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CGS scientists attend the 2023 Southern Africa Oil and Gas Conference



Figure 1. Mr Gwede Mantashe, Minister of Mineral Resources and Energy, delivering his keynote address at the 2023 Southern Africa Oil and Gas Conference.

The CGS participated in the third annual Southern Africa Oil and Gas Conference, held in Cape Town from 13–14 September 2023. The conference was a success, with over 300 participants (both local and international) discussing a Just Energy Transition focussing on the developments of the upstream hydrocarbon industry in the Southern Africa Development Community (SADC) region. The theme of the conference was “Oil and gas development to address Southern Africa’s energy challenges while ensuring a Just Energy Transition”. Mr Gwede Mantashe, Minister of

Mineral Resources and Energy, and Deputy Minister, Dr Nobuhle Nkabane, gave keynote addresses on the energy crisis in South Africa, emphasising the need to explore the potential of different natural resources to ensure economic growth.

Day 1 focussed on success stories from Guyana and Namibia with the aim of identifying key success factors in the upstream oil and gas industry. Day 2 focussed on South Africa’s oil and gas potential, with the aim of increasing the country’s energy supply and resolving its energy crisis. South Africa needs to focus specifically on indigenous



Figure 2. Representing the CGS and the Petroleum Agency South Africa (PASA), from left to right: Mr Ngqondi Nxokwana (CGS), Mr Selwyn Adams (PASA) and Dr Haajierah Mosavel (CGS).



Figure 3. Mr Ngqondi Nxokwana of the CGS at the Southern Africa Oil and Gas Conference held at the CTICC in Cape Town.



Figure 4. Dr Haajierah Mosavel from the CGS with Dr Nobuhle Nkabane, Deputy Minister of the Department of Mineral Resources and Energy (DMRE).

gas, both on- and offshore. Indigenous gas is more climate friendly as it contributes fewer carbon emissions than other greenhouse gases. South Africa's energy crisis presents an opportunity for natural resources to be explored and exploited. South Africa must make a tangible difference to poverty alleviation by unlocking the country's natural resources, which include an estimated gas resource of 60 TCF (trillion cubic feet) offshore and 200 TCF onshore. Focussing on

indigenous gas will enable us to strive for scope 1 and 2 net-zero emissions as the draft Gas Master Plan by the Department of Mineral Resources and Energy (DMRE) balances gas supply and demand until 2050. In this way, we will maximise local beneficiation and promote the growth of local companies. This approach aligns with the broader goals of sustainable economic development for South Africa by decreasing unemployment, poverty and loadshedding.

Dr Haajierah Mosavel and Mr Ngqondi Nxokwana, from the Minerals and Energy unit, represented the CGS at the conference. A special thanks is extended to the CGS management team for the opportunity to participate.

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CGS delegates attend the 31st International Cartographic Conference In Cape Town

South Africa hosted the 31st International Cartographic Conference (ICC) in Cape Town from 13–18 August 2023. The ICC is organised and facilitated by the International Cartographic Association (ICA) and is held bi-annually in one of the ICA's 73 member countries. The ICA was established in 1959 in Bern, Switzerland, and held its inaugural conference in Bern in 1961. In its 64-year history, the ICA has brought together researchers, GIS practitioners, cartographers, software developers, educators and earth and environmental scientists from government mapping agencies, research organisations and private companies to exchange knowledge and showcase innovative ways of improving cartographic materials and products.

