ORGANISATION OF AFRICAN GEOLOGICAL SURVEYS

OAGS

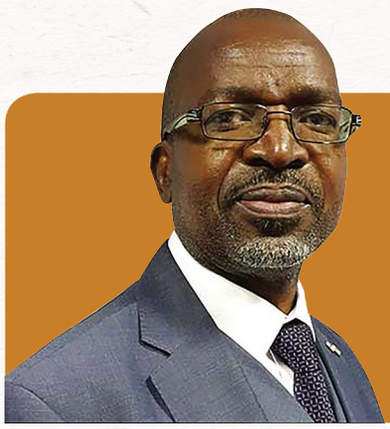
10TH OAGS ANNUAL GENERAL MEETING

GABORONE, BOTSWANA,

8 - 10 OCTOBER 2017

POWERED BY BOTSWANA GEOSCIENCE INSTITUTE

CONTENTS



FOREWORD

Tiyapo H. Ngwisanyi
Chief Executive Officer
Botswana Geoscience Institute

On behalf of Board of Directors, Management and Staff of Botswana Geoscience Institute (BGI), I am delighted to welcome you all to Botswana, in particular to Botswana Geoscience Institute. We are pleased to have this opportunity to host this large number of geoscience professionals which will go down in the history of our existence.

Most importantly, I would like to thank the Leadership of Organisation of African Geological Surveys (OAGS), for its wisdom in considering Botswana as the host of its 10th Annual General Meeting. This does not only show the confidence they have on us, but also demonstrates the recognition and gratitude OAGS has on its members.

Preparing to host this Annual Meeting has been most enjoyable, primarily because we are in the transition mode to an organization established by Botswana Statute with heightened mandate and parameters of operation.

The BGI staff members who worked on the preparations of this Annual General Meeting have been incredible. They worked tirelessly behind-the-scenes on critical logistical matters to make this meeting a success. Needless to say, there has been a number of challenges, as is often the case when communicating with colleagues across all of Africa. However, with the support of the Secretariat we have managed to overcome those.

I have no doubt that you will have the pleasure to appreciate a variety of disciplines in earth science that BGI has been tasked to be the custodian of.

In conclusion, this annual general meeting presents a unique networking opportunity amongst member delegates. This will ensure collaboration continuity in our business activities even after the AGM and many more years to come.

About BGI

Botswana Geoscience Institute (BGI) is a Body Corporate operating from Lobatse and it is wholly owned by the Botswana Government.

It was established through the Botswana Geoscience Institute Act of 2014 to undertake research in the field of geoscience, providing specialised geo-scientific services and promoting the search for, and exploration of any minerals in Botswana. The Institute is a custodian of all geoscience data/information which include non-confidential prospecting reports.

- Environmental and geotechnical investigations;
- Geoscience information in the form of maps, reports and open prospecting licenses.
- Geochemical tests on soil, rocks and minerals.
- Water analysis tests (BOS 32:2009 and BOS 365:2010).
- Research in geosciences and specialised geoscientific services;
- Advisory services in geoscience and geohazards;
- Physical property tests on clay, soil, sand and rock samples;

About OAGS

Mandate

The mandate of the Organisation of African Geological Surveys (OAGS) is to foster and sustain geoscience programmes and excellence on the African continent in the quest for socio-economic development and poverty alleviation, with special reference to mineral resource assessment, sustainable land use and development, hazard mitigation and environmental protection.

Vision

To be a leader in supporting the Geological Surveys in Africa through provision of information, capacity-building and technology transfer.

Mission

To provide comprehensive information, support and capacity-building to Geological Surveys across Africa and to assist member countries in their development through the establishment of information sources and means of technology transfer for their own use and for the attraction of investment and establishment of greater public and government understanding of the strategic importance and offerings of Geological Surveys.

An open pit where they mining dolerite and dolomite

PanAfGeo Training

The overall objective and impact of PanAfGeo is to improve the governance and sustainable use of African mineral resources and related infrastructures.

