

UK Capabilities in Mining for Critical Minerals

Industry Case Studies



GREAT

BRITAIN & NORTHERN IRELAND

Examples / Case Studies

Examples of UK Mining Capability and Expertise	3
Core Geological Services	4
Geological and Engineering Consultancy Services	6
Independent Assessment	8
Plant Design and Technology	10
Heavy Equipment	12
Mine Design	14
Environmental, Social & Governance (ESG)	16
UK Company Case Studies	18
Angus Flexible Pipelines	19
Adriatic Metals	20
Altilium Group Limited	22
BJD Crushers Limited	24
Central Asia Metals (CAML)	26/27
Clayton Equipment	28
Conundrum	30
Digbee	32
ERM	34
Howden	36
Insight Terra	38
Levin Sources	40
Mine Tech Services	42
MSA Mining Consulting UK	44
NatureMetrics	46
Padley & Venables	48
Paterson & Cooke	50
Rock Extraction Limited	52
Rokbak	53
Tautus	54
Terex	56
TMS Mining	58
TYRI Lights UK	60
Wardell Armstrong International	62
Watercycle Technologies	64
Weir	66
WSP	68

Examples of UK Mining Capability and Expertise



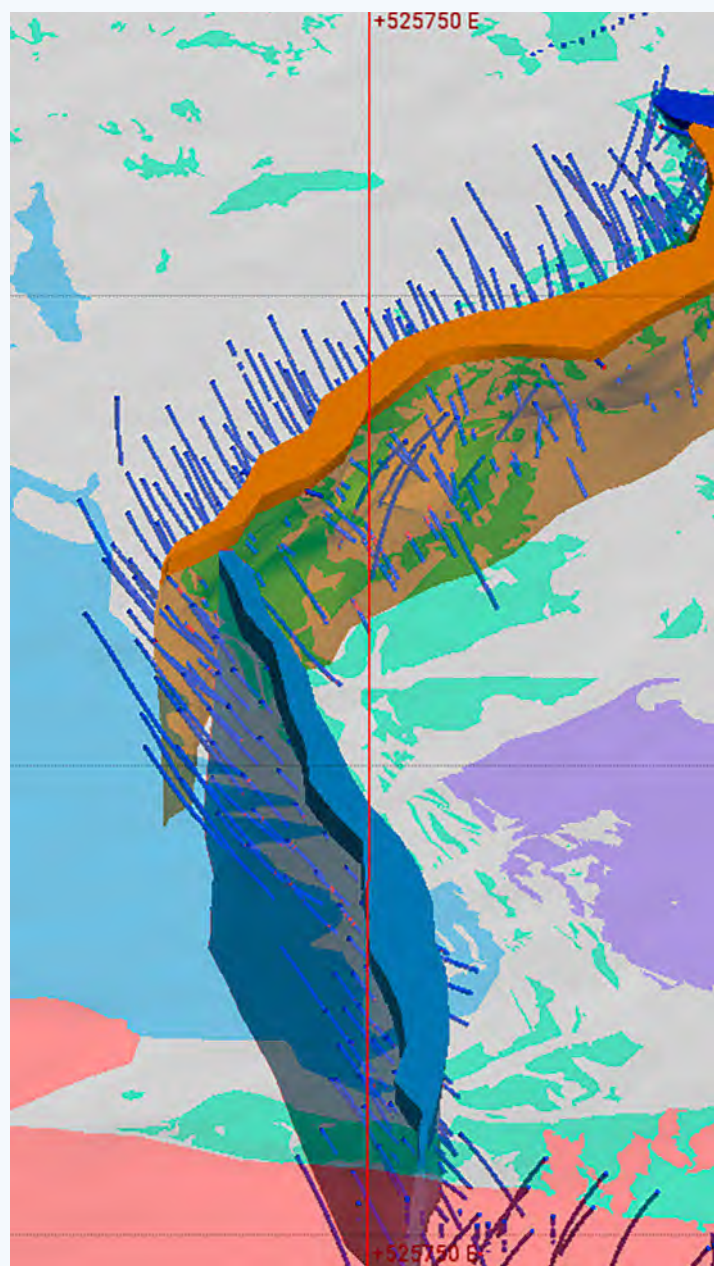
Core Geological Services

The search for and exploration of critical mineral deposits requires a set of core geological capabilities. This expertise is required to define the quantity and grade of subsurface resources and understand how these can be recovered. These services include, but are not limited to:

- Mineral exploration – geophysics, geochemistry, geological mapping
- Drilling and the sampling of drill core and cuttings
- Geological modelling
- Mineral resource estimation
- Public reporting to international mineral code standards (e.g. JORC, CIM (NI 43-101))

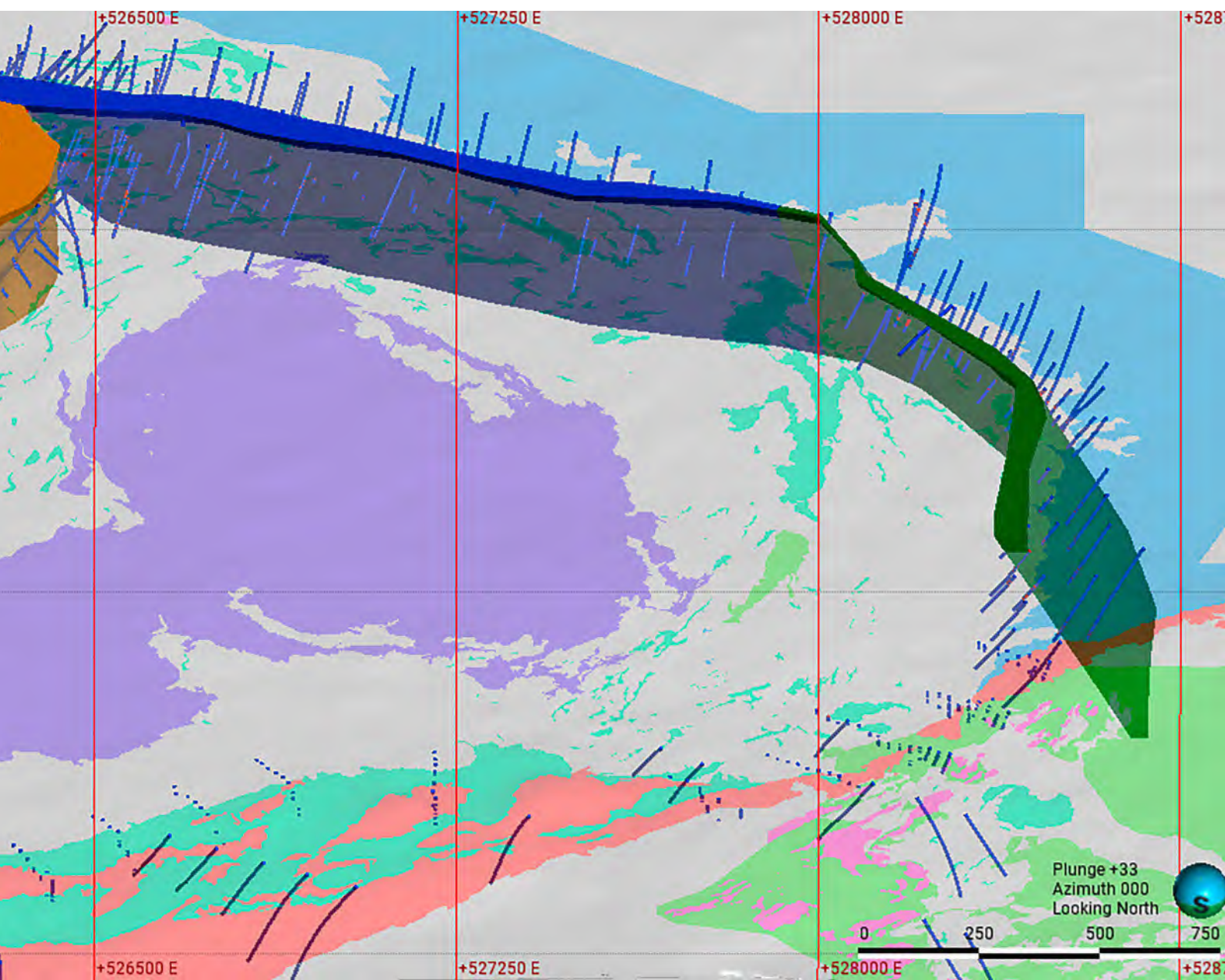
To extract ore from the ground, it is important to understand the rock and mineral conditions so a mine can be designed as a structure, in terms of pits, tunnels and access ways. Expertise is required in the following fields:

- Rock and soil mechanics
- Slope and roof stability
- Mine design (open-pit and underground)
- Mineral beneficiation and processing
- Tunnelling
- Engineering design – blasting, haulage, ventilation, backfill



Example: Mineral Exploration in Saudi Arabia

MSA Mining Consultants UK Ltd is a specialist mineral industry consultancy, domiciled in the UK and providing services in the fields of exploration, resource estimation, mining studies and ESG consulting to clients globally.



