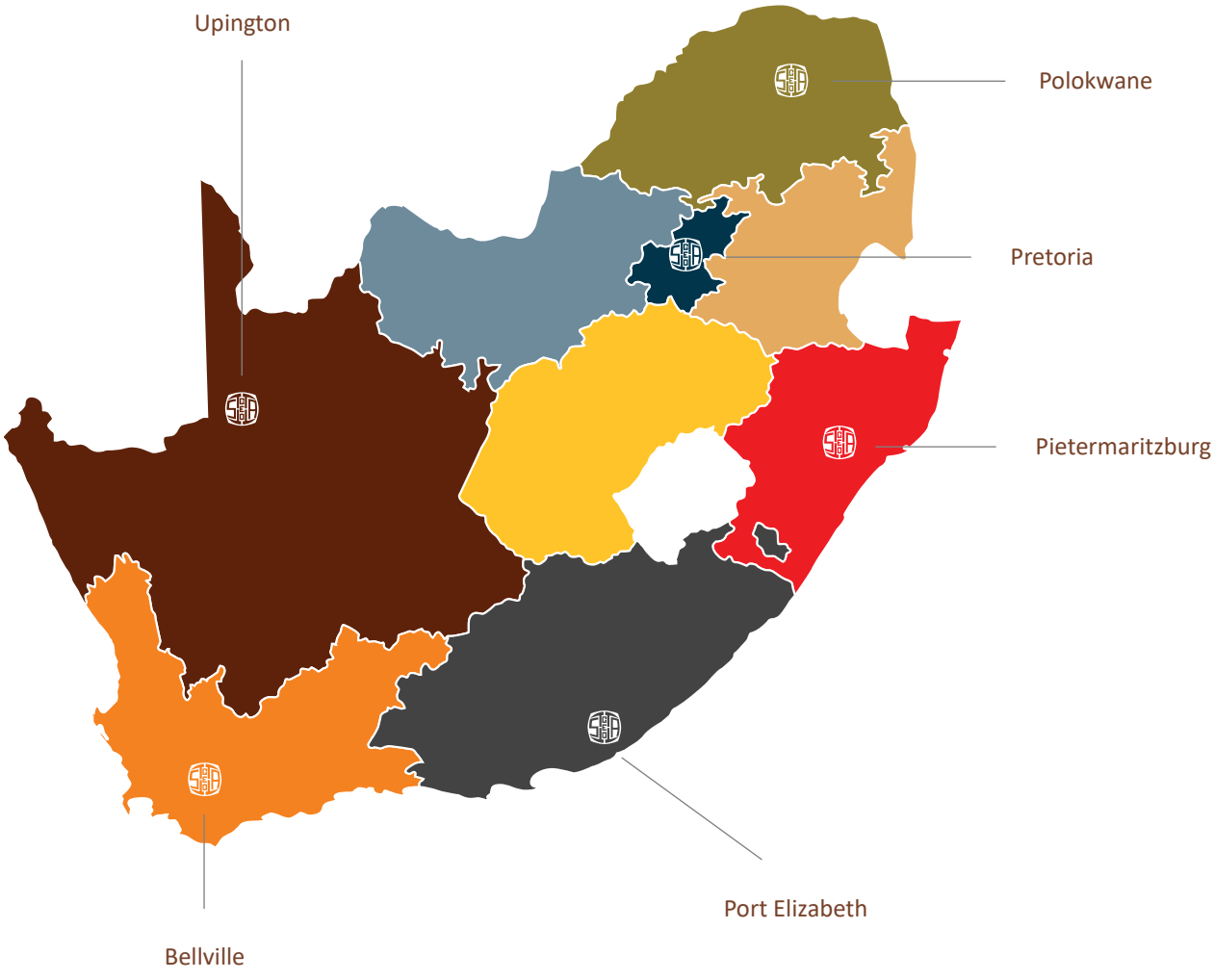


Figure 1. The six regional offices of the CGS in South Africa

1. FOREWORD BY THE CHAIRPERSON OF THE BOARD

CHAIRPERSON OF THE BOARD

Dr Humphrey Mathe

COVID-19 highlighted the need for the CGS to be more vigilant and cautious in the way it does business, and demonstrated the importance of support for the government's post-COVID economic recovery and reconstruction plans. The CGS responded to the post-COVID-19 economic recovery and reconstruction plan by supporting the Department of Mineral Resources and Energy, working with the Minerals Council, to draft an 'Exploration Implementation Plan' as the lifeblood of the mining industry's growth. We have established that exploration levels do not reflect the quality of geosciences of South Africa, due to a lack of investment for continuous mapping at an appropriate scale that is sufficient to attract exploration interest to secure a minimum share of 5% of the global exploration expenditure in South Africa. With the start of the Integrated Multidisciplinary Geoscience Mapping Programme at the beginning of my tenure as chairperson of the Board, remarkable progress was achieved. At that time, the country had been mapped at a scale of only 1:50 000, covering less than 5% of the onshore ground and almost none of the offshore environment. To date, the state has invested resources in the strategy, which had enhanced onshore mapping coverage to 9.03% by the end of 2020/21

It is my humble honour and privilege to present the Council for Geoscience (CGS) annual report covering the financial year 2020/21, the first year of the current Board's tenure. It has been just over a year since the onset of the COVID-19 pandemic that has devastated the lives of many South Africans and threatens to continue doing so, with a third wave expected in 2021. However, continued research and the availability of vaccines in our country have brought renewed hope that science will prevail over the pandemic. COVID-19 highlighted the need for the CGS to be more vigilant and cautious in the way it does business, and demonstrated the importance of support for the government's post-COVID economic recovery and reconstruction plans.

We have had to adapt to operating in a new environment, mitigating the risks of COVID-19, reorganising our programmes and reprioritising our scientific activities to protect the health and safety of our staff, while optimising our contribution to the livelihood of South Africans. At the start of the fourth quarter, 29 staff members tested positive. We are proud to report that the CGS has had 100% recovery of the affected staff. We will continue to encourage staff to exercise care and to follow all COVID-19 protocols.

The CGS responded to the post-COVID-19 economic recovery and reconstruction plan by supporting the Department of Mineral Resources and Energy (DMRE), working with the Minerals Council, to draft an 'Exploration Implementation Plan' as the lifeblood of the mining industry's growth. We have established that exploration levels do not reflect the quality of geosciences of South Africa, due to a lack of investment for continuous mapping at an appropriate scale that is sufficient to attract exploration interest to secure a minimum share of 5% of the global exploration expenditure in South Africa. With the start of the Integrated Multidisciplinary Geoscience Mapping Programme (IMMP) at the beginning of my tenure as chairperson of the Board, remarkable progress was achieved. At that time, the country had been mapped at a scale of only 1:50 000, covering less than 5% of the onshore ground and almost none of the offshore environment. To date, the state has invested resources in the strategy, which had enhanced onshore mapping coverage to 9.03% by the end of 2020/21. The partnerships developed with the South African Navy and the coastal division of the Department of Environment, Forestry and Fisheries are intended to augment the capacity to enable attainment of 0.3% offshore coverage in the next financial year. This is complemented by the acquisition of a small research vessel named R/V Nkosi, which will ramp up the offshore mapping programme.

One of the organisation's operational highlights is the Karoo Deep Drilling (KDD) Programme, which aims to develop a geoenvironmental baseline in the southern Karoo to inform and strengthen the regulatory framework for possible shale gas development in South Africa. A key part of the baseline study is using multidisciplinary geoscience data to understand, inter

We are also looking at new technologies and applications to resolve real-world problems. These include artificial intelligence for enhanced prospectivity mapping, and the identification and characterisation of natural systems such as groundwater controls and natural hazards.

alia, the current status of hydrogeology and seismicity in the area and highlighting areas over which, for example, seismicity could be triggered by shale gas exploration and exploitation.

We are also looking at new technologies and applications to resolve real-world problems. These include artificial intelligence for enhanced prospectivity mapping, and the identification and characterisation of natural systems such as groundwater controls and natural hazards.

The CGS's collaborative partnerships can be used not only to advance and support the organisation's 'Geoscience for Diplomacy' strategic intent, but to augment revenue generation. One of the advanced partnerships is with the Eswatini Geological Survey, which is boosting South Africa's geoscience contribution to the Regional Integration of foreign policy predisposition. The CGS will also cooperate on a 12-month contract extension for the Malawi Geological Mapping and Minerals Programme. This is a collaboration with BRGM (Geological Survey of France) and GTK (Geological Survey of Finland) to implement a mapping programme for Malawi. The partnership with the Namibian Geological Survey is progressing well, focusing on incremental mapping coverage of Namibia at a scale of 1:50 000. African partnerships are strengthened by collaboration with the Organisation of African Geological Surveys (OAGS).

The CGS, in partnership with the African Exploration Mining and Finance Corporation (AEMFC), is providing technical support to the DMRE in advancing the bilateral cooperation between South Africa and the Central African Republic (CAR). To this effect, the CGS concluded a strategic and technical partnership with its CAR counterpart, the Office of Geological Research and Mining (ORGEM), in January 2021.

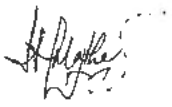
Now in their second year of service to the CGS, the Board members remain diligent in their oversight responsibilities in securing 'a prosperous and transformed society enabled by geoscience solutions'. The Board has had limited face-to-face interactions since its appointment on 1 May 2020 due to COVID-19 restrictions. However, it supervised the development of an audit system to enable the CGS to become compliant with its legislative requirements. The Auditor-General of South Africa also performed the necessary audit procedures on the organisation's performance information to provide reasonable assurance in the form of an audit conclusion. To the credit of all CGS team members, the organisation recorded an 86% achievement against its performance, with an unqualified audit outcome for the 19th consecutive year.

Thirty-eight employees registered as bursars for the 2021 academic year, 53% of whom are women (six of the eight PhD bursars). This demonstrates management's commitment to 'growing its own timber' by investing in its internal talent pool, particularly females.

I congratulate Dr Maphuthi Kwata and Dr Valerie Nxumalo for attaining their doctoral degrees; and Mr Litshedzani Mutele, Ms Thato Kgari, Ms Noluvuyo Dudumashe and Mr Melvin Sethobya on their Master's degrees. Well done, too, to Dr Asinne Tshibubudze and Dr Cameron Penn-Clarke, who were admitted as fellows of the Geological Society of South Africa (GSSA) in recognition of their concerted efforts to grow the country's geoscience knowledge base. These achievements truly reflect the worth of investing in the youth to build a capable state for future generations.

The Board conveys its deepest condolences to colleagues who have lost family members and friends during the year. The sadness of loss hit the CGS family particularly strongly with the untimely deaths of Ms Lillian Mathonsi, a Security Officer in the Protection Services Business Unit, Mr Odirile Welcome Dingoko, a Manager in the Geophysics and Remote Sensing Business Unit, and Ms Zukiswa Gladys Futiso, a Cleaner in the Facilities Management Business Unit.

In conclusion, my sincere gratitude goes to the Honourable Minister of Mineral Resources and Energy, Mr Gwede Mantashe (MP), for his unwavering support for the Board and the organisation and to the Chairperson of the Parliamentary Portfolio Committee on Mineral Resources and Energy, Mr Sahlulele Luzipho (MP), and his committee for their continued guidance and support of the CGS's work. To CGS executive management, scientific and support staff, your commitment and outstanding performance in executing the CGS mandate are greatly appreciated.



Dr H Mathe
Chairperson
Board of the Council for Geoscience
31 July 2021

2. OVERVIEW BY THE CHIEF EXECUTIVE OFFICER

CHIEF EXECUTIVE OFFICER
Mr Mosa Mabuza

The CGS has embraced the intergovernmental relations framework to enhance coordination with all three spheres of Government. During the financial year, meetings were held with key stakeholders in all three spheres, which allowed CGS scientists access to public and private land to conduct planned research. Meetings were also held with stakeholders in different provinces to open doors for implementation of the Geoscience Technical Programme (GTP). Implementation continued of the national IMMP through the GTP, which focuses on systematic collection of high-impact geoscientific research and geoscience mapping. In the year under review, the CGS streamlined the GTP in response to the post-COVID-19 economic recovery programme, continuing its detailed mapping programme at a scale of 1:50 000 and increasing onshore map coverage to 9.03% computed from 18 high-quality geological maps produced. Economic recovery projects focused on the minerals of the future, including base and precious metals, rare earth elements and coal. The geoenvironmental baseline assessment being conducted as part of the KDD Programme continued in the year under review. The programme is expected to provide a scientific basis for government to consider its options for shale gas exploration and exploitation. Two shallow observation boreholes that proved to be particularly high yielding were donated to Beaufort West Municipality in February 2018. At the time, the Western Cape was experiencing one of the most severe droughts in recent history. The two boreholes, with a combined monthly capacity of 33 million litres, continue to bring much-needed relief to the community. To date, the municipality has extracted and distributed well over 500 million litres of water. The KDD Programme has now started drilling a 3 500m ultra-deep vertical stratigraphic research borehole, with methane gas (CH4) detected at depths of 1 734m and at 2 325m.

I am pleased to present the annual report 2020/21 documenting activities for a year unprecedented in living memory. It is fitting firstly to applaud the individual and collective contributions of CGS management and the entire staff for the agility, commitment and professional aptitude that made it possible to navigate an extremely difficult year and deliver the obligations of the CGS. The effective management of COVID-19 by the Board augmented the governance and coordination of efforts to mitigate the risks of the pandemic. As a team, we can all be thankful to have emerged from the past year relatively unscathed and we thank the Board for its unwavering support.

The CGS has embraced the intergovernmental relations framework to enhance coordination with all three spheres of Government. During the financial year, meetings were held with key stakeholders in all three spheres, which allowed CGS scientists access to public and private land to conduct planned research. Meetings were also held with stakeholders in different provinces to open doors for implementation of the Geoscience Technical Programme (GTP). Engagement with local government was strengthened through participation in the strategic planning sessions of the District Municipalities of Mopani and Waterberg in Limpopo in support of the District Development Model.

The CGS had the privilege of working with the Ministry of Mineral Resources and Energy and the Minerals Council of South Africa to draft the 'Exploration Implementation Plan', the mining industry's crucial contribution to the "South African Economic Reconstruction and Recovery Plan". It seeks to achieve measurable, realistic, coordinated and time-bound action points to secure the stated national intent of a minimum 5% of the global exploration expenditure within the next three to five years.

The CGS played a critical role in intensified monitoring and impact assessment of seismicity in mining areas as a precursor to the phased reopening of mining operations during the national lockdown in accordance with the amended Chapter 4, S11(K)(3) of the National Disaster

It is fitting firstly to applaud the individual and collective contributions of CGS management and the entire staff for the agility, commitment and professional aptitude that made it possible to navigate an extremely difficult year and deliver the obligations of the CGS.

Management Act Regulations published on 16 April 2020. During the first quarter of the year under review, the CGS dedicated its resources to working with the DMRE to draft the Geoscience Act Regulations, which clarify the provisions of the Geoscience Act of 1993, as amended, that established the CGS. The regulations were gazetted for public comments during 2020/21 and stakeholders will be consulted in 2021/22 once all inputs and comments have been received.

Implementation continued of the national IMMP through the GTP, which focuses on systematic collection of high-impact geoscientific research and geoscience mapping. In the year under review, the CGS streamlined the GTP in response to the post-COVID-19 economic recovery programme, continuing its detailed mapping programme at a scale of 1:50 000 and increasing onshore map coverage to 9.03% computed from 18 high-quality geological maps produced. Economic recovery projects focused on the minerals of the future, including base and precious metals, rare earth elements (REEs) and coal.

In the Northern Cape Province, several high-priority base metal and minerals-of-the-future targets were followed up with the collection of multidisciplinary data, including geology, geochemistry and geophysics. The mineral systems approach was conducted using field mapping, remote sensing, regional geophysics and soil geochemistry. New areas found through geoscience mapping to host widespread metals and minerals include the Orange River Pegmatite Belt, which is about 67% larger than previously predicted. Drilling of certain mineral targets will commence in the outer years. Geochemical anomalies identified using regional and detailed geoscience surveys were investigated in the Northern Cape Province (Kenhardt) and North West Province (Ga-Ramokoka and Witfonteinrant) to understand their mineralising systems. Drilling of these anomalies, which show potential for nickel, chrome, cobalt and phosphates, will begin after a stakeholder engagement programme.

The geoenvironmental baseline assessment being conducted as part of the KDD Programme continued in the year under review. The programme is expected to provide a scientific basis for government to consider its options for shale gas exploration and exploitation. Useful information is being extracted to improve geological understanding, economic potential assessment, ground stability, groundwater profiling, modelling of regional seismicity and environmental impact assessment. Two shallow observation boreholes that proved to be particularly high yielding were donated to Beaufort West Municipality in February 2018. At the time, the Western Cape was experiencing one of the most severe droughts in recent history. The two boreholes, with a combined monthly capacity of 33 million litres, continue to bring much-needed relief to the community. To date, the municipality has extracted and distributed well over 500 million litres of water. The KDD Programme has now started drilling a 3 500m ultra-deep vertical stratigraphic research borehole. In the year under review, 2412.06m were drilled, with methane gas (CH_4) detected at depths of 1 734m and at 2 325m.

During the year under review, the CGS assumed the responsibility of Implementing Agency for the Carbon Capture, Utilisation and Storage (CCUS) project, a partnership of the South African Government and the World Bank. The CCUS project used extensive existing geological information test sites proximate to major carbon emitters in Mpumalanga. The recently identified storage sites include deep saline aquifers, post-gasification deep coal seams and basalt storage.

Following the application of artificial intelligence techniques, several boreholes were selected and drilled in Phuthaditjhaba (Maluti-a-Phofung project). All boreholes were associated with geological faults, representing a hitherto unidentified block fault system. One high-yielding borehole provides an estimated 12 litres/second, making it a sizeable groundwater source for the water-scarce community of Phuthaditjhaba.

In support of Medium-term Strategic Framework (MTSF) priority 5 on spatial integration, human settlements and local government, and the District Development Model, the CGS executed projects such as aggregate mapping to compile the crushed aggregate quality map of the Eastern Cape Province. Results from this project have identified six best-potential areas for good-quality aggregates based on their physical characteristics. The CGS continued to support housing delivery across the Free State Province by collaborating with the provincial Department of Human Settlements. Twenty-one project sites have been investigated thus far and four site investigation reports were concluded during the year

under review. As part of a strategic partnership with the Housing Development Agency, the CGS conducted a geological assessment and detailed dolomite risk profiling of selected townships in the Greater Khutsong area and compiled a regional dolomite risk profile in support of a strategic framework for human settlement and infrastructure planning in the region.

In line with the State's contingent liabilities for derelict and ownerless (D&O) mines in South Africa, the CGS closed four unsafe mine openings during the year under review and redesigned project activities for 2021/22 to focus primarily on research related to the subject matter. The Mine Environment and Water Management Programme (colloquially referred to as the Mine Water Project) continued to develop mitigation strategies for the sustainable management of mine water in South Africa. Construction of the Van Ryn canal was completed, with the intent of preventing about 60 litres/second of water from entering the mine voids, thereby saving around R25 million a year on the pump and treatment system.

The CGS continues implementation of its Geoscience Diplomacy Programme in Namibia and Malawi and its support of the Comprehensive Nuclear Test-Ban Treaty (CNTBT).

The annual CGS conference took place on 4 and 5 March 2021 on a virtual platform. With the theme 'Geoscience — the fulcrum of human development' – the basis of all the CGS does – the conference demonstrated that geoscience information is indispensable to advancing the geosciences body of knowledge (training and development) and supporting national developmental imperatives spanning inclusive economic development, energy security, the Just Energy Transition policy, food security, groundwater optimisation, infrastructure and sustainable land use, artificial intelligence applications in the geosciences, geoscience heritage and the importance of environmental stewardship. CGS scientists, professors and students, industry and independent professionals were among the conference participants, but attendance also reflected the regional integration foreign policy predisposition in Africa and extended to overseas partners and collaborators. The conference was an excellent platform for the geoscientific community to exchange ideas, and update itself on new research developments and applications of geoscience's outputs, and for the young scientists of the CGS to display their technical prowess, which is not generally known nor appreciated. The event resulted in the publication of 55 conference proceedings.

During 2021/22, the CGS will celebrate its 110th anniversary, having been created through amalgamation of four provincial entities into the National Geological Survey Organisation, then established in 1993 as the Council for Geoscience. A wider-reaching conference is being planned that will take an intradisciplinary approach, inclusive of various end-users of geoscience outputs.

The CGS's Statement of Financial Position reflects total assets to the amount of R741.4 million, which is comprised of Non-current and Current assets amounting to R360.5 million and R380.9 million, respectively. The CGS significantly enhanced good performance, particularly given the difficult times of the COVID-19 pandemic that affected the reporting period, with total revenue of R525.8 million and a marginal deficit of R0.7 million. A more comprehensive report on financials information is contained in part E of the report.

Sustainability is an integral part of the CGS mandate and business at the financial/economic, social, stakeholder and environmental levels. Sustainability is embedded in scientific focus and innovation within the organisation and we are privileged to have a harmonious and diversified workforce that views the CGS as its employer of choice. I extend a warm welcome to the new members of the CGS team. To those who left us, thank you for your services and may you be successful in your new endeavours.

Every year has its highlights and low moments. During the year under review, the CGS lost some of its talent, including some true stalwarts of the geosciences, through retirement. We celebrate the sterling contribution of these colleagues who served the organisation well. The following men and women are among those who have dedicated much of their lives to the organisation:

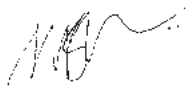
- Dr Gregory Allan Botha – 38 years as a Senior Specialist Scientist in the Geoscience Mapping Business Unit.
- Ms Maria Magdalena Schalekamp – 22 years as a Technical Officer in the Economic Geology and Geochemistry Business Unit.
- Ms Lorraine van der Merwe – 32 years as a Chief Librarian in the Facilities Management Business Unit.
- Dr Christopher Hatton – 11 years as a Specialist Scientist in the Mapping Geoscience Business Unit.
- Mr Fhatuwani Leonard Ramagwede – 12 years as an Executive Manager, two years as a Technical Adviser

to the CEO, and one year as a Chief Scientist in the Economic Geology and Geochemistry Unit.
- Dr Alazar Yosef Billay – 15 years as a Specialist Scientist in the Economic Geology and Geochemistry Business Unit.
- Ms Noluviwo Adelaide Qayiso – 28 years as a Creditors Administrator in the Finance Management Business Unit.
- Ms Lindiwe Eunice Ngcobo – 38 years as a Cleaner in the Facilities Management Business Unit.
- Mr Michael Solomon Ntuli – four years as a Cleaner in the Facilities Management Business Unit.
- Mr Sekgowe David Kgaditse – 39 years as a Technical Officer in the Analytical Services Business Unit.

As mentioned by the chairperson, we were deeply saddened during the year to lose three valued team members, namely Ms Lillian Mathonsi, a Security Officer in the Protection Services Business Unit, Mr Odirile Welcome Dingoko, a Manager in the Geophysics and Remote Sensing Business Unit, and Ms Zukiswa Gladys Futiso, a Cleaner in the Facilities Management Business Unit. My condolences go to their loved ones. Fortunately, the CGS did not lose anyone to COVID-19 during the year. To colleagues who are recovering from ailments at present, we look forward to welcoming you back.

My special thanks go to the Board members, under the judicious leadership of the chairperson, Dr Humphrey Mathe, for their patience, meticulous evaluation of our work, support and guidance throughout the year. Gratitude also goes to the Parliament Portfolio Committee on Mineral Resources and Energy for its support, commitment, oversight and guidance as well as to the Minister and officials of the Department of Mineral Resources and Energy.

Again, I sign off my overview knowing that we have built a solid foundation for a CGS that is stronger and more delivery-focused, and that exemplifies a capable state institution of government. It bears repeating that this has been achieved only because we are standing on the proverbial shoulders of giants in the form of all our forebears.



Mr M Mabuza
Chief Executive Officer
Council for Geoscience
31 July 2021

3. STATEMENT OF RESPONSIBILITY AND CONFIRMATION OF ACCURACY FOR THE ANNUAL REPORT

Based on the best of our knowledge and belief, we confirm the following:

All information and amounts disclosed in the annual report are consistent with the annual financial statements audited by the Auditor-General.

The annual report is complete, accurate and free from any omissions.

The annual report has been prepared in accordance with the guidelines on annual reports, as issued by National Treasury.

The Annual Financial Statements (Part E) have been prepared in accordance with the Generally Recognised Accounting Practice (GRAP) standards applicable to a public entity.

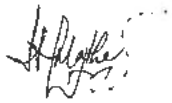
The Board of the CGS is responsible for preparing the annual financial statements and for judgments made on this information.

The Board of the CGS is responsible for establishing and implementing a system of internal controls which has been designed to provide reasonable assurance on the integrity and reliability of the information on performance, human resources and the annual financial statements.

External auditors have been appointed to express an independent opinion on the annual financial statements.
In our opinion, the annual report fairly reflects the operations, performance information, human resources and the financial affairs of the public entity for the financial year ended 31 March 2021.

Yours faithfully

Mr M Mabuza
Chief Executive Officer
Council for Geoscience
31 July 2021



Dr H Mathe
Chairperson
Board of the Council for Geoscience
31 July 2021

4. STRATEGIC OVERVIEW

The core mandate of the CGS is inscribed in its founding prescripts. The vision, mission and core values of the organisation aptly find their expression, as outlined in Geoscience Act No 100 of 1993, as amended, as follows:

VISION

The vision of the CGS is:
A prosperous and transformed society enabled by geoscience solutions

MISSION

The mission of the CGS is to contribute to a prosperous South Africa by:

- Providing integrated, systematic and thematic maps and conducting research on the onshore and offshore geology of South Africa, as mandated, to:
  - Facilitate mineral, energy and agricultural development;
  - Contribute to the assessment and sustainable management of mineral, geohydrological and geoenvironmental resources;
  - Support infrastructure development.
- Acting as a national advisory authority on geoenvironmental pollution.
- Providing an information repository and delivery platform that facilitates actionable decisions and the accessibility of relevant information by relevant stakeholders.
- Discharging the mandate in a manner that supports transformation and national developmental imperatives.

CORE VALUES

The core values of the organisation are:

- **Innovation:** Generating and implementing novel ideas and outputs that create value.
- **Diversity:** Embracing an inclusive culture that upholds transformation and recognises contributions from all stakeholders.
- **Excellence:** Striving to excel in every aspect of our business.
- **Accountability:** Fostering reliability and commitment, taking responsibility and ownership.
- **Learning:** Advancing through knowledge creation.
- **Safety, Health, and Environment:** Prioritising the health and safety of all employees and stakeholders concomitant with environmental stewardship.
- **Transparency:** Providing services impartially, fairly, equitably and transparently.

5. LEGISLATION AND OTHER MANDATES

The Public Finance Management Act (PFMA) (Act No 1 of 1999) lists the CGS as a Schedule 3A Public Entity.

The Geoscience Act (Act No 100 of 1993) and the subsequent Geoscience Amendment Act (Act No 16 of 2010) establish the CGS. The mandate of the CGS includes, albeit not limited to:

I. The **systematic onshore and offshore** geoscientific mapping of South Africa.
II. **Undertake geoscientific research** and related technological development.
III. The collection and curation of all geoscience data and act as a national geoscience repository.
IV. The **compilation and development of comprehensive and integrated geoscience knowledge** and information, such as geology, geophysics, geochemistry, engineering geology, economic geology, geochronology, palaeontology, geohydrological aquifer systems, geotechnical investigations, marine geology, geomagnetism, seismology, geohazards, environmental geology and other related disciplines.
V. **Bring to the notice of the Minister any information in relation to the prospecting for and mining of mineral resources,** which is likely to be of use or benefit to the Republic.
VI. Promote the search for and the exploitation of any minerals in the Republic.
VII. Study (i) the **distribution and nature of mineral resources** and (ii) geoenvironmental aspects of past, current and future mineral exploitation.
VIII. Study the use of the surface and the **subsurface of the land and the seabed,** and from a geoscientific viewpoint advise government institutions and the general public on the judicious and safe use thereof with a view to facilitate sustainable development.
IX. Develop and maintain the **national geoscientific library,** the national geoscientific information centre, the **national borehole core depository**, the **national geophysical and geochemical test sites**, the **national geoscience museum**, the national seismological network and the national geoscience analytical facility.
X. Conduct investigations and render prescribed specialised services to public and private institutions.
XI. Render geoscience knowledge services and **advice to the State**.

In terms of the amendments made to the Geoscience Act, sections 4(c), 4(eA), 4(f), 5(b) and 8 that deal with, *inter alia*, the custodianship of geoscientific information, the review and evaluation of geotechnical reports, the maintenance of certain national geoscientific facilities and the appointment of a Geotechnical Appeal Committee were held in abeyance. Synchronously, the Mineral and Petroleum Resources Development Act (MPRDA) explicitly provides for the CGS to receive, validate and curate geological information from prospecting and mining right holders as part of their regulatory compliance requirement. These amendments constitute organic growth prospects and significantly broaden the mandate of the CGS.

The policy mandate: The Minerals and Mining Policy for South Africa (1998) affirms the CGS as a science council that supports research and development underpinning the sustainable development of the mining industry. This further enunciates the Constitutional mandate, as elaborated in the founding prescripts of the CGS. This Strategic Plan of the CGS gives effect primarily to the policy mandate.

OTHER GUIDING POLICIES

Given the urgent need to address national imperatives, the CGS ensures that its business model and all its activities address the following strategic national outcomes in alignment with the National Development Plan (NDP) Vision 2030:

- **Decent employment through inclusive economic growth:** Increase the benefits of mineral resources to the country by delivering geoscience information and services to increase the rail, water and energy infrastructure;
- **A skilled and capable workforce to support an inclusive growth path:** Build capacity in scientific, administrative and managerial/leadership skills, and in the development of products, systems and services;
- **An efficient, competitive and responsive economic infrastructure network:** Geoscience information and services input into infrastructure development contribute to South Africa's economic development of coal, gas, electricity and water resources;
- **Vibrant, equitable and sustainable rural communities with food security for all:** Assistance by the CGS in the development of South Africa and its people through improved infrastructure development, mining and geotourism;
- **Environmental assets and natural resources that are well protected and continually enhanced:** Conducting research on acid mine drainage,

climate change, and carbon capture and storage technologies, and

- **An efficient, effective and development-oriented public service and an empowered fair and inclusive citizenship:** Development of the regulatory systems of the CGS in line with legislative requirements and the national mandates that address gender equity and employment equity (EE).

Further to the NDP and Medium-Term Strategic Framework (MTSF), the objectives of the CGS have been formulated to support the objectives of the Department of Mineral Resources and Energy (DMRE), whose core focus is the promotion of sustainable development of the mining, minerals and upstream petroleum sectors. Other objectives of the DMRE, supported by the CGS and with which its activities are aligned, include contributing to skills development, facilitating transformation in the mining, minerals and energy sectors, as well as research and development in support of sustainable exploration initiatives. The CGS derives its strategic foundation from the government's MTSF 2019 to 2024, the Stakeholders' Declaration on Strategy for the Sustainable Growth and Meaningful Transformation of South Africa's Mining Industry of the DMRE, and the 2019 White Paper on Science, Technology and Innovation of the Department of Science and Innovation (DSI).

6. ORGANISATIONAL STRUCTURE

The organogram of the CGS (Figure 2) describes the reporting structure of the organisation. The structure was developed to support the efficient, effective and robust functioning of the organisation and to streamline the composition of its Board of Directors and executive management. The executive management team of the CGS is headed by the Chief Executive Officer (CEO) who reports to the accounting authority (the CGS Board — see Part C of this report). The executive management team, in turn, oversees four portfolios: Integrated Geoscience Development, Geoscientific Services, Finance and Corporate Services (see Part A Section 7).

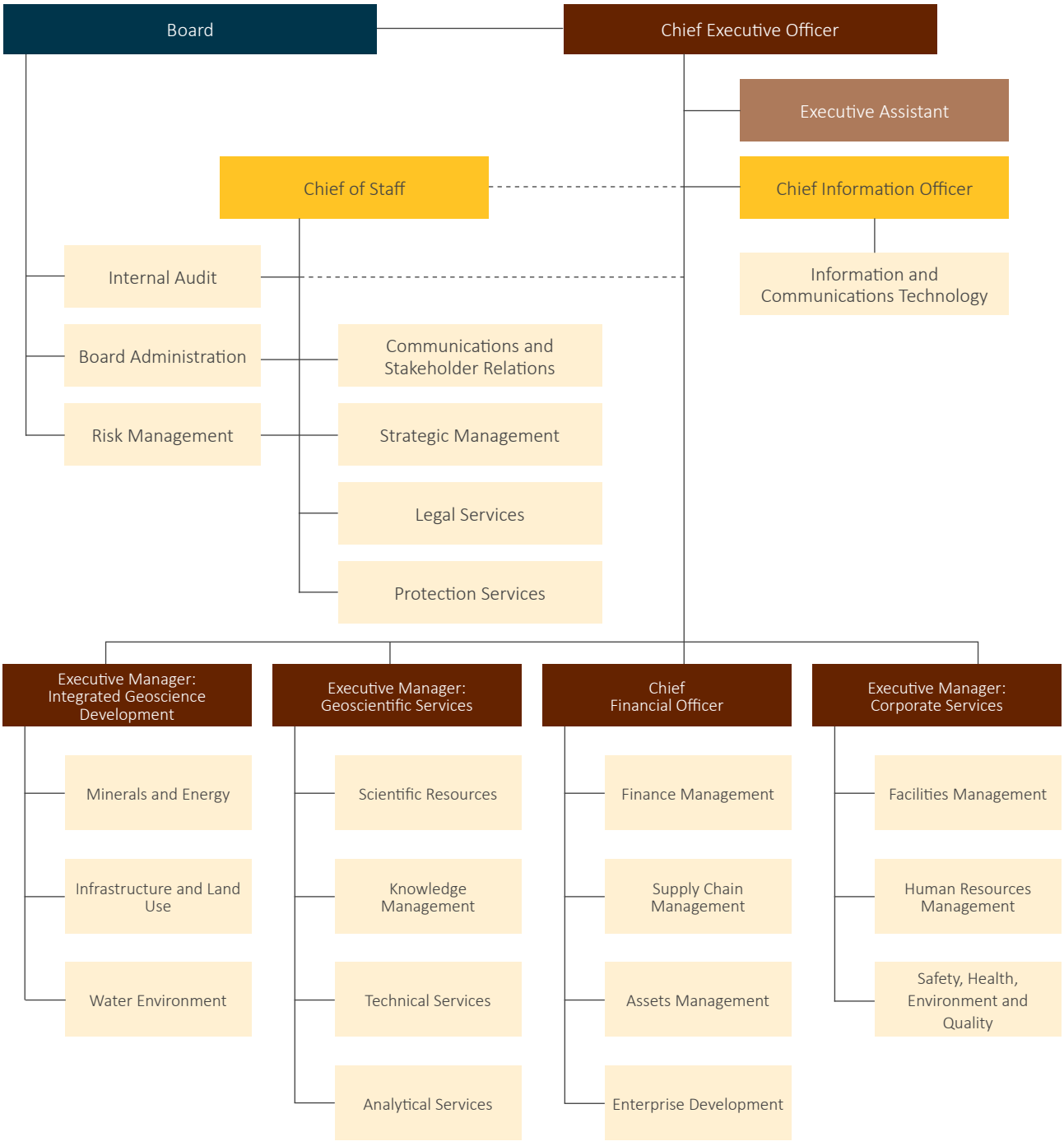


Figure 2. CGS organisational structure

7. CGS EXECUTIVE MANAGEMENT TEAM

CHIEF EXECUTIVE OFFICER: Mr Mosa Mabuza

EXECUTIVE MANAGER GEOSCIENTIFIC SERVICES: Ms Refilwe Shelembe

EXECUTIVE MANAGER INTEGRATED GEOSCIENCE DEVELOPMENT: Dr David Khoza

CHIEF FINANCIAL OFFICER: Mr Leonard Matsepe

EXECUTIVE MANAGER CORPORATE SERVICES: Dr Jonty Tshipa

PART B:
Performance Information

This section of the report provides key performance information demonstrating the service delivery achievements of the CGS. The information corroborates the organisation's effective management, planning, budgeting, implementation, monitoring and evaluation of activities. The impacts and outcomes of its actions are underpinned by symbiotic planning and management inputs and activities to achieve the desired results.

The performance information affirms the alignment of the impacts and outcomes in the strategic plan, the associated programme outputs, the output indicators and targets in the Annual Performance Plan (APP) and the various budget-related documents. This section also highlights achievements measured against the performance indicators and targets identified in the strategic plan, the APP and the budget documents.

Chairperson of the CGS Board viewing the drill rig at the official launch of the second phase of the Karoo Deep Drilling in Beaufort West.

1. AUDITOR-GENERAL'S REPORT: PREDETERMINED OBJECTIVES

The Auditor-General of South Africa performed the necessary audit procedures on the performance information of the CGS to provide reasonable assurance in the form of an audit conclusion. The audit conclusion on the performance against predetermined objectives is included in the report to executive management, with material findings being reported under the Predetermined Objectives heading in the report on other legal and regulatory requirements section of the auditor's report.

The Report of the Auditor-General, published as Part E: Financial Information, is on pages 138 to 141.

2. SITUATIONAL ANALYSIS

2.1 SERVICE DELIVERY ENVIRONMENT

The end of the reporting period represents the fourth year of continuous implementation of the current phase of the IMMP as an instrument of delivery of the strategic re-orientation of the CGS, which decisively focused on implementation of its mandate, stipulated in the Geoscience Act, Act No 100 of 1993 (amended in 2010). This includes collection, generation, compilation, interpretation and dissemination of high-quality geoscience data, information and knowledge for South Africa. The IMMP focuses on five core themes listed below and in the operational highlights. Despite the challenges presented by the COVID-19 pandemic and the resultant national lockdown, which adversely impacted the IMMP, the CGS delivered most of the COVID-adjusted APP targets for the year under review.

- **Geoscience for mineral and energy resources:**

The South African Government pronounced on its bold plan to capture a minimum of 5% of the global exploration budget of approximately US$10 billion per annum in the next three to five years. The CGS is privileged to be at the leading edge of rejuvenating and reimagining the exploration landscape, consistent with the quality of geology that suggests that the country remain a proverbial exploration frontier. Accordingly, the CGS participates in a number of DMRE-led initiatives to provide necessary geoscientific/technical support.

A geologist measuring a shear foliation in the Marshall Rocks-Pofadder shear zone, Hallenberg Mountains, Sperrgebiet Namibia.

The CGS's contribution to energy security and the 'Just Energy Transition' policy resides in the numerous projects that constitute its Geoscience Technical Programme (GTP). These include geothermal research potential, whose early positive results will augment the sustainable renewable energy programme in the medium- to long-term. In addition, the non-traditional coalfields such as Indwe-Molteno Coalfields in the Eastern Cape Province present ideal opportunities to explore production of hydrogen and rare-earth elements (REEs) from the development of coal resources, to embrace renewable energy and significantly reduce the carbon footprint.

Progress on implementation of this aspect of the CGS technical programme, albeit at an early stage, gives sufficient confidence that the much-needed inclusive economic growth, coupled with the energy security needs of the country, can be re-catalysed and attained.

- **Geoscience for health, groundwater and environment:**

As a result of CGS's advice to the DMRE on environmental stewardship, four high-risk unsafe mine openings were sealed during the year under review. This brings the physical closure phase of the project to an end. The CGS has also restructured its D&O mines project to focus exclusively on research on the impact of orphaned mines on society and advise the state on corrective action. This has allowed the CGS to strengthen research including integrated monitoring (air, soil, water etc) on legacy mines, mineral assessments for future mining of dumps and resuscitating local economies of historical mining towns. The Mine Water project completed the construction of the Van Ryn Canal as an ingress control measure, with work during the year including passive treatment piloting, and coexistence of mining and biodiversity

The CGS developed innovative machine learning techniques using integrated and multidisciplinary geoscience datasets to map groundwater resources. These techniques were successfully tested in the Maluti-a-Phofung project and used to site and drill a high-yielding well for communities in the area.

- **Geoscience for infrastructure and land use:**

The CGS is mandated to continue mapping the extent of areas susceptible to subsidence, such as in dolomitic rock. This knowledge is used to advise the State on its infrastructure development and optimal land use options. The extent of dolomitic layers nationally continued to be delineated using known boreholes. Artificial intelligence (AI) tools have also been developed to predict the development of subsidence in dolomitic areas. The CGS's National Geohazard Mapping Programme maps landslides potential at city scale to assist municipal spatial planning. The national seismic network detects continuously natural and mining-induced earthquakes in South Africa.

- **Geoscience innovation:**

The CGS is steadily strengthening its scientific innovation capacity in all geosciences. Models have been produced from machine learning algorithms to develop predictive capabilities in areas such as geohazards (subsidence), mineral, benthic habitats and water mapping.

- **Geoscience diplomacy:**

As the permanent Secretariat of the Organisation of African Geological Surveys (OAGS), the CGS promotes close relations among African member states in geoscience research. The OAGS represents the interests of African geological surveys internationally and collaborates closely with the European Geological Surveys to implement the PanAfGEO programme on capacity building across the African continent.

The CGS has renewed collaboration with the Namibian and Malawian geological surveys for the implementation of high-resolution geological mapping projects. These initiatives entail training and skills transfer for human capital development.

Business of the CGS

The CGS not only implements its mandate, but also collaborates on:

- Agency projects sourced from other government departments/institutions and public entities.
- Private sector projects.

The CGS continued to implement mandatory projects specified in the Geoscience Act, Act No 100 of 1993 as amended (e.g. development and maintenance of the national core library, geophysical reference sites) and to manage:

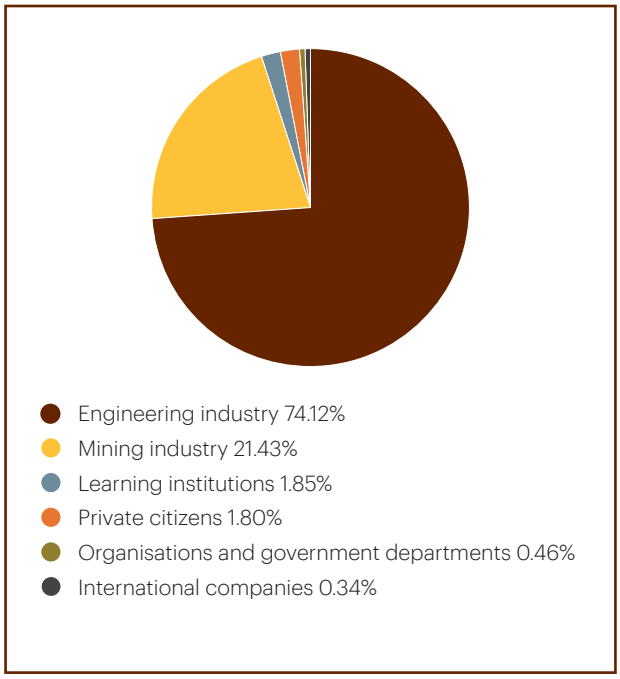
- The national seismic network, which monitors seismic activity locally and links with regional and global networks;
- Monitoring of global infrasound activity as part of its collaboration with the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO);
- The National Borehole Core Depository, which provides a comprehensive collection of valuable geological materials and now boasts hyperspectral scanning capability;

- The National Geoscience Museum, which provides information and preserves rare, scientifically valuable and geological heritage samples;
- The National Geoscientific Library and bookshop, which provide geological publications and maps to the public, and
- The national geoscience analytical facility, which is available to analyse, among others, geological samples, water samples and industrial raw materials.

2.2 ORGANISATIONAL ENVIRONMENT

During the year under review, the CGS realigned its organisational structure (Figure 2) which was further revised to streamline its core business portfolios for improved efficiency and service delivery as per the adopted strategy. This is intended to achieve its institutional outcomes. These include enhanced applications of geoscience products and improved knowledge management, which span the five thematic strategic focus areas. The Public Information Office was established to streamline dissemination of geoscience data and information to stakeholders in accordance with the Data and Information Policy of the CGS.

Information and data are disseminated to a wide variety of stakeholders, including private citizens, industry, state-owned enterprises, higher and basic education institutions as well as regional and international interested parties. From April 2020 to March 2021, the CGS received 4 363 requests, for, among others, dolomite reports and boreholes, geological borehole data, geological maps, geological mineral maps and other information such as geochemical and geophysical data.



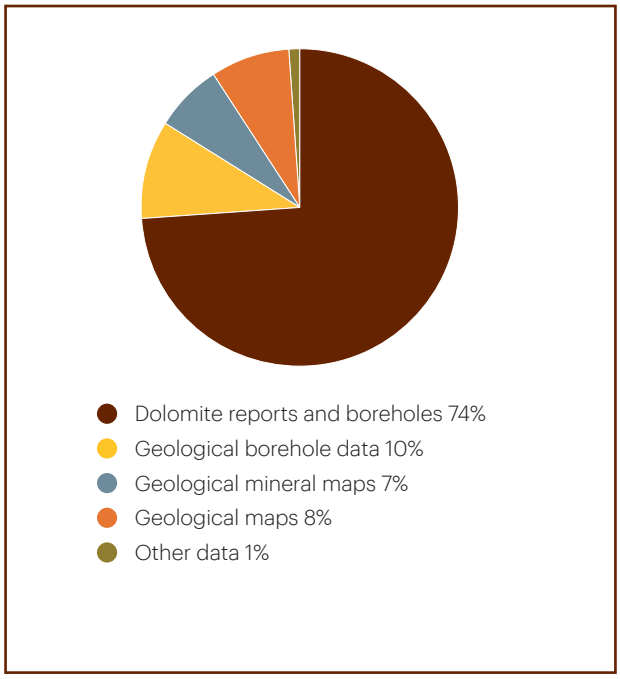


Figure 3. Statistics for geoscience data and information requests for 2020/21

2.3 KEY POLICY DEVELOPMENTS AND LEGISLATIVE CHANGES

There have been no key policy developments to the Geoscience Amendment Act 16 of 2010 since it took effect on 1 July 2012. The draft Geoscience Act Regulations elaborate the modalities of implementation of the empowering provisions in the Act and were published for public comment in the Government Gazette in March 2021. The Regulations intend to, *inter alia*, streamline the efficacy of the CGS's custodianship of geoscience data, information and knowledge in terms of the founding legislation. In addition, a provision enabling the CGS to undertake exploration is being expanded to establish sustainable modalities for the organisation to do so while balancing implementation with its broader mandate.

The Minerals and Petroleum Resources Development Amendment Act (MPRDA) of 2008 pronounces on the role of the CGS in respect of geological information generated through exploration activities in South Africa. In line with its new strategic approach, the CGS is aligning its activities with the latest developments in the MPRDA amendments, the National Environmental Management Act and the Spatial Planning and Land Use Management Act.

The District Development Model (DDM) seeks to strengthen delivery capacity and capability of municipalities. In this regard, the CGS has engaged extensively with a number of District Municipalities in the Provinces of Limpopo, Eastern Cape and KwaZulu-Natal to pilot possibilities of optimal geoscientific contribution towards the stated intent of DDM.