"PanAfGeo" for "Pan-African Support to the EuroGeoSurveys-Organisation of African Geological Surveys (EGS-OAGS) Partnership" is a project which supports the training of geoscientific staff from African Geological Surveys through the development of an innovative training programme that includes the acquisition and development of important professional skills that complement their qualifications and technical skills.

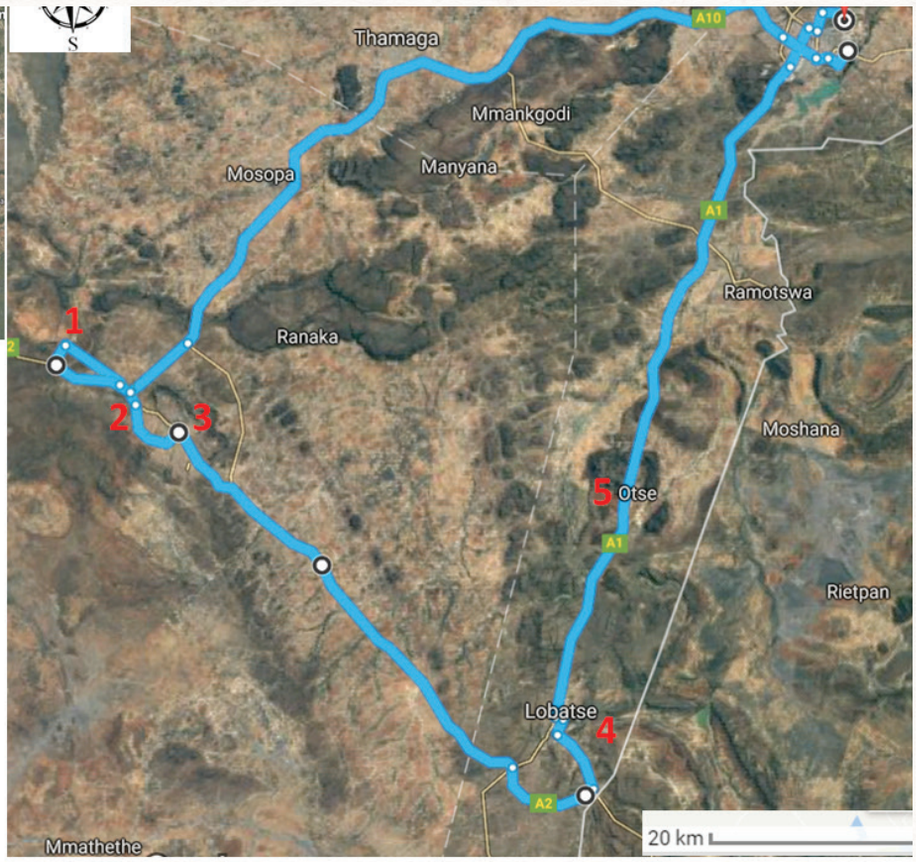
The training programme is carried out by world-class geoscientific experts coming from African and European Geological Surveys. PanAfGeo will conduct training on Environmental Management of Mines on November 6-17, in Botswana. The training is coordinated by the Geological Survey of Sweden (SGU) with the close technical and scientific assistance of Botswana Geoscience Institute and the Geological Survey of Senegal (MIM-DPPM).

Geological and Old Mining sites Field excursion

Introduction

As part of OAGS 10th annual General Meeting, BGI will showcase some of geological and disused mining sites in the vicinity of Gaborone. The aim of this excursion is to give the AGM delegates an opportunity to appreciate and gain geological knowledge of chosen localities in South East and Southern parts of Botswana with a focus on its mineral endowment.