Geological and Engineering Consultancy Services



Navigating the complex journey from mineral discovery to steady-state production requires expert guidance through each critical phase.

In the first instance, extensive fieldwork must be undertaken to gather detailed geological data. Following the discovery, drilling, and investigation of a mineral deposit, an independent technical consultant is essential for conducting a precise mineral resource estimation. The project's economic feasibility will then be initially evaluated through a Scoping Study (or Preliminary Economic Assessment), advancing to a Pre-Feasibility Study, and finally, to a Definitive Feasibility stage.

UK based mining, metallurgical and environmental consultancies provide a broad spectrum of independent appraisal services, both on-site and off-site, including but not limited to:

Exploration Support, including:

- Exploration program design and implementation
- RC and DD drilling
- Procedural audits
- Surveying, measurement and mapping

Geophysical and Geoscience Services, including:

- Electromagnetic and gravimetric surveys
- Seismology

Expert Reports and Engineering Studies, including:

- Technical and ESG due diligence
- Scoping, pre-feasibility and feasibility studies
- Competent persons reports
- Mineral resource and ore reserve estimation and audit

Mining and Minerals Engineering, including:

- Mine design, scheduling and pit optimisation
- Mine waste and tailings management
- Mine closure and rehabilitation
- Metallurgical testwork

ESG support, including:

- Environmental and social impact assessment
- ESG strategy and reporting



Example: Pre-Feasibility Study on the Amapa iron ore project in Northern Brazil on behalf of Cadence Minerals

Wardell Armstrong International (WAI) is a full-service, global technical mining, metallurgical and ESG consultancy, supporting projects from greenfield exploration through to steady-state production and beyond. Our clients include mining companies, exploration companies, public sector organisations, government bodies and financial institutions.

WAI was recently engaged by Cadence Minerals (AIM:KDNC), a London-listed investment and development company, for the provision of a Pre-Feasibility Study, including review of an updated MRE and ORE in accordance with JORC (2012), on the Amapa iron ore project in Northern Brazil. The report covered the existing mine, plant, rail and local port, and included a wide scope of works including mine design, open pit optimisation, review of metallurgical data and financial valuation.

Independent Assessment

Regular inspection is a necessary requirement for the safe, continued operation of a mining project. This reduces risk to personnel and equipment ensuring the success of the project itself, in-line with international best-practice and mining standards. UK expertise includes, but is not limited to:

- Independent engineer reports
- Risk assessment
- Technical assessments
- Mechanical inspections
- Electrical inspections
- Pipeline inspections
- Welding inspections
- Non-destructive testing
- Quality assurance and control services
- Waste and pollution monitoring
- Due diligence studies
- Practice and policy “fit-for-purpose” reviews



Example: Ventilation system efficiency and optimisation

Howden offer design consultancy and operational controls based on Ventsim™ software to equipment such as fans, and cooling/heating systems, our complete ventilation solutions support safe and efficient mines.



Plant Design and Technology

Plants and centres of operation must be planned thoroughly to ensure efficient layout of new or expanded operations without design faults or issues. Efficient and ergonomic design can significantly reduce costs and increase productivity.

From conceptual design to commissioning, the UK ecosystem is highly capable of servicing heavy industry, industrial manufacturing and large-scale projects. Using the latest plant surveying techniques and laser scanning, 2D and 3D computer-aided design technology can visualise proposed set-ups and guide installation. Services include, but are not limited to:

- Plant layouts
- Mineral processing sequences
- Heavy equipment installation
- Logistics planning
- New equipment integration
- Digital diagrams and blueprinting
- Foot traffic planning
- Water and electrical systems integration planning



Example: Altilium Nickel Laterite Process™ pilot plant in Australia used to demonstrate a more efficient way to extract metals from laterite ore.

Altilium Group Ltd has developed a ground-breaking, patented technology which extracts critical metals from ore and certain waste materials without the production of tailings. In addition to nickel laterite ore, Altilium's technology has been proven effective at extracting critical metals from bauxite ore, bauxite residue and a titanium/rare earth ore found in Brazil.



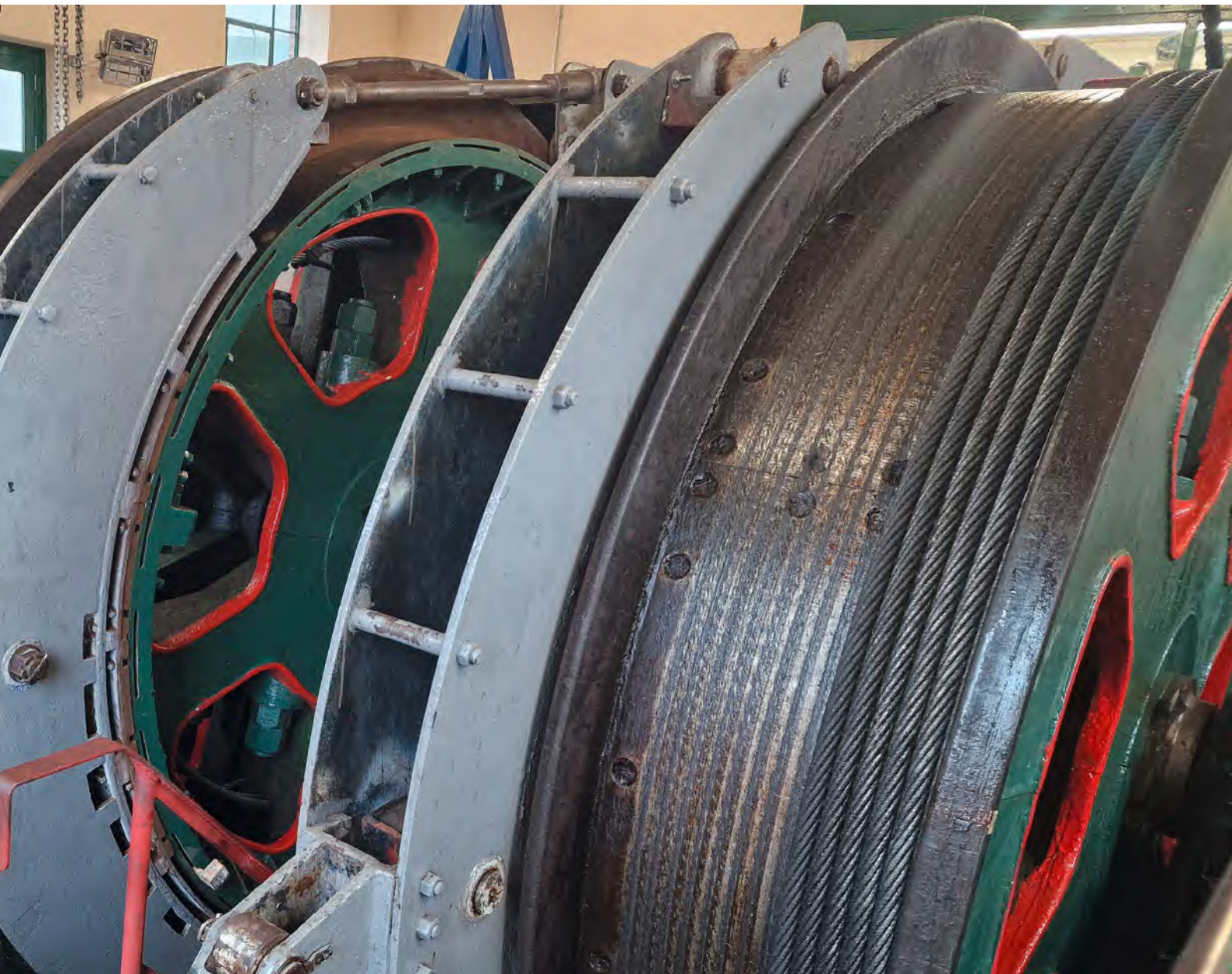
Heavy Equipment

Home to a multi-billion pound heavy machinery industry, the UK has a well-established supply of equipment necessary for the establishment of new mining operations. Large multinational providers such as Caterpillar, Hitachi, JCB, Komatsu and Volvo have operations in the UK, as well as other smaller and specialised providers. Equipment provision includes, but is not limited to:

- Excavators
- Shovels
- Earthmovers for removal and transportation of rock and debris
- Wheel loaders
- Drilling rigs
- Specialised underground mining equipment
- Conveyors
- Reelers
- Hydraulic systems
- Power packs
- Transit systems
- Tunnelling equipment
- Blasting apparatus and explosives



Example: Tautus independently assures mine operators that the equipment used in deep underground areas to transport materials, minerals and people is reliable, safe and compliant with legislation.