With the advent of the Fourth Industrial Revolution (4IR), new methods have emerged for people to represent and interact with geospatial information and utilise new cartography and GIS and management. The theme of the conference was "Smart Cartography for Sustainable Development". Considering the 2030 Agenda for Sustainable Development, especially in the context of future cities and other social solutions for South Africa and Africa as a whole, this was uniquely important for the cartographic and geospatial community at the CGS. Key focus areas included geospatial data, analysis, and mapping for sustainable development goals (SDGs); map design; ethics in cartography and GIS; cartography and GIS for climate change; sensor-driven mapping; and spatial data infrastructure (SDI) and standards. The CGS was represented by Ms Roos along with eight delegates. These were Mr Ntsako Mhlarhi, Mr Sihle Sogayise, Mr Khuliso Nedzingahe, Mr Ayanda Lawu, Ms Siphindiwe Noruka, Mr Dirk Grobbelaar, Ms Makhosazana Nkosi and Ms Charmaine Thomas.

The CGS delegates were introduced to sensor-driven mapping technologies such as the deep auto-encoder network structure based on the generalised



Figure 1. From left: Mr Ayanda Lawu, Mr Ntsako Mhlarhi, Ms Charmaine Thomas, Ms Siphindiwe Noruka, Ms Makhosazana Nkosi, Ms Magda Roos (Knowledge Management Unit Manager and member of the Conference Organising Committee), Mr Sihle Sogayise, Mr Dirk Grobbelaar and Mr Khuliso Nedzingahe posing at the conference exhibition with CGS published maps.



Figure 2. CGS delegates at the International Cartographic Exhibition.



Figure 3. From left: Mr Sihle Sogayise (CGS), keynote speaker; Dr. Pali Lehohla (Statistical and Policy Advisor, Strategist and Consultant Former Statistician-General, South Africa); and Mr Ntsako Mhlarhi (CGS).



Figure 4. Mr Khuliso Nedzingahe (CGS) with a delegate from the Shanghai Municipal Institute of Surveying and Mapping, China.

bilinear model (GBM) that is used for hyperspectral data unmixing. The GBM decomposes the observed mixed spectra in the data into a collection of constituent pure material signatures and associated fractional abundances. Web application architecture examples of the value-chain process were showcased. These included inputting sensor data into a database, to deduce a list of events and descriptions. These new insights and the knowledge gained will be useful in enhancing the ongoing work at the CGS, in particular, the Geoscience Mapping Programme, which makes use of the hyperspectral datasets.

One of the highlights of the conference was a talk on uncertainty in mapping

climate change-related flooding risk to residential property values. In quantifying coastal land at risk of being affected and the related risk to residential property values, spatial and non-spatial factors need to be accounted for (such as digital elevation models (DEM), climate change scenarios, source of projection, inundation models and flooding threshold), as each of these factors contributes to net uncertainty. Another talk on the differences in the underlying spatial data of most global online maps gave insight into feature density and label density. This explains the number of features in a map as well as the number of labelled features. This talk demonstrated the need for standardisation and/or automation due

to the level of detail and label density in large-scale maps presented by global online map providers.

In addition to learning from other practitioners, the team exhibited some of our recent cartographic products to local and international participants, including the 1:50 000-scale published geological and geotechnical maps and the online Geoportal platform.

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CGS delegates attend the 50th International Association for Hydrogeologists (IAH) Congress in Cape Town

The 50th International Association for Hydrogeologists (IAH) Congress was held in Cape Town, South Africa from 18–22 September 2023 under the theme, *Groundwater: A matter of scale*. The congress was attended by 490 delegates

from 52 countries. The IAH is a scientific and educational charitable organisation for scientists, engineers, water managers and other professionals working in the fields of groundwater resource planning, management, and protection. The

association was founded in 1956, with an aim to raise awareness of groundwater issues and work with national and international agencies to promote the use of groundwater to ensure ready access to safe drinking water.

The IAH Congress was officially opened by the Deputy Minister of Water and Sanitation, Mr David Mahlobo. In his address, the Deputy Minister spoke about the state of groundwater in South Africa. He indicated that it is the scientist's/ expert's duty to advise the government on the route to take for better water resource management, furthermore, the congress should bring about solutions that will benefit generations to come. The deputy minister further spoke about the lack of maintenance in our water systems which results in major water losses. The Mayoral Committee Member for water from the City of Cape Town, Mr Zahid Badroodien, welcomed the delegates to Cape Town, noting in his speech that Cape Town had witnessed the power of groundwater as a key resource during the *Day Zero* crisis, whereby groundwater had sustained many communities.