App.route distance: 297km



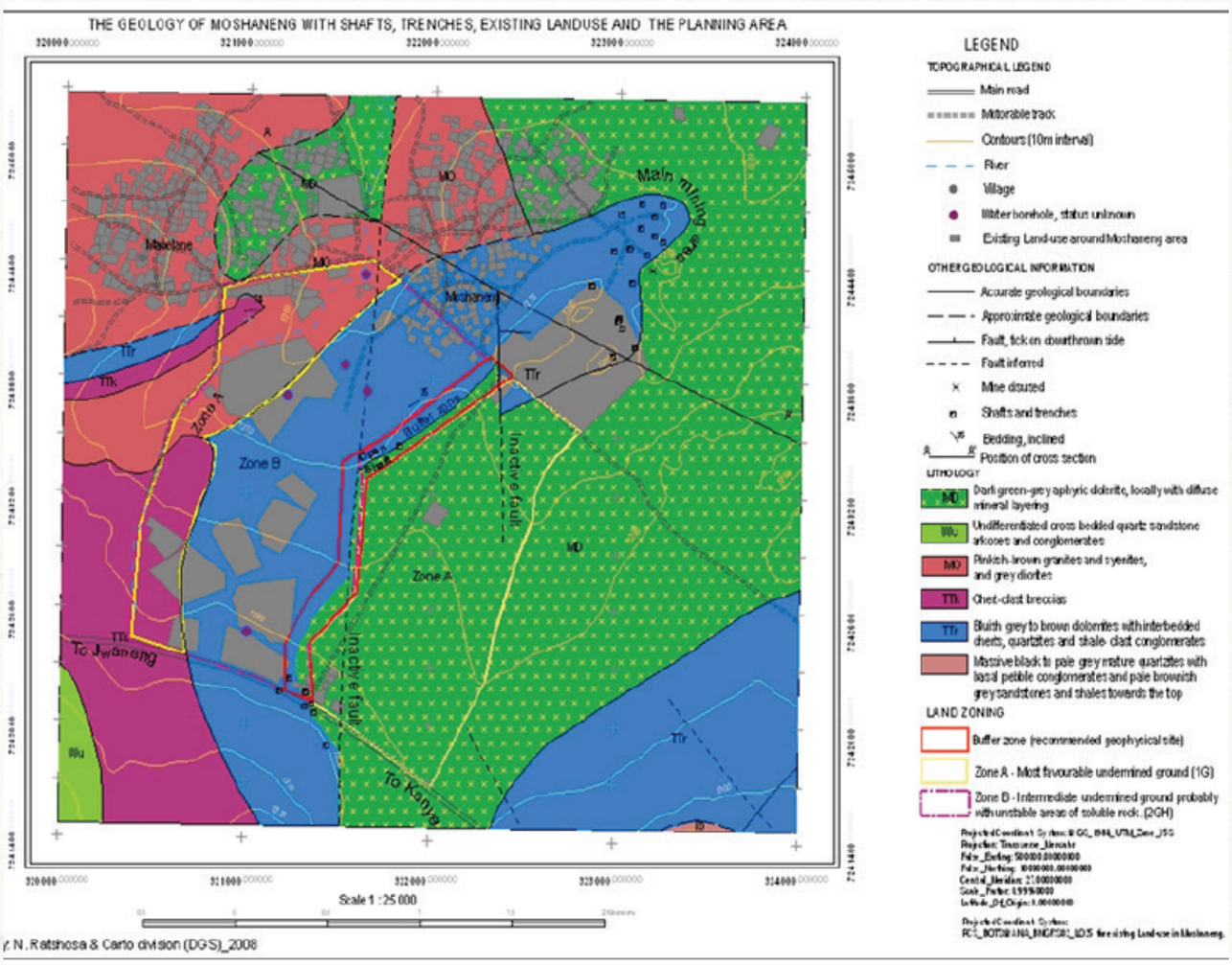
Regional Geology

Waterberg Supergroup	
Transvaal supergroup chemical sedimentary rocks	
Archaean to Proterozoic rocks of the Kaapvaal	Lobatse Volcanic group(Vendesdorp Supergroup)
	Mogobane FM Nywane FM
	Gaborone granite
	Mushroom shaped, layered (5000km²)