Mine Design



Demonstrating specialisation in the use of geoscience data, including geotechnical mapping, deformation measurements and quantitative seismology, the UK can construct mines that are smarter, benefiting project operations and worker safety.

Services include resource planning and the responsible development of orebodies.

Mine sequencing and modelling; ensuring mine design is economically viable and mitigating production risks.

Ground support; ensuring challenging mining environments are safe from structural failures and potential collapse.

Estimation of start-up and maintenance costs for mining equipment and infrastructure.

Other services include, but are not limited to:

- Feasibility studies
- Geological modelling and resource estimation
- Tailings and waste management
- Mine and quarry engineering
- Mining desk studies
- Waste rock storage
- Predictive modelling
- Mine infrastructure installation surveys
- Heap leach pad design
- Waste schedule optimisation
- Oxygen ingress control
- Engineering design

Example: Assessment of the Fen Project – Rare Earth Element in Norway

WSP is a globally recognised leader in mining consulting working on the Fen Project. WSP's multi-disciplinary team (including UK-based staff) partners with clients in responsibly delivering the metals and minerals required for a greener future.



Environmental, Social & Governance (ESG)

The UK Government places a high priority on mining and mineral processing being carried out to the highest environmental, social and governance standards. We are ensuring that we put ESG at the heart of our international approach to critical minerals and mining. UK companies and institutions offer a comprehensive range of services and solutions focussed on ESG innovation and compliance:

Rehabilitation and Historical Mine Evaluation:

- Identification of historical mine workings via drilling
- Capping of shafts
- Grouting of underground workings
- Contaminated land assessment services
- Abandoned mine rehabilitation surveys

ESG Services:

- Environmental audits
- Ecological monitoring
- Risk assessments
- Renewable energy integration
- Environmental consulting
- Lifecycle monitoring



Example: Monitoring tailings for the Anglo American El Soldado Mine in Chile

Insight Terra provides a resilient real-time edge-to-cloud IoT data management solution that captures, aggregates, validates, enriches, transforms and visualises data, enabling smarter and faster operational decision making.



UK Company Case Studies



Angus Flexible Pipelines: helping dewater the Waihi Mine in New Zealand with an innovative installation

Angus Flexible Pipelines provides innovative layflat hose solutions for a wide range of fluid transfer applications – particularly mining and irrigation.

Based in the North Island, New Zealand, the Waihi Gold Mine is an open cast gold mine reaching depths of 600 metres. Due to the nature of this mine and the presence of water, this was an underground dewatering project.

The mine had challenges with an underground dewatering project with multiple boreholes. Added to this, there was limited access and space for the riser installation. Due to high sedimentation of wells, multiple retrievals and cleans were expected and the boreholes reached depths of over 200m and were an inclined riser installation.

The solution was to use a flexible riser – 6" Wellmaster 250. Six 220m rolls were supplied, along with 12 x 6" Wellmaster couplings fitted with 'break-off' plugs. Angus cable ties and saddles for the cable strapping were also provided to allow for the cabling to be attached to the Wellmaster flexible riser. For the installation, Angus supplied a Wellmaster roller and heavy duty clamps.

The choice of the Wellmaster riser has proved successful because of its flexible nature allowing it to compensate for the complex nature of the inclined installation.

Source: Angus Flexible Pipelines 2024



Adriatic Metals: investing in modern mining technologies and tailings management at the Vareš Silver Operation, located in Bosnia and Herzegovina (BiH)

First production of silver-lead and zinc concentrates occurred in February 2024 from the Rupice Mine, at the Vareš Silver Operation. These materials will be sent to the EU for processing, further strengthening EU-BiH relationships and economic ties, and putting BiH on the world resources stage. The mine uses globally proven, cutting-edge technologies to ensure the highest levels of operational efficiency and environmental responsibility. In addition, it incorporates advanced health and safety protocols and technologies, such as remote-controlled machinery and sensor-based monitoring. These technologies enhance worker safety and minimise risks.

The Rupice Mine has two wastewater treatment facilities that have been constructed using the latest technologies. The main wastewater treatment plant, the first of its kind in a mine in the Balkans, uses advanced coagulation and flocculation processes for water treatment. This means that all contact waters are redirected to the facility, where automatic physical and chemical treatment takes place before water is discharged. About 30% of these treated waters are reused at the mine site, with the company aiming for 100% water recirculation in the future. Adriatic is committed to adopting the latest technology across its operations in

BiH, including Jameson cells (cleaner scalper flotation cells), which are used to upgrade the fastest floating material to final concentrate, using fast kinetics, fine bubble generation and high grades with froth washing, thereby replacing multiple stages of conventional cleaning.

Tailings management is another area where Adriatic has invested heavily. The process of filtration and mechanical pressing (where wastewater is reused in the processing system) produces dry stack tailings. Again, this is a technology never used in the Balkans before. Approximately 40% of the treated tailings will be transported back to the mine and used for backfilling excavated areas. Over the current 18-year life of the mine, the Vareš Silver Operation will deliver transformational benefits to Bosnia and Herzegovina. In 2023 it accounted for 25% of all Foreign Direct Investment in BiH and will be the country's largest exporter to the value of \$2.4bn. There are currently 700 employees and contractors working on the operations, approximately 60% of whom come from the local community. In terms of service procurement and supply chain, over 60% of the operation's expenditure goes to local BiH companies, but the second largest group is from the United Kingdom, accounting for 16% of expenditure. This includes

companies providing legal and financial services, environmental and technical expert advice, and equipment procurement.

Source: Adriatic Metals 2024



Altilium Group Limited: a world leader in innovative hydrometallurgy offering efficiency, sustainability, and profitability to the UK and global mining sectors.

- Altilium's technology is designed to extract critical minerals from ore, mine waste and process waste.
- Altilium holds three current patents, has two patents pending and there are five further patents being applied for.
- Altilium currently has four developed flowsheets:
- All these flowsheets **extract or separate all the critical metals** present in the feed.
- All these flowsheets **recover and reuse 99% of the nitric acid** lixiviant.
- All these flowsheets **produce zero waste**.

Altilium's achievements include:

- Producing a **high quality MHP** (over 50% Ni and Co);
- Precipitating a **very high-quality, 99.5% pure alumina**;
- Producing a **high-quality hematite** (Fe_2O_3) containing >97% iron;
- Extracting **all REEs present** in the bauxite residue as well as gallium and scandium; and
- Achieving the **highest known extractions of MREOs** from an ore – over 96% of magnetic rare earth oxides.

The tangible benefits of the Altilium's technology have attracted a great deal of interest, with Altilium embarking on various commercialisation projects:

- Queensland Pacific Metals Ltd is currently completing a bankable feasibility study for an Altilium Nickel Laterite Process™ plant which will deliver 16kt nickel metal contained in nickel sulfate and 1.75kt cobalt metal contained in cobalt sulfate; and
- an agreement with New Generation Minerals Ltd to develop an Altilium Nickel Laterite Process™ plant near Kalgoorlie, Western Australia.

Altilium remains steadfast in its commitment to shaping a more environmentally conscious future for metal extraction by setting a new standard for sustainability in the global mineral processing sector.



Altilium

FUELLING THE FUTURE



BJD Crushers Limited: formally British Jeffrey Diamond, are a Wakefield manufacturer that offer a wide variety of material processing equipment and high-capacity crushers to control product size

BJD Crushers recently supplied a major order of its market-leading crushing machinery to a new copper mine and smelting plant in the Democratic Republic of Congo.

The order includes the manufacture of two BJD 24 x 30 Hammermills with 90kW drives, both running at 40 TPH. The machines will be used for processing copper concentrate from Rotary Dryers.

The design of the BJD Hammermill crushers emphasises energy efficiency and productivity, reducing waste and minimising environmental impact to align with the business's commitment to integrating Environmental, Social, and Governance (ESG) principles into its operations.

Used worldwide in the reduction of friable and fibrous materials, BJD's Hammermill crushers can be supplied with adjustable breaker plates, produce high reduction ratios and feature capacities of up to 500 TPH, depending on duty. The whole project is due for completion in 2024/25.

The entire contract, which was awarded following BJD's successful completion of a similar project for Poland's largest copper mine, took eight months from the initial order to shipment. The total contract was delivered on schedule and within budget.

Martin Nairn, Business Development Manager at BJD Crushers explains: "We were honoured to supply BJD Hammermills to one of the world's largest copper mining projects following previous success in this sector. The customer envisages a 19 million-tonne production scenario and required industry-proven machinery to service this high-grade copper mining operation. The BJD Hammermills will be used to reduce the copper concentrate oversize material to a predicted 2mm particle size."