2.4 PROGRESS TOWARDS ACHIEVEMENT OF INSTITUTIONAL IMPACTS AND OUTCOMES

The impact of the nationwide lockdown in terms of the Disaster Management Act in South Africa necessitated the need for Government to review institutional plans to ensure that its plans sufficiently respond to the COVID-19 pandemic, balanced with continued service delivery in 2020/21. It is common cause that Strategic Plans and APPs may be revised during the five-year period, if there are significant changes to policy, changes in the service delivery environment or in the planning methodology. South Africa's response to the COVID-19 pandemic has contributed significantly to the changes in the operating environment of Government and these changes have also affected the service delivery environment. The CGS initially tabled its Strategic Plan 2020-2025 and APP of 2020/21 on 8 May 2020 in Parliament, Subsequently, Circular 2 of 2020 was issued by the DPME on 20 May 2020 to provide guidance on the revision and retabling of the 2020 - 2025 Strategic Plans and the 2020/21 APP to incorporate COVID-19 interventions and to align to the special budget adjustment. Additionally, the circular stipulated that revisions to the 2020/21 APP and 2020 - 2025 Strategic Plans (where required) should adhere to the minimum requirements of formats and core elements of the Revised framework for Strategic Plans and Annual Performance Plans (2019), which was subsequently repealed to give effect to the 2020 version. The CGS Strategic Plan 2020 - 2025 and APP 2020/21 were therefore revised to incorporate COVID-19 interventions as well as to align with the minimum requirements of formats and core elements of the Revised Framework for Strategic Plans and Annual Performance Plans (2020).

The impact statement of the CGS is drawn from its vision statement 'A prosperous and transformed society enabled by geoscience solutions'. The CGS has adopted the IMMP as a strategy to foster the sustainability of the organisation in a constantly changing state of polity, the economy, society and the ever-shifting scientific and technological landscape. The strategy is intended to maintain an impactful delivery of the core mandate. Figure 4 illustrates the impact pathway of the CGS strategy, its outcomes and areas of impact.

Figure 4. Strategic outlook and impact pathway of the CGS

Table 1 illustrates progress towards the achievement of the five-year targets against the outcome indicators of the CGS Strategic Plan 2020 - 2025

Table 1. Progress towards the accomplishment of the CGS Strategic Plan

Outcomes	Outcome indicators	Baseline	Five-year target	Progress at 31 March 2021
MTSF priorities	**Priority 1: A capable, ethical and developmental state**			
Effective and efficient financial resource management	Number of audit qualifications	0	0	0
Compliance with governance protocols/regulations				
MTSF priorities	**Priority 3: Education, skills and health**			
Capable human capital	Percentage of scientific staff with Master's or Doctoral degrees	New indicator	≥35%	40.47%
	Percentage of training expenditure to leviable amount of payroll	1.46%	≥1%	1.20%
MTSF priorities	**Priority 2: Economic transformation and job creation** **Priority 5: Spatial integration, human settlements and local government** **Priority 6: Social cohesion and safe communities**			
Enhanced applications of geoscience products and capture 5% global share exploration expenditure	Onshore geoscience map coverage	New indicator	16%	9.03%
	Offshore geoscience map coverage	New indicator	0.6%	0.05%
	Applied geoscience products for minerals and energy	New indicator	22	7
	Applied geoscience products for infrastructure, land use, health, groundwater and the environment	New indicator	26	10
Improved awareness of the CGS brand, services and products	Stakeholder satisfaction level	64.9%	≥70%	88.48%
Improved knowledge management	Number of peer-reviewed articles published	26	160	66
MTSF priorities	**Priority 7: A better Africa and world**			
Enhanced geoscience diplomacy	Number of international strategic partnerships established	New indicator	4	1

To achieve the outcome on effective and efficient financial resource management as well as zero qualifications, the CGS will continue to develop and maintain transparent systems, put in place internal controls and manage risks that may arise. The CGS will continue to aspire towards achieving zero qualifications and a clean audit by 2025. The financial statements will continue to be prepared in accordance with GRAP standards and the requirements of the Public Finance Management Act (PFMA). Controls have already been implemented to ensure the responsible management of assets, revenue, expenditure and liabilities. The established supply chain management function will ensure an appropriate procurement and provisioning system that is fair, equitable, transparent, competitive and cost-effective. Through its internal audit and risk management functions, the CGS monitors the effectiveness of internal controls, assesses the financial management controls and mitigates financial misconduct such as fraud, theft, irregular expenditure, and fruitless and wasteful expenditure. Compliance with governance protocols and regulations and other prescripts is crucial for the CGS to contribute to the achievement of Priority 1 of the MTSF, namely 'a capable, ethical and developmental state'. In order to achieve an acceptable level of compliance, the CGS aims to improve and further

develop compliance management maturity by putting the necessary policies and procedures in place to achieve the target of a fully compliant organisation by 2025. The CGS operates in a complex, diverse and extensive environment and regulatory universe, and has to comply with numerous prescripts. Compliance will be achieved in a structured and systematic manner integrated into operations. This will also result in ensuring that the CGS will attain zero qualifications by 2025.

Competitive advantage resides in the competence of the workforce. To attract, retain, engage and develop the right talent in the right positions, the CGS has developed a talent management framework to build, nurture and sustain a capable workforce by the end of the MTSF period. The framework is responsive to the short-, medium- and long-term exigencies of the business informed by workforce planning.

The IMMP strategy aims to contribute towards South Africa's Economic Reconstruction and Economic Recovery Plan by securing a minimum of 5% of global exploration expenditure through applications of geoscience information and knowledge generated from the programme. Implementation of the GTP, the primary tool to realise the CGS strategy, intends to unlock South Africa's mineral and energy resource potential and contribute to the "Just Transition" to a low-carbon economy. The GTP will also provide critical data and information (through the production of onshore and offshore 1:50 000-scale geoscience maps), including the application of AI techniques to support sustainable infrastructure development, judicious land use and environmental stewardship. During the year under review, 18 onshore geoscience maps were produced at a scale of 1:50 000, which resulted in an increase to 9.03% of onshore map coverage, marking a significant improvement from below 5% before the IMMP commenced.

To improve CGS brand awareness, services and products, the integrated communication and stakeholder relations strategy was approved in the year under review. The CGS has started to implement the strategy and to monitor the growth of its brand through tools such as stakeholder surveys.

As the national custodian of all geoscience data and information, the CGS has started with deployment of a seamless and accessible geoscience information and knowledge management system that will allow effective decision making for sustainable management of natural resources and mitigation of the impacts of geohazards, among others. Optimum use of the information management system will enable the organisation to implement the geoscience data and information policy as well as the Geoscience Act Regulations gazetted for public comment during the year under review.

The CGS aims to enhance implementation of the geoscience diplomacy thematic area as part of deployment of the national foreign policy predisposition to foster economic diplomacy and to support programmes towards South Africa's contribution to building a better Africa and the world, which is aligned with the United Nations Sustainable Development Goals 2030 and African Union's Agenda 2063. The geoscience programmes include aspects of human capital development, institutional reform, administrative and managerial/leadership, skills development and the implementation of mutually agreed programmes. During the year under review, the CGS entered an agreement with the Office of Geological Research and Mining (ORGEM) of the Central African Republic (CAR), as part of implementing modalities for the 2017 memorandum of understanding between the governments of CAR and South Africa. The agreement seeks to promote working relations between the two countries in geosciences and strengthen economic diplomacy initiatives. The CGS also supported the South African state-owned mining company, AEMFC, and a CAR delegation comprising ORGEM and Directors-General of various CAR Ministry of Mines and Energy portfolios.

3. CGS PROGRAMME PERFORMANCE INFORMATION

In accordance with the CGS strategy, a balanced scorecard methodology is used to provide an account of the overall performance of the organisation. The scorecard essentially measures the performance of the organisation at a corporate business level and at an individual level. There are five strategic programmes covering the customer, the internal business process, learning and growth and financial perspectives (Figure 5). These programmes respond to seven institutional outcomes and are aligned with Government's MTSF priorities.

CGS Impact Statement: A prosperous and transformed society enabled by geoscience solutions

	CGS Programmes	CGS Outcomes	CGS Strategic Response to the MTSF Priorities	CGS Corporate Scorecard
1	Financial Sustainability	1. Effective and efficient financial resources management	1. A capable ethical and developmental state	Economic/Financial Growth Perspective
2	Organisational Effectiveness and Efficiency	2. Compliance		Effective Systems (Organisational) Perspective
3	An Empowered, Transformed, Motivated and Capacitated Workforce	3. Capable human capital	3. Education, skills and health	World-Class People Perspective
4	Delivery of the Mandate	4. Enhanced applications of geoscience information and knowledge and to secure a minimum of 5% share of the global exploration expenditure 5. Enhanced geoscience diplomacy	2. Economic transformation and job creation 5. Spatial integration, human settlements and local government	Market (Stakeholder/ Customer) Perspective
5	Advisory, Stakeholder Engagement and Knowledge Management	6. Improved awareness of the CGS brand, services and products 7. Improved geoscience domain through effective knowledge management	6. Social cohesion and safe communities 7. A better Africa and World	

Figure 5. Summarised CGS programmes and their links to MTSF 2019 to 2024 priorities and the corporate scorecard

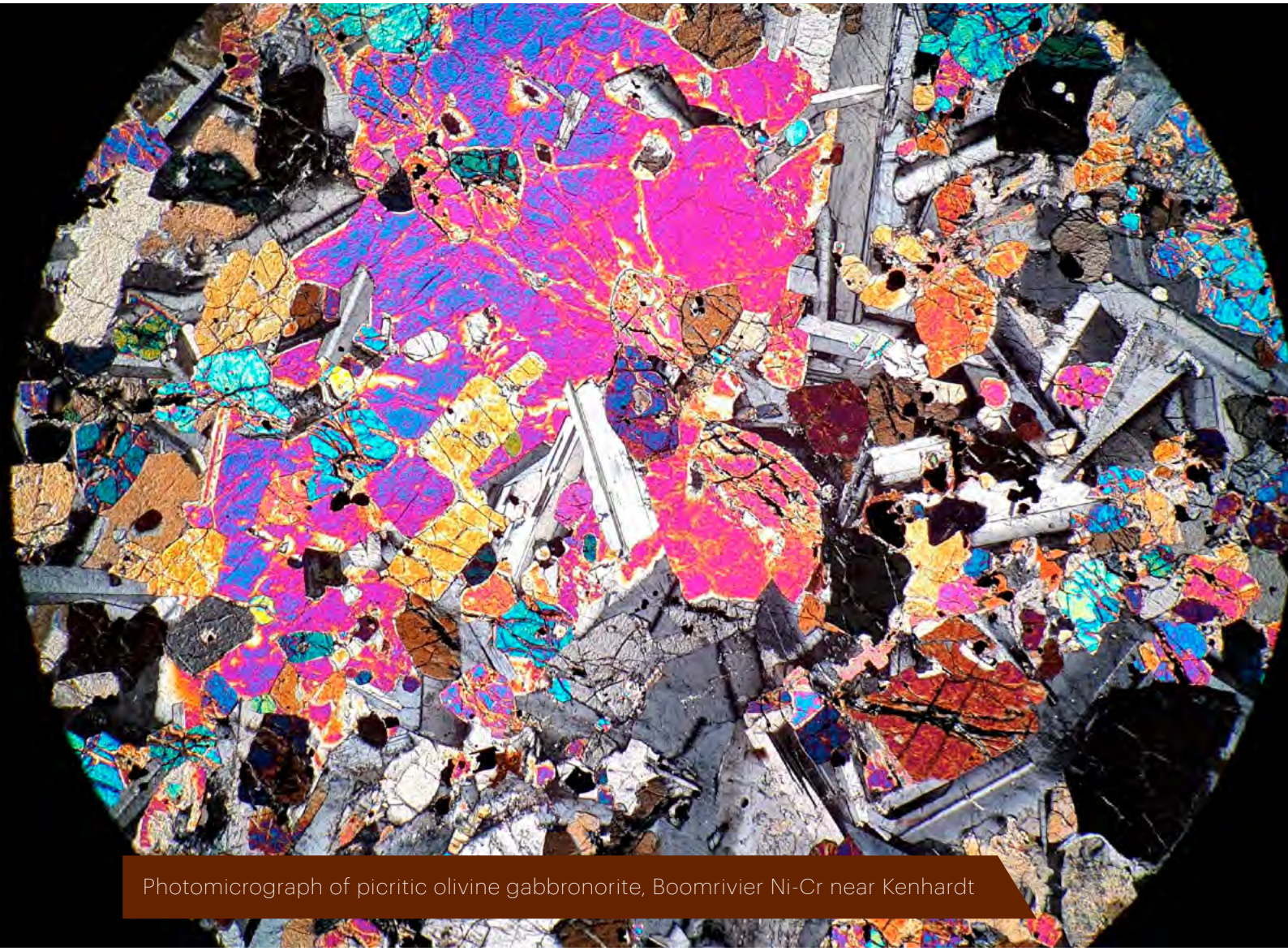
The performance information also details the service delivery environment of the organisation, broad service delivery disciplines, and clients and stakeholders served. To evaluate the corporate performance of the CGS, the organisation has developed performance indicators, which, together with the performance targets for 2020/21, are summarised in Table 2.

3.1. CORPORATE SCORECARD FOR 2020/21

The national state of disaster and the nationwide lockdown in South Africa are deliberate interventions of government to mitigate the impact of COVID-19 on the nation. This required government to review institutional plans to ensure swift response to the COVID-19 pandemic and continued service delivery in 2020/21. Therefore, the CGS's Strategic Plan 2020 - 2025 and APP of 2020/21 initially tabled on 8 May 2020 were revised and retabled on 8 July 2020 to incorporate COVID-19 interventions and to align with the minimum

requirements of formats and core elements of the Revised Framework for Strategic Plans and Annual Performance Plans (2020) as per the guidelines of Circular 2 of 2020 issued by the DPME.

Table 2 below shows actual achievements against performance information reflected in the originally tabled APP (i.e. the APP that was tabled on 8 May 2020) until date of retabling. These actual achievements represent the performance of the first quarter of 2020/21 (April 2020 to June 2020) and not necessarily achievements of the entire year. It is important to note that the originally tabled APP was based on the framework for strategic plans and APP of 2010, which was in force at the time of the original tabling. Accordingly, the outcomes, outputs and output indicator concepts were not applicable. For ease of reference and alignment, performance measures or key performance indicators and strategic initiatives from the originally tabled APP are presented below as output indicators and as programme purpose respectively. Table 3 presents actual achievements against performance information reflected in the final retabled APP 2020/21 and actual achievements for the entire financial year 2020/21.



Photomicrograph of picritic olivine gabbronorite, Boomrivier Ni-Cr near Kenhardt

Table 2. Corporate scorecard for the originally tabled APP 2020/2021 until the date of retabling (Applicable between 01 April 2020 to 8 July 2020 – first quarter of 2020/21)

Economic/Financial Growth perspective									
Programme 1: Financial sustainability Purpose: To ensure effective and efficient delivery of financial management services, to secure funding from the exploitation of collaborative activities and partnerships as well as to generate grant funding Institutional outcomes of programme 1: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
N/A	N/A	Percentage of overhead costs to total costs	New measure	61.04%	≤55%	58.69%	+3.69%	Target not achieved due to the COVID-19 lockdown, which resulted in projects related to the GTP not executed as they required fieldwork. More focus was mainly given to development of the economic recovery projects and plans.	Percentage of overhead costs to total costs target of ≤55% was revised to Percentage of overhead costs to total costs target of ≤66%. The reasons for the revisions were due to COVID-19 lockdown, Projects related to the GTP were not executed as they required fieldwork. Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Economic/Financial Growth perspective									
Programme 1: Financial sustainability **Purpose: To ensure effective and efficient delivery of financial management services, to secure funding from the exploitation of collaborative activities and partnerships as well as to generate grant funding** **Institutional outcomes of programme 1: N/A**									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Percentage of personnel costs to total costs	New measure	65.86%	≤60%	77.26%	+17.26%	Target not achieved due to the COVID-19 lockdown, which resulted in projects related to the GTP not executed as they required fieldwork. More focus was mainly given to development of the economic recovery projects and plans.	Percentage of personnel costs to total costs target of ≤60% was revised to Percentage of personnel costs to total costs target of ≤70%. The reasons for the revisions were due to COVID-19 lockdown, Projects related to the GTP were not executed as they required fieldwork. Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Economic/Financial Growth perspective									
Programme 1: Financial sustainability **Purpose: To ensure effective and efficient delivery of financial management services, to secure funding from the exploitation of collaborative activities and partnerships as well as to generate grant funding** **Institutional outcomes of programme 1: N/A**									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Revenue from col-laborative activities/ partnerships	R30m	R29m	R30m	R0.9m	-R29.1m	Target not achieved. Implementation of projects was not possible due to the national lockdown.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Grant revenue	R426.6m	R422.4m	R520.9m	R141.2m	-R379.7m	Target not achieved due to the national lockdown and the COVID-19 global pandemic, which resulted in less work being carried out. More focus was mainly given to development of the economic recovery projects and plans. As a result, less grant revenue was recognised.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Effective Systems (Organisational) perspective									
Programme 2: Organisational effectiveness and efficiency **Purpose: To develop and implement effective and compliant policies, procedures and business processes in support of the CGS integrated service-delivery model, adhere to best practice to achieve sustainable governance as well as to provide and operate flexible, expandable and secure ICT solutions** **Institutional outcomes of programme 2: N/A**									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
N/A	N/A	Percentage of total Procurement spend on goods and services from Small, Micro and Medium Enterprises (QSE and EME's) in terms of PPPFA of 2017	New measure	48.25%	≥30%	55.90%	Not applicable*	Target achieved. A concerted effort is directed towards transformation.	The title for Percentage of total Procurement spend on goods and services from small, micro and medium Enterprises (QSE and EME's) in terms of PPPFA of 2017 was revised to align to the correct and widely used terminology of percentage of total Procurement spend on goods and services from small, medium and micro enterprises (QSE and EME's) in terms of PPPFA of 2017. Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Effective Systems (Organisational) perspective									
Programme 2: Organisational effectiveness and efficiency **Purpose: To develop and implement effective and compliant policies, procedures and business processes in support of the CGS integrated service-delivery model, adhere to best practice to achieve sustainable governance as well as to provide and operate flexible, expandable and secure ICT solutions** **Institutional outcomes of programme 2: N/A**									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Number of audit qualifications	0	0	0	Not applicable	Not applicable	Not applicable as it is an annual measure and delivery was not yet due.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Availability of key enterprise services	New measure	New measure	≥99%	99.99%	Not applicable*	Target achieved. The CGS has maintained an average uptime and availability of resources of 99.99% across all the sites of the CGS.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Not applicable*: The planned target was a range rather than an absolute figure.

World-Class People perspective									
Programme 3: An empowered, transformed, motivated and capacitated workforce Purpose: To attract and retain highly skilled scientific personnel in the geoscience industry, To build capacity in respect of geoscientific, administrative and managerial/ leadership skills while also developing innovative products, systems and services, To promote and invest in human resources transformation and diversity Institutional outcomes of programme 3: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
N/A	N/A	Percentage of scientific staff with Master's or Doctoral degrees	New measure	41.56%	≥35%	43.78%	Not applicable*	Target achieved owing to deliberate investment in human capital, augmented by a focussed recruitment of Master's and PhD holders and a relatively low staff turnover rate.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Staff turnover rate	1.37%	7.99%	≤10%	1.90%	Not applicable*	Target achieved owing to retention interventions.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

World-Class People perspective									
Programme 3: An empowered, transformed, motivated and capacitated workforce Purpose: To attract and retain highly skilled scientific personnel in the geoscience industry, To build capacity in respect of geoscientific, administrative and managerial/ leadership skills while also developing innovative products, systems and services, To promote and invest in human resources transformation and diversity Institutional outcomes of programme 3: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Percentage of training expenditure to leviable amount of payroll	2.46%	3.52%	≥1%	2.41%	Not applicable*	Target achieved owing to expanded training requirements in line with the business exigencies.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Percentage of staff living with disability	1.59%	1.66%	≥1.5%	1.67%	Not applicable*	Target achieved owing to disability awareness campaign.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

World-Class People perspective									
Programme 3: An empowered, transformed, motivated and capacitated workforce **Purpose: To attract and retain highly skilled scientific personnel in the geoscience industry, To build capacity in respect of geoscientific, administrative and managerial/ leadership skills while also developing innovative products, systems and services, To promote and invest in human resources transformation and diversity** **Institutional outcomes of programme 3: N/A**									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	EE statistics, scientific cohort (female:male)	New measure	New measure	≤49:≥51	40:60	Not applicable*	Target achieved owing to capacity building interventions of the current staff and a focused recruitment campaign.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	EE statistics, EXCO (female:male)	New measure	New measure	≤20:≥80	20:80	Not applicable*	Target achieved owing to zero turnover at executive level.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Not applicable*: The planned target was a range rather than an absolute figure.

Market (Stakeholder / Customer) perspective									
Programme 4: Delivery of the mandate Purpose: Execute the integrated and multidisciplinary geoscience mapping programme Institutional outcomes of programme 4: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
N/A	N/A	Onshore geoscience map coverage	New measure	New measure	9%	8.4%	-0.6%	Target not achieved due to impact of the national lockdowns as a result of the COVID-19 pandemic. Less work was carried out on the GTP. More focus was mainly given to development of the economic recovery projects and plans.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Offshore geoscience map coverage	New measure	New measure	0.1%	Not applicable	Not applicable	Not applicable as the delivery of the outputs were not yet due for reporting at that stage.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Market (Stakeholder / Customer) perspective									
Programme 4: Delivery of the mandate **Purpose: Execute the integrated and multidisciplinary geoscience mapping programme** **Institutional outcomes of programme 4: N/A**									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Applied geoscience products for minerals and energy	New measure	New measure	6	1	-5	Target not achieved. One report was delivered in the first quarter as part of the contributions to the economic recovery programme of government.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Applied geoscience products for infrastructure, land use, health, groundwater and the environment	New measure	New measure	6	Not applicable	Not applicable	Not applicable as the delivery of the outputs were not yet due for reporting at that stage.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Market (Stakeholder / Customer) perspective									
Programme 4: Delivery of the mandate Purpose: Execute the integrated and multidisciplinary geoscience mapping programme Institutional outcomes of programme 4: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
N/A	N/A	Number of articles published on media platforms	13	17	24	2	-22	Target not achieved due to the national lockdown.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Stakeholder satisfaction level	64.9%	76%	≥70%	Not applicable	Not applicable	Not applicable as the delivery of the outputs were not yet due for reporting at that stage.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Market (Stakeholder / Customer) perspective									
Programme 4: Delivery of the mandate Purpose: Execute the integrated and multidisciplinary geoscience mapping programme Institutional outcomes of programme 4: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Number of peer-reviewed articles published	26	41	30	5	-25	Not applicable as the annual delivery of the outputs were not yet due for reporting at that stage. However, monitoring on the progress was done on quarterly bases.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.
	N/A	Number of CGS publications	6	12	7	3	-4	Not applicable as the annual delivery of the outputs were not yet due for reporting at that stage. However, monitoring on the progress was done on quarterly bases.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Market (Stakeholder / Customer) perspective									
Programme 4: Delivery of the mandate Purpose: Execute the integrated and multidisciplinary geoscience mapping programme Institutional outcomes of programme 4: N/A									
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021 until date of re-tabling**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**	**Reasons for revisions to the Outputs/Outputs indicators/Annual Targets**
	N/A	Number of conference proceedings	136	47	40	1	-39	Not applicable as the annual delivery of the outputs were not yet due for reporting at that stage. However, monitoring on the progress was done on quarterly bases.	Due to changes in the planning methodology outlined in Circular 2 of 2020 issued by the DPME, the templates of the originally tabled Strategic Plan 2020-2025 and APP 2020/21 were revised to align with the minimum requirements of the Revised Framework for Strategic Plans of 2020.

Table 3. Corporate scorecard for the final re-tabled APP 2020/2021 (representing the actual performance of the entire financial year)

Economic/Financial Growth perspective								
Programme 1: Financial sustainability **Purpose: To ensure effective and efficient delivery of financial management services, to secure funding from the exploitation of collaborative activities and partnerships as well as to generate grant funding** **Institutional outcomes of programme 1: Effective and efficient financial resource management**								
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**
Effective and efficient financial resource management	Audited financial reports	Percentage of overhead costs to total costs	New measure	61.04%	≤66%	63.00%	Not applicable*	Target achieved. A concerted effort was made to contain and reduce overhead costs.
	Audited financial reports	Percentage of personnel costs to total costs	New measure	65.86%	≤70%	64.03%	Not applicable*	Target achieved, due to containment of personnel costs in relation to project delivery costs.
	Audited financial reports	Revenue from collaborative activities/ partnerships	R30m	R29m	R30m	R23.2m	-R6.8m	Target not achieved due to national lockdown as a result of the global pandemic (COVID-19).
	Audited financial reports	Grant revenue	R426.6m	R422.4m	R520.9m**	R486.2m	-R34.7m	Target not achieved due to the national lockdown and global pandemic, which resulted in less work being carried out. The grant allocation was also reduced by R18.7m following the 2020/21 adjustments on the estimates of national expenditure and the target could not be revised.

Not applicable*: The planned target was a range rather than an absolute figure. **The Grant revenue target of R520.9m was based on the final allocation letter for the reported year. The R520.9m was subsequently adjusted down by R18.7m and only the amount of R502.2m was transferred to the Council for Geoscience.

Effective Systems (Organisational) perspective								
Programme 2: Organisational effectiveness and efficiency **Purpose: To develop and implement effective and compliant policies, procedures and business processes in support of the CGS integrated service-delivery model, adhere to best practice to achieve sustainable governance as well as to provide and operate flexible, expandable and secure ICT solutions** **Institutional outcomes of programme 2: Effective and efficient financial resource management and compliance with governance protocols/regulations**								
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**
Effective and efficient financial resource management and Compliance with governance protocols/ regulations	Audited annual report	Percentage of total Procurement spend on goods and services from small, medium and micro enterprises (QSE and EMEs) in terms of PPPFA of 2017	New measure	48.25%	≥30%	40.75%	Not applicable*	Target achieved. A concerted effort is directed towards transformation.
	Audited annual report	Number of audit qualifications	0	0	0	0	0	Target achieved. Concerted effort is made for continued improvement.
	Availability report	Availability of key enterprise services	New measure	New measure	≥99%	100%	Not applicable*	Target achieved. The CGS has maintained an average uptime and availability of resources of 100% across all the sites of the CGS.

Not applicable*: The planned target was a range rather than an absolute figure. NA: Information not available at this stage of reporting.

World-Class People perspective								
Programme 3: An empowered, transformed, motivated and capacitated workforce **Purpose: To attract and retain highly skilled scientific personnel in the geoscience industry, To build capacity in respect of geoscientific, administrative and managerial/ leadership skills while also developing innovative products, systems and services, To promote and invest in human resources transformation and diversity** **Institutional outcomes of programme 3: Capable human capital**								
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**
Capable human capital	Human resources reports	Percentage of scientific staff with Master's or Doctoral degrees	New measure	41.56%	≥35%	40.47%	Not applicable*	Target achieved through deliberate investment in human capital, augmented by a focused recruitment of Master's and PhD holders and a relatively low staff turnover rate.
	Human resources reports	Staff turnover rate	1.37%	7.99%	≤10%	5.48%	Not applicable*	Target achieved through retention interventions.
	Human resources reports	Percentage of training expenditure to leviable amount of payroll	2.46%	3.52%	≥1%	1.20%	Not applicable*	Target achieved through expanded training requirements in line with business exigencies.
	Human resources reports	Percentage of staff living with disability	1.59%	1.66%	≥1.5%	2.25%	Not applicable*	Target achieved through disability awareness campaign.
	Human resources reports	EE statistics, scientific cohort (female:male)	New measure	New measure	≤49:≥51	39:61	Not applicable*	Target achieved through capacity-building of current staff and a focused recruitment campaign.
	Human resources reports	EE statistics, EXCO (female:male)	New measure	New measure	≤20:≥80	20:80	Not applicable*	Target achieved through zero turnover at executive level.

Not applicable*: The planned target was a range rather than an absolute figure.

Market (Stakeholder / Customer) perspective								
Programme 4: Delivery of the mandate **Programme 4 purpose: Execute the integrated and multidisciplinary geoscience mapping programme** **Institutional outcomes of programme 4: Enhanced applications of geoscience products and capture 5% global share exploration expenditure and Enhanced geoscience diplomacy**								
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**
Enhanced application of geoscience products and capture 5% global share exploration expenditure, and Enhanced geoscience diplomacy.	Onshore geoscience maps	Onshore geoscience map coverage	New measure	New measure	9%	9.03%	+0.03%	Target achieved. The strategic focus on contributing to securing 5% of the global exploration spend led to increased mapping efforts in highly prospective areas. The CGS is classified as an essential service, which enabled work to continue in prioritised areas throughout.
	Offshore geoscience maps	Offshore geoscience map coverage	New measure	New measure	0.1%	0.05%	-0.05%	Target not achieved due to unavailability of deep-marine vessels, resulting in the suitable weather window for marine surveying being missed. The CGS will deploy its own mapping vessel that will accelerate the marine programme — particularly near shore — and intensify collaborative efforts with state organs with existing vessels suitable for the deep-sea environment.

Market (Stakeholder / Customer) perspective								
Programme 4: Delivery of the mandate **Programme 4 purpose: Execute the integrated and multidisciplinary geoscience mapping programme** **Institutional outcomes of programme 4: Enhanced applications of geoscience products and capture 5% global share exploration expenditure and Enhanced geoscience diplomacy**								
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**
Enhanced application of geoscience products and capture 5% global share exploration expenditure, and Enhanced geoscience diplomacy.	Value-added geoscience products such as integrated reports, 3D models, innovative solutions, mineral systems and emplacement models	Applied geoscience products for minerals and energy	New measure	New measure	6	7	+1	Target achieved. An additional assignment is in preparation to strengthen collaboration with the state's African Exploration, Mining and Finance Corporation.
	Value-added geoscience products such as integrated reports and 3D models, innovative solutions	Applied geoscience products for infrastructure, land use, health, groundwater and the environment	New measure	New measure	6	10	+4	Target achieved. To contribute to infrastructure-led economic recovery, deliberate efforts by the CGS produced additional products in response to strategic infrastructure programmes.

Market (Stakeholder / Customer) perspective								
Programme 5: Advisory, Stakeholder Engagement and Knowledge Management **Purpose: To improve stakeholder relations through collaborations with strategically aligned institutions, the private sector and the general public.** **Institutional outcomes of programme 5: Improved awareness of the CGS brand, services and products as well as Improved knowledge management**								
Outcome	**Output**	**Output indicator**	**Audited actual performance 2018/19**	**Audited actual performance 2019/20**	**Planned annual target 2020/2021**	**Actual achievement 2020/2021**	**Deviation from planned target to actual achievement 2020/2021**	**Reasons for deviations**
Improved awareness of the CGS brand, services and products. and Improved knowledge management	Media articles	Number of articles published on media platforms	13	17	24	25	+1	Target achieved through concerted efforts to inform the public about the work of the CGS and response to media queries about seismic events during the financial year.
	Stakeholder survey report	Stakeholder satisfaction level	64.9%	76%	≥70%	88.48%	Not applicable*	Target achieved through implementation of the communication and stakeholder relations strategy, which is yielding positive results.
	Peer-reviewed Articles published in scientific journals, book chapters and edited volumes	Number of peer-reviewed articles published	26	41	30	33	+3	Target achieved. The publication of the peer-reviewed papers planned annually is dependent on the vagaries of the publication schedule that often results in papers accepted late/earlier than expected.
	Examples: memoirs, bulletins, books and atlases.	Number of CGS publications	6	12	7	10	+3	Target achieved. The CGS accelerated a number of key publications.
	Examples: Conference Abstracts, extended abstracts, papers and keynotes	Number of conference proceedings	136	47	40	66	+26	Target achieved. The CGS held its biennial conference, which resulted in numerous abstracts, the majority of which were by CGS scientists.

Not applicable*: The planned target was a range rather than an absolute figure.

Strategy to overcome areas of underperformance

1) The CGS plans to develop and implement a model to expand the commercial revenue generation streams to augment and strengthen commercial activities/partnerships while sustaining its contribution to national developmental imperatives.
2) For the CGS to achieve its offshore geoscience map coverage targets, it will deploy the vessel it acquired during the third quarter of the year under review to accelerate the marine programme, particularly near shore. Collaborations will be intensified with state organs with vessels suitable for the deep-sea environment.
3) The CGS secured approval to augment its internal drilling capacity in order to enhance its agility in mobilising rigs to priority sites. Acquisition of two additional drills will be concluded in the financial year 2021/22 to allow for accelerated delineation and quantification of economic targets, while supporting fundamental science as well as geo-technical programmes within the organisation.

CGS response to the COVID-19 pandemic

Table 4. Progress on institutional response to the COVID-19 pandemic

Programme/ subprogramme	Intervention	Geographic location (province/ district/local municipality) (where possible)	No. of beneficiaries (where possible)	Disaggregation of beneficiaries (where possible)	Total budget allocation per intervention (R'000)	Budget spend per intervention	Contribution to the outputs in the APP (where applicable)	Immediate outcomes
Programme 1: Financial sustainability Programme 2: Organisational effectiveness and efficiency Programme 3: An empowered, transformed, motivated and capacitated workforce Programme 4: Delivery of the mandate Programme 5: Advisory, stakeholder engagement and knowledge management	Continuous monitoring of implementation of the CGS COVID-19 response plan and provision of advice by the CGS COVID-19 Committee	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Contributions to the achievement of the onshore geoscience coverage, applied geoscience products for minerals and energy, applied geoscience products for infrastructure, land use, health, groundwater and the environment, articles published on media platforms, peer-reviewed articles published, CGS publications, conference proceedings published	Increased percentage of onshore geoscience maps and applied geoscience products to contribute to the institutional outcome on enhanced applications of geoscience products and capture 5% of the global share of exploration expenditure.

Programme/ subprogramme	Intervention	Geographic location (province/ district/local municipality) (where possible)	No. of beneficiaries (where possible)	Disaggregation of beneficiaries (where possible)	Total budget allocation per intervention (R'000)	Budget spend per intervention	Contribution to the outputs in the APP (where applicable)	Immediate outcomes
Programme 1: Financial sustainability Programme 2: Organisational effectiveness and efficiency Programme 3: An empowered, transformed, motivated and capacitated workforce Programme 4: Delivery of the mandate Programme 5: Advisory, stakeholder engagement and knowledge management	Development of a COVID-19 policy to maintain a safe workplace by taking responsible measures to prevent the spread of the disease. The policy further outlines specific steps to be taken to safeguard employees' health and wellbeing during the pandemic, while ensuring business continuity	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Contributions to all achieved targets in Table 1 above	Increased percentage of onshore geoscience maps and applied geoscience products to contribute to the institutional outcome of enhanced applications of geoscience products and capture 5% of the global share of exploration expenditure.

Programme/ subprogramme	Intervention	Geographic location (province/ district/local municipality) (where possible)	No. of beneficiaries (where possible)	Disaggregation of beneficiaries (where possible)	Total budget allocation per intervention (R'000)	Budget spend per intervention	Contribution to the outputs in the APP (where applicable)	Immediate outcomes
Programme 5: Advisory, stakeholder engagement and knowledge management	Inclusion of the CGS in the National Disaster Management Act Regulations (published on 16 April 2020. The monitoring and impact assessment of seismicity through the Council for Geoscience must be intensified with immediate effect. The CGS monitored increasing seismic activity around mining areas and reported regularly to Minister Mantashe on safety around mines	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Increased mining growth the third quarter of 2020. Increased production of platinum group metals, iron ore, gold and manganese ore and growth of 288.3%.
Programme 5: Advisory, stakeholder engagement and knowledge management	Development of exploration implementation plan	South Africa	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Programme/ subprogramme	Intervention	Geographic location (province/ district/local municipality) (where possible)	No. of beneficiaries (where possible)	Disaggregation of beneficiaries (where possible)	Total budget allocation per intervention (R'000)	Budget spend per intervention	Contribution to the outputs in the APP (where applicable)	Immediate outcomes
Programme 4: Delivery of the mandate	Reprioritisation of scientific economic recovery projects	Limpopo Province, Northern Cape Province and North West Province	Not applicable	Not applicable	Not applicable	Not applicable	Contributions to the onshore geoscience coverage of 9.03%	Increased percentage of onshore geoscience maps and applied geoscience products to contribute to the institutional outcome on enhanced applications of geoscience products and capture 5% of the global share of exploration expenditure.
Programme 5: Advisory, stakeholder engagement and knowledge management	Intensification of stakeholder engagement programmes to expedite selected key economic recovery projects	Limpopo Province, Northern Cape Province, Eastern Cape Province, Western Cape Province, Free State Province, Mpumalanga Province, KwaZulu-Natal Province and North West Province	Not applicable	Not applicable	Not applicable	Not applicable	Stakeholder satisfaction level of 88.48%	Improved awareness of the CGS brand, services and products.

Table 5. Performance linked to budget

Programme/activity/ objective	2020/2021			2019/2020		
	Budget	Actual expenditure	(Over)/ Under expenditure	Budget	Actual expenditure	(Over)/ Under expenditure
	R'000	R'000	R'000	R'000	R'000	R'000
Programme 5: Advisory, Stakeholder Engagement and Knowledge Management	19 591	15 425	4 166	17 736	13 881	3 855
Programme 4: Delivery of Mandate	484 305	381 317	102 988	438 463	343 166	95 297
Programme 1: Financial Sustainability	81 482	64 155	17 327	73 769	57 736	16 033
Programme 3: An empowered, transformed, motivated and capacitated workforce	18 245	14 365	3 880	16 518	12 928	3 590
Programme 2: Organisational effectiveness and efficiency	127 939	100 733	27 206	115 829	90 654	25 175
Total	**731 562**	**575 995**	**155 567**	**662 315**	**518 365**	**143 950**

Remote field campsite on the Namib coastline, north of Luderitz, Namibia

4. OPERATIONAL HIGHLIGHTS

4.1 GEOSCIENCE TECHNICAL PROGRAMME

The CGS implements the national IMMP through its GTP, which includes collection of high-impact geoscientific research and mapping projects. In the year under review, the GTP was redesigned to be responsive to the post-COVID-19 economic recovery programme of South Africa.

During the year under review, GTP was composed of 35 projects (including five commercial projects and the OAGS project) covering mineral and energy resources, health, groundwater, environment, infrastructure and land use, innovation and geoscience diplomacy, all of which were deemed instrumental in providing pre-competitive geoscience information. Fundamental geoscience mapping at various scales is one of the core disciplines of the CGS. In the year under review, the CGS continued its detailed mapping programme at a scale of 1:50 000, and has increased onshore map coverage to 9.03% computed from an additional 18 high-quality geological maps produced. The CGS has improved the onshore 1:50 000 scale map coverage from below 5% before IMMP implementation (Figure 6). The CGS has focused on the Eastern, Western and Northern Cape Provinces as well as Mpumalanga, Free State, KwaZulu-Natal, North West and the Limpopo Provinces. Not only do these provinces have impressive geological landscapes that require further understanding, they also possess significant mineral and energy potential that was assessed.

The geoenvironmental baseline assessment continued as part of the KDD Programme, with drilling progress reaching a depth of 2412.06m at 31 March 2021. No major safety incidents were registered.

The GTP progress and highlights during 2020/21 are discussed in the following sections.

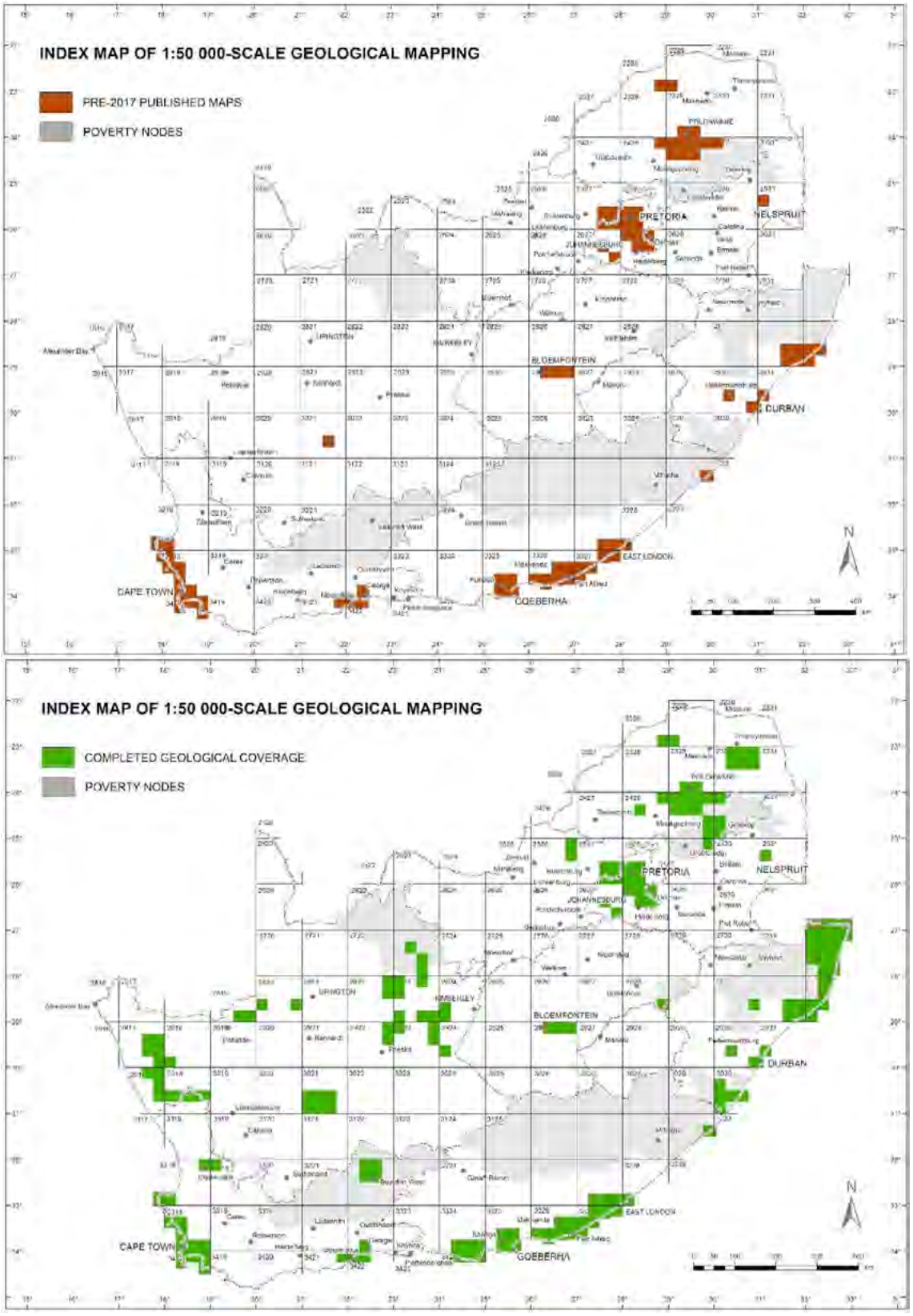
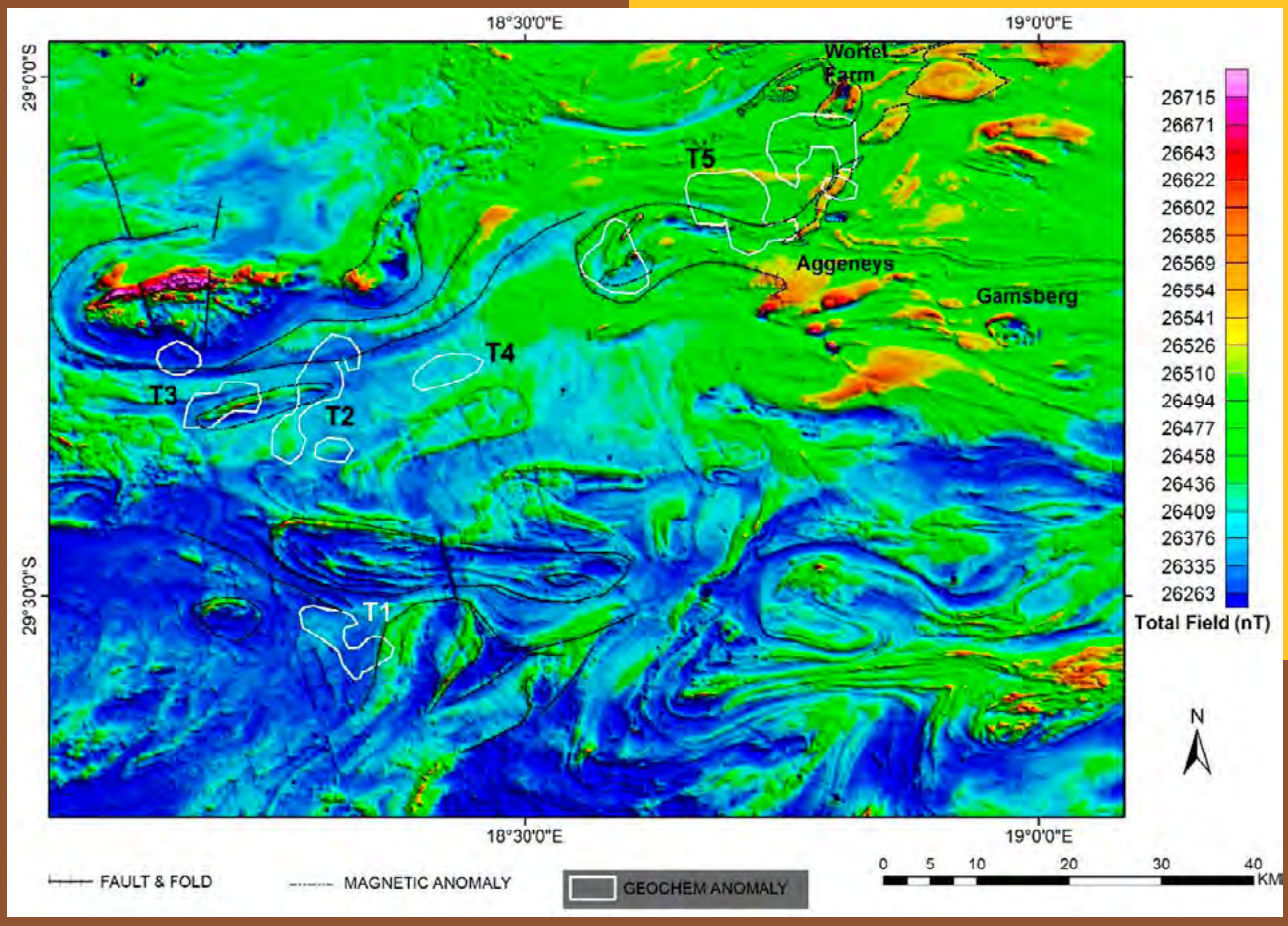


Figure 6. Comparison of onshore map coverage at the start of 2017/18, before the IMMP, to end-2020/21.

GEOSCIENCE FOR MINERALS AND ENERGY RESOURCES



Total field magnetic map of the Aggeneys Domain overlain by geochemistry anomalies.

The minerals and energy sectors are major contributors to South Africa's growth and development plan. The Geoscience for Mineral and Energy Resources Theme enables national imperatives, including the delivery of spatial and geoscience information and services. This information attracts local and international investment to develop mineral and upstream petroleum resources. The theme also aims to increase the uptake of exploration licences and expenditure, and foreign direct investment, the latter being enabled by Operation Phakisa, which is an initiative of the South African Government designed to fast track the implementation of solutions on critical development issues such as oceans and green economies. Finally, the function aims to increase support for the exploration, development and production of shale gas and mining.