Site 1: Moshaneng Quarry

Geology of the area

The most common type of asbestos in the study area is chrysotile/ white asbestos. It occurs within the Transvaal dolomite and the Moshaneng dolerite contact. Asbestos fibres are encountered in the near contact with dolomite. Asbestos vary in thickness. Low grade serpentinization also observed between the contact of dolomite and Proterozoic dolerite. Since asbestos is a hydrous magnesium silicate, it is formed by crystallisation of magnesia-rich solutions from the dolomite. A narrow intrusive body of dolerite which are parallel to the strike of the country rock are observed on the Western side of the pit (see picture below).
The dolomite unit dip towards the west. This is an indication that the dolerite was emplaced forcefully and it is a sign of emplacement under considerable pressure.



r N. Ratshosa & Carto division (DGS)_2008

Intrusive body of dolerite

Site 2: Kgwakgwe Old Manganese Mine

The Kgwakgwe old Manganese mine - An example of historical mining without rehabilitation. A smaller mine project with geotechnical stability and closure issues. Mining was operational from 1957 –1967. History of mining-pre independence. In earliest days many mines were abandoned without a suitable decommissioning process and environmental policies in place. Early explorations and mining activities were conducted with little regard to environment and rehabilitation measures.

Geology

The rocks of the Kgwakgwe Hill area belong to the Neo-Archaean Transvaal Supergroup and an older underlying Kanye Volcanic Formation. The Black Reef Quartzite Formation is the lowest stratigraphic unit and overlies rocks of the Kanye Volcanic Formation with a nonconformity. It consists mainly of coarse to medium grained sandstones, arkoses and interbedded siltsones and shales.
The sediments display plain bedding, graded bedding and cross bedding. These clastic units are silicified and indurated and are typically well-jointed. The Kgwakgwe Shale which consists of varicoloured manganiferous and ferruginous shale horizons succeeds the Black Reef Quartzite Formation.

The shales are overlain by chert breccia which consist of unsorted, clast-supported angular chert fragments. The whole system of quartzite-shale-chert breccia dips about 10° towards the NNW. The most typical appearance of the manganiferous shale unit, as found in old mine workings, in particular in the northern and northeastern slopes of Kgwakgwe Hill, is a finely laminated shale, in which thin white laminae varying from less than one millimetre up to about one centimetre, and consisting of clay material (kaolinite), alternate with black manganiferous laminae and iron oxide.

Safety Risk Associated With Old Mines

Ore extraction and treatment process left sites that could pose major risks to human and environmental health and Safety risks are related to presence of unprotected shafts, waste rock dumps, tailings, old machinery, buildings, health risk associated with polluted water. There is development of large cracks/fissures around the Kgwakgwe Hill. The cause of these cracks is unknown but can be attributed to interplay between karstification (cavities in the underlying dolomites) and drawdown or possibly a surface manifestation of basement fractures.

Lenses of red sandstones interlayered with shale clast conglomerate

Sharp contact between red sandstone and shale clast conglomerate

Unprotected opening/adit

Unprotected shaft

Recommendations

Much can be achieved by mapping cracks, adits and water pipes. Sampling of rocks, soils, waste and water should be undertaken. What is the dispersion of pollutants?

- Monitoring
- Regular measures of the increase of the thickness of these cracks should always be made
- A real involvement and participation of all actors of the planning and management from citizens to decision makers should contribute
- Risk management programs to reduce the multiple effects already noticed in the region
- Need for environmental enforcement
- Some materials can be reused
- Tourism
- Who are the receptors, is there chemical pollution
- Do they have access
- Unprotected openings a risk to receptors
- Whether risk is negligible or not
- Acid mine drainage
- Stream sediment, tailing sample and groundwater analysed to determine contamination risks
- Periodic measurements of Mn concentrations
- Personal sampling-blood, nails and hair
- As responsible companies have long ceased to exist, the problem of abandoned and non-rehabilitated sites remain a challenge.