BJD Crusher's experience in the design and manufacture of crushing and size reduction equipment spans over 128 years and covers a wide variety of applications. The company offers a comprehensive range of standard equipment and also supplies bespoke packages designed to individual customer specification.

BJD Crushers' equipment can be found working successfully in primary, secondary, and tertiary applications around the world. Its machinery is recognised for its high throughput, rugged build, and low operating costs.

The company, which markets itself as 'The Original Crusher People' can trace its heritage back to 1897 and was recently acquired by Group Rhodes in 2023.



Source: BJD Crushers Limited 2024

Central Asia Metals (CAML): generating renewable power at the Kounrad operation in Kazakhstan

Central Asia Metals (CAML) is a base metals producer quoted on the AIM market of the London Stock Exchange (LSE). CAML has a copper operation in Kazakhstan (Kounrad) and a zinc and lead mine in North Macedonia (Sasa).

CAML promotes low-cost, sustainable, and ethical metal production to benefit its workforce, local communities, host governments and shareholders. The Company believes in enriching communities close to its operations with employment opportunities, education, and other facilities, whilst also focusing on the financial sustainability of its operations.

CAML has set medium to long-term climate goals, committing to a 50% reduction in Kounrad and Sasa Scope 1 and 2 emissions by 2030 from a 2020 base and to being net zero by 2050. To support this, the Kounrad team has developed a 4.77 MW solar power plant at its site in Kazakhstan, completing the construction in Q4 2023.

This plant is producing renewable power for Kounrad and is expected to generate between 16% and 18% of the site's electrical power needs on an annualised basis. This will reduce Kounrad's Scope 1 and 2 greenhouse gas emissions by 10% compared with a 2020 baseline and contribute to its commitment to two of the UN Sustainable Development Goals: 'Climate Action' and 'Industry, Innovation and Infrastructure'. The project was built by Kounrad's own engineering team and was completed on time and below budget at \$3.1 million.

CAML is focused on operating low-cost mineral assets, producing the base metals essential for modern living, safely and sustainably for all its stakeholders.

Source: CAML 2024



CAML
CENTRAL ASIA METALS PLC

Central Asia Metals (CAML): reducing reliance on surface water at the Sasa mine in North Macedonia

Central Asia Metals (CAML) is a base metals producer quoted on the AIM market of the London Stock Exchange (LSE). CAML has a zinc and lead mine in North Macedonia (Sasa) and a copper operation in Kazakhstan (Kounrad).

During 2024, at the Sasa operation in North Macedonia, CAML made a significant capital investment ensuring that the mine transitions to paste fill mining methods. The benefits of this transition include maximum extraction of Sasa's resources, a safer and more sustainable mining method and more environmentally friendly storage of 70% of its life of mine mineral waste in either the paste fill within the mine, or the dry stack tailings facility by the end of 2026.

By reusing water from the paste backfill and dry stack tailings operations, Sasa's reliance on surface water abstraction will be materially reduced and enable the Company to meet its target of 75% reduction in surface water abstraction at Sasa by the end of 2026.

For this project, CAML is working with the following UK companies to support its local teams:

- **SRK and Geochemic** – detailed the hydro-geochemical modelling as part of the Environmental Social Impact Assessment

- **Knight Piésold** – designed the Dry Stack Tailings Landform
- **Paterson & Cooke** – continued management and support of the paste backfill system.

CAML is focused on operating low-cost mineral assets, producing the base metals essential for modern living, safely and sustainably for all its stakeholders.

Source: CAML 2024



Clayton Equipment: the UK's world-leading manufacturer of mining locomotives

Clayton Equipment has the most comprehensive range of battery rail locomotives available for surface and underground mining applications.

From 1.75 to 150 tonnes, numerous motor, controller and locomotive design options, Clayton manufacture overhead trolley/pantograph, battery, diesel, or hybrid powered to suit all applications.

The Macheng iron ore mine in Hebei Province in northern China, part of a huge iron ore and steel company Shougang Group, through operating company Luannan Macheng Mining, is one of China's largest underground mines in development, and is adopting advanced and mature mining and processing production technology to build a leading advanced underground mine with an extensive underground transport system.

With a worldwide reputation as a leading supplier of locomotives to the mining sector, Clayton Equipment secured in an extremely competitive marketplace a single order to supply a fleet of 12 hybrid battery trolley locomotives to Macheng.

The contract covered the supply of seven 55 tonne (CBT55) and five 32 tonne (CBT32) battery trolley locomotives, using the latest hybrid technology enabling safe haulage in the non-electrified areas of the mine. The battery trolley locomotives supplied are automation compatible and Clayton partnered with Beijing

Soly the EPC Company contracted to automate the mine haulage levels.

Each of the machines are equipped with a cloud-based system designed to allow remote based condition monitoring of the performance of locomotives anywhere in the world, whether above or below ground, giving real-time performance data further enhancing production efficiency, maintenance and safety via remote access to the machines. This prevents unscheduled downtime, troubleshoots performance issues, investigates faults, allows over-the-air software updates and customisation of operating parameters to best suit the Macheng mine operation.

The locomotives provide sustainability, cost savings and are environmentally compliant aligning with the Macheng commitment to invest in innovative technology.

The commissioning of the CBT55 Hybrid Electric Locomotives was carried out by Claytons in collaboration with Baifeng taking a major step towards the automation, digitalisation and intelligence of Macheng Mine rail transportation system.

In order to ensure a smooth commissioning, Macheng Iron Mine Co Ltd, actively arranged professionals with relevant work experience from Clayton to track and control the whole process and successively completed commissioning activities covering the power supply system, control

system, hydraulic system and power system to ensure that all functional parameters would meet the required standards.

Clayton Equipment is at the forefront of hybrid and battery technology and apply this to railway rolling stock, both above and below ground, leading the way in the niche sector of supplying low-emission and zero emission mining locomotives.

In the present century, Clayton has become a supplier of choice to the world's mining operations active in over sixty countries around the world.

Source: Clayton Equipment 2024



Conundrum: adaptive, closed-loop control solutions for industrial process optimisation

Conundrum is a pioneering industrial artificial intelligence (AI) company, specialising in the metals and mining sector. Offering the innovative Conundrum Platform, the company empowers users to create and deploy robust closed-loop AI solutions, ensuring optimal control of plant operations that surpass conventional methods. Conundrum Platform can be installed on-premises as well as in the cloud, ensuring adherence to required latency and security for customers.

One of the company's use cases is grinding mill optimisation. The task at hand involves maintaining the optimal weight (load) of the AG mill while adhering to various parameters of the technological process. Grinding mills, as control objects, present several challenges, including rapid transient processes, pure time delay in control channels, external disturbances such as changing properties of the ore, and changing dynamics due to equipment wear.

Conundrum's Mill Control system is designed to address various challenges. It's a hybrid system that combines the reliability of expert systems with the benefits of modern machine learning. The control system operates in two modes based on the applicability of the adaptive process model.

The first mode is an expert system that relies on fuzzy logic. This mode is activated temporarily when the accuracy of the adaptive model drops due to unknown external

disturbances. The second mode is a model-predictive optimal control system. This is the main mode and it is automatically trained on new data. This hybrid control system technology guarantees optimum performance. Additionally, it also provides the required level of redundancy.

The CMC system stabilises the load and circuit circulation, observing restrictions on power and circulation. The results showcase the Conundrum system's significant superiority over the standard Automatic Process Control (APC), with an increase in the average processing on the grinding circuit by 2.9%.

The solution also contributes to power saving and longevity. By stabilising operations, the system reduces energy consumption while maintaining the same output. Additionally, the AI-driven optimization processes reduce the wear of factory equipment by preventing overloads.

In conclusion, Conundrum's industrial AI solutions are transforming the metals and mining industry. Their platform boosts operational efficiency, enhances energy conservation, and extends equipment lifespan, leading the industry toward a sustainable and efficient future.

Source: Conundrum 2024



Digbee: monitoring at Mayfair Gold, Canada's first carbon-neutral gold project

Independent ESG assessments are crucial to Mayfair Gold's commitment to responsible mining. They partnered with Digbee for the third year running to undertake their independent ESG assessment. Led by an experienced team and in collaboration with UK-based risk management consultants, **Satarla** – Digbee's thorough assessments provide stakeholders with a comprehensive, meaningful and impartial understanding of a mining company's unique challenges and opportunities.

