

## Chairman's Chat

Colin Comberbach



Source: IOM3

Another new year is already well under way and I'm delighted to front another edition of the MTG Newsletter. You might recall my previous comments about our desire for greater involvement from MTG members and readers. To help this along we have devoted a significant section herein on the position of MTG within IOM3 and its technical communities and simple reminders on how to ensure that you can have access to mining technology content. Better still, please help us to create and publicise it! The importance of dissemination is it being a key element of your CPD, such as the future path to Qualified for Minerals Reporting Accreditation. We are very pleased to have in this edition the company of Ian Bowbrick, IOM3 Director of Membership and Professional Standards to introduce this new initiative.

It was of great interest to me that the BBC played a part when it dedicated the full hour of Countryfile to aspects of UK mining on 5<sup>th</sup> February 2023. I encourage you all to share the BBC iPlayer link (p.2) as an accessible way to broadcast the importance of mining in daily life.

This newsletter also contains several updates on UK mining and critical raw materials developments, satellite monitoring technology, mining heritage and affiliated local society activities. The International Symposium on Ground Freezing is now only months away and, as reported by the Co-Chairmen, is well and truly geared for success. Finally, if you will be in the vicinity of Derbyshire, please try and show your support for the Markham Vale 50 year Memorial Event scheduled to take place on 30<sup>th</sup> July 2023 (details on p.12).

My invitation remains open to visit [linkedin.com/in/coldcomb](https://www.linkedin.com/in/coldcomb) and find out more about my background or post me a message with any ideas or suggestions to develop the MTG. Alternatively, please send an email marked for the attention of IOM3 MTG to our IOM3 support contact David Arthur ([david.arthur@iom3.org](mailto:david.arthur@iom3.org)).

## Stop Press

See MTG webpage for latest articles:

[www.iom3.org/group/mining-technology-group.html](http://www.iom3.org/group/mining-technology-group.html)

**Critical Raw Materials:**

Aberdeen Minerals Ltd - first phase of drilling for Ni-Cu-Co resources at Arthrath is underway, see page 9.

The Critical Minerals Intelligence Centre (CMIC) interactive map of UK mineral processing, refining and recycling can be found [here](#).

**Upcoming Events:**

**Coal Authority Board Meeting in Public - England, Newcastle-upon-Tyne, 24<sup>th</sup> March 2023**, (including presentation by NEIMME & MTG member **Norman Jackson**) - Register free [here](#).

**Midland Institute of Mining Engineers - 16th Annual Safety Seminar, Sheffield, 21<sup>st</sup> April 2023** ([themime.org.uk/events/](http://themime.org.uk/events/)).

**Mines and Money Connect, London, 25-26<sup>th</sup> April 2023** ([www.iom3.org/events-awards/ems-event-calendar/mines-and-money-connect-london.html](http://www.iom3.org/events-awards/ems-event-calendar/mines-and-money-connect-london.html)).

**11<sup>th</sup> International Symposium on Ground Freezing, London, 10-12<sup>th</sup> October 2023.** ([www.iom3.org/events-awards/11th-international-symposium-on-ground-freezing.html](http://www.iom3.org/events-awards/11th-international-symposium-on-ground-freezing.html)). Update on page 11.

## Contents

Page 2	News and Views	MTG Leadership
Page 3	Contributions required	MTG Leadership
Page 4	Technical Communities	MTG Leadership
Page 5	QMR Accreditation	Ian Bowbrick
Page 6	Local Society News	Various
Page 7	PERC News	Andy Birtles
Page 7	ICMM News	Various
Page 8	Satellite Monitoring	Nathan Magnall
Page 9	CRM prospecting in Scotland	David Seath
Page 10	Scottish Shale Oil Museum	David Seath
Page 11	Symposium on Ground Freezing	Alan Auld
Page 12	Markham 50 year Memorial	SMIM/ABMEC/HSE
Page 13	Rosliston Mining Memorial	Rod Stace

## Editorial Team

Colin Comberbach, Rod Stace, Andy Birtles

IOM3 contact - David Arthur ([david.arthur@iom3.org](mailto:david.arthur@iom3.org)).

## News and Views from the Mining Sector

## MTG Leadership

### LKAB Rare Earth Element Declaration

LKAB has identified significant deposits of rare earth elements in the Kiruna area of Sweden, metals which are essential for, among other applications, the manufacture of electric vehicles and wind turbines. Following successful exploration, the company has reported mineral resources of rare earth metals exceeding one million tonnes of rare earth oxides and the largest known deposit of its kind in Europe.

No rare earth elements are currently mined in Europe, at the same time, demand is expected to increase dramatically as a result of electrification, which will lead to a global undersupply, and this at a time of increasing geopolitical tensions. According to the European Commission's assessment, the demand for rare earth elements for electric cars and wind turbines, among others, is expected to increase more than fivefold by 2030. Today, Europe is also dependent on imports of these minerals, where China completely dominates the market, a factor which increases the vulnerability of European industry.

The results are reportedly presented in accordance with the 2021 PERC Reporting Standard, which is the prevailing international standard for LKAB. This statement is currently being reviewed for "compliance" with the guidelines contained within the 2021 PERC Reporting Standard.



Location of Kiruna Deposits

Source: LKAB

### West Cumbria Mining

West Cumbria Mining indicated that they are delighted with the decision of the Secretary of State to formally approve the Woodhouse Colliery planning application. This decision is supported by the Planning Inspector following on from last year's planning inquiry, means the project can now move forwards to deliver the world's first net zero mine supplying the critical steel industry both at home and abroad with a high-quality metallurgical coal product.

Those in favour of the mine locally say the employment opportunities will provide a much needed economic boost to a deprived area of Whitehaven and Workington, traditional mining towns, and reduce dependence on imported coal required for the steel industry.

Opponents argue that any economic benefit is outweighed by the damaging impact of the mine on the climate. They also warn that the demand for coking coal for steel is declining and that most of the coal extracted from the mine would be exported which reduces the carbon footprint of the area and the UK as a whole. Steel is required in most of our basic needs, mobile phones, wind turbines, vehicles, buildings, infrastructure etc.