As with other themes, this theme is enabled by Section 5.1(c) of the Geoscience Amendment Act, to 'serve as the national custodian of geotechnical information, prospecting information and all other geoscientific information relating to the earth, the marine environment and geomagnetic space'. Under the theme, the CGS collects, analyses and processes high-quality onshore and offshore geoscience (e.g. geological, geochemical, geophysical and mineral data), which will lower the risk of and increase confidence in exploration and mining, particularly in underexplored areas. These data are also used to identify potential economic natural energy resources such as coal, petroleum, natural gas, shale gas and geothermal energy.

4.2 PROJECTS RELATED TO ENERGY RESOURCES

The Integrated Resource Plan, gazetted in October 2019, is an energy infrastructure development plan based on a least-cost electricity supply-and-demand balance, taking into account security of supply and the environment (minimising negative emissions and water usage). South Africa continues to pursue a healthy, diversified energy mix to reduce reliance on a single or a few primary energy sources and promotes a Just Transition to a low-carbon economy.

4.2.1 KAROO DEEP DRILLING AND GEOENVIRONMENTAL BASELINE PROGRAMME

Background and purpose: The KDD Programme aims to develop a geo-environmental baseline in the southern Karoo to inform and strengthen the regulatory framework for possible shale gas development in South Africa. A key part of the baseline study is using multidisciplinary geoscience data to understand the current status of the hydrogeology and seismicity in the area and highlighting areas over which, for example, seismicity could be triggered by shale gas exploration and exploitation activities.

The programme entails drilling of the ultra-deep vertical borehole that is intended to intersect and characterise potential shale gas-bearing units of the carbonaceous shales of the Ecca Group of the Karoo Supergroup. The borehole is located ~2 km, by road, northeast of Beaufort West in the Western Cape Province. The data collected downhole include geological, geophysical, geotechnical and hydrogeological information to improve understanding of geological controls on shale gas and aquifers, particularly those exploited for groundwater. The intersection of dolerite intrusions to date and of those anticipated as drilling progresses is of particular interest to understanding the role of dolerites in groundwater distribution and interactions with hydrocarbon-preserving units.

Achievements and highlights: Seismic and groundwater monitoring and geological and geotechnical logging have been, and continue to be, implemented.

Drilling and survey activities

Drilling began on 21 September 2020 and had reached a depth of 2 412.06m by 31 March 2021, totalling an overall penetration rate of 13.3 ms/day. The borehole is drilled with successive decreases in diameter with depth, starting with a 518m PQ (85mm core ø/122.6mm hole ø). The hole diameter is HQ (63.5mm core ø/96mm hole ø) size from 518m to 1 164m. The current borehole has an NQ size (47.6mm core ø/75.7mm hole ø). The hole is lined with casing to 1 164mm. A cement bond log survey confirmed that the grouting lining of the hole is firmly intact and suitable for downhole surveys. Downhole geophysical surveys have been completed to the cased depth.

Core logs, downhole surveys and hyperspectral scanning

The KDD Programme has extracted useful information to improve geological understanding, economic potential assessment and environmental impact assessment. To this end, the drill core was logged as per the convention for diamond drilling, and was surveyed downhole by a number of petrophysical techniques. Figure 7 shows the cased borehole depth and corresponding lithological succession.

In the year under review, 2 260.99m of borehole core was geologically and geotechnically logged. The logged core was transported to the CGS's National Core Library. The core was scanned using the newly acquired hyperspectral scanner at the facility. Downhole geophysical and petrophysical data acquisition was undertaken in two phases, first through the PQ section (0–518m) between 13 and 23 October 2020 and then through the HQ section between 1 and 4 December 2020 (518–1 164m).

> The Karoo Deep Drilling Programme has extracted useful information to improve geological understanding, economic potential assessment and environmental impact assessment

Gas potential

During drilling, methane gas (CH_4) was detected at depths of 1 734m on 8 January 2021 and at 2 325m towards the end of the financial year. The drill rig was fitted with a gas diverter unit and managed to contain the outflow of gas. Safety precautions and monitoring of the gas have been implemented successfully.

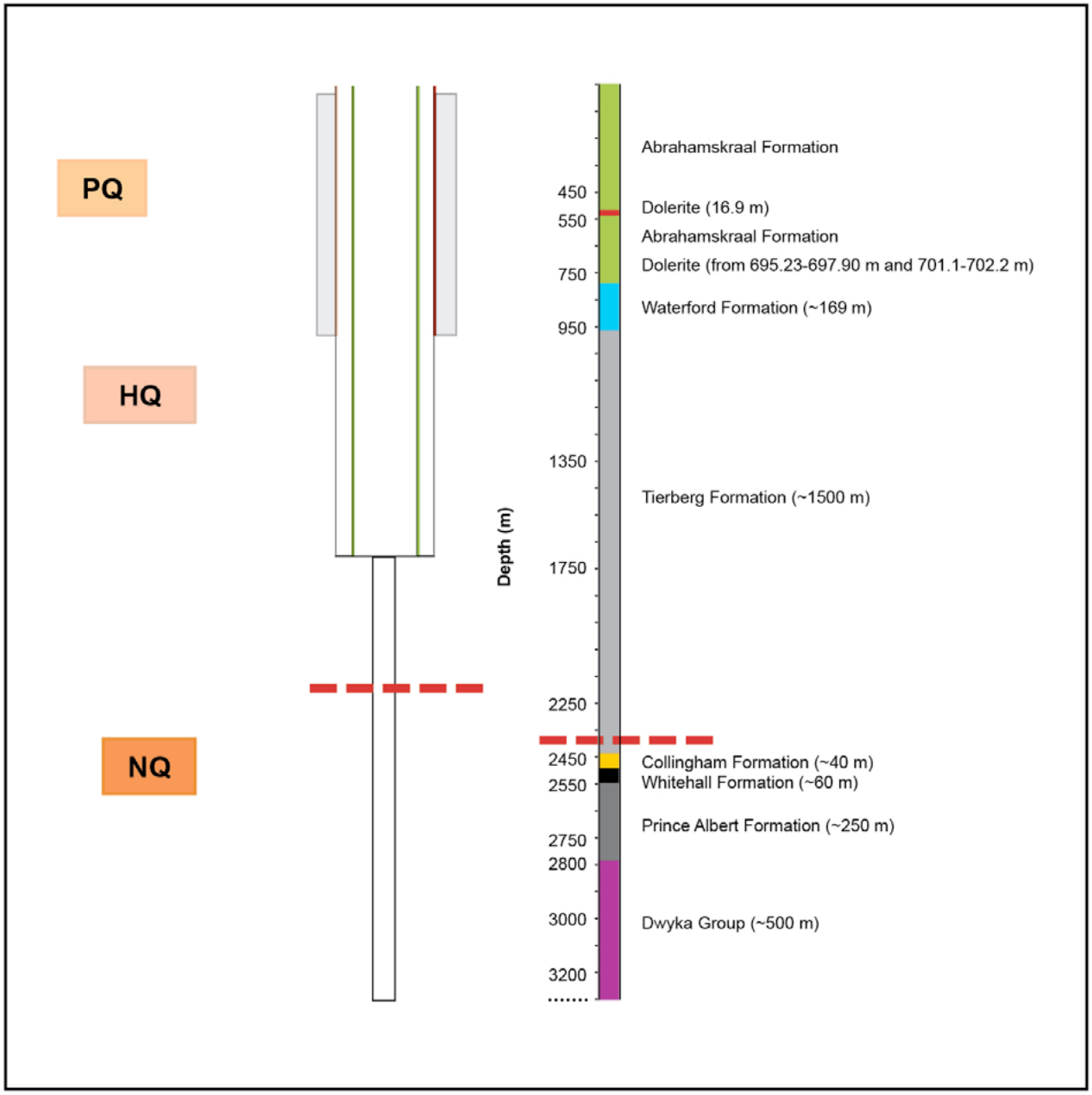


Figure 7. Borehole design showing borehole diameter step changes with depth and corresponding lithological log to the drilled depth. The red line indicates the depth of drilling to date. The lithological succession below the drill depth is based on interpreted available information.

4.2.2 GEOTHERMAL ENERGY POTENTIAL OF SOUTH AFRICA

Background and purpose: The CGS uses geoscientific knowledge to contribute to the diversification of the energy basket through the investigation of renewable energy sources such as geothermal energy. It is investigating the potential of geothermal energy as an affordable, reliable and renewable energy for direct heating of commercial and residential buildings. Its use has expanded to include utility-scale electricity production, distributed heating and cooling applications and the augmentation of various industrial processes.

In the year under review, the study sought to understand the relationship between geothermal fluid flow paths and the main geological structures in the vicinity of known hot springs (e.g. Tshipise hot spring in Limpopo Province), to build a unified geothermal conceptual model of the Tshipise geothermal system and to describe the physical features of the geothermal system. These objectives were achieved through geoscientific information to map low-enthalpy energy sources and through chemical analyses on geothermal waters and clays.

Achievements and highlights: A preliminary geological model was developed in the year under review (Figure 8). Magnetotelluric (MT) data acquired in the Tshipise area in 2019 were interpreted, which clearly delineated the boundary between the Karoo succession and the supracrustal rocks of the Beit Bridge Complex (Figure 9). Geologically, the Tshipise hot spring is along this boundary. The MT data also detected structures and delineated anomalous zones near the Tshipise hot spring, which may be good targets for drilling.

The MT data further indicated that the depth to the base of the Karoo sedimentary rocks does not exceed 3.6km. A reservoir temperature at this depth was calculated using the thermal resistance method and silica geothermometers. Similarly, computational temperatures were estimated using both the thermal resistance technique and the chalcedony geothermometer, which yielded similar temperatures. A quartz geothermometer estimated that the reservoir is 5km below the surface.

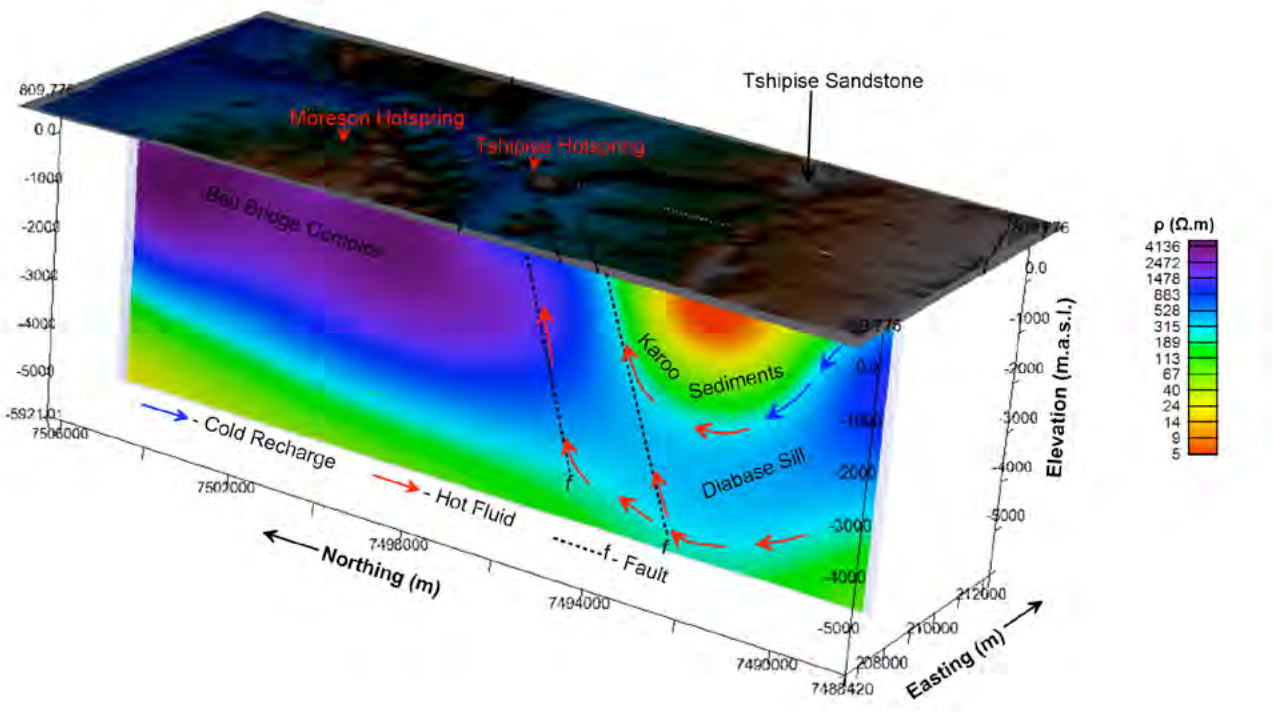


Figure 8. Preliminary conceptual model of the Tshipise geothermal prospect area

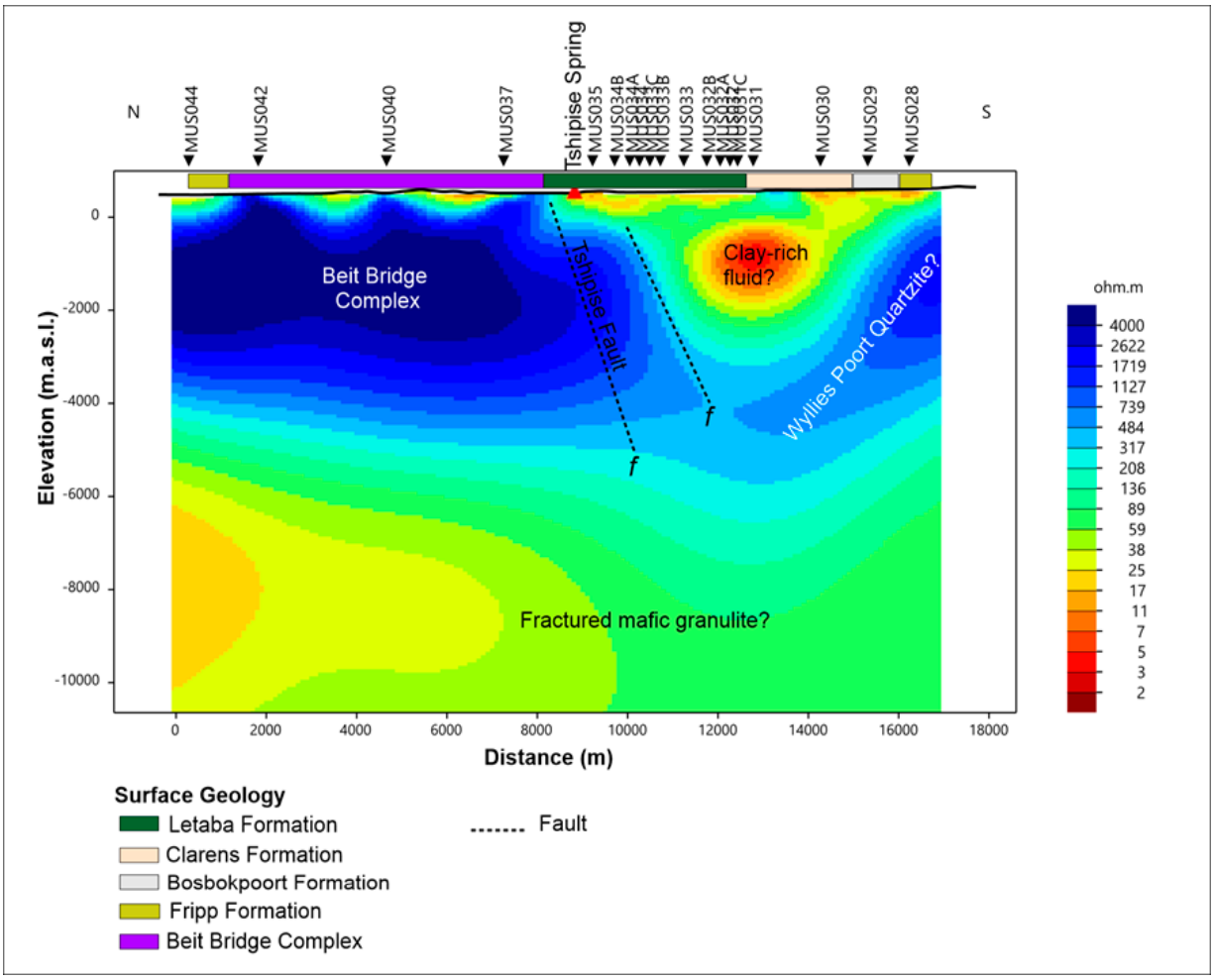


Figure 9. Vertical slice from the 3D resistivity model taken along profile L000. Superimposed are the major faults and some of the formation boundaries

4.2.3 GEOCHEMICAL ANOMALIES INVESTIGATION

Background and purpose: The primary objective of the geochemistry anomaly investigations was to understand the mineralisation style of all the anomalies identified using regional and detailed geoscience surveys. A number of anomalies were selected from the soil geochemistry data with follow-up multidisciplinary studies being undertaken during 2020/21 for the Kenhardt, Ga-Ramokoka and Witfonteinrant geochemical anomalies. The Kenhardt Ni-Cr geochemical anomaly was identified from a regional geochemical survey showing anomalous chrome (Cr) and nickel (Ni) in soil 80km west of Kenhardt. The Witfontein Cr-Ni anomalies were identified from the 1:250 000-scale regional geochemical maps for the Thabazimbi area. The anomaly is an east–west-trending mafic-ultramafic Witfonteinrant dyke that extends over about 100km.

Achievements and highlights: Field investigations determined that the Kenhardt anomalies coincide with wide, flat plains of coarse black sands associated with small (~10–25m), low clusters of gabbro boulders sporadically scattered across the plains. The MT technique was able to map the subsurface distribution of the Boomrivier geochemical anomaly very effectively. Several conductive zones ranging in depth from less than 1km to about 2km were interpreted as possible sulphide mineralisation. It is recommended that the mapped conductors be drilled to determine their compositions. Groundwater quality studies were also conducted in the study area (Figure 10).

Three soil traverses were sampled across the Witfonteinrant dyke to establish the nature of the dyke and determine the base metal enrichment. Each traverse comprised 40 soil samples over a distance of 3km. The Cr, Ni and Co trends once again confirmed the anomaly and the occurrence of the dyke across all three traverses.

Some evidence suggested that sulphidisation could have taken place in the dyke at traverse C. Anomalous Cr-Ni supported by anomalous As, Zn and Ni in the dyke at traverse C suggested that, with favourable conditions, sulphidisation may have taken place during fractionation of the magma. The absence of these anomalies at traverses A and B suggested that conditions were not always favourable for sulphidisation. The findings imply potential for Ni deposits along the Witfonteinrant ultramafic dyke, with Ni-sulphides in favourable 'hotspots' along the dyke. The Uitkomst Complex model for Ni, platinum (Pt), palladium (Pd) and base metal mineralisation may, therefore, apply at certain hot spots' along the Witfonteinrant ultramafic dyke.

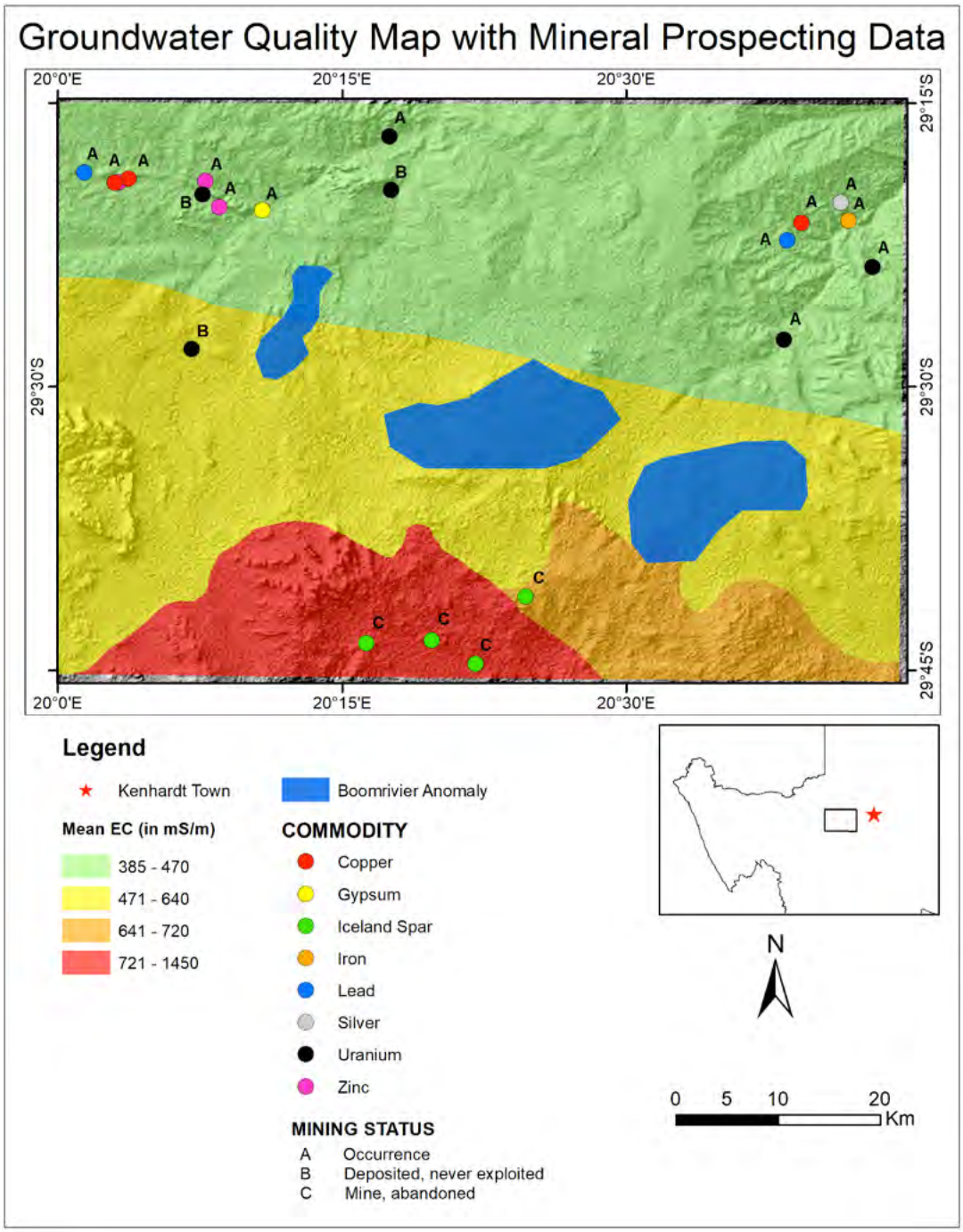


Figure 10. Groundwater quality map of the study area, showing Boomrivier anomalies and mineral prospecting points

4.2.4 CARBON CAPTURE, UTILISATION AND STORAGE

Background and purpose: Given its large industrial economy, South Africa is one of the biggest carbon-dioxide emitters on the continent, due to reliance on its abundant coal resources for energy generation and its extensive synthetic fuel industry. Despite this reliance on coal, South Africa is committed to combating climate change by reducing carbon-dioxide emissions by 50% over the next 30 years. While this plan includes the diversification of energy sources, South Africa will undertake a Just Transition towards a low-carbon economy. Just Transition relies on cleaner coal technologies, such as high-efficiency, low-emission coal technologies, and on the development of CCUS technologies. The CCUS research aims to limit carbon dioxide emitted into the atmosphere by capturing the gases and safely storing them underground. During 2020/21, the CGS conducted CCUS research, reassessing identified potential CCUS storage sites.

Achievements and highlights: Using extensive geological information, several new sites were identified in Mpumalanga Province, home to the majority of coal mines and large point-source carbon dioxide emitters. The storage sites include deep saline aquifers, post-gasification deep coal seams and basalt storage. To further support CCUS technology use in South Africa, a pilot plant is proposed targeting extensive basalts near Secunda (Figure 11), close to synthetic fuels industries that are currently the single largest point-source emitter in the world. The site also meets the need to offset carbon dioxide emissions in the region.

Geological investigations have highlighted potential basalt storage reservoirs that may support, at a minimum, several million tons of carbon dioxide. There are several reasons for basaltic rocks being considered as potential storage reservoirs for anthropogenic carbon dioxide (CO_2). The iron, calcium and magnesium-rich minerals therein readily react with CO_2 to form carbonate minerals. The rate of these reactions occurs significantly faster than that of typical saline aquifers in which the injected CO_2 may take several thousands of years before it is incorporated into carbonate minerals. In basaltic rocks, these reactions begin within hours of injection. This speed of reaction also means that there is less risk associated with the injection causing migration from the targeted reservoir. Basaltic rocks are also widespread throughout the world. These abundant occurrences mean that potential storage reservoirs are readily available and may therefore support CCUS in areas previously not thought to have any storage potential.

The expansive availability of atmospheric and surficial chemical data has further enabled preliminary environmental baseline monitoring. CCUS technologies in this region may mitigate negative environmental effects.

Figure 11. Schematic illustration of a proposed CCUS plant near Leandra, Mpumalanga Province

4.3 MINERAL RESOURCE ASSESSMENT PROJECTS

4.3.1 ONSHORE GEOSCIENCE PROJECTS

4.3.1.1 Griqualand West project

Background and purpose: The Griqualand West Geoscience Mapping Project delineates and characterises mineral, energy, hazard, engineering and environmental geosystems in the Griqualand West area. The detailed geological mapping programme encompasses both geoscience mapping and minerals mapping. Specifically, the project characterises potential of minerals such as diamond, iron (Fe) and manganese (Mn) and supports land use, agricultural and groundwater understanding and environmental studies for infrastructure development and economic growth. Griqualand West Basin is a geologically complex terrain that hosts some of the world's largest economic deposits. The study area has a complex sequence of interbedded, low-grade metamorphosed and structurally deformed Transvaal and Olifantshoek Supergroup sediments, chemical sediments representing a wide range of palaeoenvironments (from terrestrial to shallow and deep water) and volcanic rocks overlain by widespread Cenozoic cover deposits.

Achievements and highlights: During the 2020/21 financial year, the Griqualand West project compiled and interpreted all pre-existing geological datasets available mostly on the CGS databases in the form of borehole core, 1:250 000-scale geological maps, ENGEODE (engineering geology database), SAMINDABA (South African mineral deposits database) and geophysical data. Other external data sources included internet-sourced databases (e.g. national groundwater archives) and satellite data (e.g. Landsat 8, Aster, Sentinel 2). Integration and manipulation of the fused datasets identified follow-up targeted sites for both the production of 1:50 000-scale geological maps and the modelling of specific mineral potential areas. The latter was the most successful in that areas of potential were identified for lead-zinc (Pb-Zn), Fe-Mn and alluvial diamonds. The identified sites are currently not covered by existing mining or exploration permits. The project yielded 18 preliminary 1:50 000-scale geological maps, which will be reviewed and formally published in the next financial year.

4.3.1.2 Giyani Greenstone Belt Mapping

Background and purpose: The Giyani Integrated Mapping Project, which covers about 2 800km^2 around Giyani in northeastern Limpopo Province, supports economic growth and groundwater security, and promotes environmental stewardship.

Achievements and highlights: The project focused on detailed geological mapping of the Giyani Greenstone Belt (GGB), identification of mineral targets using existing soil geochemical datasets, a geophysical survey targeting deep-crustal rocks, and hydrogeological and environmental studies. Data collected addressed water shortages and the environmental effects of historical and current illegal mining activities.

An MT survey on deep crustal features (>15km) was conducted in the central part of the GGB along a profile of about 30km oriented northwest-southeast. The survey generated an integrated resistivity model that mapped out deep geological structures in the area. The integrated resistivity model revealed subsurface structures with the potential to host structurally controlled gold mineralisation (Figure 12). Six REE, Cr-Ni and magnesite mineral targets were studied and the geochemical results confirmed some promising targets. Drilling will start in 2021/22 on one confirmed mineral target with possible economic potential.

The Giyani area is one of the regions in Limpopo Province that is severely affected by water shortages. Groundwater and surface water analyses have revealed that the water is generally alkaline with high concentrations of arsenic (i.e. above the acceptable South African National Standard [SANS] for drinking water — SANS 241:2015) in regions close to historical mining areas. The CGS engaged the relevant authorities to recommend remedial measures.

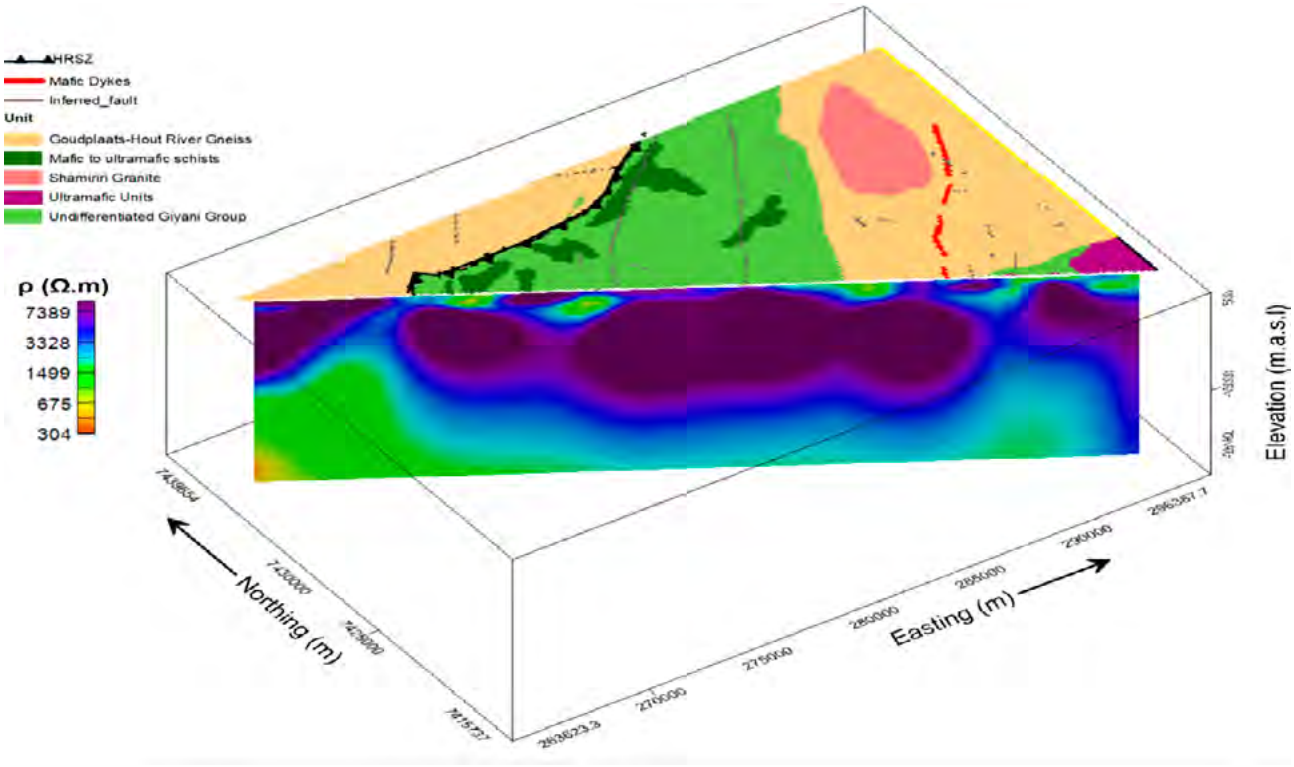


Figure 12. Cross-section displaying a perspective of geology, structure and resistivity. The comparison helps to correlate known geological contacts and known/inferred structures

4.3.1.3 Central KwaZulu-Natal Geoscience Mapping Project

Background and purpose: The multidisciplinary Central KwaZulu-Natal Geoscience Mapping Project maps geological and mineral potential through high-resolution airborne magnetic and radiometric data, and geological information. In 2020/21, this project covered the 1:50 000-scale Eshowe (2831CD) map sheet area in central KwaZulu-Natal. Eshowe geology is defined by rocks ranging from the Palaeo-Archaean to Recent, with multiple lithologies hosting mineral occurrences of various commodities (e.g. gold, zirconium and niobium) and mineralisation styles. The project centres on geological mapping to understand the structural and stratigraphic controls and the evolution of mineral-bearing sequences in the region, thus contributing to the characterisation of mineral occurrences and enabling sustainable minerals development.

Achievements and highlights: A detailed review was undertaken of the progression of geological interpretations in the region. Interpretations of basement lithologies in conjunction with Ternary potassium-uranium-thorium (K-eU-eTh) radiometric map data allowed the identification of high radio-element zones (e.g. high-U anomalies) associated with the Bulls Run Complex and Halambu Gneiss, which may warrant future exploration for U, Zr, Nb, Zn and REE (Figures 13a and 13b). Furthermore, airborne magnetic data interpretation allowed the reinterpretation of a post-Karoo normal reactivated fault, a deep-crustal terrane boundary separating the Mzumbe Terrane from the Tugela Terrane (Figures 13c and 13d). This boundary coincides with the Lilani-Matigulu Shear Zone and associated thermal hot springs. The new interpretations of the presence of these geothermal springs suggest potential for hydrogen (H_2) exploration along this structural feature reactivated and is now represented by post-Karoo normal faults. The terrane boundary is shown in Figure 13d where the lineaments extend into the Lilani Lineament, which hosts the Lilani thermal hot springs.

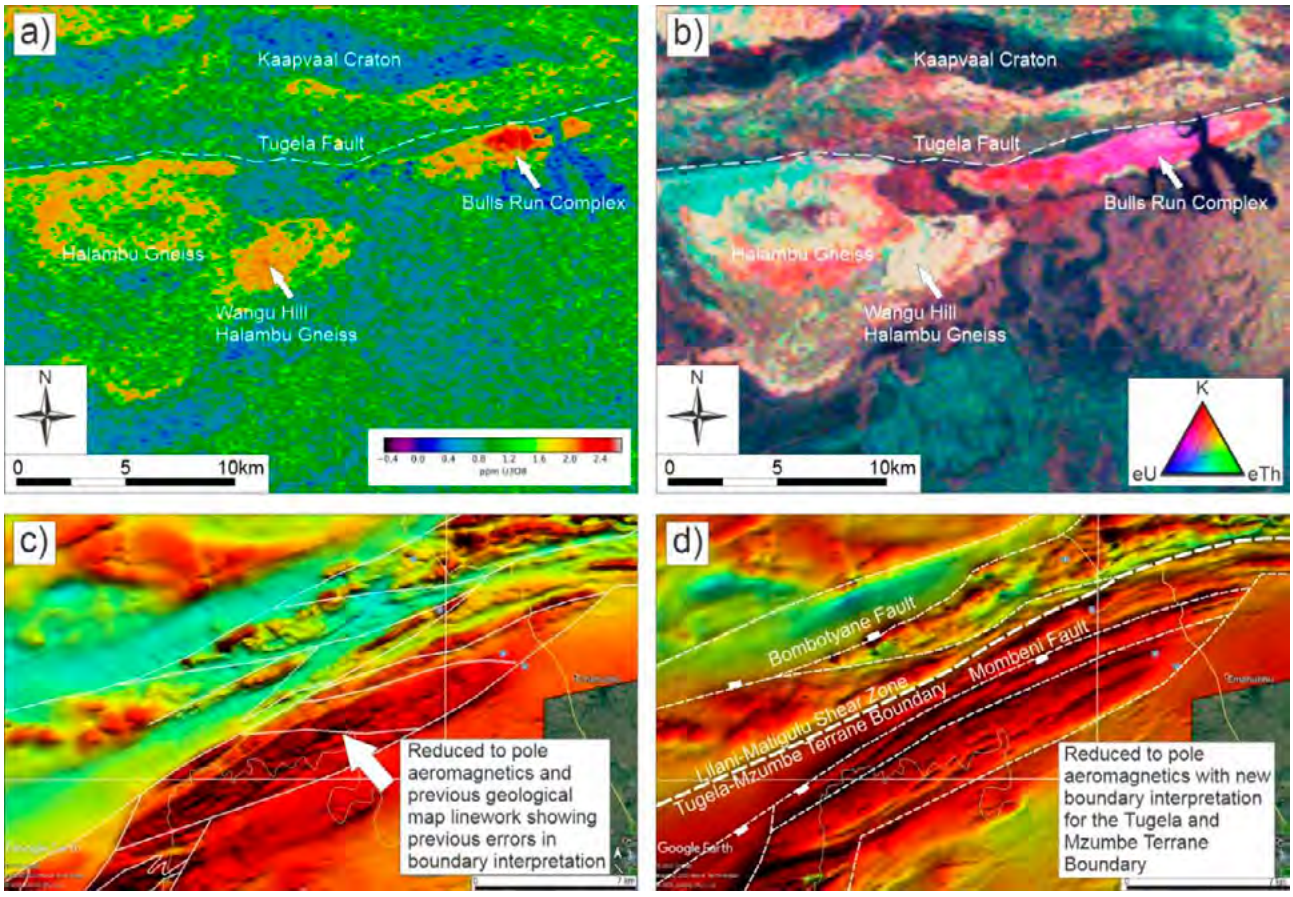


Figure 13. a) U_3O_8 radiometric map of the Bulls Run Complex and the Halambu Gneiss. b) The Halambu Gneiss in the Wangu Hill region is shown. Note the high U_3O_8 anomaly (2.4ppm U_3O_8) within the Bulls Run Complex. c) Reduced-to-pole (RTP) aeromagnetic map highlighting previous geological mapping line work from the 1:250 000 scale geodynamics map of the map region. d) Interpretations of the high-resolution RTP data showing the inconsistencies of the main thrust identified by Matthews and Charlesworth (1981) separating the Mapumulo Terrane (south of boundary line) from the Tugela Terrane (north–south of boundary line).

4.3.1.4 Characterisation of the South African lithosphere

Background and purpose: This project maps crustal and lithospheric structure to identify new mineral potential. The north-western portion of Northern Cape Province was identified as a priority area for 2020/21 and development began of associated mineralising systems models for minerals of the future through:

- Characterisation of the tectonic evolution of the Namaqua-Natal Metamorphic Province (NNMP), its terranes and major terrane boundaries to constrain the extent of mineral provinces and understand the controls of geological structures on mineral deposits through time.
- Characterisation of the Orange River Pegmatite Belt to support exploration for battery and frontier technology industries.
- Characterisation of the sedimentary exhalative (SEDEX) and volcanogenic massive sulphide (VMS) deposits in the Aggeneys and Areachap domains, respectively, to understand the base metals ore-genesis in the region and its markers.
- Characterisation of fractured aquifers to support groundwater exploration.

The integration of multiple geoscientific datasets (such as MT), airborne electromagnetic, mapped geology and structures, geochemical and hydrogeological data) is crucial in identifying new mineral targets, and

developing mineralising systems and local and regional prospectivity maps.

Achievements and highlights: The project unravelled the tectonostratigraphic architecture of the study area and put into tectonic context the development and preservation of the known SEDEX- and VMS-type copper deposits. The mineral systems approach, recent field mapping combined with remote sensing, regional geophysics and soil geochemistry identified new areas hosting the widespread Orange River Pegmatite Belt, which proved 67% larger than previously predicted (Figure 14). The thorough review of the pegmatite mineralising system generated a preliminary guide to investigating pegmatite-hosting areas through frontier exploration techniques. While regional groundwater resources are now understood, future work will characterise water resources in the province and their proximity to identified deposits.

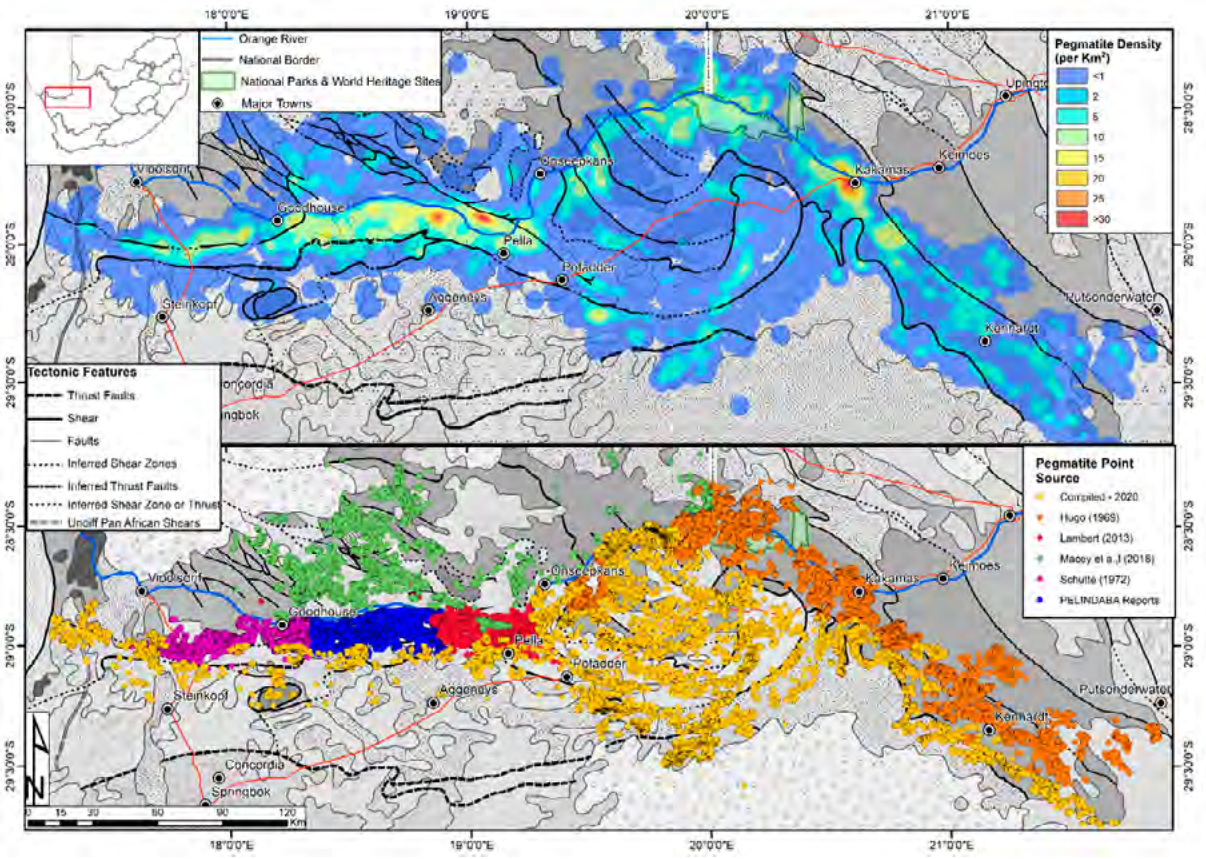


Figure 14. The spatial density of pegmatites of the Orange River Pegmatite Belt per km², which illustrates the density of pegmatites in relation to the major regional structures of the NNMP

4.3.1.5 Maluti-a-Phofung Geoscience Mapping Project

Background and purpose: The Maluti-a-Phofung Integrated Geoscience Mapping Project undertakes high-resolution fundamental geoscience research to address critical community challenges. The key objective is to develop geological information to identify lithologies with potentially undefined mineralising systems and establish controls on the flow and chemistry of groundwater resources.

Achievements and highlights: The project, initiated to map groundwater resources, included a hydrocensus study, assessment of existing groundwater infrastructure and groundwater sampling for further chemical analyses. High-resolution geological, particularly structural, mapping was undertaken. These investigations were supported by geophysical surveys that highlighted the subsurface extension of the geological features observed. Major groundwater resources were shown to be controlled by large structures (Figure 15) extensively influenced by deep chemical controls. In general,

chemical analyses of samples showed that groundwater resources in this region are potable and that there are no major elemental spikes. Furthermore, the integration showed the geological features most likely to control the flow of major groundwater resources. Finally, structural mapping highlighted the influence of vertical tectonic motion, which resulted in most groundwater resources occurring at much-greater-than-expected depths. These depths account for the past challenges of locating sustainable groundwater resources. This project is expected to contribute towards sustainable groundwater exploration and advancing effective infrastructural development. The project will be expanded to other geological environments experiencing similar problems.

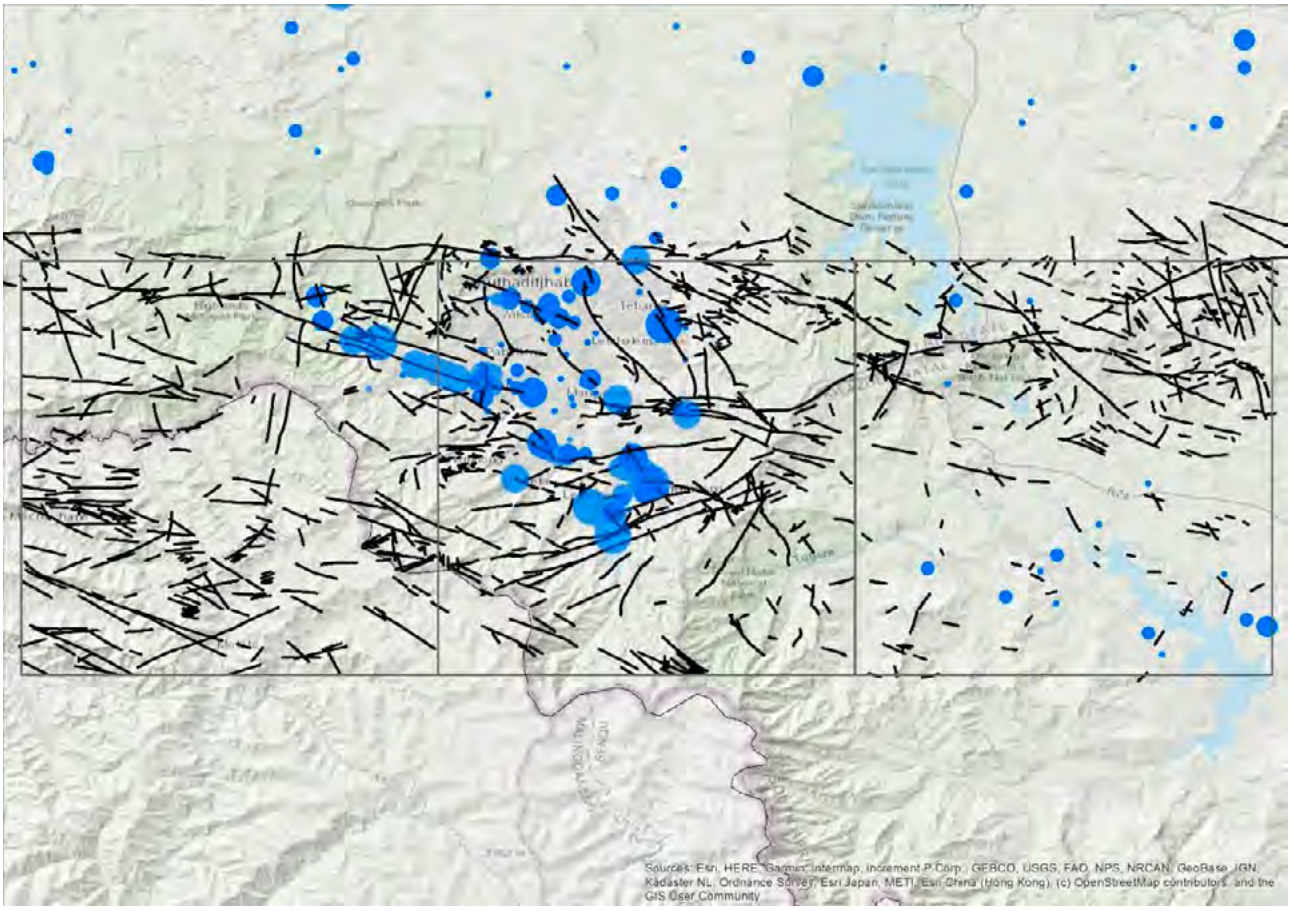


Figure 15. Schematic view of major brittle features mapped across the study area – for reference, Phuthaditjhaba is in the central quadrangle. Lineaments highlighted oriented ca northwest-southeast are generally mapped as strike-slip faults and are predicted to enable the highest flow of groundwater. The blue circles highlight groundwater strikes, proportioned according to their overall yields

> The Maluti-a-Phofung Integrated Geoscience Mapping Project is expected to contribute towards sustainable groundwater exploration and advancing effective infrastructural development.