The first day of the conference started with field excursions. Delegates were given a choice of excursion to suit their interest. The field excursions included: Table Mountain dams, Steenbras deep aquifer exploration, Atlantis managed aquifer recharge, Cape Flats urban aquifer development, and wetlands and winelands. At the Atlantis managed aquifer recharge excursion, delegates were taken to the Atlantis Water Resource Management Scheme (AWRMS), which has been in operation since the late 1970s. The scheme is used to treat domestic wastewater which is then recharged to one of the scheme's basins. In addition, the scheme captures stormwater from residential areas, which goes through the Wesfleur Wastewater Treatment Plant for polishing before being directed to the basin prior to infiltration into the aquifer. The scheme has the potential to supply 15–20 Ml/d of groundwater from two of its wellfields (Witzands and Silwerstroom). The Cape Flats Aquifer is an unconsolidated porous aquifer. This aquifer supports large-scale agriculture in the Phillipi Horticultural Area, and is a potential water source for the surrounding area. Threats to groundwater quality include sewage discharges, seepage from informal settlements, agricultural chemicals, and saltwater intrusion. A managed aquifer recharge scheme is currently under development, with a wastewater

reclamation plant under construction. A critical lesson learned is the need for continuous monitoring and clearly defined operating rules in managed aquifer recharge.

The CGS was represented by 11 delegates: Dr Thakane Ntholi, Dr Taufeeq Dhansay, Dr Henk Coetzee, Ms Lufuno Ligavha-Mbelengwa, Mr Louters Lewele, Ms Phuti Tleane, Ms Gladness Mohale, Ms Sisanda Makubalo, Ms Lebogang Nhleko, Ms Joyce Shongwe and Mr Sechaba Lenong. Ms Ligavha-Mbelengwa delivered an oral presentation entitled *Vulnerability of South African water resources to emerging organic contaminants: a case study of the Witwatersrand Goldfields, Eastern Basin*; while Ms Mohale presented on *Integrated Modelling to simulate groundwater and surface water interaction in the Letaba River Catchment, Limpopo Province, South Africa*. Ms Mohale's conference contribution was further cited in an article written by Daily Maverick. Ms Nhleko delivered a presentation on *Managed aquifer recharge (MAR) suitability mapping using GIS-MCDA: The South African perspective*. Ms Makubalo gave a poster presentation on *Hydrogeochemical characterisation of faults and dolerite dykes and sills in location of groundwater resources in Maluti a Phofong Local Municipality, Free State*. Dr Coetzee contributed to the paper *Development of United Nations Framework Classification for Resources (UNFC) for Groundwater Resources Management*, presented by Dr Peter van der Keur from the Geological Survey of Denmark and Greenland.

Some of the lessons that emerged from the congress were:

- The application of hydrochemistry and isotopes remains a useful tool in groundwater-surface water projects that aspires to understand the connectedness of surface water and groundwater, groundwater recharge processes, and groundwater contamination by pollutants of concern such as nitrates.
- Groundwater monitoring is crucial since this helps in ensuring that

the water quality and quantity are sustainably managed without over abstracting or polluting the water resources. This should be implemented in the beginning of each environmental baseline study at the CGS.

- Hydrogeological models are important in addressing current and future groundwater flow and pollution issues. Although data availability remains a major issue in the industry, projects such as the Carbon Capture Utilisation and Storage (CCUS) project that seeks to protect groundwater from carbon dioxide leakages should consider modelling techniques (numerical and geochemical).
- Managed aquifer recharge (MAR) is a technique that has been applied in South Africa, with several schemes found across the country. The CGS can collaborate with other experts in the field to develop the schemes in areas of interest. Umvoto and the Department of Water and Sanitation (DWS) have conducted a lot of work that the CGS can learn from.
- Citizen science is crucial, especially considering the knowledge and skills transfer gaps in communities. The CGS projects can make it a norm to transfer field skills and, to a certain extent, scientific skills, to community members. This will bring awareness on the importance of conserving, protecting, and managing water resources.