For further information please contact: [news@westcumbriamining.com](mailto:news@westcumbriamining.com). See the West Cumbria Mining newsletter at [www.westcumbriamining.com/wp-content/uploads/WCM\\_Project-NL\\_Feb-2023\\_R11.pdf](http://www.westcumbriamining.com/wp-content/uploads/WCM_Project-NL_Feb-2023_R11.pdf).

### UK Lithium Collaboration

Cornish Lithium Plc and Northern Lithium Ltd recently announced a collaboration agreement on the development of a sustainable, domestic supply of lithium for the UK at scale over the next decade. Cornish Lithium is concentrating on SW England granites, whilst Northern Lithium's focus is on NE England and the Northern Pennine Orefield of County Durham. The news follows on from Cornish Lithium commissioning the UK's first Direct Lithium Extraction (DLE) pilot plant in March 2022. For more information [click here](#).

### Mining Goes Mainstream - BBC Underground Britain

Mining is definitely receiving more media attention and not necessarily for the predictable reasons. It was refreshing to see the BBC get in on the act with the full hour of its Countryfile programme 'Underground Britain' on 5th February 2023. Highlights included the technology behind lithium extraction for the future energy transition, methods of polyhalite mining deep underground at Boulby Mine and its agricultural benefits today, treatment of legacy groundwater from past mining and wildlife habitat regeneration in disused mines. Whilst not the full picture, the programme was a good, objective piece to raise public awareness about UK mining. Here's the link to watch with your family and friends if you missed it first time: [www.bbc.co.uk/iplayer/episode/m001hz7x/countryfile-underground-britain](http://www.bbc.co.uk/iplayer/episode/m001hz7x/countryfile-underground-britain).

## Contributions required

## MTG Leadership

### IOM3

The Institute of Materials, Minerals and Mining (IOM3) is one of the leading global professional membership bodies for those either studying, working or interested in the science, engineering and technology relating to materials and natural resources, and the processes involved in their exploration, extraction, processing, forming, application, recycling, reuse and repurposing. The IOM3 website indicates that being a member of the IOM3 allows:

Being part of, and contributing to, a dynamic and vibrant community which is addressing the current challenges by supplying the current and future generations with minerals and materials and developing the associated science, engineering and technologies required.

Having available the latest knowledge, insight into cutting edge application and practice, and thought leadership on all classes of minerals and materials and associated technologies.

Being recognised for professional achievements, experience, and competence through a suite of awards, bursaries, scholarships, and Chartership programmes.

Staying at the top of the professional game by participating in sector recognised professional development activities including conferences, webinars, courses and podcasts.

### Get information

As the MTG Leadership Team we are trying to put out a Newsletter that is interesting and informative for IOM3 members who have selected our Technical Community, but we must of course respect members' communication preferences and ensure that we comply with Data Protection law when communicating with them. If you select MTG as your preferred group in your Member Profile on the IOM3 website (see below), you will get notifications of updates directly from our website pages. If you don't want to receive updates relating to the MTG, then you will need to remove this from your primary or other technical group as shown below.

The image contains two screenshots from the IOM3 website. The left screenshot is titled 'Technical Community' and asks the user to choose a preferred technical community from a list of IOM3 special interest groups. It includes a dropdown menu for 'Primary technical group' and another for 'Other technical groups'. The right screenshot is titled 'Opt In Preferences' and lists several options for receiving updates, all of which are checked. The options include: 'Send me information about relevant IOM3 training courses and learning opportunities', 'Send me a regular update about forthcoming IOM3 events', 'Please send me the monthly Materials World e-newsletter of news and industry updates', 'Send me Local Society event calendar updates', and 'Send me a weekly website content digest - news, articles & events'. There are also checkboxes for 'Allow email' (checked) and 'Allow post' (unchecked).

Screenshots from IOM3 website

Source: IOM3

You will also receive emails from IOM3 about events and activities relating to Mining, if you select this in your preferences in your member profile. Under the General Data Protection Regulation (GDPR) we must allow members to opt out of receiving information from IOM3 if they do not wish to do so – but if you do want to continue to receive information from IOM3, then please make sure that on your Preferences page under Communications, you have ticked 'Allow Email'. Please also opt In to other updates like the Content Digest, Events update and MW e-newsletter.

### Get involved

At the MTG we would appreciate if you could contribute to what we do, or wish to do, or suggest ways that we can improve the website, the communication to and from the affiliated members, the events that are organised, and of course you are welcome to contribute an article to this Newsletter. An e-mail to a client or customer requesting some form of information would usually be in the region of 250 words. This is about the number of words in this article, so come on and let us know of your involvement in the mining sector and share your views or contribute in some way to the MTG. Let us know at [linkedin.com/in/coldcomb](https://www.linkedin.com/in/coldcomb) or [david.arthur@iom3.org](mailto:david.arthur@iom3.org).

## Technical Communities

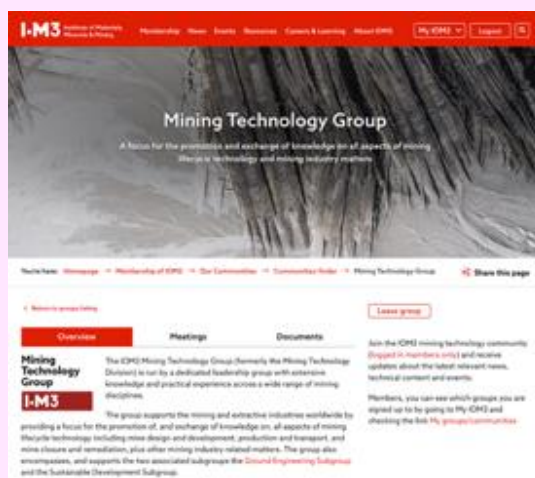
## MTG Leadership

### Groups

For over 150 years, the evolution of IOM3 has brought together a wide range of disciplines and communities. These include specialists covering many sectors, from mining to nanotechnology, biomaterials to packaging.