4.3.1.6 Bushveld Mapping Project

Background and purpose: The Bushveld Mapping Project studies the evolution of and controls on magmatic and hydrothermal mineralising systems, particularly those linked to future energy technologies. The Bushveld granites are host to numerous small- to medium-sized polymetallic deposits made up of Sn-W-Cu-lead-zinc-gold-silver-uranium-fluorite-iron-REEs (Pb-Zn-Au-Ag-U-F-Fe-REEs). In addition, the mafic phase of the Bushveld Complex is also host to significant iron-titanium-vanadium (Fe-Ti-V) deposits within magnetite layers and discordant bodies. The conceptual approach used in this study incorporates spatial analysis techniques and data integration (i.e. geophysical, geochemical, geological and remote sensing data) to perform reconnaissance-scale mineral potential mapping of critical minerals in the Bushveld Complex.

Achievements and highlights: Several target areas considered highly prospective for this mineralisation type were highlighted (Figure 16). Two dominant fracture trends, i.e. northwest-southeast (Crocodile River Fault) and northeast-southwest (Steelpoort Fault), evidently played a critical role in the concentration and distribution of fracture-controlled Cu-Pb-Zn-As-Ag-Au-Sn mineralisation (i.e. iron-oxide-copper-gold type mineralisation) in the roof rocks, particularly within the Rooiberg Group. The modelled mineral potential map highlights prospective areas for structurally controlled endogranitic and exogranitic mineralisation (Figure 16). The prospectivity model correctly predicted the world-class Vergenoeg F-Fe-REE deposit, the largest fluorite deposit on earth, hosted in the rhyolites of the Rooiberg Group. The magmatic Fe-Ti-V-rich discordant bodies were delineated using a combination of airborne geophysical and regional soil geochemical data. Three-dimensional geophysical modelling showed that these bodies elongate and do not display dyke-like features as had been thought. The bodies extend up to about 150m below the surface and range in thickness up to ±200m. Prospective targets were highlighted in the modelled mineral prospectivity maps for tin-tungsten-fluorite-REE-beryllium (Sn-W-F-REE-Be) mineralisation associated with (i) the crystallisation of a possible granitic source concentrated in the apical portions of granitic intrusions and (ii) related to a northwest-southeast regional trend.

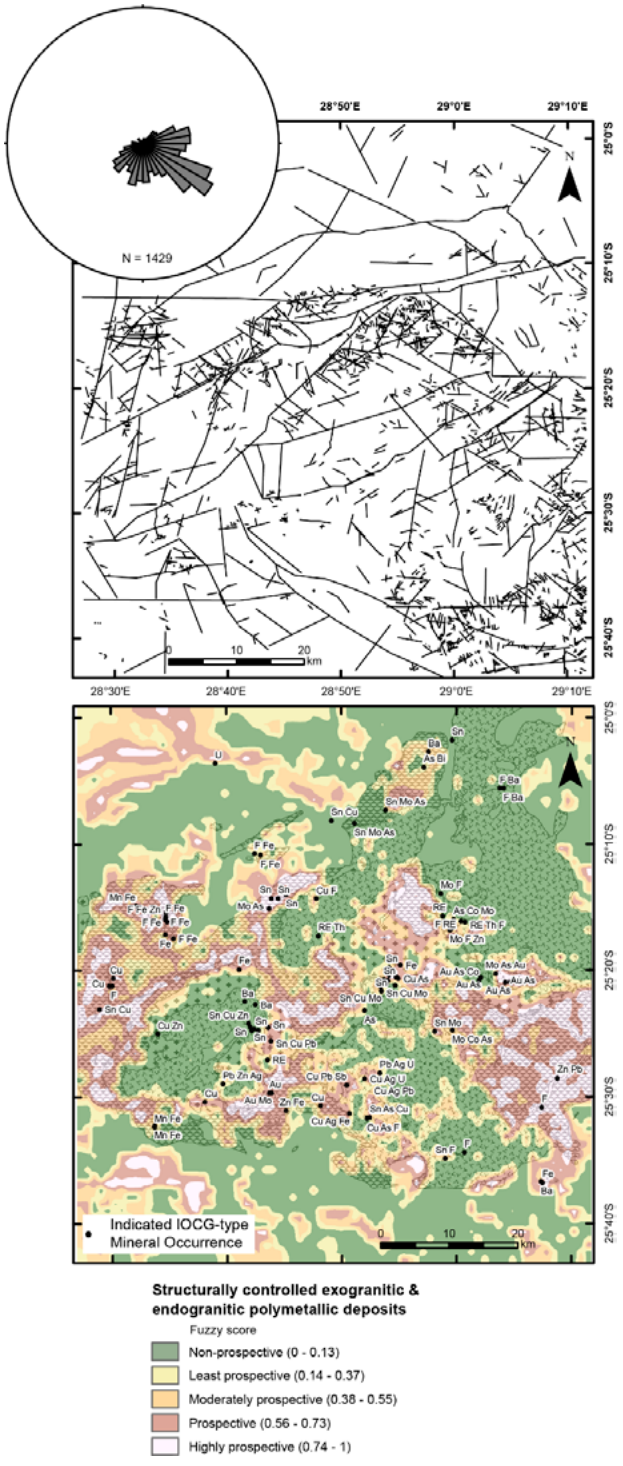


Figure 16. Integrated fuzzy evidential maps of (Cu-Pb-Zn-Fe) and fracture data using gamma operator at Y = 0.5 to indicate structurally controlled iron-oxide-copper-gold-type deposits

4.4 OFFSHORE GEOSCIENCE PROGRAMMES

4.4.1 MARINE GEOSCIENCE PROGRAMME

Background and purpose: With increased interest in identifying new mineral resources and promoting environmental stewardship of South Africa's Blue Economy comes the realisation that in many ways the ocean environment represents a 'last frontier'. While several global sustainability initiatives recognise the importance of the world's oceans (e.g. the United Nations Decade of Ocean Science), there is an increased need to enhance economic growth through research into the coast and continental shelf of South Africa. This will, in turn, boost the country's Blue Economy and assist in effectively planning adaptive strategies to address threats to infrastructure and the coastal community posed by sea level rise. Furthermore, technologies to map the seafloor have vastly improved in recent years, particularly with the introduction of multibeam echosounders.

Achievements and highlights: During 2020/21, the CGS increased seafloor mapping coverage by 0.05%. However, this achievement fell short of the 0.1% target that had been set for the year. With the deployment of the CGS's research vessel in 2021/22, the focus on near-shore mapping coverage should improve greatly.

For the year under review, a publication of the seamless onshore-offshore geological map of Mossel Bay (Figure 17) was completed. The seafloor substrate mapping technique was finalised and attempted at a local scale. This machine learning technique integrates hydroacoustic data, including multibeam bathymetry, back-scatter and side-scan sonar as input datasets to develop a holistic predictive tool that classifies hydroacoustic data into seafloor substrate maps. It is anticipated that the maps will be used to model regional biological communities and to produce benthic habitat maps for use in marine science and management. As the algorithm is expanded, real-time delineation of habitats will eventually be realised.

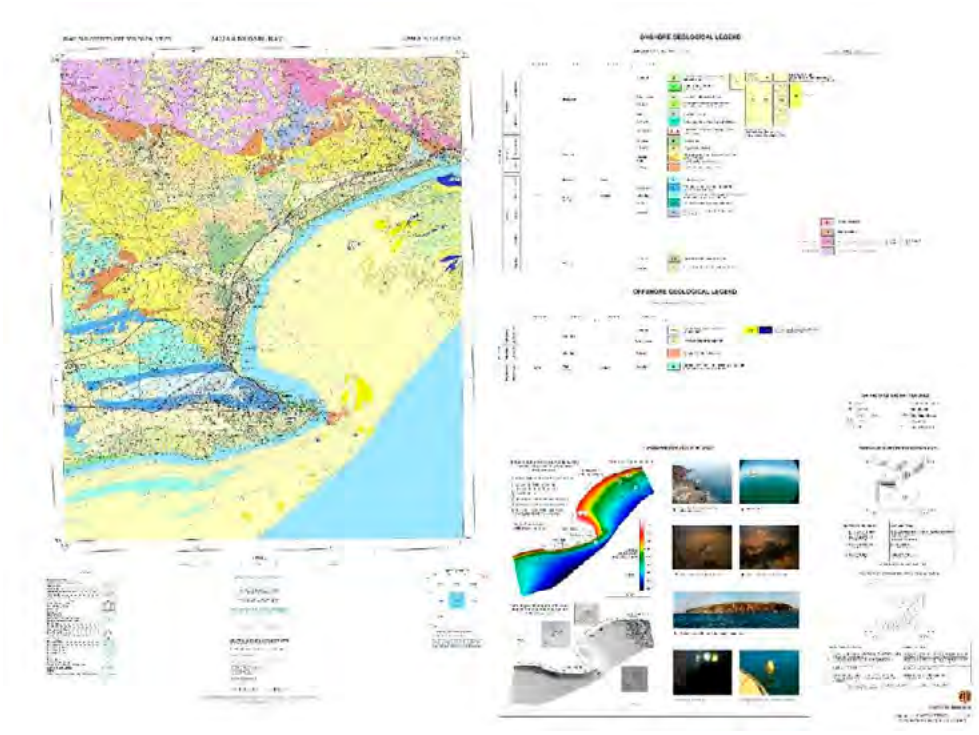
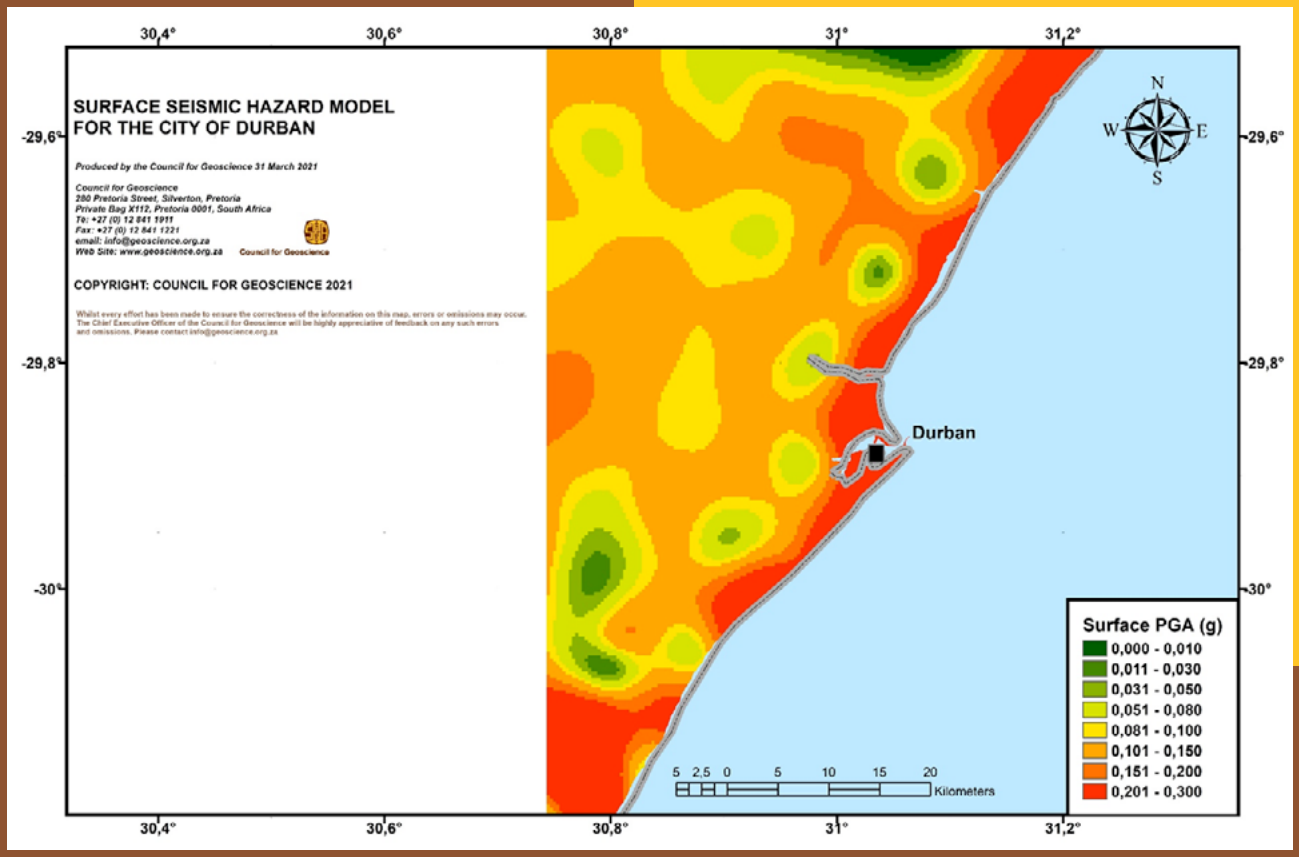


Figure 17. Geological map of Mossel Bay

> With increased interest in identifying new mineral resources and promoting environmental stewardship of South Africa's Blue Economy comes the realisation that in many ways the ocean environment represents a 'last frontier'.

GEOSCIENCE FOR INFRASTRUCTURE AND LAND USE



Surface seismic hazard maps for Durban following ground response analysis for a return period of 475 years at response period of PGA 0.0s

The Geoscience for Infrastructure and Land Use Theme provides for systematic geoscience reconnaissance mapping. The geoscience information is analysed to identify safe and sustainable human settlement areas, sustainable land-use and infrastructure development. The Constitution of South Africa and Section 5.1(eA) of the Geoscience Amendment Act holds that the CGS must 'review and evaluate all geotechnical reports in respect of geohazards that may affect all infrastructure development at prescribed tariffs'.

In line with NDP Vision 2030, the theme's objective is facilitation of effective infrastructure and land development. A number of developmental acts and agencies, such as the Municipal Infrastructure Support Agency, Disaster Management Act, Spatial Planning and Land Use Management Act and the Critical Infrastructure Bill, also create an enabling environment for the theme to support national imperatives. This theme not only provides geoscience information and input for infrastructure development, but supports South Africa's economic development of mineral, upstream petroleum (i.e. oil and gas) and water resources. The country's natural hazards include a high risk of subsidence in dolomitic terrains, and earthquakes and floods, all of which may have a significant impact on the economy, property and key infrastructure developments. The CGS strengthens the nation's ability to manage the impact of natural hazards by collecting geoscience information and building early warning systems that can reduce hazard impacts.

4.5 SEISMIC MONITORING AND MAINTENANCE

Background and purpose: The main aim of seismic monitoring and maintenance is providing regional parametric earthquake data, globally, locally and in mining areas. In addition, efforts were put into expanding South African National Seismograph Network (SANSN) coverage and reduction of the signal-to-noise ratio of time series data. This supported research projects and geohazard assessments, characterising regions prone to seismicity and facilitating international diplomacy.

Achievements and highlights: Routine seismic monitoring of the SANSN from January to December 2020 resulted in an updated databank of 4 910 seismic events recorded by three or more seismic stations. There were 642 tectonic earthquakes within South African borders and off-coast, with remaining earthquakes in neighbouring countries and at teleseismic distances of more than 1 000km outside South African borders (Figure 18A). There were 838 mining-related earthquakes from South Africa's goldfields and platinum mines (Figure 18B). Most of the seismic signals had originated in the open-cast mining areas of the Republic, 2 937 of which were flagged in the database as suspected explosions (Figure 18C).

The mine cluster network component of the project was characterised by seismic analyses for January 2020 to January 2021 and updating the South African mining cluster network seismic database. Some 6 295 events were located using the stations of the cluster networks. Of the 6 295 events, 102 were within the Strategic Water Management Project (Johannesburg) area, 5 000 in the far West Rand (Carletonville) area and 1 193 in the Klerksdorp-Orkney-Stilfontein-Hartebeesfontein (Klerksdorp) area. Data from the three cluster networks were analysed daily. The far West Rand was the most seismically active cluster (accounting for 79% of all the cluster network events analysed).

Research to identify closely spaced seismic events recorded by the SANSN stations Parys and Hartebeeshoek and located in the far West Rand gold mines uses waveform similarity analysis to develop a method that may improve epicentre locations. Further research is being undertaken to calibrate Richter magnitudes for seismic events for use as a local magnitude scale in the West Rand, far West Rand and Klerksdorp-Orkney-Stilfontein-Hartebeesfontein gold mining areas.

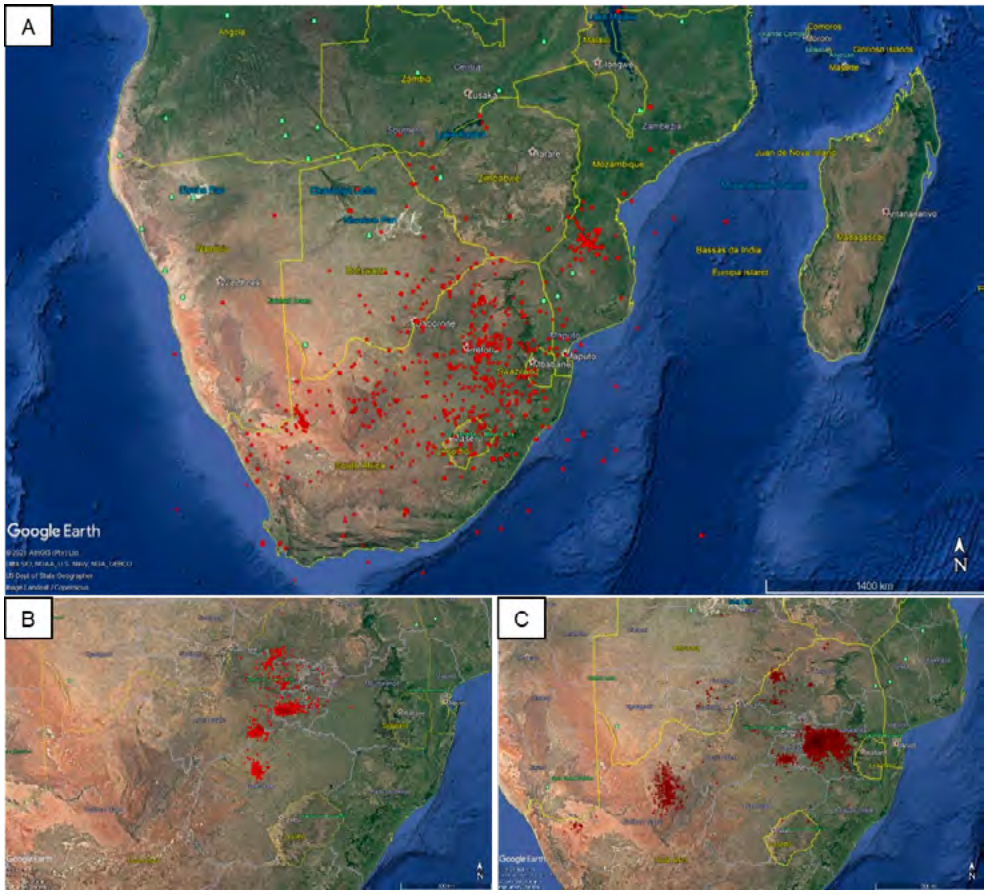


Figure 18. Located earthquakes from SANSN. A) Tectonic events located, B) mining-related events located, C) events flagged as probable explosions

4.6 NATIONAL GEOHAZARD MAPPING PROGRAMME

Background and purpose: This programme updates and refines the spatial-temporal extent and geohazards, including faulting/deformation mechanisms, studying stress and strain regimes, characterising inherent hazard and sinkhole occurrences on dolomitic land and mapping landslide occurrences and failure mechanisms; investigates the influence of external factors (such as human activity and meteorological phenomena) and geology on geohazard occurrences; compiles models for geohazard and risk assessments, and conducts awareness and capacity-building activities to highlight the value of proactive geohazard assessments.

Achievements and highlights: During 2020/21, this programme provided valuable insight into the hazards of seismicity, blasting, ground conditions, dolomite and landslides. Special care was taken to present the information in a format that municipalities and local governments could incorporate into their policymaking organs as mitigating measures.

Key highlights of the programme were:

- The surface seismic hazard maps obtained for the Durban region clearly show that the city is susceptible to damaging ground motion should a large earthquake occur (Figures 19 and 20). It is, therefore, critical that measures be taken in the design of infrastructure such as buildings, dams, power stations, roads and pipelines to mitigate the possible effects of earthquakes.
- Given continued economic development, population migration and growth in the cities along the east coast of South Africa, seismic risk is increasing. Assessment of risk is essential for these cities to investigate the possible damage-and-loss scenarios of damaging earthquakes.
- Slope failure (landslides) in the region is often triggered by anthropogenic influences relating to development and/or intense/prolonged rainfall that increases the pore water pressure of slope materials. As such, the CGS has developed its first municipal-scale landslide susceptibility map of eThekwini and its surrounds (Figure 21). The map will become an important spatial planning tool in mitigating devastating impacts of landslides in the region. It is recommended that this information be used in the interim for land use planning and community safety to mitigate the risks of geohazards in highly vulnerable areas.

Authorities are advised to develop guidelines and policies to mitigate this chain reaction. The outcomes of the study of ground motion related to blasting activities in the vicinity of an open-cast mine will aid in policymaking and regulations on the distance between mining operations and built-up areas necessary to ensure community safety. This will assist in land use and development.

> During 2020/21, the National Geohazard Mapping Programme provided valuable insight into the hazards of seismicity, blasting, ground conditions, dolomite and landslides.

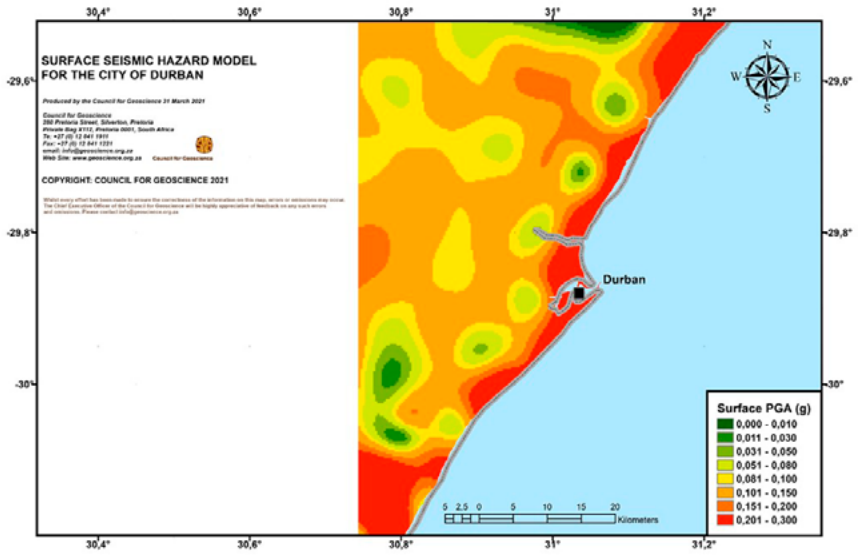


Figure 19. Surface seismic hazard maps for the city of Durban following ground response analysis for a return period of 475 years at response period of PGA 0.0s

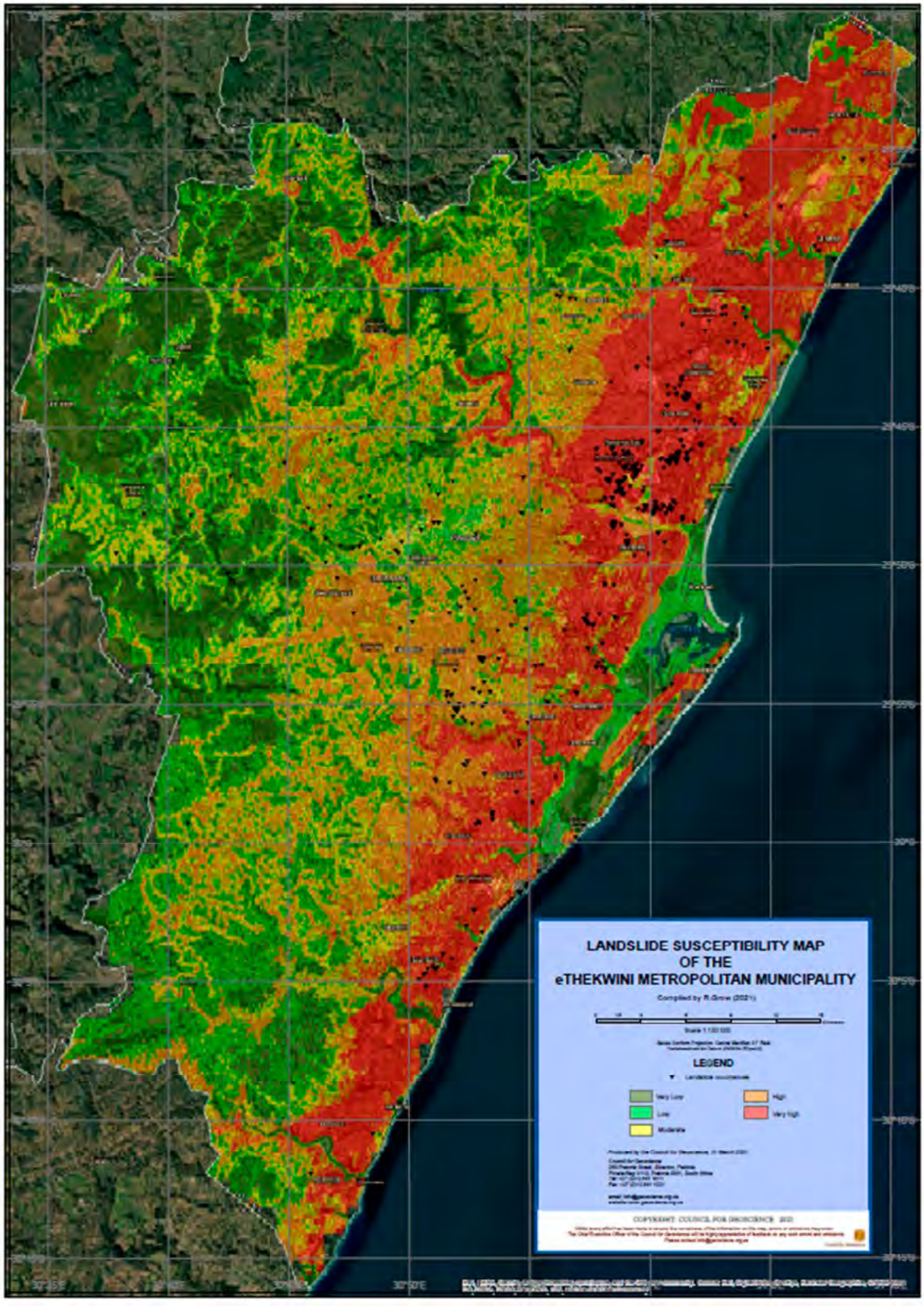


Figure 20. Landslide susceptibility map of eThekwini Metropolitan Municipality, KwaZulu-Natal Province

4.7 EASTERN CAPE MAPPING

Background and purpose: The Eastern Cape Mapping Project encompasses a wide range of research fields that capture, analyse and develop fundamental geoscientific data in key development and poverty nodes in the province. To address these challenges, area-specific studies were undertaken to assist stakeholders to make informed decisions on land-use planning, infrastructure development, conservation, environmental management and/or sustainable exploitation of valuable natural and economic resources. The key objectives are to characterise the natural and geological controls on the anomalously rapid erosion and provide fundamental stratigraphic and structural information to assist in locating potentially undefined groundwater resources. The high-resolution collection of geoscientific information through the production of 21 1:50 000-scale geological maps and the combined collection to date of more than 300 soil and rock samples, have provided valuable data for the scientific study of land degradation, groundwater potential and economic resources for the Eastern Cape Province.

Achievements and highlights: Optical stimulated luminescence and geochemical and geotechnical sampling of Late Quaternary sediments (Masotcheni Formation) associated with erosional features was undertaken to better understand the age of erosional events and the physio-chemical properties that enable land degradation. Ongoing research will predict future landscape risk scenarios for the agricultural viability and infrastructure development of the region, and will generate erosion risk assessment maps and an extended erosion inventory database. Detailed geological mapping data in combination with a range of geographical factors enabled the creation of a coarse aggregate potential map that classifies areas suitable for future prospective quarry operations for the area around Mthatha (Figure 21). Assessment and review have started of kaolin and basalt fibre as viable economic minerals in the Eastern Cape Province and nationally. Progress was made during the year in the evaluation of kaolin across four provinces, including Eastern Cape Province, as a building material or replacement in the manufacture of cement, with geochemical analyses of more than 150 kaolin samples collected during 2019/20 completed, and interpretations and data modelling now underway. A study into the feasibility for industrial applications of basalt fibre extracted from dolerites associated with the Karoo Large Igneous Province is in the desktop research phase.

> The key objectives of the Eastern Cape Mapping Project are to characterise the natural and geological controls on the anomalously rapid erosion and provide fundamental stratigraphic and structural information to assist in locating potentially undefined groundwater resources.

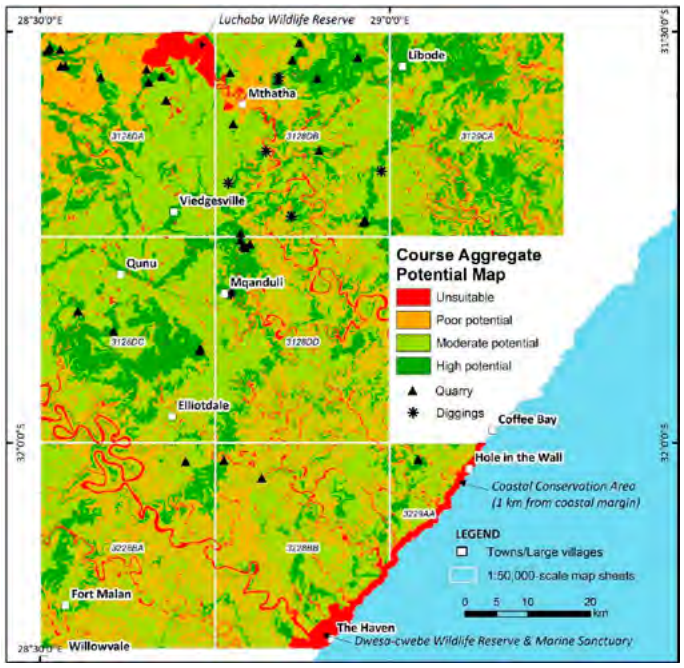


Figure 21. Weighted overlay model depicting the coarse aggregate potential for Mthatha and surrounds

GEOSCIENCE FOR HEALTH, GROUNDWATER AND ENVIRONMENT THEME

Groundwater interception during the drilling of borehole PD-BH01, Phuthaditjhaba region

Mining is a relatively mature sector that has boosted the economy but has, to some degree, left environmental legacy challenges in need of urgent attention. The social and economic wellbeing of communities is related directly to the health of the environment in which they live, produce their food and work. The focus of mining worldwide is shifting towards exploration and exploitation, with greater emphasis on environmental stewardship. As a water-scarce country, South Africa faces significant challenges in the availability and provision of water, exacerbated by a limited understanding of water resources. The development of communities, agriculture and mineral and energy resources depends on the availability of and knowledge about water resources.

The Geoscience for Health, Groundwater and Environment Theme promotes environmental stewardship, particularly in areas prone to contamination through activities such as mineral exploration and exploitation. Under this theme, sources of groundwater are identified and delineated for communities, industries and agriculture. Interventions such as artificial recharge will also be considered.

4.8 MANAGEMENT OF STATE CONTINGENT LIABILITIES FOR DERELICT AND OWNERLESS MINES IN SOUTH AFRICA

Background and purpose: The Management of State Contingent Liabilities with respect to D&O mines in South Africa project (now called Geoscientific Research on Legacy Mines) uses a detailed inter- and multidisciplinary geoscience research approach to legacy mines to identify key risks and to recommend implementable risk management and rehabilitation programmes. The primary aim is to minimise the impacts of derelict and ownerless mines by identifying, classifying, closing and rehabilitating such mines. The project will formulate integrated monitoring of hazardous abandoned mines, carry out multidisciplinary ground stability and land degradation assessments on hazardous abandoned mines, conduct an economic assessment of legacy mine sites and produce an implementation plan for the national mine closure strategy.

Achievements and highlights: The closure of four unsafe mine openings has brought the physical closure phase of the project to a close. The project focused on research using existing data to redesign the focus of work in the new financial year.

The water chemistry (both surface and groundwater) of the study area had low pH, high conductivity, high total dissolved solids and high concentrations of arsenic, aluminium, iron, zinc, selenium, sulphate and manganese that exceed the SANS (2015) guidelines for domestic use.

Geochemical soil analyses of the elements and their distribution in and around the legacy mines indicated above-average soil abundance concentrations. Ground stability studies in the study area (Witwatersrand and eMalahleni basins) found that the undermined areas were unstable (prone to subsidence). In addition to undermining, sinkholes, land subsidence and earth fissures (such as ground cracks) may be formed through massive groundwater extraction and/or dissolution processes in dolomitic rocks.

Remote sensing and airborne geophysics techniques were used to map surface deformation/subsidence and the environmental impacts of legacy/active mining. Analysis of the 17 surveys showed surface deformation in mined-out areas. The remote sensing data showed barren soil associated with coal mining.

A preliminary conceptual design was developed for backfilling coal mines with coal fly ash. The design considers the use of cemented paste backfill, which is the preferred backfilling technology because of the engineering properties of the material. Air quality in particulate matter (PM10 and PM2.5) trends in all the air quality priority areas showed seasonal variations, with most pollutants (unhealthy to hazardous) more noticeable during winter. Borehole data from Protea Colliery showed the mineralisation of carbonaceous shale at a depth of less than 100m, providing the opportunity for a subsurface remining assessment.

4.9 MINE ENVIRONMENT AND WATER MANAGEMENT PROGRAMME

Background and purpose: The Mine Environment and Water Management Programme develops mitigation strategies for sustainable management of mine water in South Africa. During 2020/21, seven technical projects were undertaken comprising both proactive (preventive) and reactive (remedial) approaches to addressing environmental challenges. This project aims to identify the pathways by which water enters the underground mines of the western, central and eastern basins of the Witwatersrand and to propose engineering measures to reduce these inflows.

Achievements and highlights: Construction of the Van Ryn canal was completed, with the practical completion certificate signed on 30 September 2020 (Figure 22). The canal will prevent approximately 60 litres/second of water from entering the mine voids, saving about R25 million a year on the pump and treatment system. A construction company was appointed to seal the Modderbee crack extension. As implementation was not possible owing to the flooded site, a new methodology was proposed with the implementation of the same scheduled to take place during the first quarter of 2021/22.

Figure 22. Completed rehabilitation of the Van Ryn canal, with rediverted water

Acid mine drainage passive treatment

An upscaled acid mine drainage passive treatment system was implemented at a legacy coal mining site, the Witkranz discharge site (in Carolina, Ermelo coalfield) in Mpumalanga Province. The implemented reducing and alkalinity-producing system (RAPS), known as CaroRap system, started operating on 17 January 2021. Initial results of field parameters indicated a dynamic system heavily influenced by the weather. In five weeks, the system raised the pH to an average of 5.6 from an average of 2.9, coupled with an increase in alkalinity in the range of about 35.8mg/L. It reduced Fe by 92% and aluminium by 58.8% – significant achievements.

GEOSCIENCE INNOVATION

An illustration of the human-centered partnership model of people and AI working together to enhance human cognitive performance

CGS investment in innovation will drive and enable high-impact science, leading to more accurate and robust insights and better decisions to support the CGS mission. The Geoscience Innovation Theme fosters the conversion of ideas into actionable solutions to solve some of the country's most pressing societal challenges, such as water scarcity, poverty and geohazards. Across a wide variety of geoscience fields datasets (geology, geophysics, geochemistry etc), data are being collected and accumulated at a dramatic pace, creating an urgent need for a new generation of computational theories and tools to allow people to extract useful information (knowledge). The Geoscience Innovation Theme also investigates the application of modern technologies such as AI in knowledge extraction. This will improve speed, efficiency and accuracy in the knowledge extraction process.

4.10 AI-PREDICTIVE MINERAL AND ENERGY POTENTIAL MAPPING PROJECT

Background and objectives: This project seeks to create software that applies the concepts of AI to geoscience data to address complex regional mineral potential mapping challenges. AI will also reduce the initial cost of generating maps/models for mineral exploration targeting, attracting investment and land-use planning. A detailed literature review and translation was undertaken of the mineral systems to mappable proxies on all the known regional mineral systems (VMS) deposits and orogenic gold in South Africa. The software package (AI_MIN1.0) houses all major mineral systems and all AI algorithms for geoscience data integration using the modified six-step knowledge discovery process (Figure 23).

Achievements and highlights: In the year under review, several geological, geophysical and geochemical parameters were assessed that are crucial to the implementation of the mineral potential predictive tool. A suite of mineralising systems was created, including for gold and SEDEX deposits. The tool was tested in the GGB, with a mineral potential map produced for parts of the belt. A user-friendly graphical interface (Figure 23) was developed to implement the software and, in future, this tool will be extended to alluvial diamond mapping, iron-oxide-copper-gold and VMS deposit characterisation.

Figure 23. Modified knowledge discovery process used by AI_MIN software

> The Geoscience Diplomacy Theme supports broader international geoscientific developmental goals and requirements, particularly of African communities.

GEOSCIENCE DIPLOMACY

The CGS team doing fieldwork in the Sperrgebiet, Namibia. In the background is a small inselberg of the Mesoproterozoic Tschaukhaib granite gneiss

The nature and vagaries of the planet's surface extend it beyond the borders of any single state or entity. As the permanent Secretariat of the OAGS, the CGS primarily uses the Geoscience Diplomacy Theme to fulfil and execute several of South Africa's international relations, particularly in the geosciences. In line with one of the bold priorities of the sixth administration of 'A better Africa', the CGS has a history of collaborating with various African countries through geoscience mapping, institutional reform, map compilation and other services. Recently, the CGS has worked with the Ministries of Minerals and Mines in Malawi and Namibia.

The Geoscience Diplomacy Theme creates an enabling environment for national imperatives. Crucial aspects are human capital building around geoscientific, administrative and managerial/leadership skills and the development of innovative products, systems and services. The agreement on an African continental free-trade area offers invaluable opportunities to place South Africa on a path of investment-led trade and to work with other African countries to develop their own industrial capacity.

The theme supports broader international geoscientific developmental goals and requirements, particularly of African communities. Detailed fundamental geological mapping has been undertaken in Namibia and Malawi to support economic development and to train and develop local geologists and students. The CGS was also appointed a supervisor in the Cameroon and Burkina Faso geological and geochemical projects. Through OAGS, the CGS continues to lead in improving African partnerships and collaboration. The South African seismic network administered by the CGS makes an important contribution to the preparatory commission for the CTBTO, which facilitates global cooperation in monitoring nuclear weapon testing.

The Geoscience Diplomacy Theme supports broader international geoscientific developmental goals and requirements, particularly of African communities.

4.11 COMPREHENSIVE NUCLEAR TEST BAN TREATY ORGANISATION (CTBTO)

Background and purpose: The CGS is the Seismic and Infrasound Waveform National Data Centre for South Africa under the Comprehensive Nuclear Test-Ban Treaty (CTBT), which was signed and ratified by South Africa in 1999. The Department of Trade, Industry and Competition, which houses the Secretariat of the South African Council for the Non-Proliferation of Weapons of Mass Destruction, acts as the national authority for all CTBT-related matters in the country.

Achievements and highlights: During the year under review, no major issues related to the uptime and functionality of monitoring station were recorded. The stations remained mission capable (Figure 24 — top) despite satellite transmission problems interrupting the data transmission of primary station 39 (PS39) data. Fortunately, no data were lost owing to the storage devices installed at the Boshof site. The infrasound 47 (IS47) station has continued to deliver good performance since the December 2019 upgrade and it remains mission capable (Figure 24 - bottom). Although the COVID-19 pandemic slowed down much of the intended work at the station, the process should resume soon. A vault replacement at the station is planned for later in 2021.

At least eight CGS personnel benefitted from attending several webinars and training courses in Quarter 4. The training offered, among others, infrasound analysis. This contributed to the improvement of skills in data analysis, equipment maintenance and fieldwork. These skills have been effectively implemented within SANSN and smaller client networks. The CGS has continued to advise the Department of Trade, Industry and Competition and the Department of International Relations and Cooperation through quarterly meetings and through papers on aspects such as the integrated field exercises previously held by the CTBTO, the import of CTBTO-related equipment, the establishment of national data centres in the country and the civil and scientific uses of CTBTO data in South Africa.

Figure 24. Operation and data transmission for January 2021 to 2 March 2021 for PS39 (top) and IS47 (bottom)

4.12 GEOLOGICAL MAPPING AND MINERAL ASSESSMENT PROJECT OF MALAWI

Background and purpose: The five-year, French-funded Geological Mapping and Mineral Assessment Project (GEMMAP) (2016 to 2021) is implemented for the Geological Survey Department of Malawi (Department of Mines) by a consortium led by the Bureau de Recherches Géologiques et Minières of France with the Geological Survey of Finland and the CGS. The project is kick starting renewed mineral exploration in Malawi by, among other things, producing modern geological maps of the entire country at scales of 1:100 000, 1:250 000 and 1:1 000 000, each with sheet explanations, memoirs and final reports. In addition to the geological mapping, the project consisted of five other modules (stream sediment geochemistry, mineral potential assessment, infrastructure and equipment provision, small-scale mining and geohazards) were completed by end-2020/21. The project also included a comprehensive training programme for Malawian Geological Survey Department staff.

Achievements and highlights: The geological mapping module is by far the largest component of GEMMAP and the task to which CGS has made the largest contribution. In addition, CGS is responsible for all linguistic editorial control of the technical and progress reports, being the only native English-speaking member of the consortium. Unfortunately, COVID-19 had an adverse impact on activities during 2020/21, along with the change in government in Malawi following a rerun of the 2019 general election. This, among other factors, led to a one-year extension of the project, with the official end date changed from December 2020 to December 2021, when it is hoped all scheduled activities and deliverables will be completed to the required standards and within budget. In February 2021, the final draft 1:100 000-scale geological maps (Figure 25) were submitted to the client (Unango Domain), completing the largest single product required by GEMMAP.

The project is on track to deliver all final products by July 2021, with time thereafter allowed for customer feedback from the local steering committee, and effect of changes required. A final conference to showcase the project is planned for October 2021 at Chancellor College in Zomba, Malawi, with the public, academia and the mining industry being invited. The CGS will receive almost €1.3 million for its contribution.

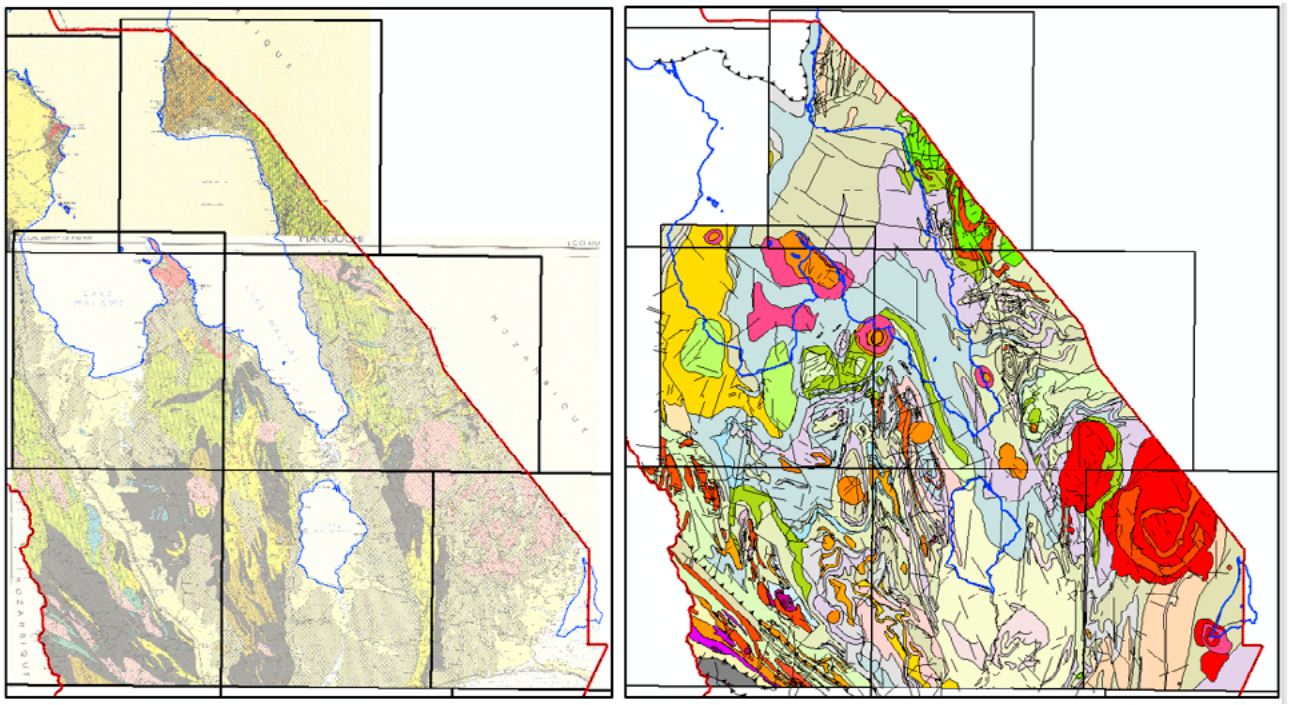


Figure 25. The final tranche of six 1:100 000-scale geological maps submitted. Comparison of the old, published maps (left) with the new, GEMMAP maps (right). Note how the high-resolution geophysical data have been used to map the complex basement geology beneath lakes Malawi and Malombe (outlined in blue)

4.13 GEOLOGICAL MAPPING AND RESEARCH FOR THE DIRECTORATE OF THE GEOLOGICAL SURVEY OF NAMIBIA

Background and purpose: Since March 2013, the CGS has led a regional-scale mapping and capacity-building project in southern Namibia under contract for, and in collaboration with, the Geological Survey of Namibia (GSN). Between 2013 and 2020, the Southern Namibia Mapping Programme produced 89 geological maps at 1:50 000 (86 maps) and 1:250 000 (three maps) scales accompanied by geological explanations, graduated 15 postgraduate students and published 11 journal articles and 23 conference abstracts.

Achievements and highlights: Work on a new contract (January 2021 to March 2022, FR-2021-5835) has started. The new project will deliver 12 more 1:50 000-scale map sheets in the areas north of Lüderitz and east of Aus and to investigate the geodynamic evolution of the NNMP in the northern Sperrgebiet. Capacity-building deliverables include the Master's research project supervision of a GSN geologist, the mentoring of GSN cartographers and the delivery of advanced mapping and research short courses and publications. In the year under review, the mapping team undertook a desktop investigation of the tectonic architecture and history in the Sperrgebiet using the structural data collected in the 2019/20 phase of the programme and the geophysical, digital elevation model and satellite image data (Figure 26). An initiation meeting was held in Windhoek from 21 to 26 February 2021 to prepare the team for upcoming fieldwork (building geodatabases, remote sensing and pre-fieldwork map compilation). A short course on the use of Sentinel 2 satellite imagery in mapping was also presented to GSN staff. In March 2021, the CGS-GSN team mapped four sheets north of Lüderitz and collected additional data and samples in the Aus-Lüderitz-Bogenfels region for the geodynamic evolution task of the project.