Site 3: Pharing Gorge (Kanye Village)

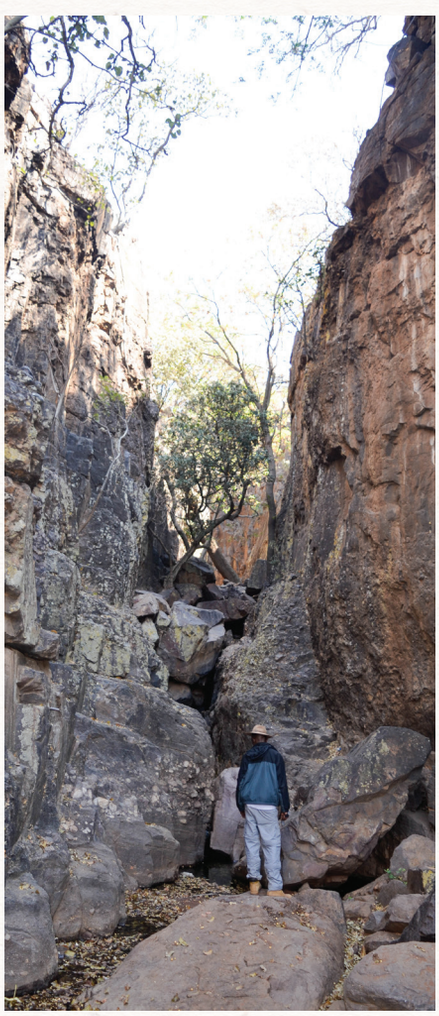
Geology of the area

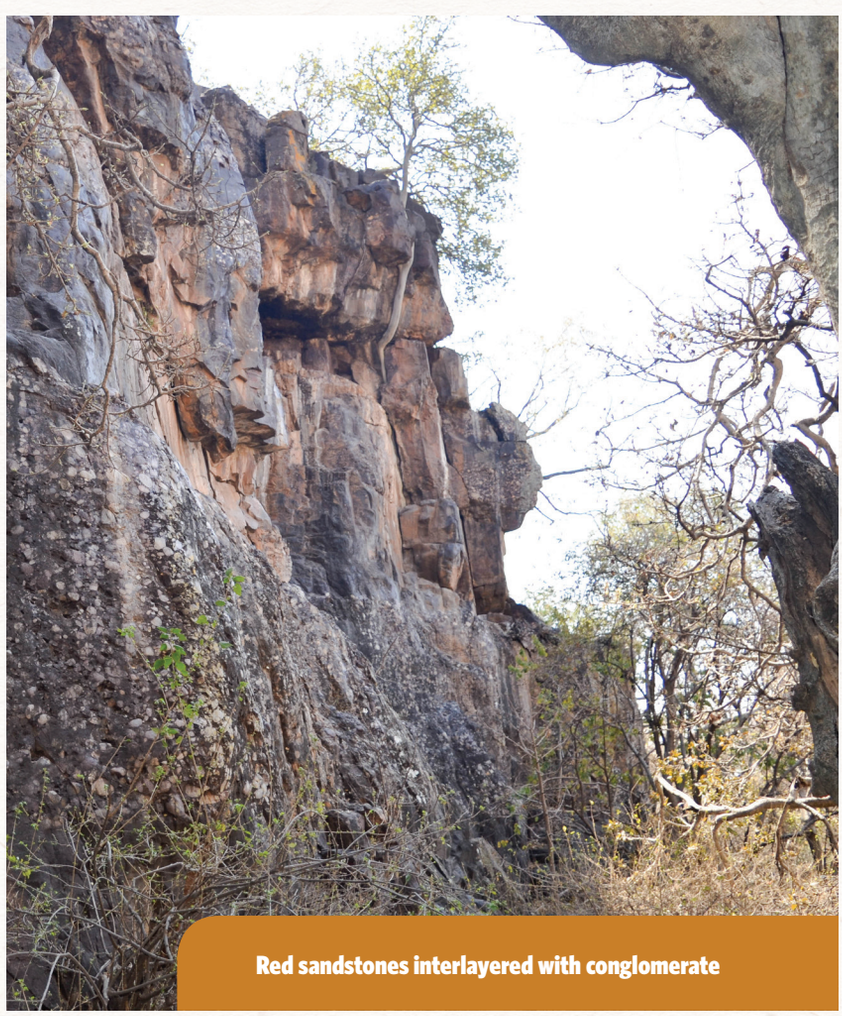
The continental mid-Proterozoic Waterberg Group sediments overlie the older rock units with marked unconformity. Most of the outcrops are in the fluvial red beds clastic sediments of the Manyelalanong Hill formation. Manyelanong Hill formation comprise of cross bedded red quartz sandstone and conglomerate.
Conglomerate occur throughout the formation: both clast and matrix supported types occur. The conglomerate themselves are multicolored, according to the type of clasts, although their matrix is argillaceous red sandstone.