How Mayfair Gold has benefited

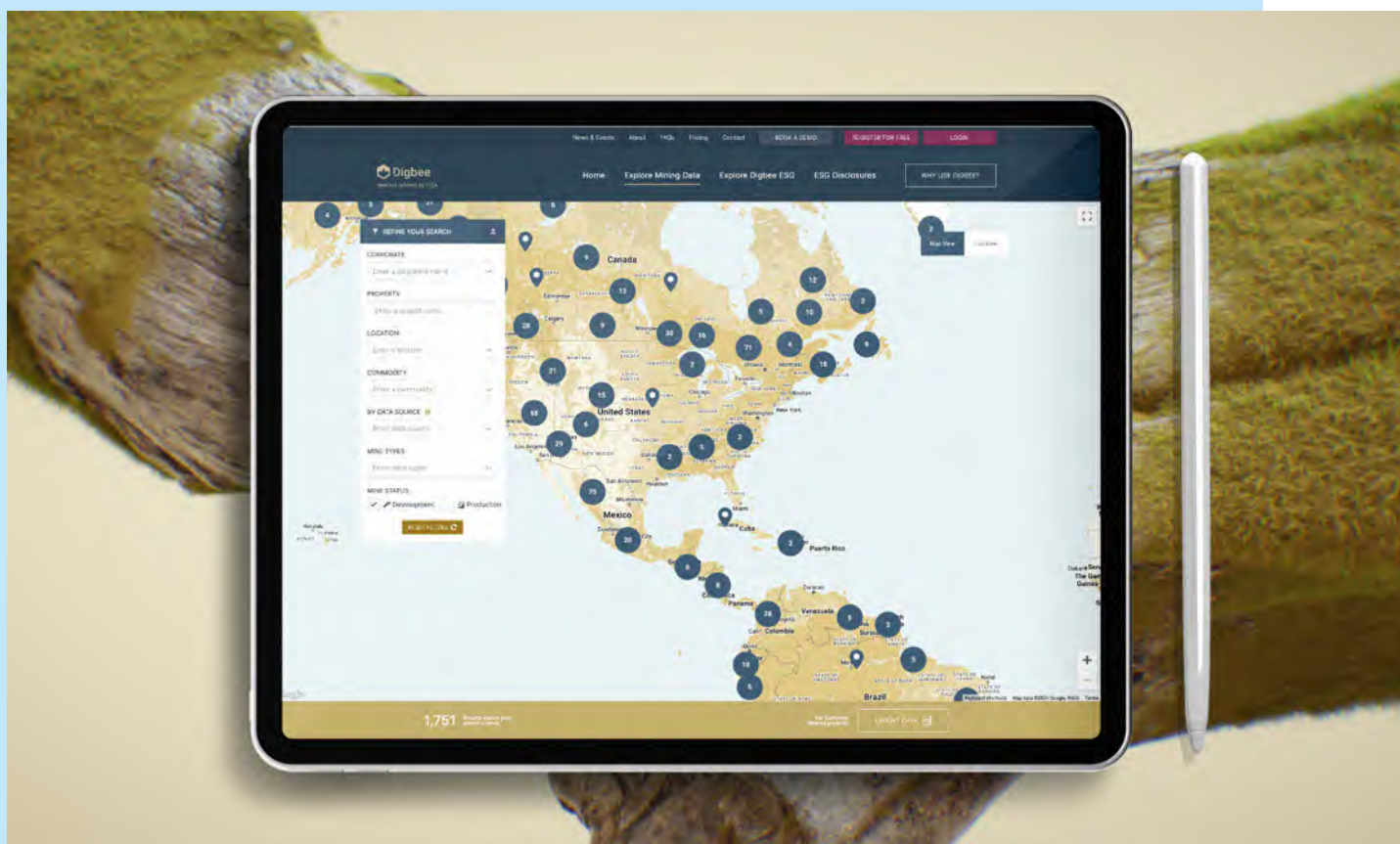
1. **Authoritative Assessments:** Digbee brings an authoritative dimension to Mayfair Gold's sustainability efforts and recognises the environmental and social initiatives they've put in place.
2. **Recognised Standards:** The depth of analysis provided by Digbee demonstrates a comprehensive understanding of the intricacies inherent in the mining sector. This allows Mayfair Gold to not only meet industry standards but to also exceed stakeholder expectations with a commitment to being "beyond compliant".
3. **Feedback and Guidance:** Digbee not only identifies areas of strength but also offers constructive insights for improvement. This collaborative feedback loop allows Mayfair

Gold to continually enhance its ESG practices.

Navigating ESG Excellence – Mayfair Gold celebrates a significant leap in its ESG performance from a rating of BB to A. The transparent and public disclosure of Mayfair Gold's 2023 assessment results, reflects their commitment to openness. Internally, the ESG report serves as a vital tool, steering the company's planning towards continual improvement. Externally, the independent assessment by Digbee enhances confidence among regulators and investors, ensuring Mayfair Gold's project follows the most sustainable development path possible.

As Mayfair Gold's business expands and it pursues a carbon-zero vision, the collaborative relationship with Digbee is poised to grow. The annual ESG assessments stand as the bedrock of this partnership, laying the groundwork for an evolving alliance that draws on Digbee's extensive industry experience. This strategic collaboration not only underlines Mayfair Gold's dedication to responsible resource development but also positions the company as a leader in navigating the complexities of sustainable mining practices.

Source: Digbee 2024



“The guidance from Digbee on ESG has helped ensure that our project is on the most sustainable development path possible. As we advance our project to development, the feedback and guidance from Digbee has supported our engagement with technical consultants, including engineers and environmental consultants.”

Mayfair Gold



ERM: is the world's largest advisory firm focused solely on sustainability. We work with mining companies worldwide to help them address strategic, tactical, and operational challenges.

Cornish Lithium is a mineral exploration and development company supporting the UK's transition to renewable energy by developing a lithium supply for electric vehicles and power storage batteries. The company is helping to enable a modern-day renaissance of Cornwall's 4,000-year mining heritage by aiming to extract lithium in an environmentally responsible manner from both geothermal waters and hard rock. Through its Trelavour hard rock mine development alone, it is estimated that Cornish Lithium could generate £800 million of economic activity for the local economy over the expected 20-year life of the mine.

Cornish Lithium engaged ERM to develop the ESIA, in parallel with the Environmental Impact Assessment (EIA), required to secure planning consents for the hard rock mine. The scope of ERM's work includes environmental baseline development and social impact studies, alongside the full suite of technical studies needed to inform the ESIA and EIA processes. ERM has also provided ESG strategy and life cycle analysis services.

This appointment reflected the trust that Cornish Lithium has in the high standard of ERM's work and the breadth of ERM's capabilities, from national-scale techno-economic studies to detailed permitting for

processing plants. ERM's global experience in successful ESIA delivery for other lithium mines will help support the UK's transition to net zero whilst delivering substantial economic growth in the region.

ERM's specialist mining team is well-equipped to provide both technical and advisory services across the full mining life cycle, built around the vision of 'The Mine We All Want to See', which brings together various elements of sustainable development of resources. It combines the strategic view of the mine's ecosystem with the technical expertise needed to deliver innovative and ambitious solutions. ERM provides tailored, comprehensive, and innovative solutions that empower mining companies to operate profitably, responsibly, and efficiently with a strong commitment to the decarbonization goals and creating a positive legacy.

ERM's work will help to progress the feasibility study required for Cornish Lithium to secure the necessary planning and permitting consents for building and operating the commercial plant.

Source: ERM 2024



Howden: Total Mine Ventilation Solutions support safe and efficient mines.

For more than a century, Howden has supplied ventilation equipment to every major mining company in the world; providing custom-designed ventilation, cooling and heating solutions, globally. Howden offers a fully flexible, integrated suite of products and services that provide efficiency and safety across your mine operations.

Mining will continue to be a key contributor to global growth, enabling existing and emerging technologies, through the provision of key metals and minerals. However, like many energy and natural resource sectors, it faces a challenge in how to do this efficiently and sustainably.

When it comes to underground operations, the need to provide a safe working environment for personnel within the mine is constant. Ventilation is a core function of a mine and the systems, developed to provide vital air and remove toxic gases and fumes, can reach up to 50% of total energy cost within a mine. Gains in ventilation system efficiency have a significant impact on operational costs and profits.

Ventilation on Demand (VOD) is a technology, which has been undergoing continuous evolution since early implementations during a period of rising energy prices in the early 2000s.

Howden's Ventsim™ CONTROL provides complete management of the ventilation system and includes an in-built energy reporting tool tracking ongoing underground ventilation energy consumption. Using Ventsim™, underground mine operators can achieve energy savings from their ventilation system of up to 70% by increasing system efficiency and reducing power use.

Through Ventsim™ CONTROL operators create an automated system covering all the ventilation equipment in the mine, including the main fans, underground auxiliary fans and airflow regulators. Ventilation Monitoring Stations (VMS) are installed to determine the quantity and quality of fresh air at various points underground. Radio Frequency Identification (RFID) tag systems give real-time data on personnel and vehicles within the mine, meaning ventilation requirements for each zone are calculated according to the exact amount of fresh air required.