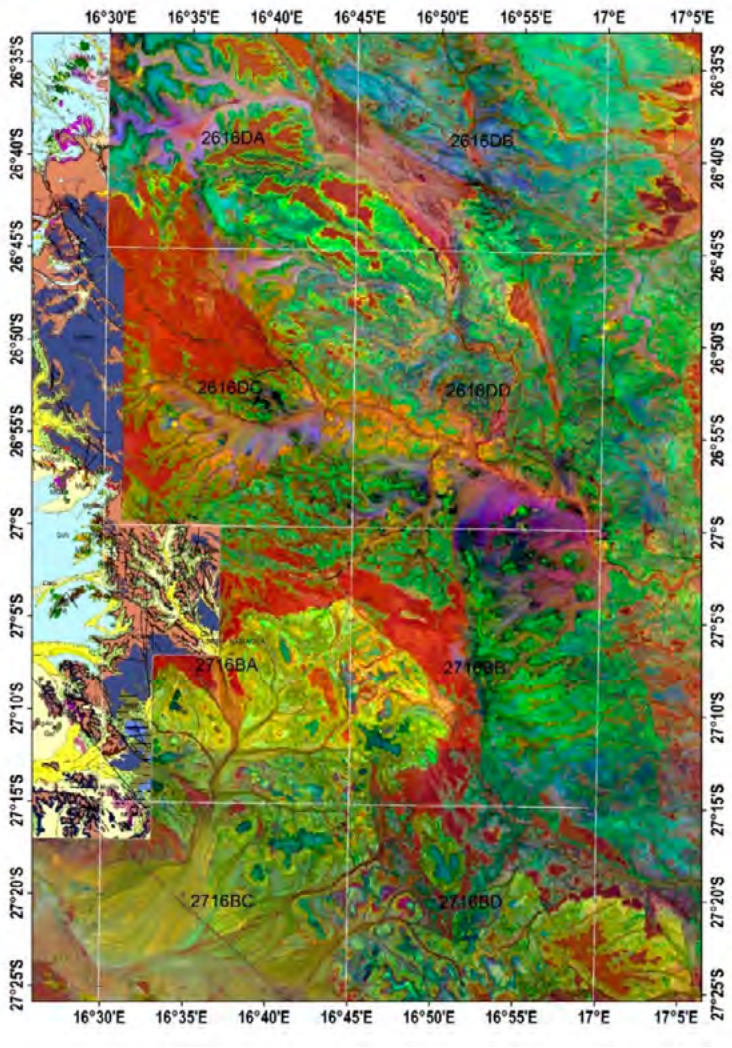


Figure 26. Processed Sentinel 2 satellite imagery is particularly useful for mapping the various members of the Ediacaran Nama Group in the area east of Aus, Karas Region, Namibia

4.14 KNOWLEDGE AND INFORMATION MANAGEMENT SERVICES PALAEONTOLOGICAL COLLECTIONS

Background and purpose: The CGS houses and curates one of the largest and most extensive (and important) palaeontological collections in South Africa, if not the continent. The collection (housed at the Silverton and Bellville offices) includes fossil specimens from the Paleoproterozoic to recent geological times, providing a roughly 2.1-billion-year record of the evolution of life from a uniquely South African perspective. The collection is composed of more than 100 000 individual representative specimens from all kingdoms of life encompassing the entire stratigraphic range of South Africa.

Achievements and highlights: The collection is currently being audited, with 885 specimens representing all specimens from the Rietvlei, Baviaanskloof and Waboomberg formations having been checked and their metadata updated. Thus far, 20 uniquely South African-type specimens have been identified, which act as the primary species reference for all similar fossil material found globally. Image and box datasets have grown to 2 339 and 95 data entries, respectively, while an ArcGIS locality dataset was constructed representing 9 088 individual locality points from digitised field sheets and digital locality data. A data ranking structure was formulated to improve the curation of these historical data points (Figure 27). Furthermore, these datasets were integrated into a prototype hybrid Access-ArcGIS database that greatly increases information control, user interface and data quality checks.

A preliminary assessment was undertaken of the palaeontological collection at the Silverton office, which will be crucial to the project execution plan in the new financial year.

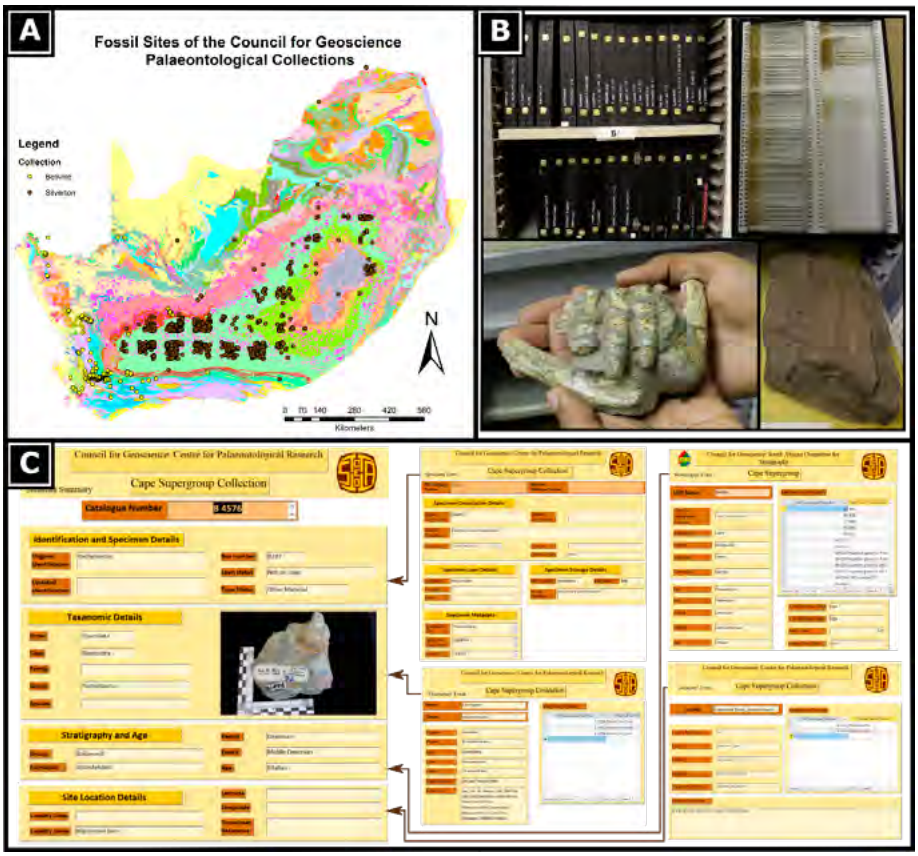


Figure 27. The CGS palaeontological collection programme. a) Map showing GPS coordinates of known fossil sites from the CGS collection. b) Important specimens found during the CGS palaeontological collection assessment at the Silverton office. Large collection of economically important palynological specimens. Top pane: Exquisitely prepared vertebrate fossil. Bottom left pane: One of the oldest fossil animals, Pteridinium simplex. c) Bottom right pane: Interface of the prototype Access-ArcGIS database illustrating input screens for multiple datasets feeding into one database interface

4.15 INFORMATION AND COMMUNICATION TECHNOLOGY

During the year under review, significant progress was made in implementing a cost-effective and efficient data centre and infrastructure, a crucial element of the CGS's digital transformation. Sixty-four services were migrated from aging to new infrastructure. New backup infrastructure was installed in the main data centre. The Bellville, Pietermaritzburg, Polokwane and Port Elizabeth regional offices data lines were upgraded from ADSL to fibre. An information and communications technology (ICT) network infrastructure was installed at the Donkerhoek offices to ensure that CGS services are accessible to all stakeholders. The ICT backup policy was reviewed, the data centre and infrastructure refurbishment is in its last phase and a project to strengthen security and governance is ongoing.

As part of the integration of end-to-end business process automation, several enterprise systems were being implemented during the year under review, including an enterprise resource planning (ERP) system, for which the project governance is in place, business specifications for streams such as human capital management have been completed, and others such as finance, supply chain management and projects are being finalised. The project management office has also been established through the appointment of a service provider to oversee the implementation of business-enabling projects, including the ERP. All the initiatives combined manifested in ICT services availability rate that was never below 99% during the 2020/21 financial year.

5. DISSEMINATION OF INFORMATION

The CGS disseminates the results of its research to its stakeholders in publication series including memoirs, bulletins, explanations, annual reports, media articles, conference proceedings and maps, and these are presented in sections 7.1 to 7.3. The organisation's refocus on its mandate and its acquisition of new multidisciplinary data have resulted in new external collaborations and partnerships and the development of additional publications.

5.1 CGS PUBLICATIONS

1. Bensid, M.L., Mukosi, N.C. and Hlatshwayo, S. 2020. Geochemical synthesis report of the Giyani mapped area (sheets 2330 BA Tlangelane, BB Muyexe, BC Giyani and BD Ka Homu) at a scale of 1:50 000, Council for Geoscience, 72 pp.
2. Bensid, M.L., Netshitungulwana, R. and Mukosi, N.C. 2020. Geochemical synthesis report of the Murchison Greenstone Belt (sheets 2330 DA Ka-Rhangani and 2330 DB Ka-Makhuva) at a scale of 1:50 000, Council for Geoscience, 86 pp.
3. Billay, A.Y. and Mutele, L. 2020. Mineral prospectivity mapping of gold-base metal mineralisation in the Sabie-Pilgrim's rest area, Mpumalanga Province, South Africa. Bulletin 159, Council for Geoscience, 73 pp.
4. Cole, D., Mosavel, H., Chevallier, L. and Dhansay, T. 2020. The geology of the Rosedene, Klipbank, Kuilspoort and Beaufort West Area. Geological Explanation Sheets 3222AB, AD, BA and BC, Scale 1:50 000, Council for Geoscience, 30 pp.
5. Geoclips, Volume 61, June 2020, 12 pp.
6. Geoclips, Volume 62, September 2020, 16 pp.
7. Geoclips, Volume 63, December 2020, 8 pp.
8. Geoclips, Volume 64, March 2021, 16 pp.
9. Grobbelaar, M.R.G. 2020. Predicting the effects of explosions placed on the earth's surface. Bulletin 158, Council for Geoscience, 65 pp.
10. Reddering, J.S.V., Rohwer, M.H., Majokweni, L.B. and Roberts, M.P. 2020. The geology of the East London area. Geological Explanation Sheets 3227DC, 3227DD, 3228CC, 3327BA and BC and 3327BB, Scale 1:50 000, Council for Geoscience, 70 pp.

5.2 PEER-REVIEWED ARTICLES

(CGS staff are indicated in bold)

1. **Abrahams, Y.** and **Macey, P.** 2020. Lithostratigraphy of the Donkieboud Granodiorite. South African Journal of Geology, 123 (3), 421–430. https://doi:10.25131/sajg.123.0028
2. Andersen, T., **Botha, G.** and Elburg, M. 2020. A late Mesozoic–early Cenozoic sedimentary recycling system on the Gondwana rifted margin of southeast Africa. South African Journal of Geology, 123 (3), 343–356. https://doi.org/10.25131/sajg.123.0023
3. Bosino, A., Bernini, A., **Botha, G.A.**, Bonacina, G., Pellegrini, L., Omran, A., Hochschild, V., Sommer, C. and Maerker, M. 2020. Geomorphology of the upper Mkhomazi River basin, KwaZulu-Natal, South Africa, with emphasis on late Pleistocene colluvial deposits. Journal of Maps. https://doi: 10.1080/17445647.2020.1790435
4. Castleman, B., Van der Merwe, E.M. and **Doucet, F.J.** 2021. Thermochemical purification of talc with ammonium sulphate as chemical additive. Minerals Engineering, 164.
5. Colarossi, D., Duller, G.A.T., Roberts, H.M., Tooth, S. and **Botha, G.A.** 2020. A comparison of multiple luminescence chronometers at Voordrag, South Africa. Quaternary Geochronology, 60, https://linkinghub.elsevier.com/retrieve/pii/S1871101420300431
6. Davies, N.S., Shillito, A.P. and **Penn-Clarke, C.R.** 2020. Cold feet: Trackways and burrows in ice-marginal strata of the end-Ordovician glaciation (Table Mountain Group, South Africa). Geology, 48, https://doi.org/10.1130/G47808.1
7. Esteban, I., Bamford, M.K., House, A., Miller, C., Neumann, F.H., Schefuss, E., Pargeter, J., **Cawthra, H.C.** and Fisher, E.C. 2020. Coastal palaeoenvironments and hunter-gatherer plant-use at Waterfall Bluff rock shelter in Mpondoland (South Africa) from MIS 3 to the Early Holocene. Quaternary Science Reviews, 250, 106664. https://doi.org/10.1016/j.quascirev.2020.106664
8. Gastaldo, R.A., Tabor, N. and **Neveling, J.** 2020. Trends in stable-isotopes and climate proxies from late Changhsingian eroded landscapes of the Karoo Basin, South Africa. Frontiers in Ecology and Evolution, 8, doi:10.3389/fevo.2020.567109

9. **Grobbelaar, M., Molea, T.** and Durrheim, R. 2020. Measurement of air and ground vibrations produced by explosions situated on the Earth's surface. The South African Institute of Mining and Metallurgy, 120, http://dx.doi.org/10.17159/2411-9717/990/2020
10. **Groenewald, C.** and **Macey, P.** 2020. Lithostratigraphy of the Mesoproterozoic Yas-Schuitdrift Batholith, South Africa and Namibia. South African Journal of Geology, 123 (3), 431–440, doi:10.25131/sajg.123.0029
11. Hancox, P.J., **Neveling, J.** and Rubidge, B.S. 2020. Biostratigraphy of the Cynognathus Assemblage Zone (Beaufort Group, Karoo Supergroup), South Africa. South African Journal of Geology, 123 (2), 217–238, doi:10.25131/sajg.123.0016
12. Helm, C.W., **Cawthra, H.C.**, De Vynck, J.C., Dixon, M. and Stear, W. 2020. Elephant tracks: a biogenic cause of potholes in Pleistocene South African coastal rocks. Journal of Coastal Research, 37 (1), 10.2112/JCOASTRES-D-20-00064.1
13. Helm, C.W., Lockley, M.G., **Cawthra, H.C.**, De Vynck, J.C., Helm, C.J.Z. and Thesen, G.H.H. 2020. Large Pleistocene avian tracks on the Cape south coast of South Africa. Ostrich (Journal of African Ornithology). doi.org/10.2989/00306525.2020.1789772
14. Helm, C.W., Lockley, M.G., **Cawthra, H.C.**, De Vynck, J.C., Helm, C.J.Z. and Thesen, G.H.H. 2020. Newly identified hominin trackways from the Cape south coast of South Africa. South African Journal of Science, 116(9/10), 8156, 13 pp. https://doi.org/10.17159/sajs.2020/8156
15. **Hicks, N.** and Gold, D.J.C. 2020. Lithostratigraphy of the Sinqeni Formation, Pongola Supergroup, South Africa. South African Journal of Geology, 123 (3), 399–420, doi:10.25131/sajg.123.0027
16. **Ligavha-Mbelengwa, L.** and Gomo, M. 2020. Investigation of factors influencing groundwater quality in a typical Karoo aquifer in Beaufort West town of South Africa. Environmental Earth Sciences, 79: 196, https://doi.org/10.1007/s12665-020-08936-1
17. Lockley, G.M., Helm, C.W., **Cawthra, H.C.**, De Vynck, J.C. and Perrin, M.R. 2020. Pleistocene golden mole and sand-swimming trace fossils from the Cape coast of South Africa. Quaternary Research, 1–18. https://doi.org/10.1017/qua.2020.97
18. **Makubalo, S.S.** and Diamond, R.E. 2020. Hydrochemical evolution of high uranium, fluoride and nitrate groundwaters of Namakwaland, South Africa. Journal of African Earth Sciences, 172, https://doi.org/10.1016/j.jafrearsci.2020.104002
19. Marimira, K., **Manzunzu, B.**, Shumba, B.T., **Midzi, V.** and **Saunders, I.** 2021. Aftershock sequence of 22 September 2016, Manica-Zinave earthquake (Mw 5.6), Mozambique. Journal of African Earth Sciences, 177, https://doi.org/10.1016/j.jafrearsci.2021.104146
20. Martin, J., **Thomas, R.**, Macey, P., et al. 2020. The core of Rodinia formed by the juxtaposition of opposed retreating and advancing accretionary orogens. Earth Science Reviews, https://doi.org/10.1016/j.earscirev.2020.103413
21. Mngadi, S., **Sihlahla, M., Lekoadu, S., Moja, S.** and Nomngongo, P.N. 2020. Evaluation of mobility, fractionation, and potential environmental risk of trace metals present in soils from Struisbult gold mine dumps. Journal of African Earth Sciences, 172, https://doi.org/10.1016/j.jafrearsci.2020.104008
22. Nke, A., Bailie, R., **Macey, P., Thomas, R.**, Frei, D., Le Roux, P. and Spencer, C. 2020. The 1.8 Ga Gladkop Suite: the youngest Palaeoproterozoic arc in the Namaqua-Natal Metamorphic Province, South Africa. Precambrian Research, 350, https://doi.org/10.1016/j.precamres.2020.105941
23. **Nxantsiya, Z.**, Gwavava, O. and Baiyegunhi, C. 2021. Variations in isochore thickness and depositional surface of the Dwyka, Ecca and Beaufort Groups in the Western Cape Province of South Africa as deduced from 2.5D gravity profile models. Heliyon Journal. https://doi.org/10.1016/j.heliyon.2021.e06478
24. **Penn-Clarke, C.R.** and Harper, D.A.T. 2020. Early-Middle Devonian brachiopod provincialism and bioregionalization at high latitudes: A case study from southwestern Gondwana. GSA Bulletin, 133 (3-4): 819–836, https://doi.org/10.1130/B35670.1
25. **Penn-Clarke, C.R.** and Theron, J.N. 2020. Lithostratigraphy and sedimentology of the Middle Devonian Tra-Tra Formation, including the Grootrivier Member (Bokkeveld Group, Cape Supergroup), South Africa. South African Journal of Geology, 123 (3), 381–398, doi:10.25131/sajg.123.0026
26. **Pillay, T., Cawthra, H.C.** and Lombarda, A.T. 2020. Characterisation of seafloor substrate using advanced processing of multibeam bathymetry, backscatter, and sidescan sonar in Table Bay, South Africa (Invited research article). Marine Geology, 429, https://doi.org/10.1016/j.margeo.2020.106332
27. Rishwortha, M.G., Dodd, C., Perissinottob, R., Bornman, T.G., Adams, J.B., Anderson, C.R., **Cawthra, H.C.**, Dorrington, R.A., Du Toit, H., Edworth, C., Gibb, R.A., Humane, L.R.D., Isemonger, E.W., Lemley, D.A., Miranda, N.A.D., Peerk, N., Raw, J.L., Smith, A.M., Steyn, P., Strydom, N.A., Teskem, P.R. and Welmana, S. 2020. Modern supratidal microbialites fed by groundwater: functional drivers, value and trajectories. Earth-Science Reviews, https://doi.org/10.1016/j.earscirev.2020.103364

28. **Sakala, E.**, Fourie, F., Gomo, M. and Madzivire, G. 2020. Natural attenuation of acid mine drainage by various rocks in the Witbank, Ermelo and Highveld Coalfields, South Africa. Natural Resources Research, https://doi.org/10.1007/s11053-020-09720-5
29. Shumba, B.T., **Midzi, V., Manzunzu, B.**, Ottemöller, L. and Marimira, K.T. 2020. Source parameters of the moderate Mozambique–Zimbabwe border earthquake on 22 December 2018. Journal of African Earth Sciences, 166, https://doi.org/10.1016/j.jafrearsci.2020.103829
30. **Thomas, A.** 2020. Processing and analysis of ASTER and Landsat 8 scenes to aid in geological mapping: A case study of Murchison Greenstone Belt area, South Africa. Geomatics and Environmental Engineering, 14 (3), https://doi.org/10.7494/geom.2020.14.3.107
31. **Vadapalli, V., Sakala, E., Dube, G.** and **Coetzee, H.** 2020. Mine water treatment and the use of artificial intelligence in acid mine drainage prediction. In: Recovery of by products from acid mine drainage treatment, Elvis Fosso-Kankeu, Christian Wolkersdorfer and Jo Burgess (eds). https://doi.org/10.1002/9781119620204.ch2
32. Van Gend, J., Francis, M.L., Watson, A.P., Palcsu, L., Horváth, A., **Macey, P.H.**, Le Roux, P., Clarke, C.E. and Miller, J.A. 2020. Saline groundwater in the Buffels River Catchment, Namaqualand, South Africa: A new look at an old problem. Science of the Total Environment, 762, 143140, https://doi.org/10.1016/j.scitotenv.2020.143140
33. **Voigt, M.**, Becker, M., Miller, J., Mainza, A. and Bam, L. 2020. The robustness of the gray level co-occurrence matrices and X-ray computed tomography method for the quantification of 3D mineral texture. Minerals, 10, 334. https://doi.org/10.3390/min10040334

5.3 CONFERENCE PROCEEDINGS

(CGS staff are indicated in bold)

1. Bailey, G. and **Cawthra, H.C.** 2020. The significance of sea-level change and ancient submerged landscapes in human dispersal: A geoarchaeological perspective. International Baltic Earth Secretariat Online Conference on Marginal Seas — Past and Future, University of Szczecin, Institute of Marine and Environmental Sciences, Poland. 16–17 December 2020.
2. **Breakfast, M., Kenan, A.O., Kirstein, L.S.** and **Mothupi, T.** 2021. Potential for rare-earth elements in the Molteno–Indwe coalfield, Eastern Cape Province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
3. **Cawthra, H.C.**, Hahn, A., Marean, C.W. and Zabel, M. 2020. How examples from palaeo record of sea-level, climate and environment can help to inform future trends. Coastal Hazards in Africa Online Conference, Durban, South Africa. 27–29 October 2020.
4. **Cawthra, H.C.** 2021. Marine geoscience perspectives on mapping and studying South Africa's blue backyard. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
5. **Chauke, R.** and Nex, P.A.M. 2021. Structural controls of polymetallic mineralisation in the Bushveld Igneous Complex, South Africa: Investigation of the spatial association of the Wonderkop Fault with mineralisation. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
6. **Claassen, D.**, Linol, B., **Botha, G.** and **Rawana, B.** 2021. Influential drivers affecting Anthropocene fluctuations in gully expansion, Mthatha, Eastern Cape. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
7. **Coetzee, H.** 2021. Environmental geoscientific investigations: How much data is enough? Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
8. **Cole, J., Cole, P., Denner, G.** and **Dudumashe, N.** 2021. Application of spectral mineral identification using hyperspectral data in Namaqualand, Northern Cape Province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
9. **Dhansay, T., Makubalo, S., Saeze, H., Nolakana, L., Lewele, L., Ledwaba, L., Nxantsiya, Z., Sakala, E., Sethobya, M.** and **Saunders, I.** 2021. Maluti-a-Phofung tectonics: It's not my fault. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
10. **Dhansay, T., Maupa, T., Mare, L., Twala, M., Sibewu, Z., Nengovhela, V., Mudau, P., Muedi, T.** and **Hicks, N.** 2021. Enabling a low-carbon economy with a large igneous province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
11. **Dlamini, N.** 2021. Bridging the gap between geoscience and society. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.

12. **Doggart, S., Macey, P., Abrahams, G.**, Ballouard, C., Buick, I., Mayne, M., **Smith, H., Lambert, C.W., Groenewald, C.** and **Cole, J.** 2021. The Orange River Pegmatite Belt: A review on how geoscience mapping and research shed insight into lithium mineralisation in the pegmatites of the Namaqua-Natal Metamorphic Province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
13. **Dube, G., Malatji, M., Vadapalli, V.R.K., Coetzee, H., Tegegn, K.** and **Lenong, S.** 2021. Passive treatment of polluted mine water using an up-scaled reducing alkalinity producing system in South Africa. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
14. **Dudumashe, N., Hobo, M.** and **Lekgothoane, M.** 2021. Monitoring the impact of coal mining on vegetation cover over the last four decades in the coalfields region of Ermelo using remote sensing data. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
15. **Gcasamba, S., Nyale, S., Coetzee, H., Vadapalli, V., Madzivire, G., Ramasenya, K.** and **Lekgothoane, M.** 2021. Feasibility study of in situ mine water treatment in flooded underground mines using waste concrete. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
16. Grantham, G., Horie, K., Satish-Kumar, M., Ueckermann, H., **Groenewald, C.** and Le Roux, P. 2020. The Kuunga Nappe of Sverdrupfjella, western Dronning Maud Land, Antarctica. Scientific Committee on Antarctic Research (SCAR) 2020 Online Conference. 3–7 August 2020.
17. **Grobbelaar, M., Molea, T.** and Durrheim, R. 2021. Modelling of air and ground vibrations from surface explosions. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
18. **Groenewald, C.**, Grantham, G. and Le Roux, P. 2020. New geochemical data from central Dronning Maud Land: Implications for Gondwana reconstruction. Scientific Committee on Antarctic Research (SCAR) 2020 Online Conference. 3–7 August 2020.
19. **Hicks, N.** and **Dhansay, T.** 2021. Preliminary findings of CCUS potential in the northern Karoo Basin. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
20. **Jonk, L., Mtshali, S.** and **Penn-Clarke, C.** 2021. Dawn of the (digital) dinosaur: Integrating the historic palaeontological collections of the CGS with state of the art database techniques. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
21. **Kenan, A.O., Breakfast, M., Setladi, C., Kirstein, L.S.** and **Hlatshwayo, S.** 2021. Molteno–Indwe coalfield in the Eastern Cape Province: An overview. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
22. **Kirstein, L.S., Kenan, A.O.** and **Breakfast, M.** 2021. Assessment of coal quality in the Molteno–Indwe coalfield, Eastern Cape Province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
23. **Kobola, M.B., Breakfast, M.** and **Elsenbroek, J.H.** 2021. Application of systematic regional geochemical mapping data to generate targets for mineral exploration in the Jan Kempdorp area, North West Province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
24. **Kwata, M.G., Moja, S.J., Masindi, K., Mtyelwa, O.** and **Malatji, M.R.** 2021. Validation of the performance of the AirCon-2 sampler and the E-sampler for capturing airborne dust from former asbestos mine dumps in the Limpopo and Mpumalanga Provinces. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
25. **Lehong, K.D.** 2021. An assessment of critical minerals: A South African perspective in the current COVID-19 pandemic. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
26. **Lehong, K.D.** and **Kenan, A.O.** 2021. An investigation into alluvial diamonds within the Griqualand West area, Northern Cape Province: Does potential still remain? Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
27. **Lusunzi, R.**, Fosso-Kankeu, E., Waanders, F. and **Netshitungulwana, K.T.R.** 2021. Spatial variation of efflorescent crusts in the vicinity of the Sabie goldfield, Mpumalanga Province. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.

28. **Malatji, M.R., Dube, G., Vadapalli, V.R.K., Coetzee, H.** and **Tegegn, K.** 2021. Implementation of a RAPS system at Witkranz 53 IT (Carolina, MP). Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
29. **Manzunzu, B., Midzi, V.** and Durrheim, R.J. 2021. Treatment of parameter and model uncertainties through a sensitivity analysis of seismic hazard in and around Johannesburg. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
30. Mapuranga, V., Kijko, A., **Saunders, I.**, Singh A., Singh, M. and Zulu, S. 2021. Macroseismic survey of the 6 February 2016 KwaZulu-Natal, South Africa earthquake. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
31. **Mashale, H.N.** and **Mashiane, N.** 2021. Geochemical atlas of the Kgomohute mapped area. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
32. **Maupa, T., Sibewu, Z., Twala, M., Nengovhela, V., Mudau, P., Nonyana, V., Mafanya, S.** and **Dhansay, T.** 2021. National Core Library and CCUS — taking geology back to basics. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
33. **Melamane, G., Kwata, M.** and **Dhansay, T.** 2021. Surface environmental monitoring to support safe storage of CO2. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
34. Mfikili, A., Bornman, T.G. and **Cawthra, H.C.** 2020. Stratigraphic and sedimentological signatures as proxies to interpret past extreme marine events along the South African coast. Coastal Hazards in Africa Online Conference, Durban, South Africa. 27–29 October 2020.
35. **Midzi, V., Mulabisana, T.** and **Manzunzu, B.** 2021. Updated seismic source model of South Africa. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
36. **Moabi, N.** and Grantham, G. 2021. The CGS's unmatched wealth of Antarctic legacy data. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
37. **Modiba, M.G.** and **Lusunzi, R.** 2021. Geochemical atlas of the Naples mapped area, Griqualand West. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
38. **Mohamed, S.**, Van der Merwe, E.M. and **Doucet, F.J.** 2021. Reactivity of plagioclase-rich slimes in extractive processes. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
39. **Mosavel, H.** 2021. Preliminary results from the ongoing Karoo deep drilling in the main Karoo Basin. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
40. **Mthembi, P., Musekiwa, C., Baglow, N.** and **Mahlase, B.** 2021. Karst development in the Griqualand West area — a look at geohazards and environmental impacts. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
41. **Mtshali, S., Jonk, L.** and **Penn-Clarke, C.** 2021. Palaeontology collections at the CGS — not going the way of the dinosaur. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
42. **Mukosi, N., Dhansay, T.** and **Baglow, N.** 2020. The concept of geoconservation and geotourism in the Limpopo Province, to enhance sustainable development and the national development plan of South Africa. Oxford Geoheritage Virtual Conference, Oxford, UK. 25–29 May 2020.
43. **Mukosi, N.C., Radzuma T., Ngobeni, D., Nhamussua, S., Bensid, M., Netshitungulwana, R., Mohale, G., Madzivire, G.** and **Hanise, B.** 2021. Integrated geoscientific mapping of the Giyani greenstone belt and surrounding areas. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
44. **Mulabisana, T., Midzi, V.**, Meghraoui, M. and **Manzunzu, B.** 2021. The impact of aftershocks on the seismotectonics of the 2017 Moiyabana, Botswana earthquake. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
45. **Musekiwa, C.**, Gaffoor, Z., Pietersen, K. and **Chevallier, L.** 2020. Revising the Groundwater Drought Risk Map: role of Grace data in mapping groundwater drought in the Southern African Development Community. 3RD SADC Groundwater Conference, International Groundwater Resources Assessment Centre, Netherlands. 24–26 November 2020.

46. **Ncume, M., Hicks, N.** and Hoyer, L. 2021. The structural evolution of the Bumbeni Complex, northern KwaZulu-Natal. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
47. **Nel, Z.** 2021. Risky business — why geoscience and human development programmes may not suffice in winning and maintaining a social licence to operate. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
48. **Netshitungulwana, K.T.R.**, Gauert, C., Vermeulen, D., Yibas, B., Shai, M. and Lusunzi, R. 2021. Investigations of enriched geochemical elements from the regional stream sediments in the Riet–Olifants catchment. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
49. **Penn-Clarke, C.** and Harper, D.A.T. 2020. Latitude induced climatic forcing as a driver for bioregionalization during the Devonian period: a case study from high latitudinal regions of West Gondwana. The Palaeontological Association 64th Virtual Annual Meeting, Oxford University Museum of Natural History, UK. 16–18 December 2020.
50. **Penn-Clarke, C., Jonk, L.** and **Mtshali, S.** 2021. The skeletons in our closet... Dusting off the hidden treasures of the CGS palaeontological collections. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
51. **Penn-Clarke, C.**, Weiss, J., Halley, M. and Weiss, A. 2021. Geoheritage in the digital frontier: Using geological maps to make geoheritage apps. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
52. **Phikiso, Z., Musekiwa, C.** and Engelbrecht, J. 2021. The weights of evidence and logistic regression approaches for mineral prospectivity mapping: A case study of Cu mineralisation in the vicinity of the town of Springbok, Northern Cape. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
53. Pietersen, K., Storie, M., Jonker, V., Reddy, T., Maharaj, D., **Musekiwa, C.**, Gaffoor, Z., Eilers, A. and Braune, E. 2020. Assessment of groundwater resources development priority intervention areas in the Southern African Development Community (SADC) region. 3RD SADC Groundwater Conference, International Groundwater Resources Assessment Centre, Netherlands. 24–26 November 2020.
54. Richter, H. and **Moja, S.** 2021. A robust technique for the environmental analysis of vinyl chloride and methylethyl ketone in soil and water matrices. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
55. **Sakala, E.** 2020. Natural attenuation of acid mine drainage by various rocks in a typical Karoo coalfield: case study of the Witbank, Ermelo and Highveld coalfields, South Africa. The Geological Society of South Africa (GSSA), Groundwater Division, Groundwater Talk, South Africa. 6 November 2020.
56. **Sakala, E.** 2020. Optimising regional mineral exploration using cutting-edge techniques. The Geological Society of South Africa (GSSA) Technology Day: African Exploration Showcase, Johannesburg, South Africa. 12–13 November 2020.
57. **Sakala, E.** 2021. Geoscience innovation: Past, present and future trends. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
58. **Saunders, I.** 2021. Optimising earthquake waveform analysis — a bi-directional approach. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
59. **Setladi, M.C.** and **Kenan, A.O.** 2021. Coal petrography of the Molteno-Indwe coalfield. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
60. **Singh, R.**, Kemp, J., **Botha, G.** and **Dunga, N.** 2021. Multitemporal mapping of conditioning factors that influence wind erosion in the Xolobeni region, Eastern Cape Wild Coast. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
61. **Surridge, T.** and **Dhansay, T.** 2021. Genesis and future of carbon capture, utilisation and storage in South Africa. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
62. **Thomas, A.** 2021. Usefulness of hyperspectral remote sensing data to aid in geoscientific studies: A case study using a 1:50 000-scale map sheet of Namaqualand. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
63. **Thomas, A.** and **Grobbelaar, D.** 2021. Mapping ground subsidence in the Kuruman and Daniëlskuil areas over a period of 44 days from 7 October to 20 November 2018. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.

64. **Thomas, A., Cole, P.** and **Coetzee, H.** 2021. Modelling of surface runoff, infiltration and diffuse pollutant loads in the eastern goldfields of the Witwatersrand using RINSPE. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
65. **Twala, T., Dhansay, T., Maupa, T.** and **Sibewu, Z.** 2021. Preliminary reservoir evaluation of Klipriviersberg basalts as CO2 host. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.
66. Webb, S.J., Trumbull, R.B., Ashwal, L.D., Roelofse, F., Hayes, B. and **Khoza, T.D.** 2021. The Bushveld Complex drilling project of the international continental scientific drilling programme — building a reference section through the Bushveld Complex. Council for Geoscience Annual Virtual Conference: The fulcrum of human development, Pretoria, South Africa. 4–5 March 2021.

5.4 MEDIA ARTICLES

1. Media advertorial – Engineering News & Mining Weekly: Research-led intervention to position South Africa's coal industry as a critical component of the Just Transition Initiative to a low carbon economy.
2. Media advertorial – Engineering News: Council for Geoscience starts deep drilling in Karoo basin.
3. Media advertorial – Mining News: CGS launces phase 2 of KDD.
4. Media advertorial – Mining Weekly: Council for Geoscience starts deep drilling in Karoo basin.
5. Media advertorial – Credible Carbon: (Fracking) Council for Geoscience starts deep drilling in Karoo basin.
6. Media advertorial – Global Africa Network: The CGS launches the Karoo Deep Drilling research project.
7. Media advertorial – Cape Times: Karoo Deep Drilling project gathers momentum.
8. Media article – Eyewitness News (EWN): Didn't feel any tremors in Cape Town? Here's why.
9. Media article – Independent Online (IOL): Cape Town tremor unrelated to offshore quake, says Council for Geoscience.
10. Media article – News24: UPDATE: Tremor felt in Cape Town on Sunday morning a result of 2.3 magnitude earthquake.
11. Media article – Times Live: Cape Town was hit by an earthquake on Saturday night — but 'no need to panic'.
12. Media advertorial – Mining Weekly: Council increases mapping to drive South Africa's exploration attractiveness.
13. Media article – Beeld: So lyk plan om PetroSA te red.
14. Media advertorial – Mining Review Africa: Council for Geoscience: Championing a lower carbon energy economy.
15. Media advertorial – South African Business Journal: Karoo Deep Drilling (KDD) Geoenvironmental Baseline Research Project.
16. Media advertorial – Green Economy Journal: Carbon Capture, Utilisation and Storage a just transition to a lower carbon energy economy.
17. Media article – Eyewitness News (EWN): SA GEO-Science Council confirms Thursday tremor in west of Joburg.
18. Media article – Independent Online (IOL): Parts of Gauteng rocked by tremors as rest of SA braces for more rain and thunderstorms.
19. Media article – News24: 5 Tremors in one day in South Africa, but 'no need to panic'.
20. Media article – Courier Newspaper for the Nuweveld: Diep gat moet antwoorde gee.
21. Media article – SABC News: Tremor hits Johannesburg.
22. Media advertorial – African Business: Environment focus a top priority.
23. Media advertorial – Mining and African Decisions: Carbon Capture, Utilisation and Storage — A just transition to a lower carbon energy economy.
24. Media advertorial – Mining Elites: Environmental Sustainability — Environment focus a top priority.
25. Media advertorial – Mining Review Africa: Karoo deep drilling — Baseline research project vital for shale gas exploration activities.

PART C:
Governance

Corporate governance at the CGS embodies systems, structures and processes by which the entity is directed, controlled and held to account. It is applied through the precepts of its enabling act, the Geoscience Act, Act No 100 of 1993, as amended, the Public Finance Management Act (PFMA) (Act No 1 of 1999, as amended), National Treasury Regulations, the Protocol on Corporate Governance in the Public Sector, and policies of the organisation. This part of the report details the organisation's governance systems, structures and processes.

- **The Board and its committees** — the composition of the Board and committees, Board induction, Board remuneration and conduct, role and responsibilities of the Board.
- **Compliance with laws and regulations** — the status of CGS compliance with legislative prescripts.
- **Internal control and risk management** — the risk management framework implemented and the effectiveness of the internal controls in the organisation.
- **Fraud and corruption** — measures to detect and combat fraudulent activities.
- **Internal audit** — activities of the internal audit function.
- **Quality assurance** — status of quality assurance.
- **Health, safety and environment issues** — compliance with safety, health, environment and quality (SHEQ) standards.

CGS senior management team looking at the geoscience map and the rocks of the Kheis Belt along the western edge of the Kaapvaal Craton

1. EXECUTIVE AUTHORITY

The Minister of Mineral Resources and Energy, (The Minister), through the CGS Board, is accountable for the control, management and performance management of the CGS. Accordingly, the organisation submits reports quarterly and annually in terms of National Treasury Regulations (26.1) to the DMRE, on 30 April, 31 July, 31 October and 31 January, unless directed otherwise by National Treasury.

2. BOARD OF THE COUNCIL FOR GEOSCIENCE

2.1 BOARD COMPOSITION AND DUTIES

The Minister appointed the CGS Board with effect from 1 May 2020, in terms of Section 4 of the Geoscience Act, Act No 100 of 1993 as amended until 30 April 2023. The Board is composed of 12 non-executive members, four alternate members and one executive member, the CEO. The Chairperson of the Board is an independent, non-executive member and the roles and duties of the Chairperson and the CEO are clearly outlined.

2.2 THE CURRENT BOARD — 1 MAY 2020 TO 30 APRIL 2023

The current Board was appointed by the Minister effective 1 May 2020. The Board includes the Chairperson (independent) and 11 other non-executive members, four alternate members and the CEO (executive member).

A geologist collecting a sample of amphibolite, Sperrgebiet, Namibia

Dr Humphrey Mathe
Chairperson of the Board

SKILLS AND EXPERIENCE:

Dr Mathe was appointed Board Chairperson on 1 May 2020. He is a qualified geologist with an MSc (Mineral Exploration) from Rhodes University, a PhD (Applied Geology) from the University of Natal, Durban and an Advanced Management Programme (AMP) from Insead, Fontainebleau, France. Dr Mathe is the Chief Executive Officer of Tranter Resources Pty Limited. Previously he was the Chief Executive Officer of Scinta South Africa Pty Limited, a coal resources company; and the Executive General Manager: Corporate Services at Exxaro Resources Limited and prior to that was the COO and Executive Director of Eyesizwe Coal Pty Limited. He has worked in the mining industry all of his life with in excess of 45 years' experience. ***He was the finalist of Boss of the Year for 2008.*** Dr Mathe serves on the boards of Talent10 Holdings Pty Limited, Scinta South Africa Pty Limited (Non-Executive Chairman), Tranter Holdings Pty Limited, Tranter Resources Pty Limited (CEO), Council for Geoscience (Non-Executive Chairman),Handa Mining Corporation (TSX listed), Cape Copper Oxide Company (Non-Executive Chairman), Empowerment Capital Investment Partners (Non-Executive Chairman) and Wescoal Holdings Limited [(JSE listed) Non-Executive Chairman]. He also serves on the Investment Committee of Acrux Resources Pty Limited. He is a Fellow of the Geological Society of South Africa and registered with SACNASP as a scientist.

Mr Mosa Mabuza
Chief executive officer

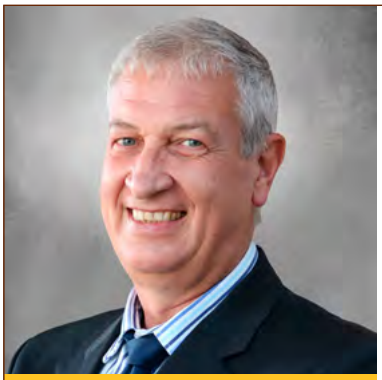
SKILLS AND EXPERIENCE:

Mr Mabuza is a Geologist with a Bachelor's Honours in Geology and a Postgraduate Diploma in Business Administration. He was appointed a Board member on 1 May 2020. He is the current CEO of the CGS and was appointed on 1 July 2017. Mr Mabuza served, inter alia, at De Beers as an Explorationist, Laboratory Geologist and Senior Business Analyst, at DMRE as Chief Director of Mineral Promotion, at Anglo American Platinum as Head of Government Relations and at DMRE as Deputy Director-General for Mineral Policy and Promotion.

Mr Xolisa Mvinjelwa:
Board member

SKILLS AND EXPERIENCE:

Mr Mvinjelwa has a Bachelor of Science in Chemistry from the University of Cape Town, Masters in Business Administration from Wits Business School, a Certificate in Management Advanced Programme from Wits Business School and Diploma in Production Management from the Production Management Institute of South Africa. He was appointed a Board member and Deputy Chairperson of the Board on 1 May 2020 and 27 May 2021, respectively. He has over 30 years' experience of working within the mining industry where he started his career at Vereeniging Refractories (Anglo American subsidiary) as a Technical Assistant in the R&D Department, while progressing through the company holding various positions as a Process Controller, Quality Superintendent, Plant Manager, Market Analyst and Technical Sales Representative. He later joined Rhino Minerals (Anglovaal subsidiary) as an Assistant Technical Marketing Manager where he was responsible for developing new markets globally. He has been working for IMERYS South Africa (IMERYS subsidiary) for the past 20 years occupying various positions over the years including Sales & Marketing Manager, Director: Special Projects, Head of HR, Policy and Strategy, Head of Strategy and Corporate Services and Board Secretary. He is currently the Executive Director: Ethics and Transformation at IMERYS South Africa and Chairman of the Social and Ethics Committee of the board. As an entrepreneur, he is also seated on various boards of companies which are mainly in the mining and associated industries. He is the Chairman of Coastal Fuels, which is a junior coal mining company with coal assets. He is also the Chairman of Ticamode, a BBBEE company that is a partner of IMERYS.



Mr Beeuwen Gerryts:
Board member

SKILLS AND EXPERIENCE:

Mr Gerryts is a Mechanical Engineer with a Master's in Engineering Management (technology and innovation management) from the University of Pretoria. He was appointed a Board member on 1 May 2020. He is serving at Department of Science and Innovation as a Chief Director for Technology Localisation, Beneficiation and Advanced Manufacturing. He has extensive experience in research and innovation management, ICT and product system specifications, policy development, and some publications in research and development and industrial development.

Ms Rosalind Mdubeki:
Board member

SKILLS AND EXPERIENCE:

Ms Mdubeki was appointed a Board member on 1 May 2020. She has a Bachelor's in Surveying, a National Diploma in Surveying and a Certificate in Project Management. She has worked for Eskom as a Survey Technician and Engineer in training and currently serves as a Surveyor General: Bloemfontein (responsible for the Free State and Northern Cape) in the Department of Agriculture, Land Reform and Rural Development.

Ms Sibongile Malie:
Board member

SKILLS AND EXPERIENCE:

Ms Malie was appointed a Board member on 27 May 2020. She has a Baccalaureus Legum (LLB) qualification and has extensive experience in the mining and minerals sector, gained over 17 years with the DMRE. She has a strong understanding of the legislative and regulatory framework of the mining and minerals sector. She is currently Director: Mineral Policy Development at the DMRE.

Ms Deborah Mochothli:
Board member

SKILLS AND EXPERIENCE:

Ms Mochothli was appointed a Board member on 1 May 2020 and has a Master's in Environment and Society, a B-Tech in Environmental Health, a BA Honours in Public Administration and a BA in Social Science. She has worked for the Department of Water and Sanitation as Chief Director for Regulations and Water Use, for South African National Parks as Manager: Environmental Audits and for Mafikeng District as Chief Environmental Health Officer.

Mr Smunda Mokoena:
Board member

SKILLS AND EXPERIENCE:

Mr Mokoena was appointed a Board member on 1 May 2020. He has a BSc in Engineering, an MBA and holds a Government Certificate of Competence (GCC) for Mines and Works. He has vast experience, having served as a director on a number of boards. He is currently an Executive Director at Best Infrastructure and Investments and Service Delivery Solutions (Pty) Ltd as well as a Part-time Member and Chairperson of the National Public Transport Regulator (NPTR) and a Part-time Regulator Member of the National Energy Regulator (NERSA). He has many years of experience in the mining and energy industries in both the public and private sectors.

Ms Lebogang Madiba:
Board member

SKILLS AND EXPERIENCE:

Ms Madiba was appointed a Board member on 1 May 2020. She has a Bcom, BCom Honours in Economics from University of Pretoria, and a Master's of Finance in Economic Policy from University of London (SOAS) and Executive Leadership Programme from UNISA School of Business Leadership. She currently serves as Chief Director: Economic Services in Public Finance at the National Treasury and is the Economic Development Function Group Leader responsible for budget-related matters of selected national departments and their public entities. Currently, she is also serving as non-executive director of the Board of South Africa Diamond and Precious Metal Regulator. Previous employment capacities include Deputy Treasurer: Front Office and Structured Finance for Transnet SOC Ltd and Director: Country Risk within the Asset and Liability Division of the National Treasury. She was also a member of the Reserve Management Committee of the South African Reserve Bank until 2018.

Dr Thuli Khumalo:
Board member

SKILLS AND EXPERIENCE:

Dr Khumalo was appointed a Board member on 1 May 2020. She has a PhD in Environmental Science, a Management Development Programme Certificate with the Gordon Institute for Business Science and is pursuing a Master of Philosophy in Corporate Strategy. She has served in a number of executive positions, including her current role as Deputy Director-General of Climate Change and Air Quality at the Department of Forestry, Fisheries and the Environment.

Ms Adila Chowan
Board member

SKILLS AND EXPERIENCE:

Ms Chowan was appointed a Board member on 1 May 2020. She is a Chartered Accountant and holds an LLB qualification. Ms Chowan is also an admitted Advocate practising from Duma Nokwe Chambers. She has served on both public and private company boards as a Non-Executive Director and as an Audit Committee member.