There are several groups within IOM3 focussed on supporting members in specific ways, providing networks for people during their careers and for under-represented groups within our profession. There are currently 22 technical communities, now known as groups, and consist of the following:

- Adhesion & Adhesives Group, including Joining Technologies Group
- Applied Earth Science Group
- Biomedical Applications Group
- Ceramics Group, including Clay Technology Subgroup
- Composites Group
- Construction Materials Group
- Defence Safety & Security Group
- Elastomer Group
- Energy Materials Group
- Energy Transition Group
- Iron & Steel Group
- Materials Characterisation & Properties Group
- Materials Processing & Manufacturing Group
- Mineral Processing & Extractive Metallurgy Group
- Mining Technology Group, including Ground Engineering Subgroup
- Natural Materials Group
- Non-Ferrous & Light Metals Group
- Packaging Group
- Polymer Group
- Surface Technologies Group, including Corrosion Subgroup
- Sustainable Development Group, including Resources Strategy Subgroup
- Wood Technology Group



Screenshot from IOM3 website

Source: IOM3

More information about these technical communities, groups and subgroups can be found on the IOM3 website (<https://www.iom3.org/membership/our-communities/technical-communities.html>).

### Local Societies

IOM3 has affiliated local societies in the UK and a number of international partnerships, providing local networks for members globally. We also have a strong community of volunteers who contribute to our activities, from governance and peer review activities to involvement in event organisation. Local Societies affiliated to the MTG include:

- MinSouth - London & Southern Counties Minerals Industries Institute
- CorIE - Cornish Institute of Engineers
- MIMinE - Midland Institute of Mining Engineers
- WIMM - Western Institute of Mining & Minerals
- NEIMME - North of England Institute of Mining & Mechanical Engineers
- MIS - The Mining Institute of Scotland

Details of the activities and events organised by these societies are indicated later in this Newsletter.

SMMMI - South Midlands Mining & Materials Institute finally ceased operations in 2022, and all assets were presented to the IOM3.

## Qualified for Minerals Reporting Accreditation

Ian Bowbrick

### Background

There have been several cases in the past where complaints have been received by the IOM3 relating to the reporting of Mineral Resources and Mineral/ Ore Reserves undertaken by IOM3 members. In addition CRIRSCO had become concerned that the standards and processes being used by organisations seeking to become Recognised Professional Organisations (RPO) to accredit professionals were far more demanding than those being used by many of the older RPO including IOM3. The Institute consequently received a clear message to raise its game. This prompted an assessment as to how these issues are handled, and how the IOM3 membership could be affected. Thus began an investigation into how the IOM3 can best serve a “specialist” group of professionals who contribute to, and report, Exploration Results, Mineral Resources and Mineral/ Ore Reserves in accordance with the guidelines contained in the CRIRSCO templated Codes and Standards.

### History

To date, several members have been subjected to an interview where their involvement in and contribution to the preparation of a Public Report (as defined in the various Codes and Standards) has been determined. This process is not to determine “Competency” (or “Qualification”, the Canadian equivalent) as defined in the Codes and Standards, but to establish whether or not the applicant appreciates the reason for the use of the various Codes and Standards in the preparation of a Public Report presenting Exploration Results, Mineral Resources and Mineral/ Ore Reserves associated with a mining project or a mining operation. The accreditation process, with the postnominals of QMR, has now been approved by the Privy Council, and the final stages of the development of the accreditation will be undertaken over the next few years.

### Way forward

Those members who are currently practicing the development of Public Reports will be “automatically” granted QMR accreditation following a suitable (“light touch”) application process (“grandparenting route”). Members with less experience, or who contribute to the development of a Public Report (rather than being a signatory), will need to apply and be subject to an appropriate interview to establish familiarity with the processes required to develop a Public Report. Every year, it will be expected that, during the membership renewal process, appropriate proof of continued involvement in the contribution and development of Mineral Resource estimation and Mineral/ Ore Reserve determination will be required.

### List of practitioners

Those members who are accredited as a QMR will be placed on a IOM3 controlled “database”, along with other membership details. This will enable appropriately qualified persons to be contacted in the event of a query from a company looking for this type of work to be undertaken, or from the membership looking for assistance in the development of a public report.

### Support

It is not expected that there will be more than 200 or so members that are involved in this “specialised” type of work, and this “specialist” group of people will be afforded appropriate support in the event of a complaint being made against them. This means that the IOM3 will be able to fairly assess any misconduct by ensuring the appropriately qualified persons are involved in the investigation process.

### Other

There will be an annual fee for QMR, which in 2023 will be £48. It will be pro-rated for individuals qualifying during the year. There will be no application or admission fee for those applying for QMR through the grandparenting route, but there will be a fee for those applying for QMR after 1<sup>st</sup> March 2023 which in 2023 will be £120, which will also cover the initial registration fee. Further information on QMR, the grandparenting route or normal application route is available from [membership@iom3.org](mailto:membership@iom3.org), from the IOM3 website ([QMR](#)) or from Ian Bowbrick ([ian.bowbrick@iom3.org](mailto:ian.bowbrick@iom3.org)).

## Local Society News

## Various

All Affiliated Local Societies (ALSs) that are linked to the Mining Technology Group are now well through their technical programme for 2022/23. There are several upcoming presentations by The North of England Institute of Mining and Mechanical Engineers ([NEIMME Lectures – The Mining Institute](#)); The Midland Institute of Mining Engineers ([Events – Midland Institute of Mining Engineers](#)); MinSouth ([Events](#) – check to see all upcoming events); the Western Institute of Mining & Minerals ([Meetings](#)); and The Mining Institute of Scotland ([Events](#)). These presentations are open to all and details can be found below, or on the relevant websites and links.

The 2023 Young Persons' Lecture Competition has several scheduled local heats organised by mining ALSs. Please come along and support these Student & Early Career members at the local heat or the regional finals.