Howden's experience with mines in North America shows a short return on investment for VOD systems of typically under 12 months. This makes the system attractive for operating mines as well as those to be developed.

Source: Howden 2024



Howden

A Chart Industries Company



Insight Terra: monitoring tailings for the Anglo American El Soldado Mine in Chile

Control of risk is a vital component of the Anglo American Sustainable Mining Plan. Tailings dams constitute one of the company's major risks that demand effective critical controls.

The El Soldado Hydraulic Dewatered Stacking (HDS) tailings facility initiative is part of Anglo American's FutureSmart Mining™ programme and serves as a proof of concept for a group-wide, industry-leading tailings monitoring solution.

The project's objectives are: to ensure effective monitoring of Anglo American's critical controls that are in place at a tailings dam at El Soldado mine in Chile; to continuously monitor, report on and enable real time visualisation of the tailings dam's health and structural integrity, and to develop a comprehensive cloud data management platform for the El Soldado tailings dam that would serve as a proof-of-concept for a group-wide tailings monitoring solution.

Insight Terra provides both a resilient and secure edge solution as well as a cloud-based data management and monitoring platform for the El Soldado tailings facility.

An edge-based compute node integrates data from nine different sensor types, totalling 108 separate instruments monitoring 500 data monitoring points in, under, around and on, the HDS tailings storage facility.

All this raw monitoring data is then uploaded to the cloud platform for further data transformation, validation and rule based alerting purposes. Data is securely stored and can then be accessed and visualised by authorised users for further analysis and decision making purposes.

To address the need for reliable communications at this remote location, the solution also incorporates a resilient telecommunications component. An all-weather container houses the edge compute node, power storage/management, LoRaWAN gateway and Inmarsat satellite terminal, and is supported by PV solar arrays for totally independent remote operation.

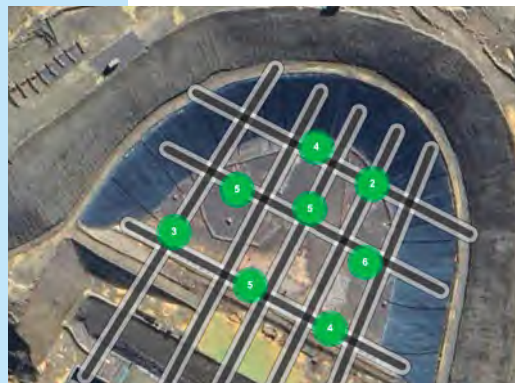
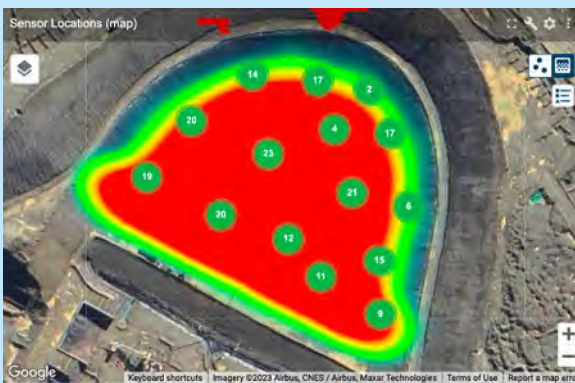
Anglo American sought to improve the monitoring of its critical controls at each of its tailings storage facilities, to ensure much greater visibility, enhanced management reporting and better control over one of the company's greatest risks.

The Insight Platform has delivered efficient, secure and resilient near real-time monitoring of the Hydraulic Dewatered Stacking (HDS) tailings storage facility in accordance with the requirements of its design engineers, Golder Associates (now part of WSP) and in compliance with the new Global Industry Standard on Tailings Management (GISTM).

Source: Insight Terra 2025



insight **terra**



Levin Sources: helping manufacturers to drive continuous improvement in their supply chains

As part of their energy transition portfolio, Levin Sources provided strategic responsible sourcing guidance to a European electric vehicle battery manufacturer, supporting the company to exercise their leverage with a key critical mineral supplier regarding their human rights and environmental risk management. To do this, Levin Sources carried out comprehensive background research both in-country in Central Africa and remotely. Through a provenance risk assessment, they identified salient human rights, governance, and environmental risks inherent to the sector and specific to the manufacturer's suppliers. The analysis included stakeholder and initiative mapping and identified key risks such as the labour rights of contracted workers, security presence on site, and transparency around environmental data. It also identified opportunities for exerting leverage to help address the root causes of risks outside of the supplier's sole control. Based on Levin Sources' recommendations, the manufacturer intends to include clauses into their contracts with the supplier, stipulating continuous improvement in addressing the main risks identified. This would include defining a reasonable timeline for changes and implementing a robust monitoring process. They also identified priority initiatives with which to engage locally, to support sustainable minerals development. Levin Sources also supported the client in ongoing

exchanges with some of their largest investors regarding the aims and findings of the work.

Knowing how to manage the complex relationship between large-scale mining (LSM) artisanal and small-scale mining (ASM) within a concession is key to ensuring that the energy transition benefits everyone. Levin Sources' approach to LSM-ASM relations is anchored in over 15 years' experience in the area. In West Africa, Levin Sources supported a mid-cap gold miner to enhance their internal ASM governance systems and align their community engagement with their ASM strategic objectives. The project helped the company maintain their social license to operate and mitigate socio-political risks by improving how they engage with ASM communities and laying the groundwork for a more sustainable way of living for the miners. To achieve these goals, Levin Sources delivered a situational analysis that dispelled misconceptions around ASM, providing the client with a clearer understanding of the dynamics involved. Levin Sources designed a human-rights based and gender-responsive strategy and concession-specific plans in line with leading practice and local realities. This strategic framework drew from the conclusions of an institutional readiness assessment, qualitative field research and impact assessment.

Source: Levin Sources 2024



LEVIN SOURCES



Mine Tech Services: 6% improvement in production at a copper mine

MTS are the mobile mining technology experts. We deliver consultancy, BI tools, change management programmes, and cutting-edge software solutions. We help world leading mining companies optimise their operations.

MTS worked with a copper miner who was passionate about minimising its impact on the environment. They have a proven track record for leveraging mining technology in their operational efficiency initiatives. This case study focuses on one of their European operations and highlights the successes achieved.

Haul trucks can account for up to 25% of the emissions by mining operations. Nevertheless, measures can be implemented to closely monitor and control these emissions, ensuring they are maintained at a minimum level. One significant contributor to unnecessary fuel consumption can be attributed to the inefficient use of equipment. Occurrences in multiple areas of the operation, include planning and execution, effective utilisation of the equipment, as well as using the most efficient routes. The operation was keen to leverage its investment in mining technology to improve the haul fleet efficiency and remove waste where possible.

MTS worked with the site to target several major areas of opportunity, with benchmarks established for key metrics. Tailored, site-based

training on the Fleet Management System (FMS) team, was delivered to ensure they could best use the FMS and the optimisation algorithms. Real-time dashboards were created around key areas of waste such as shift change and operator productivity – these steps allowed action to be taken proactively. Enhancements to processes and communication through MTS change management expertise ensured decisions were made and executed in a timely manner.

The implementation of well-trained teams, clear processes and supporting tools streamlined cross-departmental coordination, minimising decision-making time. For instance, trucks were permitted to be parked when not required, once certain agreed-upon key thresholds were met. Improved communication provided the control room with the necessary feedback to adjust the FMS and optimise system usage in accordance with the constantly changing mining environment.

As a result, there was a significant reduction in emissions, cost savings, and a more efficient operation: carbon emission reduction >2,900 tpa, a fuel saving of €1.2m, and a productivity increase of 6%.

Source: Mine Tech Services 2024



MSA Mining Consulting UK: supporting international mining projects globally

MSA Mining Consulting UK Ltd is part of The MSA Group, a company formed in South Africa with a global track record in excess of 40 years. MSA has registered offices in the UK, South Africa, Saudi Arabia and Kazakhstan, and provides consulting services across the mining project development cycle and across the commodity spectrum. Many of our more recent engagements have focussed on the discovery of critical metals to support the green energy transition.

Clients include major and mid-tier mining companies, junior explorers, governments, sovereign wealth funds, Private Equity groups and financial and legal institutions. Many of the mining companies we work for are listed on the London Stock Exchange (LSE), both across the Main Board and on the Alternative Investment Market (AIM).

- MSA is currently engaged by Ivanhoe Mines, one of the worlds' leading mining companies, providing independent signoff on their Mineral Resources across Africa. Ivanhoe's projects include some of the richest copper, zinc and platinum group metal deposits in the world.
- In Saudi Arabia we are engaged by the Saudi Geological Survey to advance high potential exploration targets as part of the Saudi Vision 2030 which has included a goal of developing a Mining Industry pillar as a lasting and meaningful alternative to the current hydrocarbon dominated economy.