Adv Ntika Maake:
Board member

Skills and experience:

Adv Maake was appointed a Board member on 1 May 2020. He has a Bluris and LLB Degrees, Diploma in Corporate Governance (Unisa). Diploma in Project Management (Executive College) Postgraduate Certificate in Climate Change and Energy Law, Postgraduate Certificate in Water Law (Wits) Master of Laws in Extractive Industries in Africa, LLD Candidate in Property Law (Property Clause) (University of Pretoria). He has served at several public entities, including Eskom Holdings, City of Tshwane and the Department of Justice and Constitutional Development. He is currently the Chairperson of the Water Tribunal at the Department of Human Settlement Water and Sanitation. Member of the Disciplinary Committee at the Premier Soccer League.

Dr Jennifer Mirembe:
Board member

SKILLS AND EXPERIENCE:

Dr Mirembe was appointed a Board member on 27 May 2020. She has a Doctorate in Town Planning, Master's in City Planning and a number of management qualifications. She has served in several senior positions, including her current role of Director for Delivery Channel Management and Chief Town Planning at the National Department of Human Settlements.

Ms Pontso Tsotetsi:
Alternate Board member

SKILLS AND EXPERIENCE:

Ms Tsotetsi was appointed an alternate Board member to Ms R Mdubeki on 1 May 2020. She has a Bachelor's in Land Surveying, a Diploma in Land Surveying and a Certificate in Advanced Management Development Programme. She is currently employed as the Deputy Surveyor General: Gauteng at the Department of Agriculture, Land Reform and Rural Development.

Mr Paul Nel:
Alternate Board member

SKILLS AND EXPERIENCE:

Mr Nel was appointed an alternate member to Ms D Mochotlhi on 1 May 2020. He has a BCompt Honours degree and is a Chartered Accountant and Information Systems Auditor. He has served as Chief Director at the Department of Water and Sanitation, Managing Director for Integrated Business Control South Africa, Senior Financial Officer for several banking institutions and an Audit Manager for Deloitte.

Dr Sabelo Malaza:
Alternate Board member

SKILLS AND EXPERIENCE:

Mr Malaza was appointed an alternate member on 1 May 2020. He has a Master's in Business Administration, B Phil degree in Knowledge and Information Management, Bachelor of Science degree as well as a Management Development Programme with the Gordon Institute for Business Science. He is an Environmental Management Practitioner with more than 18 years' experience in the public sector. He has served at the Department of Water and Sanitation and the Department of Environment, Forestry and Fisheries in diverse capacities. He is currently a Chief Director responsible for processing environmental impact assessment at the Department of Fisheries, Forestry and Environment.

Mr Andries Moatshe:
Alternate Board member

SKILLS AND EXPERIENCE:

Mr Moatshe was appointed an alternate member to Ms Malie on 1 May 2020. He has a Master's in Environmental Management and a Higher Diploma in Public Health. He is currently working for the DMRE as a Chief Director for Mine Environmental Management and has contributed to the department's policy development.

The Board upholds and embraces the fiduciary duties outlined in Section 50 of the PFMA (Act No 1 of 1999, as amended), which require that, among others, Board members:

2.1.1 Exercise the duty of utmost care to ensure reasonable protection of the assets and records of the organisation;
2.1.2 Act with fidelity, honesty, integrity and in the best interest of the CGS in managing the financial affairs of the CGS;
2.1.3 Not act in a way that is inconsistent with responsibilities assigned to Board members;
2.1.4 Not use their position and/or privileges or confidential information they obtained as members of the Board for personal gain or to improperly benefit another person, and
2.1.5 Disclose and declare any direct or indirect interests that the member or spouse or close family may have that would be a potential conflict of interest.

The Board implements annual declarations of interest and a declaration of interest at every committee and Board meeting to ensure that members disclose real or perceived conflicts in any matter before the Accounting Authority. Board members must withdraw from proceedings when the matter is considered unless the Board decides otherwise.

Subject to the provisions of the Geoscience Act, Act No 100 of 1993 as amended, read with the PFMA, the Board is accountable for the performance of the CGS. The Board shall exercise control and manage the affairs of the CGS, set the strategic direction of the organisation, and approve the vision, mission, strategic objectives and policies of the organisation.

In addition, the Board monitors compliance with policies and performance with scientific, administrative and financial objectives. The Board is solely responsible for ensuring that the CGS has and maintains effective, efficient and transparent systems of financial management, risk management and internal audit, and fair, equitable, competitive and cost-effective procurement.

The Board has the authority to lead, control and manage the business of the CGS, and has adopted a comprehensive delegation of authority framework in accordance with Section 56 of the PFMA, which delegates the day-to-day management of the affairs of the CGS to the CEO. The delegation of authority policy does not in any way divest the Board of its responsibility and accountability for the organisation.

2.3 BOARD CHARTER AND BOARD RESPONSIBILITIES

The Board Charter, which is reviewed annually, provides for the following:

a) Leadership role of the Board, judgment and strategic direction;
b) Board composition;
c) Accountability, fiduciary duties and responsibilities;
d) Code of conduct for the Board;
e) Constitution and appointment of committees;
f) Governance and meeting procedures;
g) Management of conflict of interest;
h) Responsibility for the adoption of strategic plans and the monitoring of operational performance and management;
i) Determination and approval of policies;
j) Risk management, and
k) Board selection, orientation and evaluation.

2.4 BOARD INDUCTION AND ORIENTATION

The CGS has a Board induction programme.

2.5 TRAINING OF NEW BOARD MEMBERS

A director development programme ensures that Board members are adequately and continually trained and have the necessary knowledge of and development on best practices and principles of corporate governance. Through quarterly reports and policies, Board members are kept abreast of CGS governance structures, strategic projects and organisational performance to enable them to fulfil their duties and responsibilities.

2.6 BOARD MEETINGS

The Board held six meetings in 2020/21. The accompanying tables detail the attendance of meetings by each Board member during the year.

Table 6. Board meetings

Board members	27 May 2020	29 July 2020	27 August 2020	29 September 2020	29 October 2020	28 January 2021	Number of meetings attended
Dr H Mathe (Chairperson)	Present	Present	Present	Present	Present	Present	6
Mr M Mabuza (CEO)	Present	Present	Present	Present	Present	Present	6
Mr X Mvinjelwa (Deputy Chairperson)	Present	Present	Present	Present	Present	Present	6
Dr T Khumalo	Present	Apology	Present	Apology	Apology	Apology	2
Mr S Malaza	Present	Present	Present	Present	Present	Present	6
Ms D Mochotlhi	Present	Present	Present	Present	Apology	Apology	4
Mr P Nel*	Apology	Apology	Apology	Present	Apology	Present	2
Ms R Mdubeki	Apology	Present	Present	Present	Present	Present	5
Ms P Tsotetsi*	Present	Present	Apology	Present	Present	Present	5
Adv N Maake	Present	Present	Present	Present	Present	Apology	5
Mr S Mokoena	Present	Present	Present	Apology	Present	Present	6
Ms A Chowan	Present	Present	Present	Present	Present	Present	6
Dr J Mirembe	-	Present	Present	Present	Present	Present	5
Mr B Gerryts	Present	Present	Present	Present	Present	Present	6
Mr A Moatshe*	Apology	Apology	Apology	Apology	Apology	Apology	-
Ms S Malie	-	Apology	Present	Apology	Present	Apology	2
Ms L Madiba	Present	Apology	Apology	Present	Present	Present	4

* alternative Board members

2.7 BOARD REMUNERATION

The remuneration of Board members is determined by the Minister of the DMRE in consultation with the Minister of Finance, as disclosed in note 12 of the notes to the financial statements.

Table 7. Remuneration of board members (2020/21)

Board members	Remuneration	Other allowance	Other re-imbursements*	Total
Dr Mathe H	168 406.00	-	7 190.19	175 596.19
Dr Mahachi J	107 217.00	-	-	107 217.00
Mr Mokoena S	131 328.00	-	364.59	131 692.59
Adv Maake N	113 238.00	-	-	113 238.00
Ms Chowan A	149 580.00	-	-	149 580.00
Mr Mvinjelwa X	128 641.00	-	-	128 641.00
Dr Mirembe J	-	-	-	-
Dr Khumalo T	-	-	-	-
Ms Malie S	-	-	-	-
Mr Malaza S	-	-	-	-
Mr Nel P	-	-	-	-
Ms Mdubeki R	-	-	-	-
Ms Mochothli D	-	-	-	-
Ms Tsotetsi P	-	-	-	-
Ms Madiba L	-	-	-	-
Mr Moatshe A	-	-	-	-
Mr Gerryts B	-	-	-	-

Other reimbursements include travel and subsistence allowance.*

2.8 COMMITTEES OF THE BOARD

In terms of Section 15 of the Geoscience Act, Act No 100 of 1993 as amended, the Board may establish a committee that shall, subject to the direction of the Board, perform such functions of the Board as determined from time to time. Furthermore, Section 56 of the PFMA (Act No 1 of 1999, as amended) provides that some Board responsibilities may be delegated to Board committees and the management of the CGS without divesting the Board of its roles and responsibilities. The Board committees are, therefore, required to make recommendations to the entire Board before strategic decisions are implemented by management. Mandated by Section 15 of the Geoscience Act, Act No 100 of 1993 as amended, Section 56 of the PFMA and the recommendations of the King Code, the Board has constituted and delegated some of its functions to the following four Board committees:

2.8.1 AUDIT AND RISK COMMITTEE

The Audit and Risk Committee was established in terms of Section 77 of the PFMA and National Treasury Regulation 27. The committee discharges its responsibilities in terms of the Audit and Risk Committee Charter, which sets out its committee composition, roles and responsibilities. It continually monitors the quality and reliability of CGS financial information used by the Board, financial statements issued by the CGS and various functions in the organisation. It ensures that emerging risks are timeously identified and that appropriate and effective control measures are put in place to mitigate these risks. The composition and meeting attendance of the Audit and Risk Committee from 1 April 2020 to 31 March 2021 are reflected in the table below.

Table 8. Audit and Risk Committee meetings

Committee members	2020/21					Meetings attended
	17 July	19 August	25 September	21 October	19 January	
Ms K Maroga (Chairperson)	Present	Present	Present	Present	Present	5
Ms D Morabe	Present	Apology	Present	Present	Apology	3
Mr O Willcox	Present	Present	Present	Present	Present	5
Dr T Khumalo	Present	Present	Apology	Present	Present	4
Adv N Maake	Present	Present	Present	Present	Apology	4
Ms A Chowan	Present	Present	Present	Present	Present	5
Mr S Mngadi	Present	Present	Present	Present	Present	5
Mr S Xulu	Present	Present	Present	Apology	Apology	3
Ms M Seane	Present	Present	Present	Present	Present	5

2.8.1.1 Audit and Risk Committee report

The Audit and Risk Committee reports that it has complied with its responsibilities arising from Section 77 of the PFMA and National Treasury Regulation 27.1. The committee also reports that it has adopted the Audit and Risk Committee Charter as its appropriate terms of reference, has regulated its affairs in compliance with this charter and has discharged all its responsibilities contained therein.

In executing its duties, the committee has performed, *inter alia*, the following functions:

2.9 EVALUATION OF INTERNAL CONTROLS

The committee has directed, monitored and evaluated the activities of the Internal Audit function. Through the Internal Audit function, the committee constantly monitored the effectiveness of the internal controls and assessed whether the Internal Audit function fulfilled its roles. During 2020/21, the internal controls were reported to have significantly improved, and compliance with prescribed policies and procedures was reported to be satisfactory. However, there is a room for improvement in:

a) Procurement
b) Asset Management
c) Protection Services
d) Performance Information
e) Information Technology
f) Fraud, Corruption and Ethics
g) Health, Safety and Environment

The committee reports that corrective measures were implemented to resolve all findings of internal control weaknesses.

2.10 EVALUATION OF THE ANNUAL REPORT

The committee has:

a) Reviewed the CGS's report on corporate performance information;
b) Reviewed the CGS accounting policies and practices;
c) Reviewed the adequacy and usefulness of the financial information provided to the Auditor-General;
d) Evaluated, reviewed and discussed with the Auditor-General the audited Annual Financial Statements included in the annual report;
e) Reviewed the Auditor-General's management report and the Auditor's report, and
f) Based on the information provided to the committee, considered and concluded that the Annual Financial Statements comply with the requirements of the PFMA, National Treasury Regulations and South African Standards of Generally Recognised Accounting Practice (SA Standards of GRAP).

2.11 RISK MANAGEMENT

The committee reports that during the year under review it approved the Strategic Risk Register, Anti-Fraud and Corruption Policy as well as the Enterprise Risk and Compliance Management Policy, which was subsequently

communicated to employees and incorporated in the culture of the CGS. The committee reviewed:

a) The organisation's risk appetite and tolerance levels, and
b) The significant financial risk exposures, and directed management to monitor and develop mitigation strategies for such exposures, including reputational, operational, fraud, strategic, information technology and communications systems, as well as disaster recovery and business continuity risk.

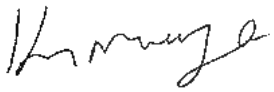
2.12 EVALUATION OF FINANCIAL STATEMENTS

The committee reviewed and discussed with the Auditor-General the financial statements of the CGS for the year ended 31 March 2021. The committee also reviewed the management letter of the Auditor-General and management responses thereto. The committee is of the opinion that the financial statements are compliant, in all material respects, with the requirements of the PFMA and SA Standards of GRAP.

2.13 AUDITOR'S REPORT

The Audit and Risk Committee is pleased to present its report for the financial year ended 31 March 2021.

The committee reviewed the prior-year audit findings implementation plan and reports that a significant number of findings have been resolved. The committee will ensure that management resolves all audit findings that are still in progress. The committee concurs and accepts the conclusions of the Auditor-General on the financial statements and is of the opinion that the audited Annual Financial Statements should be accepted and read together with the report of the Auditor-General.



Ms KM Maroga
Chairperson
Audit and Risk Committee
31 July 2021

2.14 FINANCE COMMITTEE RESPONSIBILITIES AND COMPOSITION

The Finance Committee of the CGS is mandated to consider and recommend for the Board's approval the following matters:

- Significant financial activities;
- Liquidity and financial condition of the CGS;
- Write-off of bad debts;
- Material variances in the approved annual and/or revised budgets in accordance with the Materiality and Significance Framework Plan;
- Proposed capital and operating budget for capital expenditures;
- Financial statements for the annual report;
- All policies that have financial implications, and
- Corporate performance information management against the approved budget.

The Finance Committee consists of six non-executive members. Member details are presented in the table below, with meeting attendance from 1 April 2020 to 31 March 2021.

Table 9. Finance Committee meetings

Committee members	2020/21						Meetings attended
	2 June	17 July	19 August	25 September	21 October	19 January	
Mr P Nel (Chairperson)	Present	Present	Present	Present	Present	Present	6
Mr S Mokoena	Present	Present	Present	Present	Present	Apology	5
Ms A Chowan	Present	Present	Present	Present	Present	Present	6
Ms D Morabe	Present	Present	Apology	Present	Present	Apology	4
Dr J Mahachi	Present	Present	Present	Present	Present	Present	6
Adv N Maake	Present	Present	Present	Present	Present	Apology	5
Mr M Mabuza	Present	Present	Present	Present	Present	Present	6
Mr O Willcox	Present	Present	Present	Present	Present	Present	6

2.15 TECHNICAL COMMITTEE

The Technical Committee of the CGS is mandated to consider and recommend for the Board's approval the annual scientific and strategic technical programme of the organisation, evaluate the scientific and technical output and oversee the annual technical audit.

The composition and meeting attendance of the Technical Committee from 1 April 2020 to 31 March 2021 are reflected in the table below.

Table 10. Technical Committee meetings

Committee members	2020/21					Meetings attended
	2 June	16 July	18 August	19 October	18 January	
Mr B Gerryts (Chairperson)	Present	Present	Present	Present	Apology	4
Mr X Mvinjelwa	Apology	Present	Present	Present	Present	4
Dr M Mayekiso	Present	Present	Present	Present	Present	5
Dr J Mahachi	Present	Present	Present	Present	Present	5
Mr S Malaza	Present	Apology	Present	Present	Apology	3
Mr S Mngadi	Present	Present	Present	Present	Present	5
Mr S Mokoena	Present	Present	Present	Present	Present	5
Mr M Mabuza	Present	Present	Present	Present	Present	5

2.16 PERSONNEL, REMUNERATION AND TRANSFORMATION COMMITTEE

The Personnel, Remuneration and Transformation Committee is mandated to consider and recommend for the Board's approval the human resources strategies and policies of the CGS, the organisational remuneration model, remuneration for executive management and annual salary increases. It also evaluates and makes recommendations on the payment of performance bonuses and considers organisational performance reports on labour-related matters, employment equity, and employee training and development matters.

The composition and meeting attendance of the Personnel, Remuneration and Transformation Committee from 1 April 2020 to 31 March 2021 are reflected in the table below.

Table 11. Personnel, Remuneration and Transformation Committee meetings

Committee members	2020/21					Meetings attended
	2 June	16 July	18 August	20 October	18 January	
Ms R Mdubeki (Chairperson)	Present	Present	Present	Apology	Present	4
Dr J Mirembe	-	-	-	Present	Present	2/2
Ms S Malie	-	-	-	Apology	Present	1/2
Ms M Seane	Present	Present	Present	Present	Present	5
Mr X Mvinjelwa	Apology	Present	Present	Present	Present	4
Dr M Mayekiso	Present	Present	Present	Present	Present	5
Mr M Mabuza	Present	Present	Present	Present	Present	5

3. RISK MANAGEMENT

The CGS Board is responsible for entrenching risk management governance through effective leadership. Management accounts to the Board for the integration of risk management into CGS daily operations and for the implementation and monitoring of the risk management process. The Audit and Risk Committee is an independent committee responsible for overseeing risk exposure related to governance and risk management at the CGS. The CGS develops the strategic risk register annually based on the organisational strategy, which is monitored quarterly and which provides assurance to the Board that the CGS is adequately managing identified risks. Operational risk is managed through operational risk registers and the GTP risk register.

The organisational governance risk management structure of the CGS is presented in the figure below.

Figure 28. Organisational governance risk management structure of the CGS

4. INTERNAL CONTROL

Management is responsible for designing, implementing and continually reviewing internal controls to provide assurance on the effectiveness and efficiency of operations and on the reliability of financial reporting, and for safeguarding and maintaining accountability for the assets of the organisation. These controls are monitored throughout the CGS by management and employees, with the necessary segregation of duties. Internal Audit performs independent reviews on the adequacy and effectiveness of these controls as part of the approved annual internal audit plan, and the internal audit reports are presented to the Audit and Risk Committee.

5. INTERNAL AUDIT

The internal audit function was established in terms of the PFMA and conducts risk-based audits aligned to the International Standards for the Professional Practice of Internal Auditing. A formal internal audit charter was reviewed and approved by the Audit and Risk Committee.

An annual internal audit plan was approved by the Audit and Risk Committee, and internal audit reports were presented to the committee quarterly. Follow-up audits were conducted on prior-year audit findings. Internal Audit also performed preliminary investigations on matters reported on the whistleblowing hotline and ad-hoc assignments requested by management.

6. COMPLIANCE WITH LAWS AND REGULATIONS

The CGS complies with National Treasury Regulations through the PFMA compliance checklist and calendar, which are continually monitored and updated. Compliance with laws and regulations is monitored through the activities of the Audit and Risk Committee and by the Risk and Compliance unit at operational level, based on the regulatory universe for the CGS.

7. FRAUD AND CORRUPTION

The CGS has a legal responsibility in terms of the PFMA to take steps to prevent unauthorised, irregular, fruitless and wasteful expenditure and losses resulting from criminal conduct. An Anti-fraud and Corruption Policy was reviewed and approved in January 2021, and the whistleblowing facility was renewed. This function is administered by Deloitte. Reports are issued monthly, and fraudulent conduct is investigated by the internal auditors and reported to the Audit and Risk Committee.

8. MINIMISING CONFLICT OF INTEREST

All suppliers of goods and services to the CGS are required to complete standardised National Treasury documentation (SBD4 Declaration of Interest). In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons employed by the CGS, or to persons connected with or related to them, it is required that the bidder or his or her authorised representative declare his or her position to the evaluation/adjudication authority.

In addition, staff members of the CGS involved in the Bid Evaluation and Adjudication Committee are required to complete declaration and non-disclosure forms at each meeting.

9. CODE OF CONDUCT

All CGS staff members abide by the Code of Ethics and Conduct. The CGS is committed to ethical and fair business dealings and promotes a corporate culture that is non-sectarian, and is socially and environmentally responsible. It does so by subscribing to the following values and principles:

- Fairness and integrity in all business dealings, including the ethical handling of actual or apparent conflicts of interest between personal and professional relationships;
- Respect for the human rights and dignity of all employees;
- Acceptance of diverse cultural, religious, race, gender and sexual orientations;
- Honesty, transparency and accountability, and
- Adherence to sound standards of corporate governance and to laws.

In terms of the Code of Ethics and Conduct, all persons representing the CGS must uphold the highest standard of business ethics and integrity. Furthermore, all staff, contractors, consultants and others acting on behalf of the organisation must accurately and honestly represent the organisation and not engage in any activity or scheme intended to defraud anyone of money, property or services. The reputation and integrity of the CGS are central to its ability to operate as an effective state-owned organisation.

10. BOARD SECRETARY

The Board Secretary provides advisory services to the Board and notifies Board members of regulatory changes and new developments in corporate governance. Furthermore, the Board Secretary guides the Board and Board committees on how to discharge their responsibilities in the best interests of the organisation. The Board Secretary facilitates and attends Board and Board committee meetings, and takes custody of the related policy documents.

11. QUALITY ASSURANCE

To be recognised as a world-class facility, the CGS is currently preparing for ISO 17025 accreditation for its laboratory. This is an important project because an accredited calibration laboratory holds many commercial, and health and safety benefits. Customers associate accredited laboratories with quality, accuracy, reliability and efficiency, which ultimately lead to customer satisfaction and increased brand equity. However, for the laboratory to be accredited, test methods should be validated at a certain controlled humidity and temperature. Consequently, a heating, ventilation and air conditioning system is a minimum requirement for ISO 17025 accreditation. This system should be commissioned by the end of the calendar year, after which the accreditation process will resume in earnest. ISO 9001 certification is well underway.

12. HEALTH, SAFETY AND ENVIRONMENT

As part of continual improvement to provide and maintain a safe and healthy work environment for all, management undertook an intensive audit of the compliance universe against Occupational Health and Safety Act, No 85 of 1993 and Regulations, and National Environmental Management: Waste Act, 2008 (No 59 of 2008): Waste Classification and Management Regulations. The audit generated a comprehensive occupational, health and safety checklist, which is a standing agenda item at meetings of the Audit and Risk Committee of the Board. During the year under review, in line with its ISO 17025:2017 accreditation and ISO 9001:2015 certification aspirations, the organisation ensured that employees:

- Follow a SHEQ policy and procedures, including a COVID-19 policy;
- Appoint safety, health and environment representatives;
- Use protective clothing and equipment as recommended;
- Assess and report risks;
- Attend training and put it into practice in the workplace;
- Report incidents that resulted in, or could have resulted in, injury or damage;
- Assist in the investigation of accidents with the aim of introducing preventive measures;
- Report unsafe conditions or actions and work cooperatively to improve health and safety standards and performance, and
- Work safely at all material times.

The CGS team closely monitors the following aspects of occupational healthcare:

- Medical surveillance programme (including entrance, periodic, exit and executive medicals);
- Medical surveillance testing (including audiometry, spirometry and biological monitoring);
- Injuries on duty, and
- Non-occupational health (primary healthcare, wellness screenings etc).

Proper waste management is crucial to protect the environment and to ensure the health and safety of employees and the population. Certain waste can be hazardous and pollute the environment. Bad waste management practices can also cause land and air pollution, which may cause serious medical conditions in both humans and animals. To this end, during the year under review, the CGS introduced a waste management project to provide a clean work environment for staff.

13. MARKETING, COMMUNICATION AND STAKEHOLDER ENGAGEMENT PROGRAMME

BUILDING THE CGS BRAND

During 2020/21, the CGS coordinated brand awareness activities to illuminate its work among stakeholders. This involved events, campaigns, stakeholder engagements, participation in conferences, media relations, and establishing and maintaining strategic collaborations and partnerships.

Brand-building highlights included:

- A Mining Weekly article on increasing mapping to drive South Africa's exploration attractiveness.
- A media advertorial in Engineering News & Mining Weekly on research-led intervention to position South Africa's coal industry as a crucial component of the Just Transition Initiative to a low-carbon economy.
- An article in the Cape Times on the KDD Programme and its momentum.

- An advertorial in Mining Review on championing a lower carbon energy economy.
- An advertorial in Mining Elites on environmental sustainability.
- An article in City Press on shale gas exploration.
- An article on Independent Online on the Cape Town tremor, which was unrelated to the offshore quake.
- Twenty-four advertorials in various trade and mainstream media.
- Real-time newsfeeds about organisational developments, stakeholder engagement initiatives, campaigns, events and geoscience information that have contributed to the steady growth of followers on CGS social media platforms such as Facebook, Twitter and LinkedIn.

Media interviews:

- The CGS received media coverage during an interview by SAFM's Cathy Mohlahlana in the build-up to the launch event of the KDD Programme.
- A number of news platforms covered the launch of the KDD Programme. The CEO was interviewed on Radio 702 by John Perlman, on the SABC News channel by Nzinga Qunta and on Newzroom Afrika by Thabo Mduli.
- eNCA's Thulasizwe Simelane interviewed the CEO after the launch of the KDD Programme.
- An interview was conducted with Newzroom Afrika on the Cape Town earthquake.
- An interview was conducted on Radio Islam focusing on the Cape Town earthquake.

In addition, the CGS responded to a plethora of ad-hoc print and online media enquiries about earthquakes as they happened.

Campaigns and events:

Key campaigns and events for the year:

- A Youth Month social media campaign, themed 'Youth in geosciences', was carried out throughout June. It profiled the diverse youth of the CGS who contribute to building the organisation.
- The KDD Programme was officially launched at an event hosted by the CGS in Beaufort West, Western Cape.
- In September, Heritage Day and Heritage Month were celebrated at various CGS offices and on CGS social media platforms, which profiled different geological rocks and geoheritage sites.
- A fence-wrap was installed at the CGS head office to create awareness of the '16 days of Activism for No Violence against Women and Children' campaign and to encourage employees to report abuse or violence to the authorities.
- A season's greetings video message was produced and sent to CGS stakeholders. The message was also extended to followers on CGS social media platforms.
- The CGS hosted a Women's Day virtual webinar themed 'Women in geosciences', which showcased women trailblazers at the CGS and invited guest speakers to share meaningful content.
- The CGS participated in the virtual Prospectors & Developers Association of Canada (PDAC) conference, at which the CEO was part of a panel discussion facilitated by Fasken through its annual seminar series with the DMRE. The seminar shared recent developments and opportunities in the South African minerals sector.
- A pre-event marketing campaign was run on social media to publicise the CGS geoscience conference, a flagship event that shares the organisation's work and provides insight into its projects, and into trends and technologies that are used in the geoscience field.
- A wellness day was staged to boost employee morale and promote a healthy work environment.

Stakeholder engagement:

The CGS understands that, for it to deliver on its mandate, it must engage and communicate with a broad spectrum of stakeholders, including employees, international, national and provincial departments, municipalities, traditional authorities, state-owned entities, farmers, environmental non-government organisations, academia and professional bodies, private companies and the public.

During the review year, the CGS adopted an integrated approach to stakeholder engagement that included understanding, aligning and managing stakeholder expectations, all of which are fundamental to corporate responsibility, good governance and transparency. This approach focuses on building strong constructive and interpersonal relationships with key stakeholders, particularly in areas conducive to the successful implementation of important CGS projects. The executive management, management and the scientific, technical and support staff of the organisation alike have embraced this approach, which is now beginning to bear fruit for project implementation.

Numerous engagements were held with key stakeholders to enable seamless implementation of the GTP, and corporate-wide projects and events. Given the unprecedented socioeconomic impact associated with COVID-19, the CGS was directed by the DMRE to lead the economic recovery programme and develop an exploration implementation plan. Several projects were prioritised to address the country's economic challenges.

Limpopo Greenstone Belt project

A CGS delegation led by the CEO held iterative engagements with key stakeholders in the Greater Giyani and Collins Chabane local municipalities and with representatives of the traditional leaderships of these communities. Communities often actively participate in CGS projects. During the year, in line with the CGS's commitment to capacity building the communities in which it works, 13 local labourers were employed rotationally to assist the geophysics, geochemistry and hydrogeology teams. The project seeks to elucidate the mineralisation and economic potential of the anomalies and assess the potential and inherent quality of the groundwater.

Maluti-a-Phofung groundwater study

The CGS met with the King of Bakoena, Morena Moremoholo Mopeli, in QwaQwa, Free State. Another meeting followed, coordinated by the Bokoena Royal Council. Among those involved were the MEC of Cooperative Governance and Traditional Affairs, the Maluti-a-Phofung Local Municipality, representatives of Sedibeng Water and the Department of Water and Sanitation Free State. This project addresses societal challenges through geoscience, particularly groundwater assessment.

KDD Programme

The need for public participation on the KDD Programme was satisfied through stakeholder meetings held in Beaufort West. The CGS team met with leaders of the Central Karoo District Municipality and Beaufort West Local Municipality, then consulted with community members. Drilling began in September 2020 and by the end of the financial year, had progressed to a depth of more than 2 000m.

Several agreements were reached between the CGS and stakeholders in response to the Intergovernmental Relations Framework and the District Development Model championed by the Presidency. The agreements involved the:

- Housing Development Agency
- South African National Roads Agency SOC Ltd
- Petroleum Agency of South Africa
- UThukela District Municipality
- ORGEM and the Ministry of Mineral Resources and Energy (South Africa) and Ministry of Energy and Mines (Central African Republic)

Corporate social responsibility:

- Branded face masks were donated to stakeholders such as Beaufort West Local Municipality, Mpumalanga Department of Economic Development and Tourism, AbaThembu Royal Council, AmaZizi Traditional Council, Central Karoo District Municipality, Mopani District Municipality and King Sabatha Dalindyebo Local Municipality.

An invitation was disseminated to various stakeholders and on social media platforms to promote the CGS conference

A Youth Month campaign was held to acknowledge the roles of the youth in various CGS business units

Stakeholder engagement during a multistakeholder meeting to discuss the Maluti-a-Phofung groundwater study

a) CGS staff involved in aerobics during the wellness day at head office.

b) Staff participating in a fun walk at the Bellville regional office.

Dr Taufeeq Dhansay conducting a presentation during a CCUS technical workshop

The CAR delegation visited the CGS National Core Library to learn about the hyperspectral scanner and its applications after the signing of a memorandum of cooperation between the CGS and ORGEM

CEO Mosa Mabuza participating in a PDAC panel discussion during the Fasken annual seminar series with the DMRE

14. BBBEE COMPLIANCE PERFORMANCE INFORMATION

The information below is presented to comply with the broad-based black economic empowerment (BBBEE) requirements of the BBBEE Act of 2013 determined by the Department of Trade, Industry and Competition.

Table 12. BBBEE compliance performance information

Has the department/public entity applied any relevant code of good practice (BBBEE certificate levels 1 to 8) to the following:		
Criteria	**Response Yes/No**	**Discussion (include a discussion on your response and indicate what measures have been taken to comply)**
Determining qualification criteria for the issuing of licences, concessions or other authorisations for economic activity in terms of any law?	No	If Yes, please attach Qualification Criteria as well as the compliance report of implementation thereof in the Annual Report
Developing and implementing a preferential procurement policy?	No	If Yes, please attach Preferential Procurement Policy as well as the compliance report of implementation thereof in the Annual Report
Determining qualification criteria for the sale of state-owned enterprises?	No	If Yes, please attach Qualification Criteria as well as the compliance report of implementation thereof in the Annual Report
Developing criteria for entering into partnerships with the private sector?	No	If Yes, please attach Qualification Criteria as well as the compliance report of implementation thereof in the Annual Report
Determining criteria for the awarding of incentives, grants and investment schemes in support of broad-based black economic empowerment?	No	If Yes, please attach Qualification Criteria as well as the compliance report of implementation thereof in the Annual Report

CGS geoscientists working on a hyperspectral scanner at the National Core Library in Donkerhoek

PART D:
Human Resources Management

This section presents key focus areas of the Human Resources department for the year under review, including training and transformation initiatives.

It also includes:

- Performance measurement systems to assess performance;
- Management of employee wellness to ensure the health and wellbeing of staff;
- Key human resources activities for the year;
- Human capital challenges;
- Human resources goals, and
- Human resources statistics.

The CGS regards its staff members as a resource pivotal to the delivery of its strategic objectives. To this end, the Human Resources department is a strategic partner in the organisation whose role is to ensure that the CGS attracts and retains the required resources and expertise to carry out its legislative mandate and strategic objectives.

Remote field campsite on the Namib coastline, north of Luderitz, Namibia

1. OVERVIEW OF HUMAN RESOURCES MATTERS

1.1 STAFF COMPLEMENT

The CGS boasts a staff complement of 442 across six regions. Of these, 58% are in core (scientific) functions and 42% in support functions, which essentially translates to two support staff for every three core/scientific employees. This ratio is in line with other science councils. The organisation invests significantly in youth and women employment, with 30% of the workforce falling in the youth cohort and females constituting 48% of staff, as depicted in Figure 29 below.

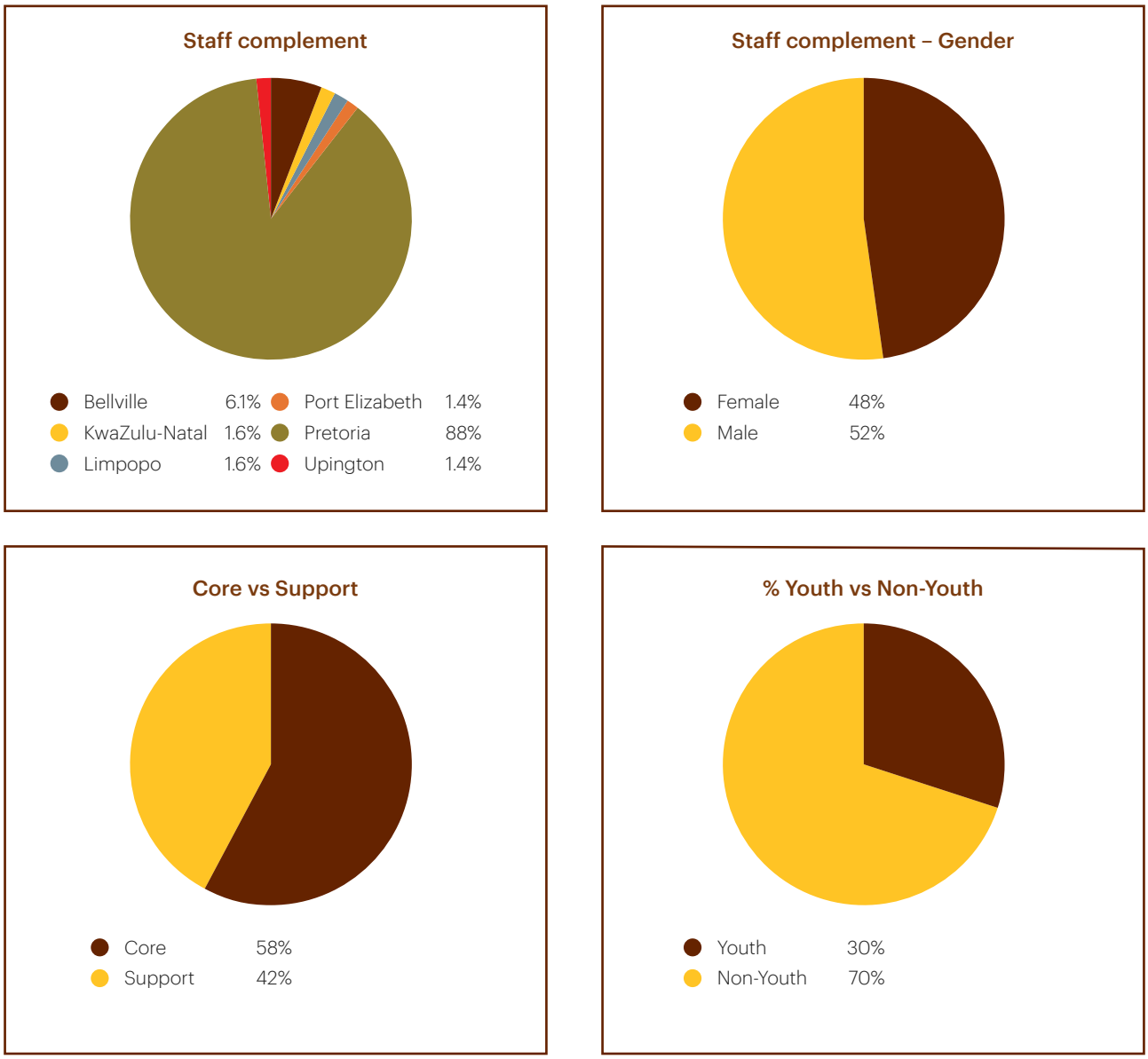


Figure 29. Composition of CGS staff complement

The COVID-19 pandemic has been a test of character for employees and organisations alike. The CGS's first response to the pandemic was to do everything in its power to protect the health, safety and wellbeing of employees, and by extension their loved ones. A COVID-19 committee was established and, guided by the World Health Organization and national authorities, management immediately implemented health and safety protocols by providing remote tools of trade, restricting the number of people in boardrooms, insisting

on physical distancing and distributing sanitisers and personal protective equipment across offices. A wellness service provider was brought on board to help employees with their physical, emotional and mental wellbeing. Extensive wellbeing interventions were commissioned, including counselling and support services.

The organisation will continue to be vigilant, mindful that the pandemic persists and will probably continue to dominate lives and thinking for at least another year. The pandemic has, however, presented new opportunities for the organisation to contribute to the economic recovery plan of the country by collaborating with various stakeholders.

1.2 KEY HUMAN RESOURCES ACTIVITIES DURING THE YEAR

- As winter sets in from the first quarter of any financial year, it is expected that more and more colleagues will be exposed to flu viruses. In anticipation, management hosted a successful Wellness Day during the last quarter of 2020/21. The programme included teambuilding exercises, voluntary testing for conditions such as HIV, blood pressure and glucose, and – critical amid the COVID-19 pandemic – flu shots.
- Key staff addressed the economic recovery programme of the government and prepared for the implementation of the GTP.
- As a national key point, the CGS must vet new recruits before appointment. Social media checks were performed for certain management, and marketing and communications positions.

1.3 KEY ACHIEVEMENTS

- An awareness campaign was launched to encourage employees to disclose any disabilities. The campaign increased the number of colleagues living with disabilities by 0.6% from 1.7% to 2.3%. Management will continue to encourage disclosure while supporting those with disabilities and also dispelling the perception that disability is restricted only to physical disability.
- Thirty-eight employees registered as bursars for the 2021 academic year, 53% of whom are women (six of the eight PhD bursars). This demonstrates management's commitment to 'growing its own timber' by investing in its internal talent pool, particularly females.
- The Mining Qualification Authority allocated R720 000 to enrol six CGS employees for a Management Development Programme. Candidates have been identified, including labour representatives, half of whom are women. The group has enrolled at Unisa, which offers the course at degree-equivalent National Qualifications Framework level 7.
- A business partnering model was introduced through which each human resources business partner is assigned a business unit. The partners have first-hand knowledge of the business unit, attend its monthly meetings, provide a one-stop service to the business to ensure workforce planning, and assist in first-line employee relations matters, probation, performance management and employee wellness, among others.
- The CGS is an implementing agent of the CCUS project with both organisations involved in extensive consultation, with affected employees. In line with Section 197 of the Labour Relations Act 66 of 1995, employees transferred to the CGS were given the same terms and conditions of their previous contracts, including remuneration. An agreement signed by the institute, the CGS and the employees ensured effective and seamless transition.

1.4 STAFF TURNOVER ANALYSIS

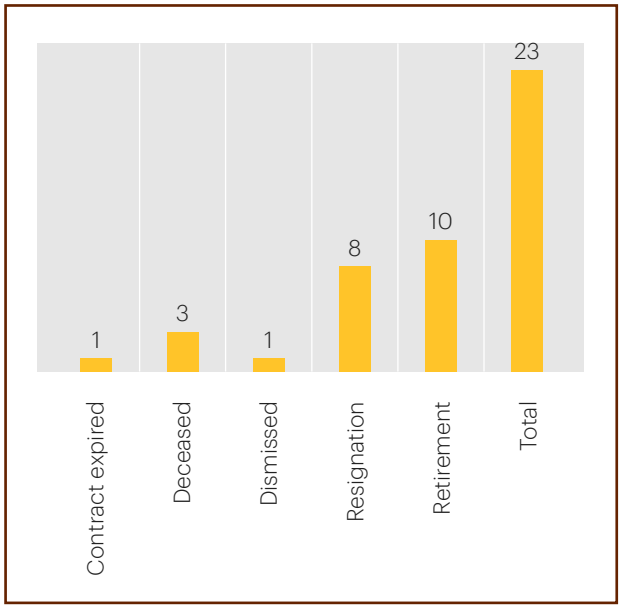


Figure 30. Staff turnover

Employee turnover measures the percentage of employees who left the CGS during the year under review, as well as the rate of filling the vacancies. The year ended with turnover remaining below 6%, lower than the 10% target. This rate is attributed to retention initiatives such as learning and development and to filling vacant positions within three months. Voluntary employee turnover (resignations) was 35%, with 44% of terminations being retirement. As reflected in the figure below, 56% of all terminations were from the support cohort, with 75% of the voluntary terminations (resignations) also from the support group. This is expected as the job market has greater demand for support staff than for scientists.

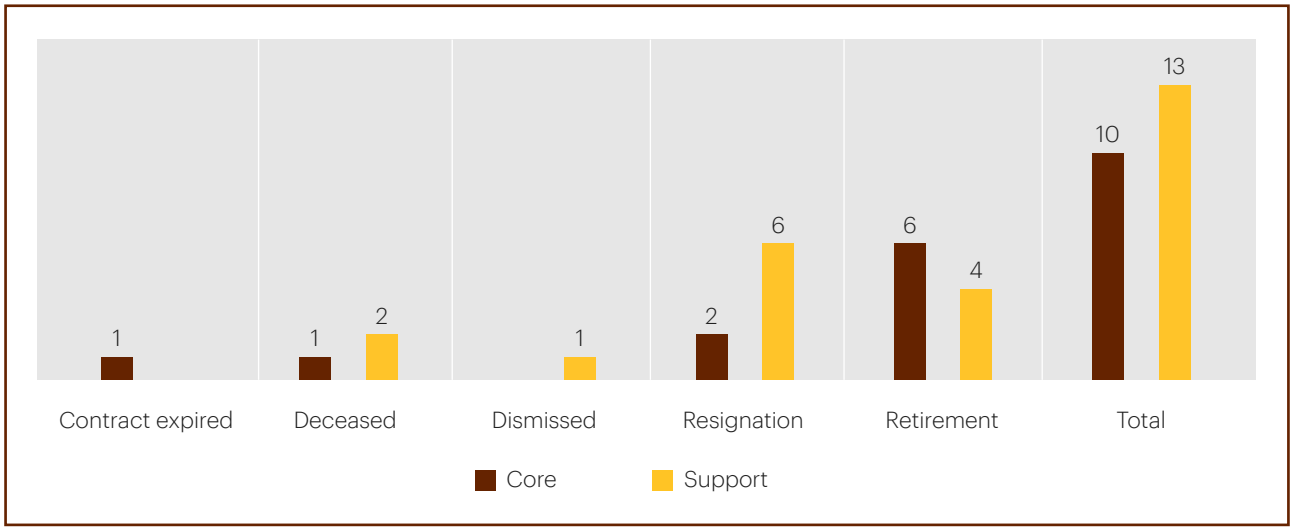


Figure 31. Turnover for support and core staff

1.5 OVERALL EMPLOYEE TENURE

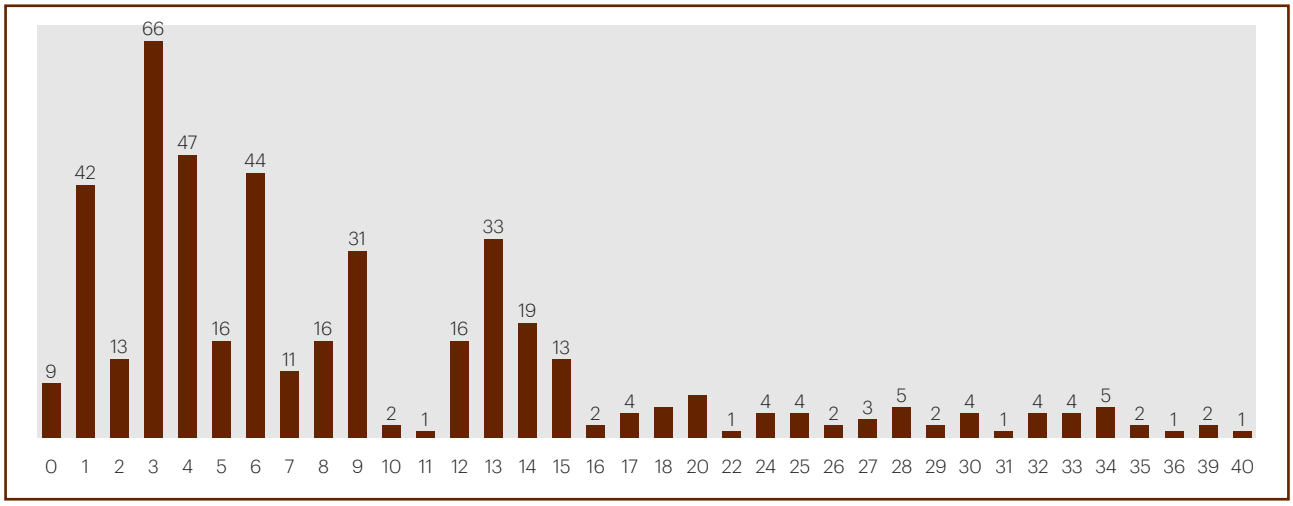


Figure 32. Overall employee tenure

About 56% of the workforce have a tenure of five years or more at the CGS. While longer-tenured employees have knowledge of the organisation's culture, services and mandate, a precarious balance of new hires is equally important as they bring new and fresher ideas and often question the status quo. The CGS is fortunate to have a blend of the two cohorts.

1.6 GROWING OWN TIMBER

Management is able to prepare for involuntary termination, or retirement. The figure below shows that 27 employees will retire in the next three years and 51 students will complete their studies. A skills audit will be conducted to identify skills that will be lost, skills that will remain and skills in the pipeline (full-time bursars). This will inform training needs and workforce planning to meet business exigencies.