### MIMinE

The MIMinE is holding its 16<sup>th</sup> Safety Seminar, with technical papers of relevance to mining and mineral extraction on 21<sup>st</sup> April 2023. This annual event attracts a diverse audience which includes senior personnel, procurement managers, trade unionists, students and apprentices. The event also features company exhibition stands and ample opportunities for delegates to network during break times. Members of the MTG Board will be in attendance and would welcome meeting anyone who wishes information on MTG activities. More details can be found at [here](#).

Also note that the AGM and annual dinner is to be held on Friday, 13<sup>th</sup> October 2023. Details can be found at [themime.org.uk/](#).

9<sup>th</sup> February 2023 – Daniel Sharpe of Komatsu presented 'The evolutionary development of AFCs'

9<sup>th</sup> March 2023 – Graham Vodden of Amco Giffen presented 'ICL Boulby infrastructure refurbishment'

21<sup>st</sup> April 2023 – Annual Safety Seminar in Sheffield (Safely Managing the Challenge of Change)

11<sup>th</sup> May 2023 – Ryan Alexander of Fuchs (Lubrication and equipment reliability)

### NEIMME

The North of England Institute of Mining and Mechanical Engineers Council Member and IOM3 MTG Leadership Team Member Norman Jackson has been invited to give a presentation at the Coal Authority Board Meeting in Public - England at The County Hotel, Newcastle-upon-Tyne on 24<sup>th</sup> March 2023. The subject of the presentation is The History of Coal Mining in The North East of England and the Importance of the North of England Institute of Mining and Mechanical Engineers. This is great news for Norman and reflects not only his professional standing as an acknowledged authority on mining engineering and industry restructuring but also the importance of fostering relationships between various bodies with mining interests. To register free for attendance in person or via Zoom, click [here](#).

### WIMM

WIMM have published their list of meetings and presentations for the remainder of 2022/23, at Keele University:

- Monday 6<sup>th</sup> February 2023: Dave Greenwell/ Alun Jenkins - SES Ltd presented "Alternative Shaft Access at a North Wales Shaft site"
- Monday, 6<sup>th</sup> March 2023: Stuart Houlton – MRST (Mines Rescue and Training Ltd) presented "How the Mines Rescue Service have moved into a new era"
- Monday 24<sup>th</sup> April 2023: James Thorne, CEO Institute of Quarrying - Developments at the National Stone Centre (NSC)

### MinSouth

Clare Onal of Mott MacDonald presented on the Kidston Pumped Storage Project (Queensland, Australia) on 9<sup>th</sup> February 2023. More details of this can be found [here](#).

### MIS

On 14<sup>th</sup> December 2022, the inaugural joint meeting of The Mining Institute of Scotland and the Mining Technology Group was held in Edinburgh. A recording of a presentation entitled "Mine Shaft Access - a new approach" given by Martin Downing and Dave Greenwell can be downloaded [here](#), and accessing it with passcode: U85H\*@+h if necessary.

- 19<sup>th</sup> April 2023: Mark Hudson, MD at Geoterra - Modern Underground Survey Techniques

## PERC News

Andy Birtles

# PERC

Source: [percstandard.org](http://percstandard.org).

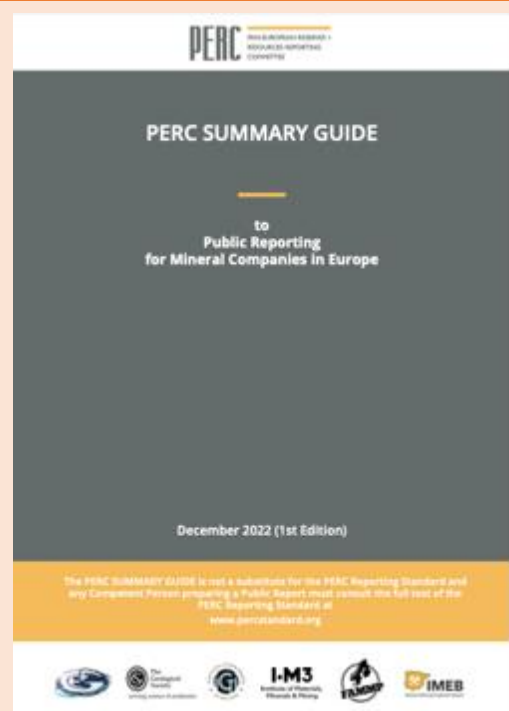
The Pan-European Reserves and Resources Reporting Committee's PERC SUMMARY GUIDE (the Guide) provides a valuable starting point to anyone seeking to understand the Mineral raw materials industry. The PERC Reporting Standard sets out the required minimum standard and

additional guidelines for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves.

The Guide summarises the principles and standard definitions in the PERC Reporting Standard 2021. The Guide highlights the key aspects of Public Reporting for Mineral Companies, as an easy reference for both non-technical and expert users. The Guide assists the reader in familiarising themselves with the sector's language, particularly the proper use of the terms Exploration Results, Mineral Resources and Mineral Reserves. The specialist minerals geologist, mining engineer, processing engineer, or any other interested person must fully understand these specific terms, when to use them and, more importantly, when not to use them.

The Guide is based on the previously published 'IGI Summary Guide to Public Reporting' (December 2021) prepared by the Institute of Geologists of Ireland (IGI).

If you are interested in participating in discussions about Minerals Reporting in Europe and the PERC Reporting Standard, please join PERC's LinkedIn discussion group: [www.linkedin.com/groups/7489875/](https://www.linkedin.com/groups/7489875/) or subscribe to the PERC mailing list using the option provided on the PERC website: <https://percstandard.org/>.



Source: [percstandard.org](http://percstandard.org).

## ICMM News

Various

There are some really interesting articles and features on the International Council on Mining and Metals (ICMM) website that are worthy of noting, including an article on the circular economy in mining. It indicates that, when done responsibly, mining can be transformational to host communities and economies.