Lessons acquired from this conference will be implemented in the ongoing CGS projects such as the Hydrogeological Mapping, Mine Environment and Management Programme (MEWMP), CCUS, Managed Aquifer Recharge (MAR), and water supply projects. These will be useful in refining some of the methods or approaches that the CGS used in the projects. Some of the conference highlights were in line with past projects such as the Karoo Deep Drilling (KDD) environmental baseline studies.

This conference was an excellent



Figure 1. Left: Ms Gladness Mohale of the CGS delivering a presentation. Right: an article published in the Daily Maverick which cites Ms Mohale's presentation.

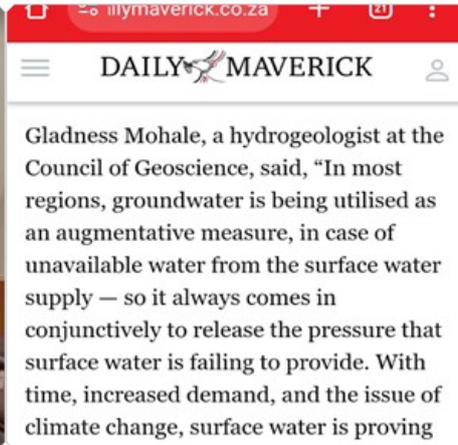


Figure 2. Mr Sechaba Lenong chairing a technical session.



Figure 3. Ms Lebogang Nhleko chairing a technical session.

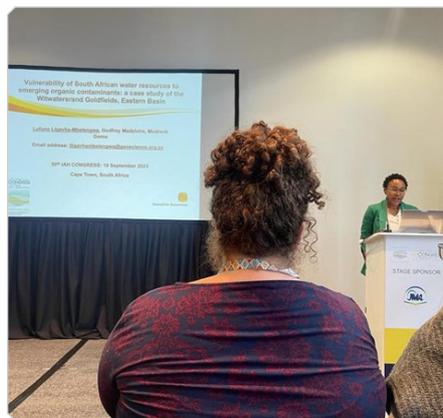


Figure 4. Ms Lufuno Ligavha-Mbelengwa delivering a presentation.

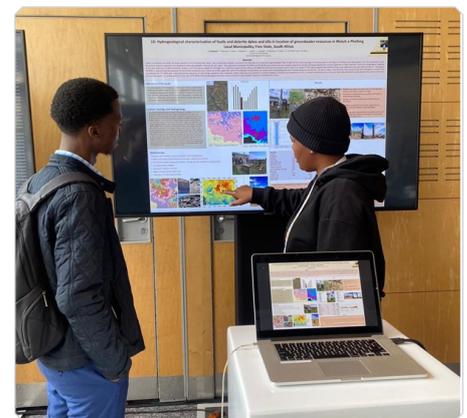


Figure 5. Ms Sisanda Makubalo taking a delegate through her poster.



Figure 6. The CGS team. Front row, from left: Ms Lebogang Nhleko, Ms Eloise Ely and Dr Thakane Ntholi. Back row, from left: Dr Taufeeq Dhansay, Ms Lufuno Ligavha-Mbelengwa, Ms Phuti Tleane and Ms Joyce Shongwe.



Figure 7. The CGS team, from left: Mr Louters Lewele, Ms Lebogang Nhleko, Ms Phuti Tleane, Ms Gladness Mohale, Ms Lufuno Ligavha-Mbelengwa and Ms Eloise Ely.