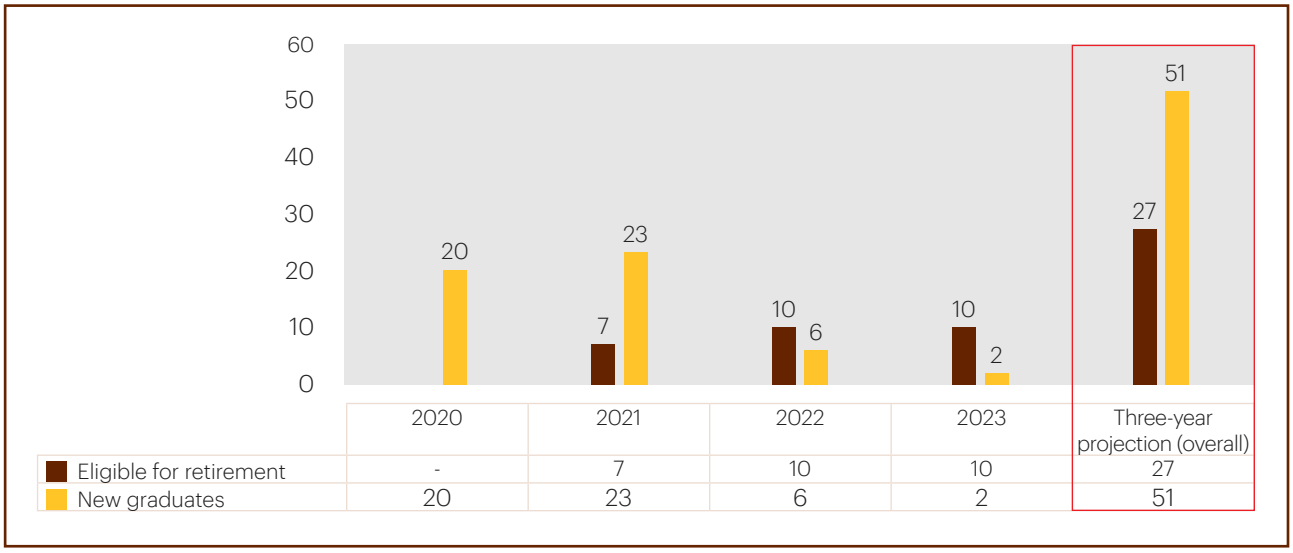


Figure 33. Talent pipeline

1.7 WORKFORCE AGE ANALYSIS

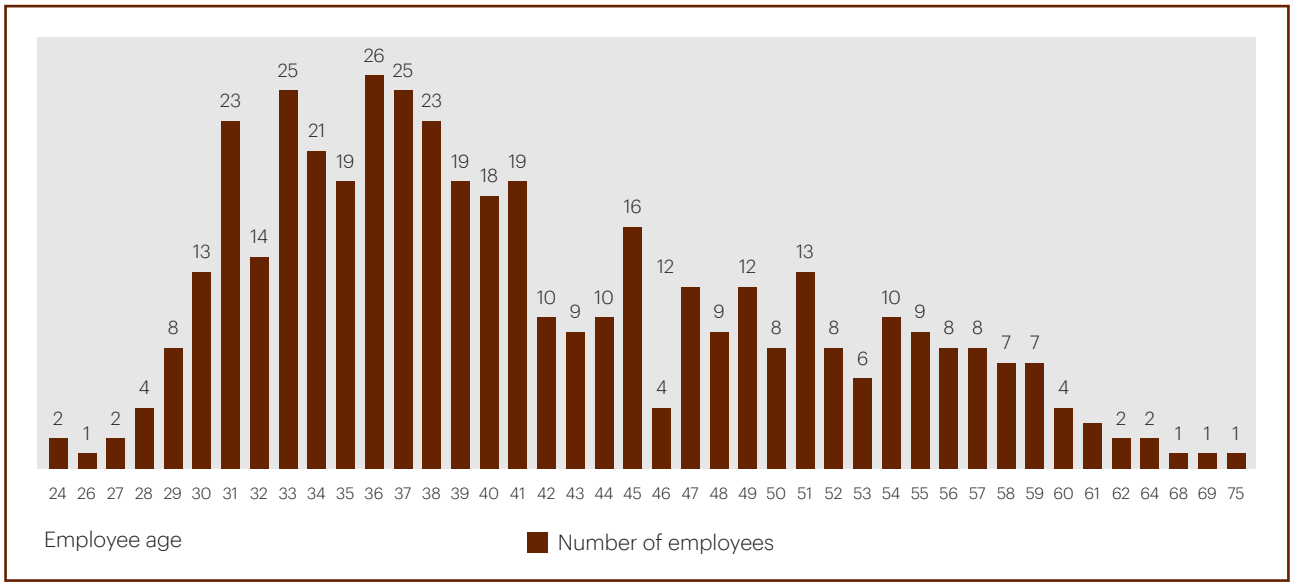
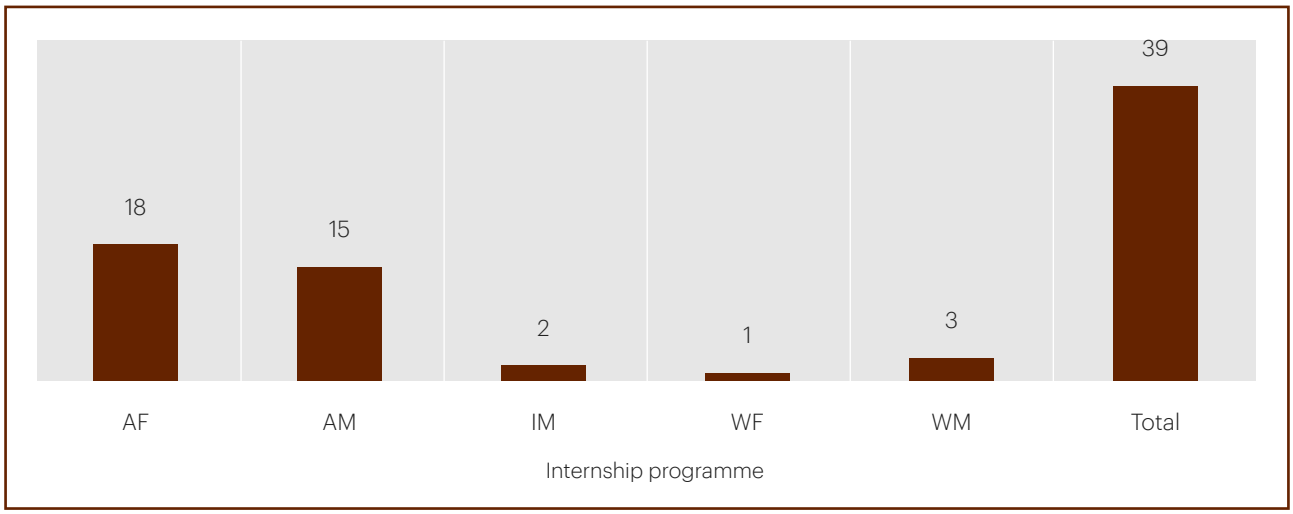


Figure 34. Age analysis

About 30% of the workforce are youth, which presents a timely opportunity to plan for skills transfer. In line with business continuity and the skills audit, a formal mentorship and coaching programme will be spearheaded by the human resources business partners.

1.8 INTERNSHIP PROGRAMME

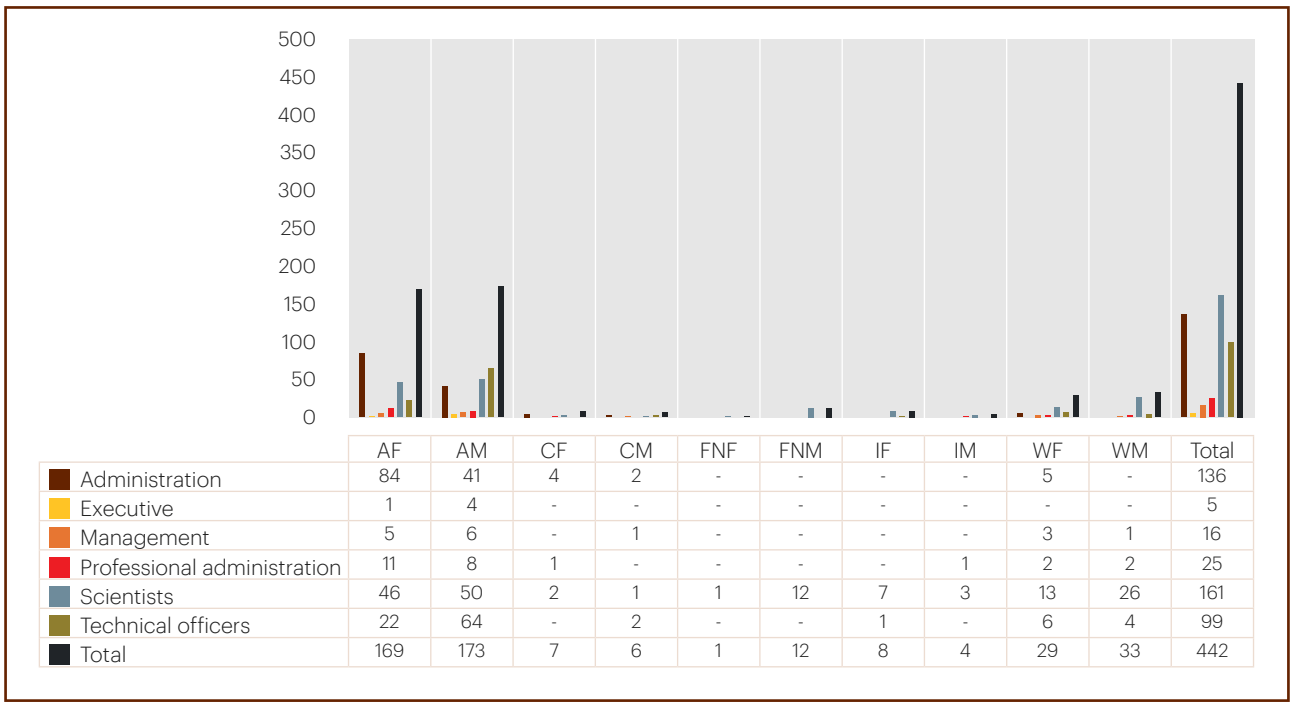
The figure below shows internship programme figures for the year under review.



AF – African female; AM – African male; IM – Indian male; WF – White female; WM – White male

Figure 35. Internship programme

The CGS currently has 39 interns on a programme that runs for two years. Forty-nine percent of the interns are placed at core, with the balance in support functions. The programme gives graduates much-needed practical exposure to increase their prospects of employment. The CGS plans to trace and track all interns from the programme who found formal employment.



	AF	AM	CF	CM	FNF	FNM	IF	IM	WF	WM	Total
Administration	84	41	4	2	-	-	-	-	5	-	136
Executive	1	4	-	-	-	-	-	-	-	-	5
Management	5	6	-	1	-	-	-	-	3	1	16
Professional administration	11	8	1	-	-	-	-	1	2	2	25
Scientists	46	50	2	1	1	12	7	3	13	26	161
Technical officers	22	64	-	2	-	-	1	-	6	4	99
Total	169	173	7	6	1	12	8	4	29	33	442

AF – African female; AM – African male; CF – Coloured female; CM – Coloured male; FNF Foreign national female; FNM – Foreign national male; IF – Indian female; IM – Indian male; WF – White female; WM – White male

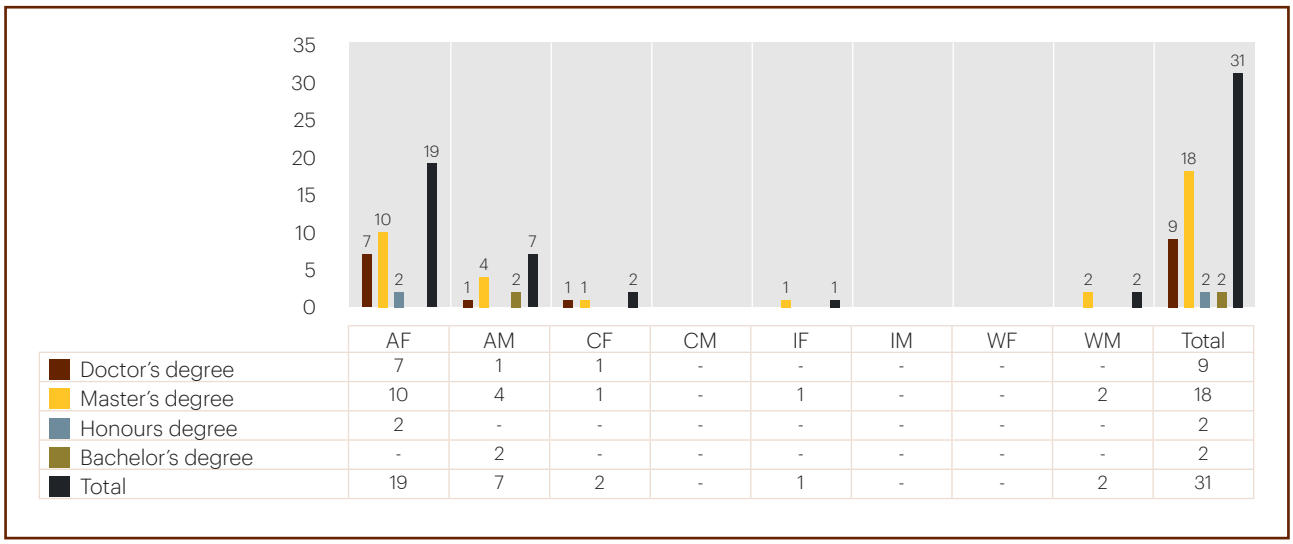
Figure 36. Workforce profile: Demographics by race, gender and job category

While gender parity has been achieved at organisational level, representation in key and strategic roles is still lacking. Noticeably, 50% of African females occupy administrative roles, while a meagre 3.6% are in management positions. Management is considering 'fair discrimination' in line with the Employment Equity Plan to ensure that more African females are appointed in critical positions.

1.9 BURSARIES

1.9.1 FULL-TIME BURSARS

The external full-time bursary programme supports talented students from previously disadvantaged backgrounds who cannot afford tertiary education. In the 2020 academic year, 31 students were supported. Figure 37 profiles the full-time bursars for the year under review.



	AF	AM	CF	CM	IF	IM	WF	WM	Total
Doctor's degree	7	1	1	-	-	-	-	-	9
Master's degree	10	4	1	-	1	-	-	2	18
Honours degree	2	-	-	-	-	-	-	-	2
Bachelor's degree	-	2	-	-	-	-	-	-	2
Total	19	7	2	-	1	-	-	2	31

AF – African female; AM – African male; CF – Coloured female; CM – Coloured male; IF – Indian female; IM – Indian male; WF – White female; WM – White male

Figure 37. Full-time bursars

Of the 31 full-time bursars, 61% are African females and 22% are African males. Seventy-eight percent of the nine full-time PhD bursars are African females. While these numbers are palatable, they are not mirrored in the CGS workforce.

1.9.2 PART-TIME BURSARS

The bursary scheme allows employees to apply for study support in courses they want to pursue as part of their career development. Bursaries provided to employees for under- and postgraduate studies in the 2020/21 financial year totalled R2.5 million and benefitted 38 employees. Figure 38 shows the part-time bursars for the year under review.

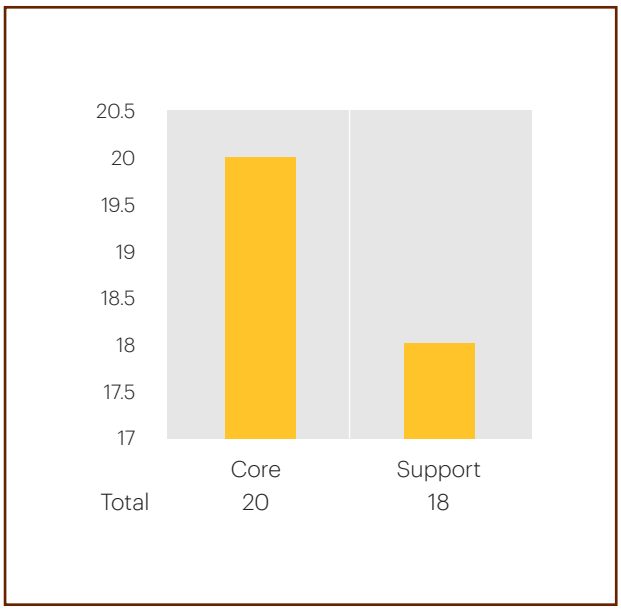


Figure 38. Breakdown of part-time bursars

The part-time bursary programme is integral to CGS career development and retention strategies. There were 38 new part-time bursars in the review year across business units. Eight core bursars and 12 support bursars – 53% of the total – are females, with 47% male. This is another demonstration of 'growing own timber' to ensure gender parity.

Figure 39 shows the 16 part-time bursars for PhD and Master's degrees for the year. Of the eight PhDs, 75% are females. There is only one female Master's bursar. Of the Master's bursars, 75% are African.

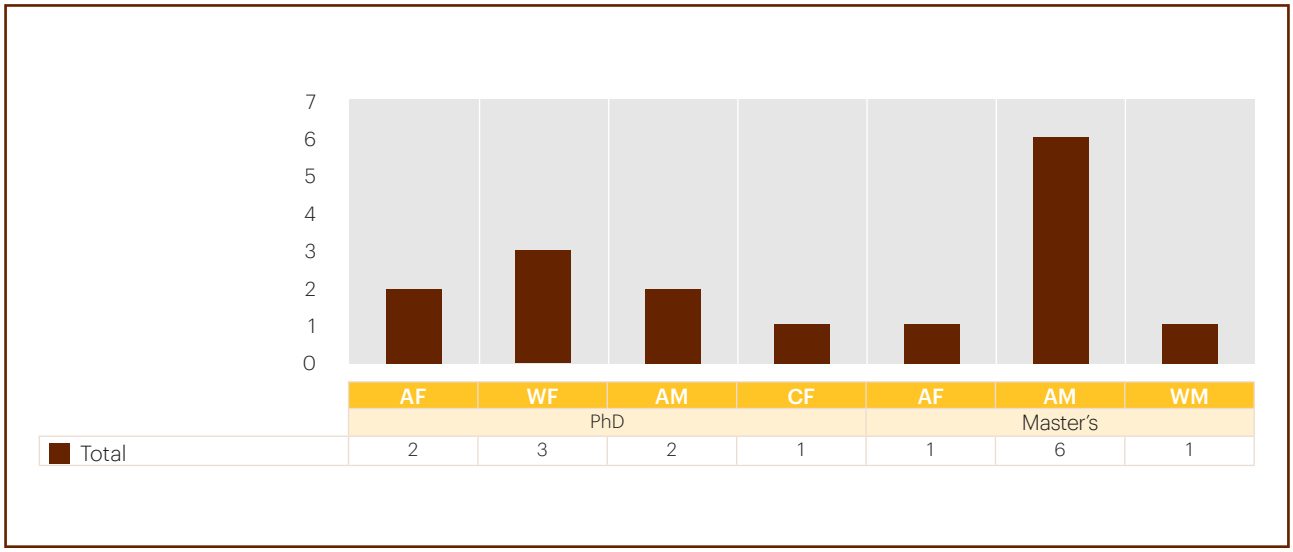


Figure 39. Part-time PhD and Master's bursars

1.10 TRAINING INTERVENTIONS COMPLETED DURING THE YEAR

Training topic	Number of employees trained
Gravity and Remote Sensing	9 employees
Diverse Corporate Training Solutions	3 employees
Health and Safety Representatives	19 employees 1 employee
First-aider Level 1	10 employees 31 employees
Auditing Governance, Strategy, Ethics and Risk Management	2 employees
Quality Assurance and Improvement Programme	1 employee
Creating Pyhtins Script ArcGIS	5 employees
Geoscience Analysis – Introduction	15 employees
Geoscience Analyst Online Training	12 employees
Effective Stakeholder Management	1 employees
Report Writing Skills	1 employee
Combined Assurance – Internal Auditors	2 employees

1.11 INVESTING IN YOUTH

> "Harmonious relations at the heart of business success

MS MUFA NEMUDZIVHADI

When did you join the CGS?
I joined in 2011 as a unit administrator.

What did you want to do when you were in matric?
I wanted to be an attorney.

How did the CGS assist you in fulfilling your dreams?
The CGS funded my law studies at Unisa. My executive, Dr Jonty Tshipa, assigned me to a development and mentoring programme within his employee relations section. I remained under his mentorship and supervision throughout the programme.

What is your current role?
My current role is Employee Relations Officer.

What does the role entail and what about it is rewarding?
The role is fostering a harmonious relationship between management and employees. It is rewarding in that it involves developing policies and strategies that contribute to human rights principles such as dignity, fairness, respect and equality in the workplace. These are important principles in a democratic South Africa.

How is your role linked to the CGS's strategic objectives?
The CGS pledges to discharge its technical mandate in a way that supports transformation and national developmental imperatives. The employee relations officer helps to drive transformation goals by ensuring compliance with the Employment Equity Act and other guidelines and legislations.

What challenges you?
The ongoing balance between the protection of workers' rights and their contractual obligations.

With hindsight, would you have chosen a different career?
No. I find employment law very rewarding.

How would you encourage:

- ***Youngsters wanting to follow your career?***
  I would tell them to follow this career path only if they have a passion for complex legal tasks and an aversion to comfort zones.
- ***Ambitious CGS employees below your level?***
  Hold on tight to your dreams and keep working to fulfil them.

"Bridging the gap between planetary wealth and health

DR THAKANE NTHOLI

When did you join the CGS?
On 4 January 2016.

What did you want to do when you were in matric?
I wanted to be an environmental scientist.

How did the CGS assist you in fulfilling your dreams?
When I was at university, I realised that my dream was to strike a balance between enjoying the earth's precious resources and preserving the environment. This is exactly what I get to do at the CGS. By leading and participating in projects related to mine water remediation and the coexistence of mining and the environment, I bridge the gap between the wealth and health of the planet.

What is your current role?
Manager: Water and Environment Unit.

What does the role entail and what about it is rewarding?
My role entails creating and leading a skilled and motivated team in the Water and Environment Unit. It is also to enable the team to execute projects and to contribute to the strategy of the CGS. The rewarding part about my role is witnessing the growth, development and success of my team. Knowing that with every project we contribute to better management of the water resources and environment is fulfilling.

How is your role linked to the CGS's strategic objectives?
I ensure the successful execution of the projects that contribute to the CGS mandate. I am the link between executive management and the scientific team.

What challenges you?
Conceptually, the misunderstanding that mining and the environment cannot coexist. As a manager, I want to build a team with a long-term vision, a team that sees beyond the current financial year or medium-term expenditure framework cycle.

With hindsight, would you have chosen a different career?
No, I love what I do.

How would you encourage:

- ***Youngsters wanting to follow your career?***
  You need to know what drives you, but you don't need to have it all figured out. You just need to do your best where you are and take opportunities as they come. Invest in yourself and take pride in your work, as it will forever speak for you.
- ***Ambitious CGS employees who are below your level?***
  The vision of the CGS is achieved through the contribution of each and every employee. In working together and supporting one another we thrive. Additionally, the CGS offers unique opportunities for growth and development – make the best of them.

"Analysis and assessment just what the doctor ordered for Nontobeko

MS NONTOBEKO MAGWAZA

When did you join the CGS?
On 1 September 2016.

What did you want to do when you were in matric?
I wanted to study MBChB, but when I was accepted by the University of the Witwatersrand, my father did not approve this choice. He said I was too young to move to Gauteng as he believed that life was too fast for me to survive. I enrolled at the University of Natal (now University of KwaZulu-Natal) for a Bachelor's.

How did the CGS assist you in fulfilling your dreams?
The CGS believed in me by appointing me as a Section Head: Environmental. It also sponsored my final year Master's studies. A few years later the CGS entrusted me with an acting business unit manager role, which was a life-changing career development opportunity for me. I learnt a great deal about management, strategy planning and implementation, finance and human resources. I believe this exposure transformed me from a scientist to a manager and I was appointed a unit manager. In addition, the CGS is funding my PhD studies and also enrolled me for a management development programme.

What is your current role?
Business Unit Manager: Analytical Services.

What does the role entail and what about it is rewarding?
I manage the operations of a geoscience laboratory and a team of highly qualified scientists and skilled technicians in the application of the latest scientific technology, providing accurate and timeous analytical results that meet client needs and ISO 17025 requirements. The position also includes providing professional technical advice, project management, writing technical reports, people management, stakeholder engagement, performance management and budget control.

Most rewarding are developing my team, especially those previously disadvantaged, applying conflict management to contribute to positive results, and knowing that analytical data produced in our laboratories has an impact on the recovery and growth of the country's economy.

How is your role linked to the strategic objectives of the CGS?
My main role in the analytical services unit is to support the GTP, which is part of implementing the IMMP. We offer analytical services and advice for various GTP projects. I also ensure that the laboratories are equipped with state-of-the-art analytical instruments, and that my team has the knowledge, skills and analytical techniques to execute the analytical services strategy aligned with the CGS organisational strategy.

What challenges you?

My role is demanding and time management is crucial. I put in additional hours, but when I acknowledge that I can't do everything myself, I delegate some tasks to my team. ISO 17025 keeps me awake. Our laboratories are not yet ISO 17025 accredited nor ISO 9001 certified. However, my team is working with other business units to implement the requirements of these ISO standards in readiness for accreditation and certification.

With hindsight, would you have chosen a different career?

No. I'm actually glad that medicine didn't happen. Science is an interesting career filled with new opportunities and discoveries. However, it is quite a complex and sophisticated field that requires one to think critically, and analyse and assess a problem or situation.

How would you encourage:

- ***Youngsters wanting to follow your career?***
  You must have a passion for science, technology, engineering and maths (STEM) skills. Many countries still face a shortage of skills in science, especially in governments, industries, academia and research institutions. I encourage young people, especially women, to consider a STEM career to bridge this gap. Women are under-represented in STEM-related roles.

- ***Ambitious CGS employees who are below your level?***
  Be focused, acquire knowledge and skills that are relevant to your career goals and get a mentor to coach and guide you. Use your skills in different CGS business units when required. Understand the policies, values, mission, culture and strategy of the CGS – where it's heading and how your role impacts on its performance. Lastly, ethics, respect and humility are key in working with your team members.

From scientist to Head of Strategy

DR VALERIE NXUMALO

When did you join the CGS?
In November 2007 as a junior geologist in the Central Regions Mapping Unit.

What did you want to do when you were in matric?
I thought of becoming an Information Technology Specialist or an Engineer. However, during my matric year, my sister, who is a Metallurgist made me aware of Geology. Around the same period, my father brought a Sowetan newspaper in 2001 which, had an article on 'Mining course for women'. The article caught my attention as it illuminated the role of Geology and encouraged women to be part of the mining industry. Consequently as a result of the influence from an article and support from my family, I chose geology as a career and I have never regretted that choice.

How did the CGS assist you in fulfilling your dreams?
The CGS has ensured that I participate in different geoscience projects and has allowed me to further my studies. I obtained my Master's in Geology at the University of the Witwatersrand in 2011 and my PhD in Geology at the University of Johannesburg in 2020 with CGS support. I am proud to say that the government of South Africa, through the CGS, continues to produce high-calibre geologists, some of whom are now experts in poorly studied Karoo-aged basins such as the Springbok Flats Basin. In addition, the CGS enrolled me in a mentorship programme, on which I was a protégé to some senior management team members from the economic geology and strategic management units.

My rising through the CGS ranks would not have been possible without the support of the management team, my mentors and my university supervisors. These people saw my passion for geology (mostly understanding the fault-controlled Karoo-aged basins) and the broader business of the CGS. They recognised my dedication and how I could contribute to the growth of the organisation.

What is your current role?
Manager of the Strategic Management Office.

What does the role entail and what about it is rewarding?
As Manager of the Strategic Management Office, I am responsible for strategic and business planning, Board support, special projects and other corporate activities. I also partner with all levels of leadership and work effectively with key stakeholders across all functions. I am able to contribute to the bigger picture of the CGS and the realisation of its impacts and outcomes, through understanding the strategy and business. I constantly learn more about strategic management, the alignment of strategic plans with national developmental imperatives and the goals of the DMRE and also how a strategy addresses societal challenges broadly. This position also allows me to engage with stakeholders such as the CGS Board, DMRE and DPME, Auditor-General, Parliament and other government departments.

How is your role linked to the CGS's strategic objectives? The Strategic Management Office is a crucial business function of the CGS as it entails evaluating current strategic focus/goals, vision, impact, outcomes and future business plans.

What challenges you?
Advising the CGS to continue developing and implementing excellent strategies that will enable the geosciences to have a positive impact and outcome in society in the short-, medium- and long term.

With hindsight, would you have chosen a different career?
No – being a geologist in South Africa means that the country has capable people who can help the government to achieve its goals.

How would you encourage:

- ***Youngsters wanting to follow your career?***

It is important to have a vision, follow your passion and choose a career of your choice. Geology is important for South Africa and the continent. Africa is continuously developing and it is enriched with mineral deposits. The geology profession should find innovative solutions to address the challenges our continent and the world face.

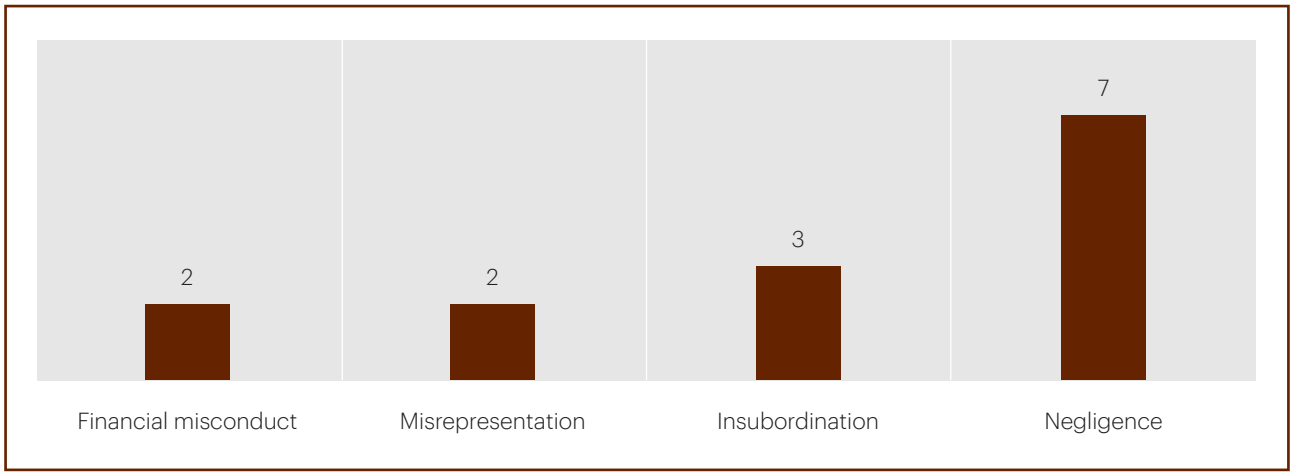
- ***Ambitious CGS employees who are below your level?***

Be focused, passionate and contribute to the geosciences by working in the different projects or programmes of the CGS. Develop yourself at the CGS, as it offers great opportunities to all employees to contribute to achieving its strategic goals.

Outcrops of pegmatites in the Northern Cape Province

1.12 EMPLOYEE RELATIONS

During the year under review, various misconduct cases and grievances were lodged. The most prevalent transgression was negligence, followed by insubordination, financial misconduct and misrepresentation. The organisation counselled employees to conform to its norms. Training on how to manage discipline in the workplace will be rolled out in 2021/22.



1.13 SAFETY AND LOST TIME INJURY

Two injury-on-duty cases were reported during the review year and steps are being taken to prevent recurrence.

1.14 PLANNED ACTIVITIES FOR 2021/22

The following activities are ongoing and will be rolled out in 2021/22:

- Track and trace interns after CGS exposure
- Remuneration model review
- Automation of recruitment and performance systems
- Recognition of prior learning
- Ongoing review of policies
- Probation management process mapped and to be rolled out
- Organisation-wide skills audit
- New organisational structure implementation/migration
- Human resources processes and procedure documentation (ISO9001)
- Staff induction.

1.15 CHALLENGES

Baseline grants have dwindled in recent years, which has prevented the organisation from offering in-service training to its bursars and graduate programmes on completion of studies. The situation was exacerbated by COVID-19, which has reduced the baseline by R90 million. Management, with Board support, is exploring other options to augment the revenue stream.

PART E:
FINANCIAL INFORMATION

This part of the report provides insight into the financial wellness of the organisation and covers the following aspects:

- The statement of responsibility for the Annual Financial Statements of the year ended 31 March 2021, signed by the CEO, Mr M Mabuza, and the Chairperson of the Board, Dr H Mathe;
- The report of the CEO, which includes the general financial review and matters related to the proposed activities, retention of surplus, supply chain management, audit report and plans for the future;
- Report of the Auditor-General to Parliament on the CGS. This report gives an opinion regarding the fairness of the Annual Financial Statements in presenting the organisation's financial position, financial performance, cash flow in accordance with SA Standards of GRAP and requirements of the PFMA in all material aspects. It reports on performance on legal and regulatory compliance, internal control and related matters, and
- The Annual Financial Statements, comprising the Statement of Financial Position, Statement of Financial Performance, Statement of Changes in Net Assets, Cash Flow Statement and Notes to the Financial Statements.

CGS geoscientists working on a hyperspectral scanner at the National Core Library in Donkerhoek

1. STATEMENT OF RESPONSIBILITY

Statement of responsibility for the Annual Financial Statements for the year ended 31 March 2021

The Board is responsible for the preparation of the Annual Financial Statements of the CGS and the judgments made in this information.

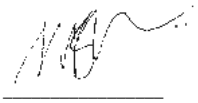
It is the responsibility of the Accounting Authority to establish and implement a system of internal controls designed to provide reasonable assurance of the integrity and reliability of the Annual Financial Statements.

In our opinion, the financial statements fairly reflect the operations of the CGS for the financial year ended 31 March 2021.

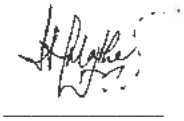
The external auditors are engaged to express an independent opinion on the Annual Financial Statements of the CGS.

The Annual Financial Statements of the CGS for the year ended 31 March 2021 have been audited by the external auditors, and their report is presented on pages 138 to 141.

The Annual Financial Statements of the CGS set out on pages 142 to 177 have been approved.



Mr M Mabuza
Chief Executive Officer
Council for Geoscience
31 July 2021



Dr H Mathe
Chairperson
Board of the Council for Geoscience
31 July 2021

2. CHIEF FINANCIAL OFFICER'S REPORT

CHIEF FINANCIAL OFFICER
Mr Leonard Matsepe

'In the midst of COVID-19 pandemic constraints, the CGS appropriately reorganised its geoscience programme to contribute to the national economic recovery plan. The annual financial statements echoed this fervid commitment'

Background

The Council for Geoscience is listed as a Schedule 3A Public Entity in terms of the Public Finance Management Act, Act No 1 of 1999. The objectives underlying the establishment of the CGS are to develop and publish world-class geoscience knowledge products and to render geoscience-related services to the South African public and industry.

Financial position

A steady balance sheet position with an average growth rate of 7% has been maintained over the last 12 years. The CGS boasts total assets to the value of R741.4 million and a liquidity ratio of 1.4: 1 in the reported financial year.

Property and equipment

An investment to the amount of R49.3 million was made in property, equipment and intangible assets during the year. Continued investment in scientific infrastructure and equipment remains a priority to ensure that world-class facilities and equipment are acquired and maintained.

Cash flow management

The cash and cash equivalents increased from R232 million in 2020 to R358,3 million in 2021, resulting in a net cash inflow of R126.3 million. This investment was made to support the acceleration of economic recovery through the implementation of the geoscience programme.

Going concern

The CGS's Annual Financial Statements have been prepared on the going-concern basis. Executive management has performed a formal review of the CGS's ability to continue as a going concern in the foreseeable future and based on this review, considers that the presentation of the financial statements on this basis is appropriate.

Events after the reporting date

The Geoscience Act regulations, which aims to provide clarity and give effect to the principal Acts (the Geoscience Act No 100 of 1993 and the Geoscience Amendment Act No 16 of 2010), from which CGS derives its mandate to be the custodian and curator of all geoscience information in South Africa, were gazetted for public comment. Responses received from the wider geoscientific community are being considered.

Request for the retention of surplus

In terms of Section 53(3) of the PFMA of 1999, the CGS has to obtain approval from National Treasury to retain surpluses. Approval was obtained for the use of accumulated surpluses for the maintenance of and investment in scientific equipment and infrastructure, and the implementation of the repositioning strategy. A new request will be made for the year under review.

Supply chain management

The Supply Chain Management Unit is operational under the division of the Chief Financial Officer. This business unit provides an appropriate procurement and provisioning system, which is fair, equitable, transparent, competitive and cost-effective, and is established in accordance with Section 54 of the PFMA of 1999 (as amended by Act No 29 of 1999). In terms of BBBEE, Section 13G (1) of the B-BBEE Act, the CGS complied with Management control and Enterprise Supplier Development.

Audit report matters

Matters raised in the audit report of the Auditor-General are given due attention to ensure attainment of unqualified audit opinions. The CGS obtained an unqualified audit opinion from the Auditor-General for the year ended 31 March 2021 and will continue to enhance the internal control environment.

Financial sustainability

In order to ensure financial sustainability, the CGS is deliberate in exploiting its vast geoscience information, knowledge and scientific prowess to develop apposite value propositions worthy of both fiscal and commercial investment.

1. REPORT OF THE AUDITOR-GENERAL TO PARLIAMENT ON THE COUNCIL FOR GEOSCIENCE

Report on the audit of the financial statements

Opinion

1. I have audited the financial statements of the Council for Geoscience set out on pages 142 to 177, which comprise the statement of financial position as at 31 March 2021, the statement of financial performance, statement of changes in net assets and cash flow statement for the year then ended, as well as notes to the financial statements, including a summary of significant accounting policies.

2. In my opinion, the financial statements present fairly, in all material respects, the financial position of the Council for Geoscience as at 31 March 2021, and its financial performance and cash flows for the year then ended in accordance with the Standards of Generally Recognised Accounting Practice (Standards of GRAP) and the requirements of the Public Finance Management Act of South Africa, 1999 (Act No. 1 of 1999).

Basis for opinion

3. I conducted my audit in accordance with the International Standards on Auditing (ISAs). My responsibilities under those standards are further described in the auditor-general's responsibilities for the audit of the financial statements section of my report.

4. I am independent of the public entity in accordance with the International Ethics Standards Board for Accountants' *International code of ethics for professional accountants (including International Independence Standards)* (IESBA code) as well as other ethical requirements that are relevant to my audit in South Africa. I have fulfilled my other ethical responsibilities in accordance with these requirements and the IESBA code.

5. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Emphasis of matter

6. I draw attention to the matters below. My opinion is not modified in respect of these matters.

Write off work in progress: HVAC

7. As disclosed in note 12 to the financial statements, material losses of R18 496 000 was incurred as a result of write-off of work in progress relating to the HVAC project.

Restatement of corresponding figures

8. As disclosed in note 24 of the financial statements, the corresponding figures for 31 March 2020 were restated as a result of an error in the financial statements of the public entity at, and for the year ended, 31 March 2021.

Responsibilities of the accounting authority for the financial statements

9. The accounting authority is responsible for the preparation and fair presentation of the financial statements in accordance with the standards of GRAP and the requirements of the PFMA and for such internal control as the accounting authority determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

10. In preparing the financial statements, the accounting authority is responsible for assessing the entity's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless the appropriate governance structure either intends to liquidate the entity or to cease operations, or has no realistic alternative but to do so.

Auditor-general's responsibilities for the audit of the financial statements

11. My objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance but is not a guarantee that an audit conducted in accordance with the ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

12. A further description of my responsibilities for the audit of the financial statements is included in the annexure to this auditor's report.

Report on the audit of the annual performance report

Introduction and scope

13. In accordance with the Public Audit Act 25 of 2004 (PAA) and the general notice issued in terms thereof, I have a responsibility to report on the usefulness and reliability of the reported performance information against predetermined objectives for selected programme presented in the annual performance report. I performed procedures to identify material findings but not to gather evidence to express assurance.

14. My procedures address the usefulness and reliability of the reported performance information, which must be based on the entity's approved performance planning documents. I have not evaluated the completeness and appropriateness of the performance indicators included in the planning documents. My procedures do not examine whether the actions taken by the entity enabled service delivery. My procedures do not extend to any disclosures or assertions relating to the extent of achievements in the current year or planned performance strategies and information in respect of future periods that may be included as part of the reported performance information. Accordingly, my findings do not extend to these matters.

15. I evaluated the usefulness and reliability of the reported performance information in accordance with the criteria developed from the performance management and reporting framework, as defined in the general notice, for the following selected programme presented in the entity's annual performance report for the year ended 31 March 2021:

Programme	Pages in the annual performance report
Programme 4 – Delivery of the mandate	48 – 49

16. I performed procedures to determine whether the reported performance information was properly presented and whether performance was consistent with the approved performance planning documents. I performed further procedures to determine whether the indicators and related targets were measurable and relevant, and assessed the reliability of the reported performance information to determine whether it was valid, accurate and complete.

17. I did not identify any material findings on the usefulness and reliability of the reported performance information for this programme:

    - Programme 4 – Delivery of the mandate

Other matter

18. I draw attention to the matter below.

Achievement of planned targets

19. Refer to the annual performance report on pages 32 to 56 for information on the achievement of planned targets for the year and management's explanations provided for the under/over achievement of targets.

Report on the audit of compliance with legislation

Introduction and scope

20. In accordance with the PAA and the general notice issued in terms thereof, I have a responsibility to report material findings on the public entity's compliance with specific matters in key legislation. I performed procedures to identify findings but not to gather evidence to express assurance.

21. The material findings on compliance with specific matters in key legislation are as follows:

Annual financial statements

22. The financial statements submitted for auditing were not prepared in accordance with the prescribed financial reporting framework, as required by section 55(1)(b) of the PFMA. Material misstatements on property, plant and equipment and related parties disclosure note were identified by the auditors on the submitted financial statements. These were corrected, which resulted in the financial statements receiving an unqualified opinion.

Expenditure management

23. Effective steps were not taken to prevent fruitless and wasteful expenditure amounting to R18 496 000, as disclosed in note 23 to the annual financial statements, as required by section 51(1)(b)(ii) of the PFMA. All of the fruitless and wasteful expenditure was caused by ineffective contract management on the HVAC project.

Other information

24. The accounting authority is responsible for the other information. The other information comprises the information included in the annual report, which includes the audit committee's report. The other information does not include the financial statements, the auditor's report and those selected programmes presented in the annual performance report that have been specifically reported in this auditor's report.

25. My opinion on the financial statements and findings on the reported performance information and compliance with legislation do not cover the other information and I do not express an audit opinion or any form of assurance conclusion on it.

26. In connection with my audit, my responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements and the selected programme presented in the annual performance report, or my knowledge obtained in the audit, or otherwise appears to be materially misstated.

27. If based on the work I have performed, I conclude that there is a material misstatement in this other information, I am required to report that fact.

28. I have nothing to report in this regard.

Internal control deficiencies

29. I considered internal control relevant to my audit of the financial statements, reported performance information and compliance with applicable legislation; however, my objective was not to express any form of assurance on it. The matters reported below are limited to the significant internal control deficiencies that resulted in the findings on compliance with legislation included in this report.

30. Management did not implement adequate controls to ensure that the annual financial statements are prepared in accordance with the applicable framework and supported by accurate, complete and reconciled supporting schedules. There were material misstatements identified on property, plant and equipment and related parties disclosure note, which were subsequently adjusted, resulting in material non-compliance with the PFMA.

31. Management did not ensure that adequate contract management is implemented to avoid fruitless and wasteful expenditure, resulting in material non-compliance with the PFMA.

Auditor-General

Pretoria
31 July 2021

AUDITOR-GENERAL
SOUTH AFRICA
Auditing to build public confidence

ANNEXURE – AUDITOR-GENERAL'S RESPONSIBILITY FOR THE AUDIT

1. As part of an audit in accordance with the ISAs, I exercise professional judgement and maintain professional scepticism throughout my audit of the financial statements and the procedures performed on reported performance information for selected programmes and on the entity's compliance with respect to the selected subject matters.

Financial statements

2. In addition to my responsibility for the audit of the financial statements as described in this auditor's report, I also:

    - identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error; design and perform audit procedures responsive to those risks; and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations or the override of internal control
    - obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control
    - evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the accounting authority
    - conclude on the appropriateness of the accounting authority's use of the going concern basis of accounting in the preparation of the financial statements. I also conclude, based on the audit evidence obtained, whether a material uncertainty exists relating to events or conditions that may cast significant doubt on the ability of CGS to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements about the material uncertainty or, if such disclosures are inadequate, to modify my opinion on the financial statements. My conclusions are based on the information available to me at the date of this auditor's report. However, future events or conditions may cause an entity to cease operating as a going concern
    - evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and determine whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation

Communication with those charged with governance

3. I communicate with the accounting authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

4. I also provide the accounting authority with a statement that I have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on my independence and, where applicable, actions taken to eliminate threats or safeguards applied.

4. ANNUAL FINANCIAL STATEMENTS FOR THE YEAR ENDED 31 MARCH 2021

STATEMENT OF FINANCIAL POSITION

Annual Financial Statements as at 31 March 2021

	Notes	2021 R'000	2020 (Restated) R'000
Assets			
Non-current assets			
		360 533	348 912
Property and equipment	3	335 804	330 015
Intangible assets	4	7 167	1 335
Heritage assets	27	17 562	17 562
Current assets		380 895	271 316
Inventories	5	5	5
Trade and other receivables from exchange transactions	7	22 528	39 298
Cash and cash equivalents	8	358 362	232 013
Total assets		741 428	620 228
Net assets and liabilities			
Accumulated surplus		448 408	449 181
Non-current liabilities			
Post-employment benefit liabilities	6	11 260	9 254
Current liabilities		281 760	161 793
Trade and other payables	9	56 943	28 444
Deferred income	10	191 345	108 151
Accruals	11	33 472	25 199
Total net assets and liabilities		741 428	620 228

STATEMENT OF FINANCIAL PERFORMANCE

for the period ended 31 March 2021

	Notes	2021 R'000	2020 (Restated) R'000
Total Revenue		**525 878**	**489 277**
Revenue from exchange transactions	12	272 185	290 738
Revenue from non-exchange transactions	12	253 693	198 539
Total cost of projects		**(194 862)**	**(165 672)**
Cost of commercial projects	12	(14 932)	(22 698)
Cost of statutory projects	12	(179 930)	(142 975)
Gross surplus		**331 016**	**323 605**
Administrative expenses		(312 196)	(254 938)
Other operating expenses	12	(19 580)	(3 600)
Surplus from operations		**(759)**	**65 067**
Finance cost	13	(14)	(20)
Net deficit/surplus for the year		**(773)**	**65 047**

STATEMENT OF CHANGES IN NET ASSETS

for the period ended 31 March 2021

	Notes	Accumulated surplus R'000	Total R'000
Opening balance at 31 March 2019		**389 746**	**389 746**
Net loss for the period		(5 611)	(5 611)
Restated balance at 31 March 2019		**384 134**	**384 134**
Net surplus for the period		60 946	60 946
Correction of prior period error	25	4 101	4 101
Restated net surplus for the period		65 047	65 047
Restated balance at 31 March 2020		**449 181**	**449 181**
Net surplus for the period		(773)	(773)
Balance at 31 March 2021		**448 408**	**448 408**

CASH FLOW STATEMENT

for the period ended 31 March 2021

	Notes	2021 R'000	2020 (Restated) R'000
Cash inflow from operating activities		175 058	69 275
Cash receipts from customers		525 901	550 588
Cash paid to suppliers and employees		(363 398)	(504 622)
Cash generated from operations	14	162 503	45 966
Interest received	12	12 569	23 329
Finance cost	13	(14)	(20)
Cash outflow from investing activities		(48 710)	(90 844)
Acquisition of:			
Property and equipment	15,1	(41 912)	(93 828)
Intangible assets	15,2	(7 431)	(306)
Proceeds from sale of asset	12	29	874
Insurance proceeds for property and equipment	3,1	604	2 416
Net increase/(loss) in cash and cash equivalents		126 349	(21 569)
Cash and cash equivalents at beginning of period	8	232 013	253 582
Cash and cash equivalents at end of period	8	358 362	232 013

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

1 Accounting policies

1,1 Basis of preparation

Statement of compliance

1. The financial statements have been prepared in accordance with the Standards of Generally Recognised Accounting Practices (GRAP) including any interpretations, guidelines and directives issued by the Accounting Standards Board.