About the Gorge

This gorge was formed among highly jointed rocks of the Waterberg Group. There are a series of waterfalls formed between boulders which fell from overhead rocks due to weathering of the parent rock. These attract animals such as vervet monkeys, rock rabbits and some birds. There is a belief that there is a mythic snake living at nearby Mmakgodumo Dam.

There is a stone wall resembling this snake near this dam. Near the gorge, there is a plant nursery, birds and game facility which promote activities such as bird viewing, hiking, picnics and photography. The local people perform rituals and cleansing ceremonies in this gorge.





Red sandstones interlayered with conglomerate

Site 4: Botswana Geoscience Institute

Some of BGI Facilities

Laboratory services

It conducts both chemical and physical tests on geological raw materials such as soil, rocks, ores and water. The laboratory is staffed with competent personnel and a wide range of modern instrumentation that enables it to produce quality and timely analytical results.

The laboratory gives technical advice on water quality test reports basing on BOS 32:2009 for human drinking water specification and BOS 365:2010 drinking water for livestock and poultry specification.

Chemistry laboratory participates in the following proficiency testing schemes offered at different levels for it to monitor, assure quality of the results as well as checking competence of its personnel:

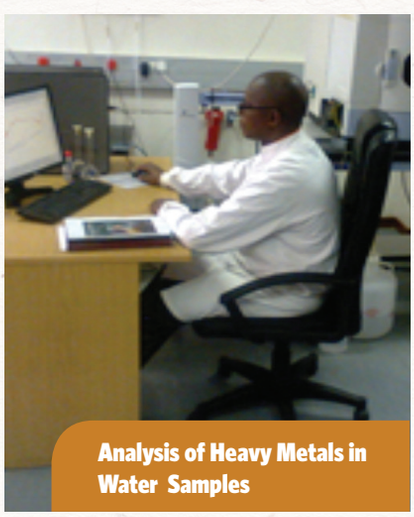
- BOBS Water Proficiency Testing Scheme (National)
- SADC.MET Water Proficiency Testing Scheme (Regional)
- International Geochemistry Proficiency Testing Scheme-U.K (international)

Services offered include

- Geochemical analysis
- Water quality analysis
- Mineral Identification (XRD, Microscope and SEM)

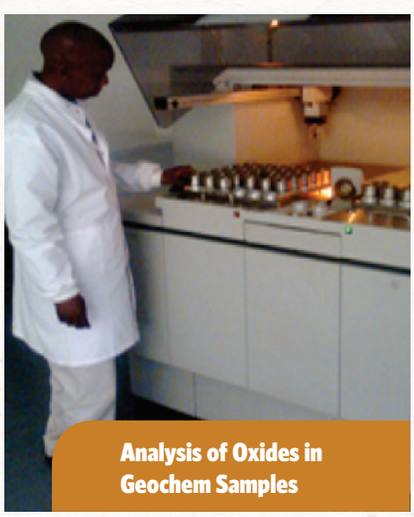
National Geological Information Centre – NGIC