Included in the news and analysis section of the website ([www.icmm.com/en-gb/news-and-analysis/analysis](https://www.icmm.com/en-gb/news-and-analysis/analysis)) are articles on the European Commission's proposed Critical Raw Materials Act, and a comment on the UK Government Net Zero Review.

ICMM has published two reports – The Mining Contribution Index (MCI) and the 2021 update to the Tax Contribution Report – and whilst showing only one aspect of 'contribution' they highlight that which the mining industry makes to the economies of host countries together with the important role of mining in some of the poorest countries in the world. The MCI synthesises into a single number, and associated ranking, the significance of mining's economic contribution to national economies. Since ICMM first published the report in 2014, the data has consistently shown that mining remains the primary driver of economic activity in many low and lower-middle income countries.

At the time of the compilation of this Newsletter, the ICMM team will have attended the Mining Indaba in Cape Town, South Africa. Rohitash Dhawan spoke on the actions taken on Diversity, Equity and Inclusion in the industry, and Aidan Davy discussed the role of ESG in risk and uncertainty among the investor community and on a 'zero harm' approach to tailings and safety management.

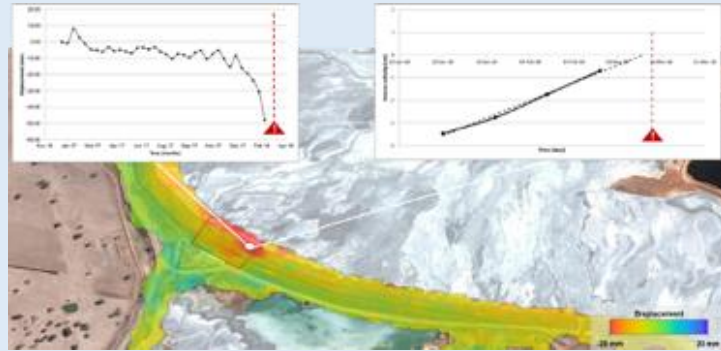
Other pages of the website give comment and insight into a range of topics relating to mining and the extractive industry.

## Satellite Monitoring

Nathan Magnall

### Using Satellite Imagery to Monitor Critical Mine Infrastructure

Recent high-profile incidents at several Tailings Storage Facilities (TSFs), such as the failures at Jagersfontein, Cadia and Brumadinho, have highlighted the need for accurate and frequent monitoring techniques that can be deployed globally. Earth observation technologies, such as interferometric synthetic aperture radar (InSAR), are now established tools that are regularly used within the mining industry to monitor critical assets. CGG has over 25 years of experience delivering InSAR services globally and is well placed to give mining companies access to timely intelligence to avoid these failures.



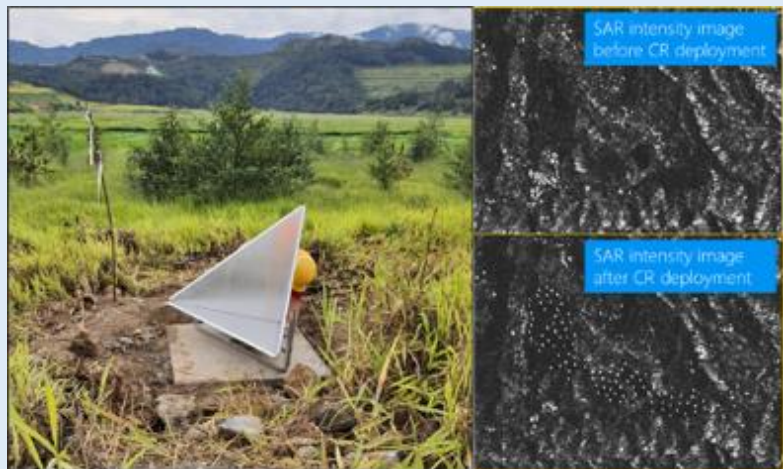
InSAR displacement map of the Cadia TSF wall prior to failure. Graphs show displacement over time (left) and inverse velocity modelling (right). © CGG 2023. Contains modified Copernicus Sentinel Data, 2023.

InSAR uses the difference in a property called phase between at least two synthetic aperture radar (SAR) images to determine ground movement towards or away from a satellite. InSAR is a remote technique capable of detecting ground displacement as small as a few millimeters per year. It is capable of working day or night, in all weathers, and can provide updates up to every 6 days. However, InSAR is not without its limitations, often struggling in areas of dense vegetation and where large ground disturbances occur.

In two recent tailings dam failures, InSAR has been able to show clear pre-cursor signals. While this information in isolation is unlikely to have been sufficient to have predicted the failure, it could have provided a warning to trigger in-situ investigation and/or real-time ground-based monitoring at the location of the anomalous movement. At the recent Jagersfontein TSF failure in South Africa, InSAR detected deformation that could be correlated to possible bulging of a large buttress constructed on the southeast tailings wall over a month before the eventual failure on the 11th September 2022. At the Cadia Mine in Australia, InSAR monitoring by CGG showed clear precursors to eventual failure of one elevated TSF into a second lower TSF. Displacement could be seen over a month before the wall failure in February 2018, and inverse velocity modelling demonstrates good agreement between the predicted and actual failure date.

The previous examples show situations where InSAR can work effectively without any need for ground infrastructure. However, sometimes InSAR will not work without the deployment of fixed radar reflectors, i.e. corner reflectors. Corner reflectors are fixed radar reflectors that can be deployed on a site to act as regular and reliable measurement point, which are measured with each satellite acquisition. They are particularly useful for sites with dense vegetation cover or that experience snowfall and are especially valuable for mines undergoing closure and rehabilitation, where on-site resources and powered monitoring solutions may be limited or impractical.

InSAR has become a proven technology within the mining sector, which is helping to improve safety and help companies meet new regulatory requirements. Alongside InSAR, other remote sensing techniques can be used to conduct topographic surveys, map seepage and ponded water, and monitor vegetation health (to name just a few applications). As the number of Earth Observation satellite missions proliferates, the applications and uptake of this rapidly expanding technology will continue to broaden.