- In Egypt we are engaged by the Egyptian Mineral Resources Agency, as part of a consortium, to develop Egypt's online mining cadastre. This will represent a major step forward in the transparency and governance of exploration licences in Egypt and is viewed as a major step forward in attracting foreign investment into Egypt in the non-traditional solid minerals mining sector.
- In Zambia, we are engaged by a private client to undertake a comprehensive review and gap analysis of a historic copper mining project from the perspective of study readiness. Our scope includes the re-estimation of Mineral Resources and conceptual techno-economic right-sizing of the project, which includes several Mineral Resources and a number of exploration targets, together with a range of potential mining and processing methodologies

Source: MSA Mining Consulting UK 2024



NatureMetrics: Anglo American and other miners are choosing NatureMetrics to report on nature

At NatureMetrics, we are transforming how the mining sector monitors biodiversity. Our clients recognise the importance of adopting new technology to efficiently and robustly meet increasing stakeholder demands for comprehensive reporting on nature. With our solutions and services, mining companies are collecting, analysing, and sharing, biodiversity data at unprecedented speed and scale.

Anglo American is deploying our state-of-art environmental DNA (eDNA) technology across its global portfolio. eDNA facilitates comprehensive biodiversity assessment across the tree of life at unprecedented speed, scale, and cost. For Anglo, this includes baselines at the exploration phase in Australia and Germany, biodiversity monitoring during operation in Peru and Brazil, through to closure and restoration in South Africa. Our tools have identified the presence of thousands of species, including 749 vertebrates alongside thousands of invertebrates, fungi and bacteria.

Our NatureMetrics technology is deployed by your ground teams with no prior experience necessary, objectively plugging data gaps and expanding the scope of environmental monitoring across the tree of life. This data feeds into our Biodiversity Insights platform, allowing you to transparently track the state of nature and ecosystem condition across time and space.

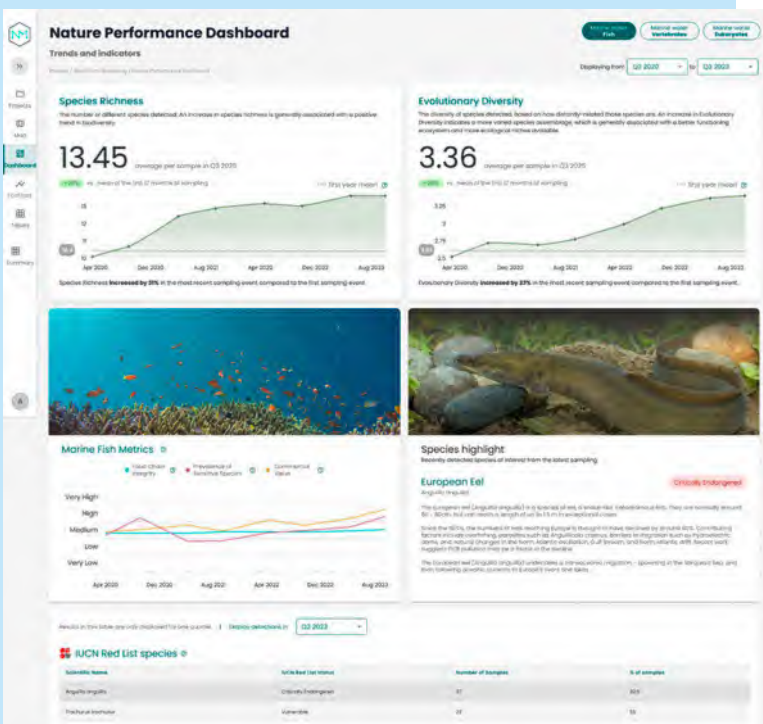
We are monitoring nature in over 110 countries, across multiple sectors and in diverse ecosystems. We were also 2024 Earthshot Prize finalists.

Contact us for a free consultation to understand how our services can push your biodiversity reporting to the next level.

Source: NatureMetrics 2025

“NatureMetrics’ new measurement service is transformative in how we make decisions on our natural capital. Over the last two years, the data from their eDNA technology has changed the way we understand our impact on nature, allowing us to ensure we’re making the right decisions to meet our strict environmental targets.”

**Warwick Mostert,
Principal Biodiversity
at Anglo American**



Padley & Venables: state-of-the-art drill bits using green steel

Our Ninja button bits are a result of our quest to create a button bit that delivers world-class performance while also being compatible with the vision of Net Zero.

We used our decades of design experience to optimize the placement of tips for each head size, which was the first step in the design process. The placement of the flushing channels was determined using state-of-the-art fluid simulation software. Due to the enhanced wear properties and hardness of our new green steel, we were able to place the flushing channels closer to the tips than ever before.

All our products are tested worldwide in every rock type imaginable, a challenge the Ninja bits were more than capable of tackling. The field testing undertaken on our Ninja button bits demonstrated a clear superiority compared to conventional bit designs offered by our competitors. Some small tweaks were made during this process to allow a truly versatile design suited to most rock conditions. Our design processes and field testing resulted in a button bit superior to anything we've made before.

We didn't just want Ninja button bits to perform, we also wanted them to be sustainable. Our Ninja button bits utilise only green steel with a carbon footprint 80% lower than the global average, with scrap steel being the only required input. Additionally, all our Ninja button bits are heat treated in house using our electrically powered furnaces.

Most importantly, instead of drilling with single-use bits purchased as cheaply as possible, true sustainability comes from using quality bits that last.

Source: Padley & Venables 2024



P&V
Padley & Venables



Paterson & Cooke: is a global engineering consultancy with world leading experts in mine backfill, slurry pipeline systems, tailings processing, sub-sea systems and mineral processing.

P&C assisted KGHM with developing a solution for cycloning and thickening of tailings for its Southern Quarter expansion of the existing Żelazny Most tailings facility. The Southern Quarter expansion is raised using cycloned tailings, with thickened tailings placed inside the facility. P&C completed an initial options study, feasibility study and basic engineering, complete with 3D model, for a station for segregation and thickening of tailings, which houses cyclones, thickeners and pumps to classify and dewater tailings.

Following completion of the Basic Engineering, P&C supported KGHM in the execution of the detailed design, writing the control philosophy documentation, and supervising the site commissioning.

The plant has been successfully commissioned and accepts tailings from the Rudna and Lubin processing facilities and is capable of operating in differing configurations based on seasonal requirements. These configurations cover, cycloning with and without thickening and thickening without cycloning.

Following cycloning and thickening the slurry streams are pumped to the tailings facility via a series of pipelines and spigots for wall building or deposition into the Tailings Management Facility.

P&C Provided Testing

To establish the technical design criteria, P&C undertook test work at its specialist laboratory in the UK. The testing comprised of:

- Cyclone testing – to ascertain the performance and count of cyclones required
- Thickening testing – including flocculant screening to understand the thickener sizes required, the optimum flocculants to use and the impact of cold weather and salts on flocculant performance.
- Slurry rheological testing – to characterise the multiple tailings streams and inform the pump and pipeline designs.

This design data formed the basis of the selection of equipment and design of the technology solution

Technical Data

The cyclone underflow operates between 800 and 970 m³/hr, with the pumping installation comprising three 12/10 pumps discharging through a 450 mm OD HDPE pipeline up to 5.1 km in length.

The thickener underflow slurry operates between 1100 and 2200 m³/hr with installation of four 12/10 pumps discharging through a 500 mm OD HDPE pipeline up to 4.9 km in length.

Thickener overflow is returned to the processing facilities at Rudna and Lubin via a balance pond located adjacent to the cyclone and thickening plant.

Source: Paterson & Cooke UK Ltd. 2025



Rock Extraction Limited: providing highly productive revolutionary electric rock breakers to reduce costs and carbon emissions

The 'all electric drive breaking tool', provides primary extraction and oversize breaking of limestone and basalt in UK quarries and mines.

We have now more than 1,000 hours of on-site experience with basalt and limestone rocks in UK based quarries.

The TRL 9 'all electric' rock breaking tool system provides a viable alternative to explosives in the mining and quarrying industries and to large hydraulic hammers in the construction and recycling sectors.

20 tonne class excavators can be used to carry the 'Rock X' electric breakers. Our product provides instantaneous and extremely

powerful torque using an electric drive train resulting in considerable productivity benefits in a diverse range of applications such as mining, quarrying, demolition and recycling. Equally importantly it offers significant potential savings in capital and operating costs, alongside carbon reductions from fuel use.

For example, the difference between 23 tonne excavator and a 75 tonne excavator is approximately 42 litres per hour which equates to 880kg eCO₂ for each shift of a 75 tonne excavator.

All electric hammer tools have applications in a whole range of critical mineral operations, including mining processes, recycling work and slag breakage.