The National Geoscience Information Centre is the custodian of geoscience information and data which is made accessible to the public. Geoscience data plays a key role in scientific research, managing geological hazards,civil and structural engineering projects, formulation of government resource policy and in enabling the efficient exploitation of naturally occurring resources such as minerals, soils, rocks and water. There is a range of geoscience data including geological maps at different scales, open prospecting license reports, GIS and remote sensing data, and specimens that include cores and chip samples. There is also a comprehensive collection of earth sciences literature in print and digital formats including books, journals and maps. Core and chip samples may be accessed by appointment made with the NGIC.



Analysis of Heavy Metals in Water Samples

Analysis of Major Constituents in Water Samples



Analysis of Oxides in Geochem Samples

Site 5: Otse Village

South end of Maladiepe Hill

There is a continuous development of red beds interpreted to be the western continuation of the Waterberg Supergroup basin of South Africa. The red beds have been divided into three lithostratigraphic Formations of the Otse Group. Of interest is the Maladiepe Hill Formation which comprises of red sandstones intercalated with shale –clast conglomerate. The sandstones tend to form lenses rather than continuous outcrops. The conglomerates consist of clasts of red, micaceous, finely laminated shales and siltstones.

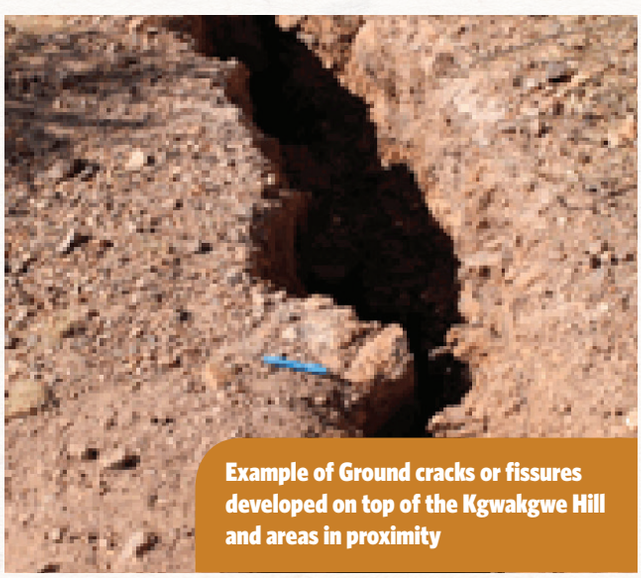
Close view of the shale clast conglomerate

The basal clast conglomerate and sandstones probably formed on the channel floor during a period of high discharge or transgression. Following this period, there was abandonment of the active channel (regression) and fine grained sediment accumulated from suspension in low energy environment. The resulting muds were reworked onto the conglomerates.

Examples of ineffective rehabilitation

Examples of ineffective rehabilitation

Old pipeline route now exposed and suspended above sunken ground.



Example of Ground cracks or fissures developed on top of the Kgwakgwe Hill and areas in proximity

Cattle drinking from stream water suspected to be Mn contaminated.