Corner reflectors deployed on a vegetated mine. Insets show the radar amplitude before and after installation, bright spots show the new reflectors. © CGG 2023. Contains modified Copernicus Sentinel Data, 2023.



## Critical Raw Materials in Scotland

David Seath

Aberdeenshire is a highly prospective geological setting with identified nickel-copper-cobalt-platinum group metal sulphide mineralisation hosted in Ordovician-aged mafic intrusive complexes within a 10,000 square km area north and west of Aberdeen city. Whilst Aberdeen may be known as Europe's oil and gas capital, it is so much more. It is at the forefront of a global energy transition to a lower carbon world. Whilst the offshore geology has provided over 50 years of hydrocarbon production, the story of the onshore mineral wealth is just beginning. The region was extensively but not exhaustively explored by Riofinex (RTZ) and Consolidated Gold Fields (CGF) from as early as 1967 (and as a joint venture – Exploration Ventures Ltd. (EVL) from 1969) for reef-type (layered intrusions) copper-nickel mineralisation. One discovery that



Source: Aberdeen Minerals Ltd

resulted from this work was at Arthrath, which is considered home to the largest known nickel deposit in the UK.

Aberdeen Minerals Limited (AML) is a mineral exploration company currently engaged in mineral exploration in North East Scotland. Its mission is to help Scotland locally source supplies of the battery raw materials necessary to achieve its green industrial goals to deliver a zero-emissions transportation sector. The company is using cutting edge exploration technologies to discover and define economic copper and nickel deposits and has secured exploration agreements with a package of landowners over the areas it considers most prospective.

AML hired international specialist SkyTEM Surveys for the first modern airborne geophysical survey of the region. Helicopter surveys got under way last autumn. A full targeting study concluded that the North East of Scotland is prospective for Ni-Cu-Co (+/- PGE) magmatic sulphide deposits and remains under explored from the perspective of modern dynamic conduit-style deposit models and availability of more advanced geochemical / geophysical surveying techniques and analyses since the historical work was conducted. A detailed data driven review utilised all available historical datasets to identify regional targets and to reassess the potential of historical prospects. The initial data review and digital acquisition, geostatistical analysis and interpolations were performed on licensed and public domain data acquired from the British Geological Survey (BGS), including large volumes of previous operator survey results. Upon conclusion of the survey in 2022, AML commenced data interpretation on an accelerated timeline. The results will help the company to refine its understanding of the highly prospective broader North East region in preparation for a potential second phase of geophysical surveys in 2023.

All of the historical regional exploration predated new, dynamic genetic exploration models, which followed the Voisey's Bay, Labrador discovery in 1998. The dynamic exploration model predicts that mafic- ultramafic intrusions are prospective where they contain olivine-rich gabbro-norites with evidence of assimilation of metasedimentary country rock and sulphide immiscibility. Feeder zones which acted as conduits for large volumes of magma are particularly favourable targets as geometric-velocity decrease trap zones – such favourable lithologies and conduit pulse evidence have been identified at Arthrath.

AML's targets are based on favourable geology, geochemical surface expression and geophysical responses for magmatic nickel-copper potential. A number of the regional targets identified have surface geochemical surface expression coincident with geophysical responses that may be associated with concealed intrusions. The company continues to optimise its exploration programme, utilising a range of technologies, but is presently focusing on diamond drilling.

At Arthrath, a maiden drilling programme is now underway, designed to validate and expand on drilling carried out by Rio Tinto in the 1960s and 1970s, from which only limited information is now available. The drilling will allow new and detailed geological, mineralogical and rock chemistry data to be collected and modelled, and higher-grade nickel-copper-cobalt mineralized zones to be investigated. The results will help AML to investigate the high potential in North East Scotland for deposits of nickel, copper and cobalt, which are critical raw materials for the energy transition. Find out more:

[www.aberdeenminerals.com](http://www.aberdeenminerals.com)

## Museum of the Scottish Shale Oil Industry

David Seath

Everyone is familiar with fossil fuels such as coal, oil and gas. Shale oil is an unusual form of fossil fuel that was produced from oil-shales mined in West Lothian. James "Paraffin" Young's works in Bathgate were the first in the world to produce and refine oil, and shale oil continued to be produced in West Lothian until 1962.

Oil-shale is a hard, shiny, sedimentary rock which contains the remains of microscopic creatures that lived over 300 million years ago. When this rock is crushed and heated, a crude oil is released, very much like the crude oil produced from oil wells in many parts of the world. This crude oil was processed at a refinery to produce many different kinds of oil, wax and grease. In West Lothian, detergents and bricks were also produced as a by-product of shale oil production.

Oil-shale was mined from deep beneath the eastern part of West Lothian. The shale was brought to the surface and taken to a crude oil works, where it was heated in a retort to release crude oil and other useful chemicals. The crude oil was then taken by railway to a refinery where many oil products were produced.

The Scottish shale oil industry began in 1850, when James "Paraffin" Young invented a process for obtaining oil from a special kind of coal. This created a world-wide demand for paraffin that could be burned in oil lamps. In 1864 Young began construction of a new works, which used oil-shale for producing oil. The success of these works inspired many others to enter the oil business, and new oil works were built in many parts of West Lothian.



Shale oil extraction.

Source: Museum of the Scottish Shale Oil Industry

At the start of the 20th century, the shale oil industry was very profitable and much was invested in new works, new mines and new villages to house the workforce. This changed suddenly after the First World War as Britain began importing crude oil from oil wells in Arabia and other overseas countries. This imported crude oil was much cheaper than oil produced from oil-shale, and many shale oil works were forced to close. To prevent mass unemployment, the government introduced a subsidy on shale oil products, and invested in new mines and a new oil works prior to the second world war. The industry finally closed in 1962 after the government decided to remove the subsidy.