Figure 8. A field visit to the Phillipi Horticultural Area, on the Cape Flats Aquifer.

platform for sharing and exchanging groundwater-related issues that affect various water users worldwide. Furthermore, the conference was beneficial in terms of networking, meeting up with potential collaborators and mentors/supervisors, and bringing

together young hydrogeologists from a range of scientific backgrounds to exchange ideas. The congress also celebrated early-career scientists and their importance in the development of the IAH and the hydrogeology profession.

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The 10th International Conference of the African Association of Women in Geosciences, Luanda, Angola

Background

The African Association of Women in Geosciences (AAWG) was created to promote and strengthen the participation and development of women in the earth sciences, as well as to provide a platform/forum for discussions and cooperation in the geosciences and other related professions in Africa. The association aims to advance scientific and technological knowledge in the field of geoscience, disseminate information on scientific and technical research and discoveries, and promote public understanding of the role of the geosciences in Africa's development. It also assists African governments with capacity building in the geosciences and its applications.

The AAWG hosts roundtable discussions and workshops championed by women in the geosciences. The first international conference of the AAWG was held in Cape Town in 2002. This conference paved the way for women geoscientists in Africa to meet and discuss geoscience-related issues on a biennial basis. This year, the 10th International Conference of the AAWG was held in Luanda, between 26 and 29 July 2023, under the theme *Earth sciences and sustainable development in Africa – perspectives and challenges*.

The conference objectives were as follows:

- Bring together women geoscientists from across Africa;
- Contribute to improving scientific and social inclusion and attracting women to careers in the geosciences;
- Encourage women to take advantage of global programmes such as the Agenda 2030 for Sustainable Development, the Paris Agreement on Climate Change, and the Agenda 2063 – The Africa We Want,



Figure 1. Participants in the 10th International Conference of the African Association of Women in Geosciences (AAWG) with senior Angola government official representatives.



Figure 2. Panellists of the roundtable titled *Geoheritage and Geoparks in Africa: Challenges and perspectives*. From left: Honória Susso Domingos (Angola), Ms Gabriela Teixeira (Angola), Dr Juliette Tea (Côte d'Ivoire), Prof Ezzoura Errami (Morocco), Dr Sonia Domingos Pom (Angola), and Ms Ndivhuwo Cecilia Mukosi (South Africa).

- among others;
- Help women to have a vision of their technical, economic and social performance in these areas.

Conference attendance

The conference was well attended by researchers and miners, specifically

from the Southern African Development Community (SADC) (Angola, Malawi, Botswana, Kingdom of Eswatini, Lesotho, Namibia, South Africa, Democratic Republic of the Congo, and Zambia), and the Economic Community of West African States (ECOWAS) (Nigeria, Cameroon, and Côte d'Ivoire). Delegations from



Figure 3. AAWG participants group photo at the famous Miradouro da Lua (Moon Viewpoint) during a field trip to Cabo Ledo.



Figure 4. AAWG participants with field trip co-leader Dr Kinanga Pedro (wearing a reflector jacket) discussing the geology of Cabo Ledo.



Figure 5. Cabo Ledo field trip participants.



Figure 6. The delegation at the Catoca Diamond Mine, viewing an open-pit diamond mine.

other African countries, including Morocco, attended. Senior government officials from Angola, namely, the Deputy Governor of Social Affairs, Dr Manuel Gonçalves; the Secretary of State for Family and the Promotion of Women, Dr Alcina da Cunha Kindamba; the Secretary for Science, Technology and Innovation, Dr Alice de Ceita e Almeida; and the National Director of the Ministry of Mineral Resources, Oil and Gas, Eng Domingos Francisco, were present at the conference opening ceremony held at the Intercontinental Hotel in Luanda. The Minister of Mineral Resources, Oil and Gas, Dr Diamantino Zavedo, attended the conference closing ceremony.