MEETING AGENDA

10th OAGS Annual General Meeting
Gaborone, Botswana, 8 - 10 October 2017

Directors of Ceremonies: James B. Molosankwe and Mosa Mabuza

Day 1: (FIELD TRIP)	**SUNDAY, 8TH OCTOBER 2017**		
Time	**Session**	**Field Excursion**	**Person Responsible**
07:30-16:30	**Departure from the hotel**	Kanye-Moshaneng area where there are old manganese and asbestos mines.	All
16:30-18:00	**Return to the hotel**	Woodlane hotel	All
Day 2: (OPENING CEREMONY)		**MONDAY, 9TH OCTOBER 2017**	
Time	**Session**	**Session Details**	**Person/s Responsible**
08:30-09:00	**Registration**		
09:00-09:10	**Welcome and opening of the meeting**	Welcome and introductory remarks and the expected outcome	**OAGS President**
09:10-09:15		Introduction of dignitaries and participants, by the OAGS Secretariat and Chief Executive Officer of the Council for Geoscience	**Mr Mosa Mabuza**
		African Union Commissioner of Trade and Industry	**Albert M. Muchanga**
		Address by Minister of Minister of Minerals Resources, Green Technology and Energy Security (Botswana	**Hon Advocate Sadique Kebonang**
		Address by the Minister of Mineral Resources (South Africa)	**Mr Mosebenzi Zwane**
09:15-10:30	**Official opening**	Address by Minister of Mines and Steel Development (Nigeria)	**Dr. Kayode Fayemi**
		Address by Chief Executive Officer of the Botswana Geological Survey	**Mr Tiyapo Ngwisanyi**
		Address by Senior Mineral Sector Governance Advisor for the United Nations Economic Commission for Africa (UNECA)'s African Mineral Development Centre (AMDC)	**Mr Kojo Busia**

10th OAGS Annual General Meeting
Gaborone, Botswana, 8 - 10 October 2017

		Address by the head of the EuroGeo Surveys	**TBC**
10:30-11:00		Tea / coffee break	
11:00-11:15		The role of the African Union Commission on Geological and Mineral Information, by the Senior Industry Advisor to the African Union Commissioner of Trade and Industry	**Mr Frank Dixon Mugyenyi**
11:15-11:30	**Presentations/ Discussion**	African Mineral Resource Classification (results from Cairo Workshop), by Head Geology and Mineral Information Section African Mineral Development Centre - AMDC	**Dr Kaiser G. De Souza**
11:30-11:40		Proposal for an African regional database construction, Geological Survey of Brazil.	**Mr Joao Henrique**
		OAGS & PanAfGeo Project	
11:40-11:50		An Introduction of the OAGS	**OAGS President**
11:50-12:00		OAGS Activities: current status	**Ms Anna Nguno**
12:00-12:20		PanAfGeo Project Overview	**Mr Jean Claude Guillaneau**
12:20-12:30		PanAfGeo Project: current status	**Mr Isaac Okorie & Dr Rokhaya Samba**
13:30-14:30		Lunch break	
		Presentations / Discussion	
14:30-14:45		Manufactured sand, a potential for river sand substitute	**Wantlo N.**
14:45-15:00	**Presentations/ Discussion**	Earthquakes (latest seismic activities, central Botswana	**Kwadiba T. Ntibinyane O**
15:00-15:15		The legacy of old mining with emphasis on the health and environmental hazards posed by the kgwakgwe and Moshaneng manganese mines	**Moseki M.**

10th OAGS Annual General Meeting
Gaborone, Botswana, 8 - 10 October 2017

15:15-15:30		Pollution monitoring in BcL mine	**Phemo M.**
15:30-15:45		Tea / coffee break	
		Presentation	
15:45-16:00	**Technical Presentations**	"Africa's Part on the Global-scale Geo-chemical Mapping Project	**Simubali G.**
16:00-16:15		Mineral Accounts	**Tshoso**
16:15-16:30		Open for a presentation	**TBC**
		Closing remarks and conclusion of meeting	
16:30-17:00		Closing remarks and conclusion of meeting	**OAGS President**
19:30-22:00		Group Dinner	All
Day 3: Tuesday , 10th October 2017 (This meeting is solely for OAGS members)			
Time	**Session**	**Session Details**	
08:00-11:00	EXCOM MEETING	ONLY EXCOM MEMBERS ARE TO ATTEND THIS MEETING	
10th OAGS ANNUAL GENERAL MEETING Chair: (OAGS President) Co-Chair: (OAGS Vice-President) 11:00-17:00			

Notes

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