There are still many reminders of this famous industry. Many of the red shale "bings", made from the waste material produced at crude oil works, still survive. A few are now preserved as monuments. Many of the houses built to house the shale oil workers and their families also survive and have been modernised to provide good solid homes.

The Museum of the Scottish Shale Oil Industry was created in 1990 and holds a collection of National significance to Scotland. A large and varied collection that illustrates many aspects of the shale oil industry in Scotland has been assembled. The collection ranges in scale from large items of machinery to individual paper documents, and records both the activities of the oil companies and the everyday life of the communities that served the industry.

The museum is also custodian of the 'BP Archive' containing the surviving official records of those Scottish shale oil companies that became part of the BP group of companies. Such documents relate mainly to legal and technical matters, but are nevertheless a unique primary



Museum interior.

Source: Museum of the Scottish Shale Oil Industry

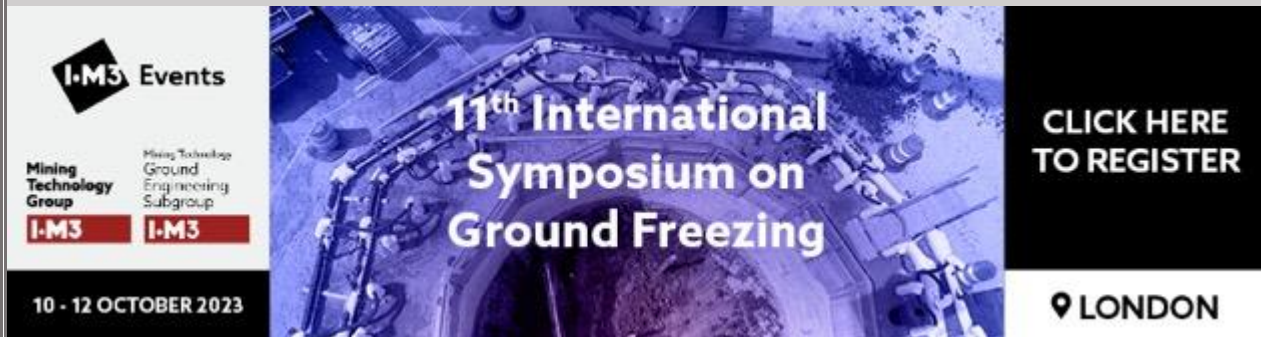
source for research. Materials that have been lent to the museum for copying, published works, research notes, and other library items are held in a separate collection. The catalogues of all collections are published on the website [Museum of the Scottish Shale Oil industry - Scottish Shale](https://www.scottishshaleoilindustry.com/), and many search results are linked to digital copies of these resources which can be downloaded. A virtual tour of the Museum can be found by following this link: [A Virtual Tour of the Museum - Scottish Shale](https://www.scottishshaleoilindustry.com/virtual-tour/).

Source: [Almond Valley Heritage Trust](https://www.almondvalleyheritagetrust.com/)

## Symposium on Ground Freezing

Alan Auld

### 11<sup>th</sup> International Symposium on Ground Freezing – Update



The Chairman of the International Organising Committee Joe Sopko, Director-Ground Freezing of Keller-North America and myself, Alan Auld, as Co-Chairman and a Member of the IOM3 MTG Leadership Team, are pleased to announce that arrangements for the Symposium are progressing well. Keller is a Main Sponsor with the additional promotion of the event by the IOM3 Mining Technology Group and the support of the Mining Technology Ground Engineering Subgroup. The IOM3 Events Team are running the Symposium.



Venue

Source: IOM3

A venue has now been confirmed and the Symposium will be held at the Museum of the London Docklands, close to Canary Wharf, as shown in the photographs. The photograph shows the outside of the venue. The Wilberforce Room which is on the 3<sup>rd</sup> floor will hold 270 delegates in theatre style. Additional facilities include a 310sqm area Riverside Room on the Ground Floor with private access and private outdoor terrace for catering and exhibition purposes. On the 3<sup>rd</sup> floor also is the Quayside Room which will hold 100 seated delegates.

The response to our request for the submission of Abstracts for papers to be considered for publication in the Symposium Proceedings has exceeded our expectations. After initial hopes of receiving at least 25, 75 have been returned. All have been accepted apart from one still under consideration as to whether it contains ground freezing content. The Authors' Guidelines for the format of the final papers has been sent out together with a request for the presenting Author's photograph and biographical notes. Exhibits for Poster Sessions will also now be accepted. The Symposium will need to consist of parallel sessions throughout the three day event. Referees to vet the papers and Chairmen for the Symposium Sessions will be required, so volunteers will be welcome.



Venue

Source: MOL



Ground Freezing

Source: A Auld

The analysis of Abstract submissions by country comprises Canada 7, China 10, France 4, India 1 (under consideration), Italy 8, Germany 4, Japan 20, Norway 1, Spain 2, UK 6 and USA 12 giving a total of 75.

By affiliation, the analysis of Abstract submissions is Academic 35, Consultant 18 and Contractor 22.

The following are now critical dates:

Full paper submission deadline:	21 <sup>st</sup> April 2023
Paper Review deadline:	23 <sup>rd</sup> June 2023
Final revised paper submission deadline:	23 <sup>rd</sup> July 2023
Presenters' registration deadline:	3 <sup>rd</sup> July 2023

We have twelve sponsors and exhibitors so far. We need to continue increasing these to enable us to provide more social and networking activities.

The International Organising Committee comprises eight UK Members and eleven from overseas. It is intended to hold an on-line Committee meeting in the near future to update everybody.