Technical sessions and workshops

The conference comprised several technical sessions that focussed on the following themes: geosciences and society, geosciences and economy, and fundamentals of geosciences. The conference also hosted two workshops

titled *Geoheritage and Geoparks in Africa: Challenges and perspectives* and *Women in Geosciences*, chaired by the President of the AAWG, Professor Ezzoura Errami.

The *Geoheritage and Geoparks in Africa: Challenges and perspectives* workshop highlighted the importance of geoconservation in Africa, noting that some geological sites in Africa have cultural significance for local communities. It was recommended that indigenous knowledge should be incorporated in plans to build and propose geoheritage sites or geoparks. The discussions also focussed on challenges which geoscientists face while compiling an inventory assessment. Participants were encouraged to engage with local authorities and government departments responsible for tourism and social affairs in their respective countries, and promote geoconservation and geoheritage projects.

The *Women in Geosciences* workshop focussed on the challenges women generally face while pursuing their degrees or upon entering the workforce. The workshop explored challenges and opportunities available in the geosciences, in addition to offering opportunities for women geoscientists to connect and network with one another.

Post-conference fieldtrips

The conference had two post-field trips. The first was a field trip to Cabo Ledo, which is a significant area for understanding the tectonic reconstruction and exploration for oil and gas in Angola. The second field trip took delegates to the Saurimo Region (eastern Angola) for an operational tour of the Catoca Diamond Mine. Catoca is the fourth largest diamond mine in the world. It operates 24 hours a day and its operation is technologically advanced. The field trips to Cabo Ledo and Catoca Mine gave delegates an overview of the geology,

mining and exploration activities taking place in Angola.

Overall, the conference gave delegates an opportunity to share experiences, network and present their technical work during various technical sessions, and workshops. The conference also offered

a learning platform for participants through the technical sessions and field trips.

For more information about AAWG initiatives, upcoming workshops and outreach programmes, visit the AAWG website at <https://aawg.org/>.

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CGS flag flies high in Berlin

Six seismologists represented the CGS at the 28th IUGG General Assembly (IUGG2023) from 11–20 July 2023 in Berlin, Germany. The IUGG is the mother body of eight (8) semi-autonomous scientific associations, one of which is the International Association of Seismology and Physics of the Earth's Interior (IASPEI), made up of twelve (12) commissions.

The CGS team delivered four oral presentations and two posters:

1. Michelle Grobbelaar: "Sources of vibrations within buildings — a case study from Johannesburg" (poster),
2. Vunganaï Midzi: "Quantitative evaluation of source parameters of historical earthquakes in southern Africa" (oral),
3. Thifhelimbilu Mulabisana: "Tectonic Geomorphology in KwaZulu-Natal (KZN), South Africa: Active faulting background for the 31/12/1932, MW 6.9 earthquake" (oral),
4. Tebogo Pule: "Updated Exposure Model for the City of Johannesburg, South Africa" (oral),
5. Sinovuyo Myendeki: "Identification of seismogenic structures in Witwatersrand Basin, South Africa" (oral),
6. Brian Zulu: "Horizontal-to-Vertical Spectral Ratio at Four Major Cities of KwaZulu-Natal" (poster).

The presentations garnered positive feedback. Some seismologists expressed interest in Ms Grobbelaar's poster on the source of the vibrations and the equipment the CGS has used for monitoring in Johannesburg, indicating that they would like to collaborate with the CGS on similar monitoring.



Figure 1. The seismologists representing the CGS. From left to right: Ms Thifhelimbilu Mulabisana, Ms Michelle Grobbelaar, Ms Tebogo Pule, Mr Vunganaï Midzi, Mr Sinovuyo Myendeki and Mr Brian Zulu.

In addition to attending the scientific sessions, CGS delegates attended several business meetings, where the activities of the various IASPEI commissions and other linked organisations were discussed. These included the following:

- The International Seismological Centre (ISC) Governing Council. As paying members of the ISC, the CGS is kept abreast of its activities.
- The Commission on Earthquake Hazard, Risk, and Strong Ground Motion. The CGS indicated its interest in being involved in the development

of a new international intensity scale for earthquakes. The attendees of the commission were also encouraged to suggest scientific sessions for the next IASPEI meeting in 2025.