The financial statements have been prepared on a historic cost basis and accounting policies are consistent with prior years.

These annual financial statements have been prepared on a going concern basis, i.e. the assumption that the Council for Geoscience will continue to operate as a going concern for at least the next twelve months.

2. The cash flow statement has been prepared in accordance with the direct method.

3. Specific information is presented separately on the statement of financial position 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.

The budget reporting standard does not apply to the Council for Geoscience as our budget is tabled as part of the Department of Mineral Resources and Energy budget.

1,2 Revenue recognition

Revenue comprises the revenue from non-exchange transactions recognised as income in the current year, contract income and sales of publications.

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.

1,2,1 Revenue from non-exchange transactions

The Council for Geoscience receives grants in the form of a baseline allocation from the Department of Mineral Resources and Energy.

Revenue from non-exchange transactions is recorded as deferred income when it is received. It is then recognised as income proportionate to the costs incurred.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

1,2,2 Revenue from exchange transactions

Revenue from exchange transactions comprises sales and contract revenue as follows:

Sales revenue

Sales revenue represents the invoiced value of goods and services supplied by the Council for Geoscience. This revenue is recognised when the revenue recognition criteria are met.

Contract revenue

Revenue from contracts is recognised by means of progress payments over the duration of the contracts. Revenue from contracts in progress is recognised when the revenue criteria are met. When the outcome of a contract can be estimated reliably, revenue is recognised by referring to the stage of completion of the contract outcome.

1,3 Interest received

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

1,4 Property and equipment

Property and equipment are tangible non-current assets that are held for use in the production or supply of goods or services, or for administrative purposes, and are expected to be used during more than one period.

The cost of an item of property and equipment is recognised as an asset when:

- it is probable that future economic benefits associated with the item will flow to the Council for Geoscience; and
- the cost of the item can be measured reliably.

Land and buildings were valued at initial recognition and subsequently only the building is depreciated on a straight-line method.

Costs include costs incurred initially to acquire or construct an item of property and equipment and costs incurred subsequently to add to, replace part of, or service it. If the cost of a replacement part is recognised in the carrying amount of an item of property and equipment, the carrying amount of the replaced part is derecognised.

Property and equipment are carried at cost less accumulated depreciation and any impairment losses.

Day to day expenses incurred on property and equipment are expensed directly to surplus or deficit for the period.

Where an asset is acquired at no cost, or at a nominal cost, its cost is its fair value as at date of acquisition.

Major refurbishment that meets the recognition criteria of an asset is capitalised.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

Depreciation is provided on all property and equipment other than freehold land, to write down the cost, less residual value, on a straight line basis over their average useful lives, as follows:

Land	Not depreciable
Buildings	30 years
Motor vehicles	5 to 10 years
Equipment	5 to 10 years
Aircraft and helicopter – body	15 years
Aircraft and helicopter – components	Useful hours as per Civil Aviation Authority
Boat	10 years
Office furniture	20 to 23 years
Computer equipment	6 to 11 years
Specialised equipment	15 years

The depreciation charges for each period are recognised in the statement of financial performance, unless it is included in the carrying amount of another asset.

The average useful lives and residual values are reviewed on an annual basis and changes are reflected as change in accounting estimates on a prospective basis.

1,5 Intangible assets

An intangible asset is recognised when:

- it is probable that the expected future economic benefits that are attributable to the asset will flow to the entity; and
- the cost of the asset can be measured reliably.

Capitalised computer software is carried at cost less accumulated amortisation and less accumulated impairment losses. Computer software is tested annually for impairment or changes in estimated future benefits. Amortisation is provided to write down the intangible assets to their residual value, on a straight-line basis, being two to eight years.

Research and development

Expenditure on research activities is recognised as an expense in the period in which it is incurred.

An internally generated intangible asset arising from research and development is recognised as part of intangible assets only if all of the following conditions are met:

- an asset is created that can be identified;
- it is probable that the asset created will generate future economic benefits;
- the development cost of the asset can be measured reliably.

Where no internally generated intangible asset can be recognised, development expenditure is recognised as an expense in the period in which it is incurred. Internally generated assets are amortised on a straight-line basis over their useful lives.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

1,6 Heritage assets

Heritage assets are assets held for their cultural, environmental or historical significance. Heritage assets are initially recognised at deemed cost, which has been determined, due to the nature of heritage assets, by specialist valuators. Heritage assets are reflected at deemed cost and are not depreciated. At each reporting date, heritage assets are assessed for indications of impairment. If any such indication exists, an estimate of the recoverable amount or the recoverable service amount of the heritage assets will be determined and tested against the carrying amount.

1,7 Inventories

The Council for Geoscience is a custodian of scientific information that produces publications in the form of books, maps and map explanations etc. These publications are distributed to the public for free or at a nominal charge.

Inventories are initially measured at deemed costs (fair value).

1,8 Translation of foreign currencies

Foreign currency transactions

A foreign currency transaction is recorded, on initial recognition in Rands, by applying to the foreign currency amount the spot exchange rate between the Rand and the foreign currency at the date of the transaction.

At each balance sheet date:

- foreign currency monetary items are translated using the closing rate.

Exchange differences arising on the settlement of monetary items or on translating monetary items at rates different from those at which they were translated on initial recognition during the period or in previous annual financial statements are recognised in the statement of financial performance in the period in which they arise.

Cash flows arising from transactions in a foreign currency are recorded in Rands by applying to the foreign currency amount the exchange rate between the Rand and the foreign currency at the date of the cash flow.

1,9 Deferred income

Deferred Income is accounted for in the statement of financial position. The related revenue is recognised on an accrual basis in the statement of financial performance in the period in which it satisfies the revenue recognition criteria.

1,10 Retirement benefit costs

Short-term employee benefits

The cost of short-term employee benefits (those payable within twelve months after the service is rendered, such as bonuses, paid vacation leave and sick leave) is recognised in the period in which the service is rendered and is not discounted.

The expected cost of compensated absences is recognised as an expense as the employees render services that increase their entitlement or, in the case of non-accumulating absences, when the absence occurs.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

Defined contribution and defined benefit plans

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. The qualifying plan asset of this scheme is held and administered by Momentum Group Limited.

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) exceed 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.

1,11 Provisions and contingent liabilities

Provisions are recognised when:

- the entity has a present obligation as a result of a past event;
- it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation; and
- a reliable estimate can be made of the obligation.

The amount of a provision is the present value of the expenditure expected to be required to settle the obligation.

Commitments

The Council for Geoscience classifies commitments as contracted future transactions that are non-cancellable or only cancellable at significant cost, and that will normally result in the outflow of cash. This excludes steady routine transactions such as salary commitments relating to employment contracts or social security benefits.

A distinction is made between operational and capital commitments.
Disclosure is made of the aggregate amount of operational and capital expenditure contracted for at the reporting date, to the extent that the amount has not been recorded in the financial statements.
If a commitment is for a period longer than a year, it is stated in the note to the commitments.
Disclosure of expenditure that has been approved, but that has not yet been contracted for, is made.

1,12 Financial instruments

Initial recognition

The entity classifies financial instruments, or their component parts, on initial recognition as a financial asset, a financial liability or an equity instrument in accordance with the substance of the contractual arrangement.

Financial assets and liabilities are recognised on the entity's statement of financial position when the Council for Geoscience becomes party to the contractual provisions of the instrument.

Financial assets and liabilities are recognised initially at fair value.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

Derecognition of financial instruments

The entity derecognises a financial asset only when the contractual rights to the cash flows from the asset expire, or it transfers the financial asset and substantially all the risks and rewards of ownership of the asset to another entity.

The entity derecognises financial liabilities when the entity's obligations are discharged, cancelled or they expire.

Impairment of loans and receivables

Financial assets are assessed for indicators of impairment at each balance sheet date. Financial assets are impaired where there is objective evidence that, as a result of one or more events that occurred after the initial recognition of the financial asset, the estimated future cash flows of the investment have been impacted.

The carrying amount of trade receivables is reduced through the use of an allowance account (bad debt provision). When a trade receivable is considered uncollectible, it is written off against the allowance account. Subsequent recoveries of amounts previously written off are credited against the allowance account. Changes in the carrying amount of the allowance account are recognised in surplus or deficit.

Fair values of trade and other payables are determined at a price charged at transaction date and impaired when indicators of impairment are present. At period end there were no differences between the book value and the fair values of trade and other payables.

Fair value of trade and other receivables

Fair values of trade and other receivables are determined at a price charged at transaction date and impaired when indicators of impairment are present. At period end there were no differences between the book value and the fair values of trade and other receivables because of the short-term maturity.

Financial assets carried at amortised cost

Loans and receivables are measured at amortised cost less any impairment losses recognised to reflect irrecoverable amounts. Impairment is determined on a specific basis, whereby each asset is individually evaluated for impairment indicators. Write-offs of these assets are expensed in surplus or deficit.

Cash and cash equivalents

Cash and cash equivalents are short-term, highly liquid investments that are readily convertible to known amounts of cash. Cash and cash equivalents are measured at fair value.

Financial liabilities carried at amortised cost

Trade and other payables are initially measured at fair value and are subsequently measured at amortised cost.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

1,13 Operating leases

Leases of assets under which all the risks and rewards of ownership are effectively retained by the lessor are classified as operating leases. Lease payments under an operating lease are recognised as an expense on a straight-line basis over the lease term.

Any contingent rents are expensed in the period they are incurred.

1,14 Impairment

The Council for Geoscience identifies cash generating assets as assets that are managed with the objective of generating a commercial return, and non-cash generating assets as assets that do not generate market related cash flows from that asset .

The entity assesses at each balance sheet date whether there is any indication that an asset may be impaired. If there is any indication that an asset may be impaired, the recoverable amount is estimated for the individual asset. The recoverable amount of an asset is the higher of fair value less assumed costs to sell and its value in use.

If the recoverable amount of an asset is less than its carrying amount, the carrying amount of the asset is reduced to its recoverable amount. That reduction is an impairment loss recognised immediately in surplus or deficit.

At each reporting date the entity assesses impairment losses recognised in prior years for continued existence or decreases. If such indication exists, the recoverable amounts of those assets are estimated. The increase in the carrying amount of an asset attributable to a reversal of an impairment loss does not exceed the carrying amount that would have been determined had no impairment loss been recognised for the asset in prior periods. A reversal of an impairment loss of assets carried at cost less accumulated depreciation or amortisation is recognised immediately in surplus or deficit.

1,15 Critical accounting estimates and judgements

Provision for bad debts

Past experience indicates a reduced prospect of collecting debtors over the age of four months. Debtor balances are regularly assessed by management and provided for in line with the policy.

Provisions

Provisions were raised and management determined an estimate based on the information available and in line with the policy.

Property and equipment

Management has made certain estimations with regard to the determination of estimated useful lives and residual values of items of property and equipment.

Leases

Management has applied its judgement to classify all lease agreements that the entity is party to as operating leases, as they do not transfer substantially all risks and ownership to the entity. Furthermore, as the operating lease in respect of premises is only for a relatively short period of time, management has made a judgement that it would not be meaningful to classify the lease into separate components for the land and for the buildings for the Polokwane office current lease, and the agreement will be classified in its entirety as an operating lease.

ACCOUNTING POLICIES

for the Annual Financial Statements for the year ended 31 March 2021

1,16 Sources of estimation uncertainty

There are no key assumptions concerning the future and other key sources of estimation uncertainty at the balance sheet date that could have a significant risk of causing material adjustment to the carrying amounts of assets and liabilities within the next financial year.

1,17 Irregular expenditure

Irregular expenditure is recorded in the notes to the financial statements when confirmed. The amount recorded is equal to the value of the irregular expenditure incurred, unless it is impractical to determine, in which case reasons therefore must be provided in the notes. Irregular expenditure receivables are measured at the amount that is expected to be recovered and are de-recognised when settled or written-off as irrecoverable.

1,18 Fruitless and Wasteful Expenditure

Fruitless and Wasteful Expenditure is expenditure that was made in vain and would have been avoided had reasonable care been exercised. Fruitless and wasteful expenditure where identified is accounted for in the related year. The expenditure is accordingly classified with its nature, and where subsequently recovered, it is accounted for as income in surplus or deficit.

1,19 Post-reporting date events

Events after the reporting date are those events, both favourable and unfavourable, that occur between the reporting date and the date when the financial statements are authorised for issue. Two types of events can be identified:

- Those that provide evidence of conditions that existed at the reporting date (adjusting events after the reporting date)
- Those that are indicative of conditions that arose after the reporting date (non-adjusting events after the reporting date).

The Council for Geoscience will adjust the amounts recognised in the financial statements to reflect adjusting events after the reporting date once the event occurred.

The Council for Geoscience will disclose the nature of the event and estimate its financial effect or a statement that such estimate cannot be made in respect of all material non-adjusting events, where nondisclosure could influence the economic decisions of users taken on the basis of the financial statements.

1,20 Related party transactions

Individuals as well as their close family members, and/or entities are related parties if one party has the ability, directly or indirectly, to control or jointly control the other party or exercise significant influence over the other party in making financial and/or operating decisions. Management is regarded as a related party and comprises the Board Members and Senior management. Related party transfers/ payments of appropriated funds, specific-purpose allocations, etc. would generally fall under the disclosure exemption in GRAP 20, and such transfers and allocations are therefore part of the normal supplier and/or client/recipient relationships and are therefore not disclosed.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

2 New standards and interpretations

2,1 2.1 Standards and interpretations issued, but not yet effective

The Council for Geoscience has not applied the following standards and interpretations, which have been approved but are not yet effective for accounting periods 2020/2021:

GRAP statement	Description	Impact	Effective date
GRAP 25	Employee Benefits	None	To be determined
GRAP 104	Financial instruments (revised)	None	To be determined

3 Property and equipment

2021	Land R'000	Buildings and Fixtures R'000	*Equipment R'000	Office furniture R'000	Aircraft and Boat R'000	Motor vehicles R'000	Computer equipment R'000	Total R'000
Gross carrying amount	18 231	210 421	196 458	13 325	23 555	26 900	54 176	543 066
Accumulated depreciation at the beginning of the period	(1 600)	(68 618)	(99 302)	(8 744)	(9 284)	(13 058)	(12 445)	(213 051)
Opening net carrying amount at 31 March 2021	**16 631**	**141 803**	**97 156**	**4 581**	**14 271**	**13 842**	**41 731**	**330 015**
Movements during the period:								
Work in progress (refer to note 3.2)	-	24 665	(27 167)	-	(1 282)	-	(6 032)	(9 816)
Acquisitions	-	-	33 269	982	2 585	-	14 990	51 826
Reversal of impairment	-	315	-	-	-	-	-	315
Disposals	-	-	(10)	(40)	-	(1)	(119)	(170)
Disposals - Cost	-	-	(102)	(181)	-	(1)	(199)	(483)
Disposals - Depreciation	-	-	92	141	-	-	80	313
Depreciation	-	(6 341)	(22 494)	(720)	(507)	(2 605)	(3 699)	(36 366)
Closing net carrying amount at 31 March 2020	**16 631**	**160 442**	**80 755**	**4 803**	**15 067**	**11 236**	**46 870**	**335 804**
Gross carrying amount	18 231	235 086	202 459	14 126	24 859	26 899	62 934	584 593
Accumulated depreciation/ impairment	(1 600)	(74 644)	(121 704)	(9 322)	(9 792)	(15 663)	(16 064)	(248 789)

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

3 Property and equipment (continued)

Property and equipment (continued)

2020	Land R'000	Buildings and Fixtures R'000	*Equipment R'000	Office furniture R'000	Aircraft and Boat R'000	Motor vehicles R'000	Computer equipment R'000	Total R'000
Gross carrying amount	18 231	195 082	166 001	13 315	22 348	29 264	20 552	464 793
Accumulated depreciation at the beginning of the period	(1 960)	(65 334)	(90 541)	(8 382)	(10 286)	(13 695)	(14 543)	(204 741)
Opening net carrying amount at 31 March 2019	**16 271**	**129 748**	**75 460**	**4 933**	**12 062**	**15 569**	**6 009**	**260 052**
Movements during the period:								-
Work in progress (refer to note 3.2)	-	14 854	27 045	-	1 282	-	29 810	72 991
Reversal of impairment	360	2 881	-	-	-	-	-	3 241
Acquisitions	-	485	10 718	356	-	872	8 406	20 837
Disposals	-	-	(2 221)	(82)	(7)	(524)	(348)	(3 182)
Disposals - Cost	-	-	(7 306)	(346)	(75)	(3 236)	(4 592)	(15 555)
Disposals - Depreciation	-	-	5 085	264	68	2 712	4 244	12 373
Adjustments	-	-	-	-	1 036	-	-	1 036
Depreciation	-	(6 165)	(13 846)	(626)	(102)	(2 075)	(2 146)	(24 960)
Closing net carrying amount at 31 March 2020	**16 631**	**141 803**	**97 156**	**4 581**	**14 271**	**13 842**	**41 731**	**330 015**
Gross carrying amount	18 231	210 421	196 458	13 325	23 555	26 900	54 176	543 066
Accumulated depreciation/ impairment	(1 600)	(68 618)	(99 302)	(8 744)	(9 284)	(13 058)	(12 445)	(213 051)

* Equipment in the tables above include the following categories of equipment: Specialised Equipment, Audio & Visual, Technical Equipment,Office Equipment and Scientific Equipment

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.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

3 Property and equipment (continued)

Location	Fair value at date of transfer R'000
474 Carl Street, Town Lands 351JR, Pretoria West	R2 800
280 Pretoria Street, Silverton, Pretoria	R94 000

The value of these properties has been included in the carrying amount of land and buildings as at 31 March 2020 and was determined by an independent valuator.

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

	2021 R'000	2020 R'000
3,1 Compensation from third parties for property and equipment lost		
Proceeds from insurance	604	2 416

3,2 Property and equipment in the process of being constructed

Cumulative expenditure recognised in the carrying value of property and equipment being developed/constructed

	Buildings and Fixtures R'000	*Equipment R'000	Aircraft and Boat R'000	Total R'000
Gross carrying amount	46 916	57 132	2 322	106 370
Opening net carrying amount at 31 March 2019	46 916	57 132	2 322	106 370
Movement	24 665	(33 199)	(1 282)	(9 816)
Closing net carrying amount at 31 March 2020	71 581	23 933	1 040	96 555

Property and equipment in the process of being constructed with delays

Included in the work in progress for buildings and fixtures is a carrying amount of R36,649m in respect of a ventilation system in the Silverton building that has been delayed.

	Buildings and Fixtures R'000
Gross carrying amount	36 649
Opening net carrying amount at 31 March 2020	36 649
Movement	22 944
Closing net carrying amount at 31 March 2021	59 593

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
3	**Property and equipment (continued)**		
3,3	**Property and equipment continued**		
	Repairs and maintenance expenditure incurred for the year to repair and maintain property and equipment		
	Repairs and maintenance		
	Land and Buildings	4 751	2 931
	Office Equipment and Furniture	4	27
	Technical and Scientific Equipment	2 482	1 947
	Specialised Equipment	-	-
	Computer Equipment	163	99
	Aircraft	127	777
		7 527	5 781
4	**Intangible assets**		
	Computer software		
	Gross carrying amount	9 501	9 865
	Accumulated amortisation	(8 166)	(8 310)
	Opening net carrying amount at 31 March 2020	1 335	1 555
	Movements during the period:		
	Acquisitions	7 333	306
	Disposals	-	(2)
	Disposals - Cost	-	(671)
	Disposals - Amortisation	-	669
	Amortisation	(1 501)	(526)
	Closing net carrying amount at 31 March 2021	7 167	1 335
	Gross carrying amount	16 833	9 501
	Accumulated amortisation	(9 666)	(8 166)
5	**Inventories**		
	Publication inventories	5	5
6	**Retirement benefit**		

6,1 Post-retirement medical-aid fund (PRM)

The Council for Geoscience has made provision for the medical-aid fund covering all its qualifying employees. All eligible employees are members of the defined benefit scheme. To improve management of this defined benefit scheme the Council for Geoscience established a qualifying plan asset in October 2010 which is held and administered by Momentum Group Limited and evaluated annually as at 31 March.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

6 Retirement benefit (continued)

	2021 R'000	2020 R'000
The amount recognised in the statement of financial performance is determined as follows:		
Current service costs	37	48
Interest charge	2 562	2 074
Expected return on planned assets	(1 541)	(1 517)
Actuarial (gain)/loss recognised	949	3 947
Recognition of loss on asset realisation	(1)	(2 959)
	2 006	**1 593**

The amount included in the statement of financial position arising from Council for Geoscience obligation in respect of PRM is as follows:

	2021	2020	2019	2018	2017
Present value of fund obligations	26 070	24 348	(15 094)	25 565	23 084
Fair value of planned assets	(14 810)	(15 094)	8 035	(17 530)	(15 034)
Liability recognised in statement of financial position	11 260	9 254	(7 059)	8 035	8 050

Movement in net liability during the period is as follows:	2021 Liability	2021 Planned asset	2021 Net	2020 Liability	2020 Planned asset	2020 Net
Liability at beginning of period	24 348	-	24 348	24 214	-	24 214
Value of planned assets at beginning of period	-	(15 094)	(15 094)	-	(16 553)	(16 553)
	24 348	(15 094)	9 254	24 214	(16 553)	7 661
Interest charge/expected return of planned asset	2 562	(1 541)	1 021	2 074	(1 517)	557
Contributions received	-	(1)	(1)	-	(2 959)	(2 959)
Current service costs	37	-	37	48	-	48
Benefits paid	(2 311)	2 311	-	(2 179)	2 179	-
Actuarial (gain)/loss	1 434	(485)	949	191	3 756	3 947
Closing balance	26 070	(14 810)	11 260	24 348	(15 094)	9 254

Contributions expected to be paid

Top up payments are expected to be made during the 2022 financial year

Expected rate of return on assets	9,43%
Assumptions	
Discount rates	9,43%
Basis of discount rates: JSE zero coupon bond yield after the market closed on 31 March 2021	
Return on assets	9,43%
Expected salary increases	5,00%
Health care cost inflation rate	7,35%

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

6 Retirement benefit (continued)

Sensitivity analysis-on accrued liability (R Millions) for the year ending 31 March 2021

Assumption	Change	In service	Continuation	Total	Change
Central assumptions	-	2,123	23,947	26,070	-
Health care inflation	1%	2,465	25,795	28,260	8%
	-1%	1,842	22,296	24,138	-7%
Discount rate	1%	1,849	22,339	24,188	-7%
	-1%	2,462	25,776	28,238	8%
Post retirement mortality	-1 year	2,193	25,005	27,198	4%
Average retirement date	-1 year	2,161	23,947	26,108	0%
Continuation of membership at retirement	-10%	1,912	23,947	25,859	-1%

The table above indicates, for example that if medical inflation is 1% greater than the long-term assumptions made, the liability will be 8% higher than that shown.

Sensitivity analysis for current service and interest cost (R Millions) for the year ending 31 March 2021

Assumption	Change	Current service	Interest cost	Total	Change
Central assumptions	-	36 700	2 554 900	2 591 600	-
Health care inflation	1%	43 800	2 768 600	2 812 400	9%
	-1%	30 900	2 365 400	2 396 300	-8%
Discount rate	1%	31 100	2 588 000	2 619 100	1%
	-1%	43 700	2 512 600	2 556 300	-1%
Post retirement mortality	-1 year	37 700	2 658 900	2 696 600	4%
Average retirement date	-1 year	40 600	2 567 100	2 607 700	1%
Continuation of membership at retirement	-10%	33 100	2 534 900	2 568 000	-1%

The table above indicates, for example, that if medical inflation is 1% greater than the long-term assumptions made, the liability will be 9% higher than that shown.

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 R15,591m (2020: R13,994m) represents equal contributions of 7.5% by the employer and employee.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
7	**Trade and other receivables from exchange transactions**		
	Trade receivables	5 503	1 024
	Contract customers	9 006	32 544
	Other receivables	10 044	7 778
		24 554	41 345
	Less - Provision for bad debts	(2 026)	(2 047)
		22 528	39 298
	Provision for bad debts		
	Opening balance	2 047	2 175
	Movement	(21)	(128)
	Closing balance	2 026	2 047
	Analysis of Impairment		
	Long overdue debtors considered impaired	2 026	2 047
		2 026	2 047

There is no difference between the fair value of trade and other receivables and their book value.

8	**Cash and cash equivalents**		
	Cash and cash equivalents at the end of the period are represented by the following balances:		
	Cash at bank	26 800	24 197
	Call accounts	331 562	207 816
	Cash and cash equivalents at the end of the period are represented by the following balances:	358 362	232 013

There is no difference between the fair value of cash and cash equivalents and their book value.

9	**Trade and other payables**		
	Trade payables	21 673	8 324
	Other payables	35 270	20 120
		56 943	28 444

There is no difference between the fair value of trade payables and their book value.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
10	**Deferred income**		
	Exchange revenue		
10,1	**Deferred income arising as a result of an agreement entered into with the Department of Science and Innovation to develop an intellectual property management office. (Geoscience Act par 5(1)(g))**		
	Carrying amount at the beginning of period	2 609	3 264
	Amounts used during the period	(2)	(655)
	Carrying amount at the end of period	2 607	2 609
10,2	**Deferred income arising as a result of an agreement with the Organisation of African Geological Surveys.**		
	Carrying amount at the beginning of period	248	48
	Amounts received	45	200
	Carrying amount at the end of period	293	248
10,3	**Deferred income arising as a result of an agreement with the Department of Science and Innovation for the environmentally friendly and efficient methods for the extraction of Rare Earth Elements.**		
	Carrying amount at the beginning of period	182	182
	Amounts used during the period	(182)	-
	Carrying amount at the end of period	-	182
10,4	**Deferred income arising as a result of an agreement entered into with the National Research Foundation.**		
	Carrying amount at the beginning of period	110	110
	Carrying amount at the end of period	110	110
10,5	**Deferred income arising as a result of Carbon Capture, Utilization and Storage (CCUS)**		
	Carrying amount at the beginning of period	-	-
	Amounts received	90 000	-
	Amounts used during the period	(8 182)	-
	Carrying amount at the end of period	81 818	-

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
10	**Deferred income (continued)**		
10,6	**Deferred income arising as a result of an agreement entered into with the Department of Mineral Resources & Energy to develop and implement various measures to mitigate the effect of mining-induced contamination.**		
	Carrying amount at the beginning of period	105 002	217 756
	Amounts received	248 537	215 523
	Amounts used during the period	(247 021)	(328 277)
	Carrying amount at the end of period	106 518	105 002
	Total deferred income	191 345	108 151
11	**Accruals**		
	Accruals for leave pay		
	Carrying amount at the beginning of period	19 804	18 983
	Provision current period	9 133	2 839
	Amounts used during the current period	(1 721)	(2 018)
	Carrying amount at the end of period	27 216	19 804
	The leave pay provision relates to the estimated liabilities as a result of leave days due to employees.		
	Accruals for 13th cheque		
	Carrying amount at the beginning of period	5 395	6 130
	Provision current period	861	(735)
	Carrying amount at the end of period	6 256	5 395
	The 13th cheque accrual relates to the structuring of the employee costs to company and is paid out on employees' birthdays.		
	Total accruals	33 472	25 199

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
12	**Surplus/Deficit from operations**		
	Operating surplus/deficit is arrived at after taking the following items into account:		
	Revenue	**525 878**	**489 277**
	Non-exchange revenue		
	Total grant received	502 230	414 062
	Project related revenue	(248 537)	(215 523)
	Total non-exchange revenue	253 693	198 539
	Exchange revenue		
	Department of Mineral Resources & Energy project related revenue	224 351	225 051
	Contracting revenue	19 872	27 689
	Publication revenue	3 337	3 276
	Carbon Capture, Utilization and Storage (CCUS)	8 182	-
		255 742	256 016
	Other exchange revenue		
	Foreign currency gains	627	835
	Proceeds from sale of asset	29	874
	Recovery of asset losses	604	2 416
	Sundry income	2 908	6 863
		4 168	10 988
	Interest received		
	- Interest income on call accounts	8 345	17 100
	- *Interest income on current accounts	3 930	6 634
	(* includes interest accrued to the amount of R299 699)	12 275	23 734
	Total exchange revenue	272 185	290 738
	Total cost of contracts	**194 862**	**165 673**
	Cost of commercial projects		
	Direct cost	5 710	10 613
	Personnel expenditure	9 222	12 085
		14 932	22 698

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

12 Surplus/Deficit from operations (continued)	2021 R'000	2020 R'000
Cost of statutory projects		
Direct cost	51 789	35 302
Personnel expenditure	128 141	107 673
	179 930	142 975
Administrative expenses include:		
Audit fees	2 872	3 820
- Current period	1 786	2 084
- Internal audit	955	1 736
- Fee for other services	131	-
Bad debts written off	-	-
Provision for bad debts	(21)	(2 047)
Depreciation - on owned assets	36 366	23 924
- Buildings	6 341	6 165
- Equipment	22 494	13 846
- Office furniture	719	626
- Motor vehicles	2 605	2 075
- Aircraft	354	102
- Aircraft adjustment	-	(1 036)
- Boat	154	-
- Computer equipment	3 699	2 146
Reversal of impairment	315	3 241
Amortisation - intangible assets		
- Computer software	1 501	526
Rentals in respect of operating leases		
- Land and buildings	843	1 044
- Multifunctional printers	855	1 400
Other operating expenses		
Net loss on disposal of equipment	10	2 221
Net loss on disposal of vehicles	-	524
Net loss on disposal of intangible assets	-	2
Net loss on disposal of computer equipment	120	348
Net loss on disposal of office furniture	40	83
Net loss on disposal of aircraft	-	7
Write-off work in progress-HVAC	18 496	-
Foreign currency losses	914	415
	19 580	3 600

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

12 Surplus/Deficit from operations (continued)

	2021 R'000	2020 R'000
Staff costs	337 293	280 074
Included in staff costs are:		
Defined benefit plan expense for the post-retirement medical-aid fund	2 006	1 593
- Current service cost	37	48
- Interest cost	2 562	2 074
- Expected return on plan assets	(1 541)	(1 517)
- Recognised actuarial (gain)/loss	949	3 947
- Recognition of loss on asset realisation	(1)	(2 959)
Defined contribution plan expenses for the pension and provident fund	15 591	13 994

Emoluments

Senior management	2020/2021				
	Pensionable salary R'000	Performance bonus R'000	Provident/ Pension fund contributions R'000	*Other contributions R'000	Total R'000
Mr Mabuza M	3 114	334	188	678	4 314
Mr Matsepe L D	2 577	298	157	552	3 584
Ms Shelembe P R	1 941	236	127	437	2 741
Dr Tshipa J	2 057	238	123	457	2 875
Dr Khoza T D	1 949	233	119	427	2 728

	2019/2020				
	Pensionable salary R'000	Performance bonus R'000	Provident/ Pension fund contributions R'000	*Other contributions R'000	Total R'000
Mr Mabuza M	2 736	-	167	561	3 464
Mr Matsepe L D	2 455	-	150	550	3 155
Ms Shelembe P R	1 849	-	121	423	2 393
Dr Tshipa J	1 959	-	118	298	2 375
Dr Khoza T D	1 857	-	113	391	2 361

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

12	Surplus/Deficit from operations (continued)	2021 R'000	2020 R'000
	Board emoluments		
	Non-executive Board Members		
	Dr Mathe H	176	120
	Dr Mahachi J	107	139
	Mr Koloi K	-	55
	Mr Ramokgopa K	-	23
	Mr Mvinjelwa X	129	68
	Mr Mokoena S	131	-
	Adv Maake N	113	-
	Ms Chowan A	150	-
	Dr Mirembe J	-	-
	Dr Mayekiso M	-	-
	Dr Khumalo T	-	-
	Ms Malie S	-	-
	Mr Malaza S	-	-
	Mr Abader I	-	-
	Mr Nel P	-	-
	Ms Mdubeki R	-	-
	Mr Menoe K	-	-
	Ms Mochothli D	-	-
	Ms Tsotetsi P	-	-
	Ms Madiba L	-	-
	Mr Wilcox O	-	-
	Mr Moatshe A	-	-
	Mr Gerryts B	-	-
		806	405

*** Other contributions relate to employer contributions towards statutory deductions and leave.**

13	Finance cost		
	Finance cost on motor vehicle fleet cards.	14	20

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
14	**Reconciliation of net surplus/(loss)for the period to cash generated from operations**		
	Net surplus for the period	(773)	65 047
	Interest	14	20
	Depreciation on property and equipment	36 366	23 924
	Amortisation - intangible assets	1 501	526
	Reversal of impairment of assets	(315)	(3 241)
	Proceeds from sale of assets	(29)	(874)
	Compensation from third parties for property and equipment lost	(604)	(2 417)
	Net loss on disposal of fixed assets	170	3 182
	Interest earned	(12 569)	(23 329)
	Provision for post-retirement medical-aid benefits	2 006	1 592
	Operating cash flows before working capital changes	25 767	64 430
	Working capital changes:		
	Increase in provision for accumulated leave pay and 13th cheque	8 273	87
	(Increase)/Decrease in trade and other receivables	16 770	94 898
	Increase/(Decrease) in trade and other payables	28 499	(1 019)
	Increase/(Decrease) in deferred income	83 194	(112 430)
	Cash generated from operations (including finance costs)	162 503	45 966
15	**Acquisition of:**		
15,1	**Property and equipment**		
	Land and buildings	-	485
	Equipment	33 269	10 718
	Office furniture	982	356
	Aircraft and boat	2 585	-
	Motor vehicles	-	872
	Computer equipment	14 990	8 406
		51 826	20 837
	Work in progress - Acquisitions		
	Land and buildings	24 665	14 854
	Computer equipment	(6 032)	29 810
	Equipment	(27 167)	27 045
	Aircraft and boat	(1 282)	1 282
		(9 816)	72 991
	Total acquisitions	42 010	93 828
15,2	**Intangible assets**		
	Computer software	7 333	306
		7 333	306

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
16	**Contingent liability**		
16,1	**Bank guarantees**		
	Performance bonds and bid bonds issued for contract work to various financial institutions.	-	1 927
		-	1 927
16,2	**Pending legal action**		
	The Council for Geoscience has an estimated legal liability due to pending labour cases.	-	-
		-	-

17 Taxation

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.

18 Operating lease commitments

18,1 Lease of office space

The operating lease between a supplier and the Council for Geoscience entered into from 01 December 2017 to 30 November 2023.

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

Up to I year	674	385
2 to 5 years	1 209	-
Total lease commitments	1 883	385

18,2 Lease of office printing equipment

The operating lease between a supplier and the Council for Geoscience entered into from 01 October 2015 to 31 May 2021.

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

Up to I year	792	1 121
Total lease commitments	792	1 121

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

18	Operating lease commitments (continued)	2021 R'000	2020 R'000
18,3	**Commitments**		
	Operating expenditure		
	Approved and contracted	42 719	29 274
	Approved but not yet contracted	13 170	-
	Capital expenditure		
	Approved and contracted: Property and equipment	55 234	69 701
	Approved but not yet contracted: Property and equipment	10 281	1 548
	Total commitments	121 404	100 523
	Commitments		
	Up to I year	51 793	52 950
	2 to 5 years	69 611	47 573
	Total commitments	121 404	100 523

The Council for Geoscience has usage based contracts for the provision of the following services

- Sampling Services Geophysics
- Accommodation and travel
- Courier services

19 Financial instruments

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

19,1 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 on-going basis. The Council for Geoscience does not have any significant exposure to any individual customer or counterparty.

Trade receivables and other payables are carried at amortised costs. Refer to notes 7 and 9.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

19,2 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 2021

	Weighted average effective interest rate	Weighted average effective interest rate
	%	%
Assets		
Cash	1,00%	3,90%
Call accounts	3,64%	6,87%

Short-term deposits

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.
- Short-term deposits are only reinvested or invested with Management approval.

19,3 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 exposure at 31 March 2021 is disclosed in note 20.

19,4 Airborne operations risk

It is the policy of the Council for Geoscience to transfer risk in respect of airborne operations to third parties, namely insurance and an external operator.

20 Foreign currency exposure

	2021 '000			2020 '000		
	Exchange rate	Foreign amount	R-value	Exchange rate	Foreign amount	R-value
20,1 Trade receivables						
Foreign currency						
US$	R 14,563	$28	404	R 17,626	$34	596
20,2 Banks						
Foreign funds						
Euro	R 17,069	€ 240	4 097	R 16,026	€ 240	3 846

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000
21	**Related-party transactions**		
	During the period, the following related-party transactions took place between the Council for Geoscience and the Department of Mineral Resources & Energy:		
	Total grant received	502 230	414 062
	Refer to note 10 for further details regarding transactions with the Department of Mineral Resources & Energy.		
	All other related-party transactions were concluded at arm's length.		
	Relationships:		
	Parent National Department: Department of Mineral Resources & Energy		
	Other Government Departments and Entities: South African National Energy Development Institute	90 000	-
	The Council for Geoscience has been appointed as the implementing agency of the agency of the Carbon Capture, Utilization and Storage (CCUS) project. The Director General of Minerals and Energy requested South African Nation Energy Development Institute (SANEDI) to transfer the MTEF funding allocations that were made available for the Carbon Capture, Storage and Utilisation project to the CGS.		
	Refer to note 10 for further details regarding transactions with South African Energy Development Institute.		
22	**Irregular expenditure**		
	Opening balance	-	-
	Irregular expenses identified in the current year	1 695	-
	Expenditure condoned	-	-
		1 695	-
	Details of irregular expenditure identified in the current year		
	Non-compliance with National Treasury's instruction note 5 of 2020/2021 'EMERGENCY PROCURMENT IN REPSONSE TO NATIONAL STATE OF DISASTER"'.National Treasury Practice note number 5 was repealed by National Treasury Practice note number 11 with effect from 1 September 2020. The contract variation of 25% for internet services was concluded after the instruction note 5 of 2020/2021 was repealed on 26 August 2020. No loss has been incurred as services were rendered. National Treasury condoned the irregular expenditure on 30 April 2021.	1 695	-
		1 695	-

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

23 Fruitless and Wasteful expenditure

Opening balance	-	-
fruitless and wasteful expenditure identified in the current year	18 496	-
Less: Amount resolved	-	-
Less: Amount transferred to recievables	-	-
	18 496	-

Determination

"Fruitless and wasteful expenditure was identified in regards to the implementation of the Humidity, ventilation and aironditioning (HVAC) system up to 2017. The work was found to be technically not accepatable and needed remediation. Management remains committed to eliminate and avoid any fruitless and wasteful expenditure.

Investigation

The Council for Geoscience has commenced with investigative procedures to recover the loss.

24 Events after reporting date

Non-Adjusting events

Eminent acquisition of significant assets

Acquisition of drilling capacity in support of the Geoscience program, in particular the Geological mapping for the exploration of mining has commenced . The estimated cost for this acquisition is at R50 million

The Geoscience Act regulations,

The Geoscience Act regulations, which aims to provide clarity and give effect to the principal Acts (the Geoscience Act No 100 of 1993 and the Geoscience Amendment Act No 16 of 2010), from which CGS derives its mandate to be the custodian and curator of all geoscience information in South Africa, were gazetted for public comment. Responses received from the wider geoscientific community are being considered.

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

25 Correction of prior year error

Nature	Period	2021 R'000	2020 R'000
A correction was made to the financial statements on vat expenditure that was not recognised in the period to which it relates.	31-Mar-20	5 149	-
A correction was made to payables in the prior period relating to the allocation of payments .	31-Mar-20	(3 100)	-
A correction was made to the financial statements on other income that was not recognised in the period to which it relates.	31-Mar-20	(2 882)	(279)
A correction was made to the financial statements to depreciation/amortisation for prior period.	31-Mar-20	(2 383)	-
A correction was made to the financial statement to prepaid expenses for the prior period.	31-Mar-19	-	(397)
A allocation correction was made from expenditure and capitalised.	31-Mar-19	(65)	(2)
A correction was made to expenditure that was not recognised in the correct period. .	31-Mar-20	12	5 203
An adjustment was made to payables in the prior period relating to a construction project retention.	31-Mar-20	(637)	-
An adjustment was made to deferred income in the prior period relating to a construction project retention.	31-Mar-20	(197)	-
		(4 101)	4 525

Effect

Statement of financial performance as at 31 March 2020		
Revenue recorded in the incorrect period - MTEF	(3 079)	-
Other income recorded in the incorrect period - Recovery of study debt/insurance claims	-	(279)
Expenditure recorded in the incorrect period	5 161	5 203
Payment incorrectly allocated	(3 100)	
Prepaid expenses not accounted for correctly	-	(397)
Retention on projects recorded in the incorrect period	(637)	
Depreciation/amortisation recorded in the incorrect period	(2 383)	-
Work in progress captured as an expense	(65)	(2)
	(4 101)	4 525

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

25 Correction of prior year error (continued)	2021 R'000	2020 R'000
Effect		
Statement of financial position as at 31 March 2020		
Government Grant Project Related Revenue Recognised - Deferred income	976	-
Study debt recovered and insurance claim accounted for correctly	-	279
Retention on projects not provided for - Payables	637	-
Capitalisation of vat on asset	1 319	-
Payment incorrectly allocated	3 100	
Expenditure recorded in the incorrect period not provided for	(6 480)	(5 203)
Prepaid expenses not accounted for correctly	-	397
Revenue recorded in the incorrect period -debtors	2 103	
Accumulated depreciation/amortisation recorded in the incorrect period	2 383	-
Work in progress captured as an expense	65	2
Statement of net assets for the period ended 31 March 2019		
Accumulated surpluses	4 101	(4 525)

Correction of Prior year disclosure

Nature

Disclosure as at 31 March 2020

Restatement of closing balances of cumulative expenditure recognised in the carrying value of property and equipment being developed/constructed:

	Period	2021 R'000	2020 R'000
Buildings and Fixtures	31-Mar-19	-	5 919
Equipment	31-Mar-19	-	1 865
Aircraft and Boat	31-Mar-19	-	57
Restatement of closing balances of commitments			
Approved and contracted	31-Mar-19	-	(25 370)

Effect

None (only disclosure item)

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

		2021 R'000	2020 R'000

26 Change in accounting estimate

The useful lives of property and equipment was reassessed. This resulted in change of estimated remaining lives of certain assets in the categories listed below:

	Old	New
Equipment	5 - 7 years	5 - 10 years
Office furniture	20 years	20 - 23 years
Motor vehicles	5 - 8 years	5 - 10 years
Computer equipment	6 years	6 - 11 years
Computer software	2 - 5 years	2 - 8 years

The effect of the change in accounting estimate has resulted in depreciation amounting to R 143,876 in 2020/2021.

The change of R1,213,345 will be reflected in future periods.

The residual values of property and equipment was reassessed. This resulted in a change of estimated residual values of assets in the categories listed below:

Residual values

	Old	New
Equipment	5% of cost	0% of cost
Office furniture	5% of cost	0% of cost
Computer equipment	5% of cost	0% of cost
Vehicles other	10% of cost	0% of cost

The effect of the change in accounting estimate has resulted in depreciation amounting to R 3,425,263 in 2020/2021.

Due to the change in accounting estimate regarding the useful life of assets, the depreciation expense is reported at:	31 018	20 563
Equipment	22 494	14 362
Office furniture	719	628
Motor vehicles	2 605	2 466
Computer equipment	3 699	2 297
Computer software	1 501	810

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

26 Change in accounting estimate (continued)

	2021 R'000	2020 R'000
Depreciation expense using the previous rates would have been reported at:	27 737	23 679
Equipment	19 985	16 756
Office furniture	291	635
Motor vehicles	2 565	2 670
Computer equipment	3 321	2 719
Computer software	1 574	899
Difference	(144)	(3 117)
Equipment	(71)	(2 394)
Office furniture	8	(8)
Motor vehicles	14	(204)
Computer equipment	(22)	(422)
Computer software	(73)	(89)
Difference	3 425	-
Equipment	2 580	-
Office furniture	420	-
Computer equipment	400	-
Vehicles other	25	-

NOTES

to the Annual Financial Statements for the year ended 31 March 2021

27 Heritage assets disclosure

GRAP 103 defines heritage assets as assets which have a cultural, environmental, historical, natural, scientific technological or artistic significance and are held indefinitely for the benefit of present and future generations.
Certain heritage assets are described as inalienable items thus assets which are retained indefinitely and cannot be disposed of without consent as required by law or otherwise.

Nature
The Council for Geoscience has the following different classes of heritage:

- Gemstone collections	1 445	1 445
- Meteorite collections	2 804	2 804
- Mineral collections	13 313	13 313
	17 562	17 562

The heritage assets were at initial recognition valued at fair value using evaluators with the following credentials:

Fossils -	Professor for Paleontological Research, University of the Witwatersrand
Mineral collections -	M.Sc. Geology and Professor and Chairman of the Department of Geology, University of the Witwatersrand
Meteorite collections -	Author of "Meteorites", Private collector of meteorites
Gemstones -	M.Sc. Geology

Various valuation methods were used taking into account the different types of heritage assets held by the Council for Geoscience.
The valuations reports are held at the Council for Geoscience offices and are available for inspection.
The Palaeontological (fossil) assets have no monetary value as legislation does not permit the purchase or sale of fossils.
(National Heritage Resources Act 1999 par 35(4)(c).
The Council for Geoscience is in possession of old scientific equipment only for display purposes. This equipment does not carry any value.

CONTACT INFORMATION

Pretoria
280 Pretoria Street,
Silverton, Pretoria

Private Bag X112,
Pretoria 0001
South Africa

Tel: +27 (0)12 841 1911
Fax: +27 (0)12 841 1221
Email: info@geoscience.org.za
Website: www.geoscience.org.za

Bellville
3 Oos Street, Bellville,
South Africa

PO Box 572,
Bellville 7535
South Africa

Tel: +27 (0)21 943 6700
Fax: +27 (0)21 946 4190
Email: info@geoscience.org.za
Website: www.geoscience.org.za

Pietermaritzburg
139 Jabu Ndlovu Street,
Pietermaritzburg, South Africa

PO Box 900,
Pietermaritzburg 3200
South Africa

Tel: +27 (0)33 345 6265/6
Fax: +27 (0)86 675 6880
Email: info@geoscience.org.za
Website: www.geoscience.org.za

Polokwane
30A Schoeman Street,
Polokwane, South Africa

PO Box 620,
Polokwane 0700
South Africa

Tel: +27 (0)15 295 3471
Fax: +27 (0)15 295 2826
Email: info@geoscience.org.za
Website: www.geoscience.org.za

Port Elizabeth
16 2nd Avenue,
Walmer, Port Elizabeth

PO Box 5347,
Walmer 6065
South Africa

Tel: +27 (0)41 581 1164/1128
Fax: +27 (0)41 581 1165
Email: info@geoscience.org.za
Website: www.geoscience.org.za

Upington
24 Josling Street,
Upington, South Africa

PO Box 775,
Upington 8800
South Africa

Tel: +27 (0)54 332 1403
Fax: +27 (0)54 332 3961
Email: info@geoscience.org.za
Website: www.geoscience.org.za

@CGS_RSA

NOTES

NOTES

Council for Geoscience

www.geoscience.org.za

ISBN: 978-0-621-49700-7

RP Number: RP260/2021