## Markham 50 Year Memorial

SMIM/ABMEC/HSE/DCC/MIMinE

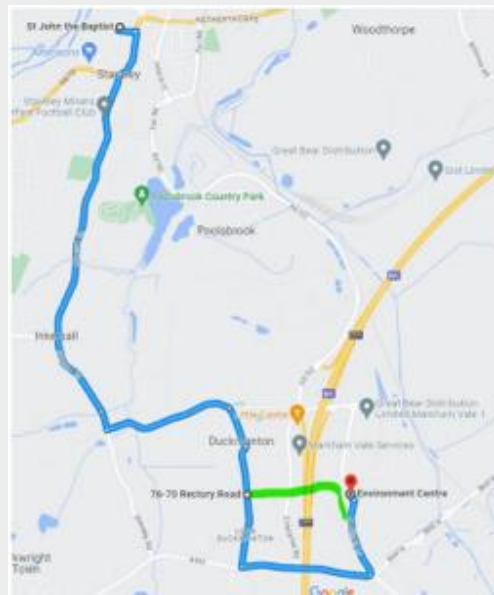
On Monday 30th July 1973 at Markham Colliery, Derbyshire, a terrible disaster happened when the cage carrying the miners to go underground into the pit failed to stop. 13 men died at the scene and another 5 men died later in hospital. The other 11 men in the cage and one rescue worker were very seriously injured and were taken to hospital at Chesterfield.

This year will be the 50th anniversary of the disaster. The organisation of this commemoration event is progressing, and this can be attributed to interested members of Safe Manriding in Mines (SMIM), Health and Safety Executive (HSE), the Association of British Mining Equipment Companies (ABMEC), Derbyshire County Council (DCC), and the Midlands Institute of Mining Engineers (MIMinE).



Church of St. John the Baptist

Source: ABMEC



Bus (blue) and walking (green) routes

Source: ABMEC

So far it is planned that the commemoration event will take place on Sunday 30<sup>th</sup> July 2023 (exactly 50 years after the event), focussed around the Church of St. John the Baptist in Staveley, near Chesterfield, and the Markham Vale Environment Centre. The Church of St. John the Baptist is quite large and would accommodate a maximum of 500 people. The community hall is at the side of the church with two rooms. There is good parking available in and around the Church, with a shuttle bus service being planned between the church and environment centre.

The “Walking Together Memorial”, some three miles from the Church, is a fixed installation along which people may wish to walk to reflect on the disaster prior to the service at the Church. The organisers of the event will be placing ribbons on the memorials. It will be possible to place individual tributes should people be moved so to do. The walk may take approximately 45 minutes to allow time for reflection.

The finalised times and details of this commemorative event will be presented in subsequent Newsletters, but currently it is planned that the Church Service will be held at 3:00pm.

The Ireland Colliery Brass Band has agreed to participate in the commemoration proceedings.

The Ireland Colliery Brass Band has agreed to participate in the commemoration proceedings.

A large mural has been completed (at the time of the disaster) which will be included in the commemoration. Local schools are also expected to be involved.

Other commemorative events are being held by Caphouse Mining Museum and Big Pit, details of this are available from the relevant organisers. The Coal Authority has been approached to be involved.

Sponsorship for the event has been provided by the following:

- CIS Critical Industry Suppliers (formerly Coal Industry Society)
- Anglo American plc
- Redpath Mining
- Finch Consulting
- MIMinE

Anyone wishing to sponsor this event should get in touch with ABMEC ([enquiries@abmec.org.uk](mailto:enquiries@abmec.org.uk) or [marketing@abmec.org.uk](mailto:marketing@abmec.org.uk)).

Limited parking for the event will be available at the Markham Vale Environment Centre, as space is required for the regular bus shuttle service which will be provided to and from the church during the course of the proceedings.

It is proposed that lunch and refreshments will be made available.

Further information about this event can be obtained from the IOM3, MTG, the MIMinE, or from ABMEC.



Miners Shrine

Source: ABMEC

## Rosliston Mining Memorial

Rod Stace

### The Cadley Hill Colliery Memorial

In the late 1980's, the Countryside Commission promoted the idea of a National Forest. The area chosen was 200 square miles of the Midlands lying between Leicester and Burton on Trent in East Staffordshire, linking the ancient Charnwood and Needwood Forests. This covered the site of the South Derbyshire and North-West Leicestershire coalfields, that had suffered because of the closure of coal mining and clay extraction in the late 1980s. The landscape needed significant levels of renewal. The promotion of tourism was also an aim of the designers of the National Forest and several sites in the Forest were selected to create tourist attractions, often accompanied by the regeneration of old coal mining activities.

Rosliston Forestry Centre, on the edge of Rosliston village, some two miles from the southern edge of Burton on Trent, is one such attraction. Covering 62 hectares (154 acres), it boasts woodlands, lakes, and meadows, all freely accessible by the public. The Forestry Centre was one of the first areas of woodland planted as part of The National Forest. Between 1994



Source: R Stace

and 1996, over 120,000 trees, both broadleaf and conifer, were planted on former farmland. It is here that can be found a remarkable memorial sculpture celebrating the South Derbyshire coal-mining community in general, and the local pit, Cadley Hill colliery that worked under this area, and which closed in 1988, in particular.



Source: R Stace

The sculpture is cast from concrete and has four sides. The first depicts the drift man-riding train entering the mine. The second side has a sign stating "South Derbyshire Miners Underground Overground" with a Cadley Hill mine plan, a young lad filling a tub and, something called the "Pit Pony Derby" suggesting miners racing ponies. The third side shows a relief of a man and a woman dancing together under a sign saying "The Alexandra Rink" (a dance hall and entertainments centre in nearby Swadlincote – now long gone) and some sheet music with a band. Finally on the fourth side we are back underground with a miner walking in a roadway.

The video of this memorial can be found on YouTube, and is entitled Cadley Hill Colliery Remembered.

Better still, take a visit to Rosliston Forestry Centre to see it yourself. To me it is unique. Details are available on the internet, simply by searching for Rosliston Forestry Centre, or by accessing [www.roslistonforestrycentre.co.uk/](http://www.roslistonforestrycentre.co.uk/).



Source: R Stace

Does anyone know of something similar that celebrates our mining heritage? Please let us know of any "hidden gems" by contacting a member of the editorial team or of the MTG leadership Team via IOM3 support contact David Arthur ([david.arthur@iom3.org](mailto:david.arthur@iom3.org)).