- The Commission on Seismological Observations and Interpretation. The CGS provided input on the suggestions for the scientific session of the IASPEI 2025.
- FDSN opening and closing plenaries, as well as the working groups. FDSN is a global organisation comprising groups responsible for the installation and maintenance of seismographs,

either within their national borders or globally, which encourages cooperation between scientists worldwide to further the advancement of the earth sciences and, in particular, the study of global seismic activity. The CGS is an active member of this organisation and Ms Grobbelaar is the chair.

- IASPEI – African Seismological Commission (AfSC). We discussed the progress being made in seismology

on the continent and plans for the upcoming 4th AfSC General Assembly to be held in 2024. The CGS has been active in this commission since its inception in 2014 and Dr Midzi and Ms Grobbelaar of the CGS have held various positions within the ExCo.

- IASPEI ExCo and SPC Scientific Assembly 2025. Elections for the new executive committee were held. The highlight for the CGS delegation was

Ms Michelle Grobbelaar being elected as President of the IASPEI. Ms Michelle Grobbelaar is the first female president and the first African to be elected to this position.

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Logitec experts provide training and equipment maintenance in the Petrography Lab

Recent guests from Logitec, Scotland, were hosted by the CGS's Petrography section in the Analytical Services Unit from 11–14 September 2023. The Petrography team is happy to report that the thin-section production services that had been hampered by equipment failures are now accessible. After performing maintenance and servicing on the Logitec lapping machines, the Process Engineering professionals from Logitec hosted a 4-day refresher course on preparing thin sections.

In order to produce high-quality results for subsequent petrographic research, the Petrography personnel were led through each stage and showed how the equipment is used in the thin-section preparation process.

The steps demonstrated by Logitec professionals included, but were not limited to:

- (1) Glass preparation and measurement using a micrometre,
- (2) Rock sample cutting to an appropriate size and slab geometry for mounting on a glass slide,
- (3) Using Logitec bonding jigs on a hotplate (with adjustable temperature) to adhere specimens to glass slides,
- (4) Using a disco plan, trimming, or grinding bonded specimens,
- (5) Preparing the lapping machine with monitors to achieve proper plate flatness,



Figure 1. Ms Nondumiso Dlamini (centre), Manager of the CGS's Analytical Services Unit, joins the Petrography team in extending a warm welcome to the Scottish Logitec experts.



Figure 2. Prior to producing thin sections, training participants are guided through the process of measuring and preparing glass slides using a micrometre.



Figure 3. Following a successful 4-day refresher training on thin-sections preparation, Petrography staff at the CGS in Pretoria said their goodbyes to the Logitec visitors from Scotland. From left: Mr Bethuel Makofane, Ms Nosi Zilibokwe, Mr Grant Taggart (Logitec trainer), Ms Thelma Moloi, Mr Tom McGroggan (Logitec trainer), and Mr Lucas Mabena.



Figure 4. A Logitec trainer demonstrates how to condition a lapping machine using monitors for the correct plate flatness to achieved the desired or consistent thickness of the thin section.

- (6) Lapping slides to the desired thickness, and
- (7) Polishing samples with Logitec heads.

The participants were thrilled with the abundance of information and insights offered by top industry professionals regarding the successful methods of thin-section preparation for positive geological results. The experts also emphasised the importance of using high-quality consumables to produce petrographic outputs of the highest calibre.

To maximise productivity, enhance quality, and satisfy TAT, participants were also shown alternatives for the new, fully automated systems which are now on the market.

The assistance of the CGS management team in making this venture a success has earned the gratitude of the Petrography team.

For thin section requests, please email Sample reception at: lab_reception@geoscience.org.za.

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