Source: Rock Extraction Limited 2025



Rokbak: a manufacturer of off-highway articulated haulers that are used in mining, quarrying, and construction applications around the world.

With DNA that can be traced back to 1934 the brand has a heritage to be proud of. Headquartered in Motherwell, Scotland, UK, Rokbak has two models of articulated haulers, with payloads ranging from 28 to 38 tons.

Built in Scotland and shipped around the world, these machines are made for the toughest environments. The harshest conditions. The most demanding jobs. For decades, our articulated haulers have delivered. From the heat of the desert to the cold of the arctic, you can rely on Rokbak.

Designed for minimum downtime and maximum return on your investment, your Rokbak will help you look after your people, your targets and your bottom line.

As a member of the Volvo Group, exceptional quality, safety and sustainability is at the heart of everything we do. From design to drive, from parts to people. It means you're guaranteed a dedicated, responsive and responsible partner, wherever you're working in the world.

At Rokbak we are committed to building a world that we want to live in and have clear science based targets for the development of alternative fuel machines and clean, sustainable manufacturing processes. With around 320

employees based at our Motherwell facility we heavily rely on local fabrication companies to deliver high quality, durable components for our machines.

As our business drives growth within key areas such as North America, Europe and Indonesia it is vital that we continue to develop our products and connected services to meet the needs of todays' customers.

Rokbak knows how hard graft can be hard going on your machines. You need strong performance, power and productivity, every single day. That's why our powerhouse haulers are built to last – pushing reliability and efficiency to the next level for your next job.

Source: Rokbak 2025

ROKBAK



Tautus: assuring operators that underground equipment is reliable, safe and compliant with legislation

In the engineering and design of winders, hoists and winches in mines, assurance plays a pivotal role in ensuring the reliability, safety, and compliance of a critical part of a mine – the transportation of people and materials.

Independent assurance guarantees that any system, even an automated one, is assessed free from bias or outside influence, offering the confidence of an objective snapshot of an assets' condition at that point in time.

Validation through testing and inspection is an essential aspect of the assurance process, serving as a means to verify, record and validate the functionality and performance of a system in real time. The goal is to ensure that the design not only meets the specified requirements but also functions reliably.

As well as managing business risk with assurance at design stage, ongoing compliance requirements can then be managed through regular independent testing programmes.

Both design assurance and ongoing inspection involve static and dynamic testing, which adds an extra layer of confidence for operators regarding the system's safety, compliance, and reliability.

Static testing ensures that the design is robust, well-structured, and aligns with industry best practices, and encompasses an examination of the system to gain confidence in the component parts.

Dynamic testing involves thorough execution of the system or components under various conditions to observe its behaviour. This includes, but is not limited to, unit testing, integration testing, system testing, and brake performance testing. By subjecting the design to dynamic testing independently of its development, the assurance process verifies that the system operates as intended, meets performance benchmarks, and can withstand real-world challenges.

Tautus is the only independent testing, inspection and assurance provider of mine winder, hoist and mine transportation systems in the UK and is working with mine operators, associations, and regulators to consistently elevate safety standards in mines.

Source: Tautus 2024



Terex: sustainable solutions for quarrying and recycling operations

Terex MPS, a Terex brand that provides modular, portable, and static crushing, screening, and conveying solutions, successfully installed a large modular plant in the UK at Tarmac's Hendre Quarry. Tarmac, a CRH Company and a leader in sustainable building materials, aimed to reduce dust emissions and lower diesel costs. Terex MPS designed a fully electric modular setup, which included four modular plants: two Terex MPS MC320 cone modules and two Terex MPS MHS6203 screen modules, enhancing reduction ratio, dust control, and material shape.

The Terex MPS team overcame the challenge of reducing dust while maintaining material quality and throughput with a tailored solution that addressed Tarmac's needs and industry-specific challenges. The plant processes blasted limestone through primary crushing, secondary and tertiary cone modules, and sizing screens, producing varied limestone aggregates.

Together with PowerX Equipment, a UK-based distributor of Terex MPS equipment, Terex MPS provided Tarmac with comprehensive support during the acquisition process, including site visits, equipment training, and fine-tuning for optimal performance. The solution not only enhances the bottom line for Tarmac but supports their operations and sets a precedent for environmental solutions in the quarrying and construction industry.

Powerscreen, a Terex brand that provides mobile crushing, screening, and conveying solutions worked with Collen Bros (Quarries) Ltd, a leading civil engineering company in Northern Ireland, to supply a Powerscreen Premiertrak 600E (PT600E) Jaw Crusher, the first of its kind in the UK & Ireland.

The PT600E, part of the Powerscreen Hybrid range, caters to large-scale operators in recycling, quarrying, construction, and mining. Its features result in operational savings, reduced fuel consumption, and lower CO₂ emissions, aligning with Collen Bros' commitment to sustainability.

The PT600E has the ability to run on an onboard diesel generator or mains power, offering flexibility amidst rising energy costs. The crusher's extra-large feeder and pre-screen option enhance production rates and product quality, contributing to significant operational improvements.

Collen Bros also invested in an electric CT80 Powerscreen Conveyor, which easily integrates with the PT600E, sharing the same power source. The Powerscreen conveyors offer benefits such as lower maintenance costs, reduced fuel usage, dust, and emissions, eliminating the need for a loading shovel and ensuring higher quality end products.

Collaborating with Powerscreen Ireland, Powerscreen distributor in Ireland, Collen Bros receives local support, spare parts access, and technical assistance. The solution provided to Collen Bros is a testament to their forward-thinking approach and commitment to sustainable investment in hybrid machines.

Source: Terex 2024



TMS Mining: established in 2009, TMS is a leading international equipment supply company with a presence in the United Kingdom, Lebanon, and Nigeria. Specialising in genuine OEM spare parts, TMS is a key player in supplying components for various industries including mining, construction and transportation.

Our extensive inventory covers approximately 80% of heavy equipment and truck machinery brands, including Caterpillar®, Hitachi®, Komatsu®, Liebherr®, Renault®, Volvo® and many more. From its inception, TMS Mining has prioritised an unwavering commitment to quality assurance, fostering enduring relationships with customers and partners.

TMS Mining is synonymous with top-quality branded spare parts. Our adept team focuses on delivering solutions without intermediaries, providing optimal service and financial solutions tailored to meet diverse business needs.

TMS Mining is the go-to source for quality branded spare parts, serving a vast clientele spanning more than 36 countries worldwide. Our journey has been underscored by a dedication to excellence, customer satisfaction, and is supported by a global presence in the ever-expanding field of heavy equipment spare parts.

TMS Mining operates an in-house logistics and freight forwarding company, offering cost efficient air and sea freight options to ensure timely delivery.

For speedy top quality OEM spare parts, at competitive prices, with excellent service and after-sales support, try TMS Mining.

Source: TMS Mining 2025



TMS Mining
Trading Machinery Spares



TYRI Lights UK: is an award-winning industry leader in off-road work lighting systems. TYRI designs, develops and manufactures precision LED lighting that enhances safety and efficiency in the mining industry.

TYRI is at the forefront of developing advanced lighting solutions specifically engineered for demanding environments such as mining and heavy machinery operations. Our lights are rigorously tested and approved to meet the highest standards of durability and reliability, ensuring long-lasting performance in the toughest conditions.

TYRI collaborates closely with OEMs and operators in the mining sector to provide advanced, customised lighting solutions tailored to the specific needs of this challenging industry. With years of experience and expertise, TYRI UK delivers high-performance lighting systems, that significantly enhance visibility, productivity, and operational efficiency in mining environments.

Our collaborative approach ensures that each lighting solution is customised to suit the needs of the application, not only improving visibility, but also reducing energy consumption, and minimising environmental impact.

Advanced Lighting for Mining:

Providing light for the mining sector can be very challenging. The harsh conditions, both underground and aboveground, mean that lighting needs to be robust and adaptive.

Underground, glare from materials such as chalk can quickly cause operator fatigue, while aboveground, reflections from machine buckets can blind the operator.

Choosing the correct light spread, lumen output, and colour rendering index (CRI) is crucial for addressing these challenges. Different substrates reflect light in varying ways, and selecting the appropriate lighting helps reduce glare, improves contrast, and enhances material differentiation. TYRI's Hi-CRI range is specifically designed to reduce operator fatigue and improve visibility, making mining operations safer and more efficient while minimizing errors in demanding tasks.

INTELLilight:

One of our most innovative solutions, TYRI's INTELLilight system, offers operators flexible control over lumen output and colour temperature. This adaptability ensures optimal visibility in changing conditions, improving safety and overall working conditions. By delivering precise lighting control, TYRI's INTELLilight helps reduce operator fatigue and eye strain, contributing to a safer, more comfortable working environment.

TYRI understands the unique demands of mining, from harsh conditions to strict safety requirements. Our INTELLilight system provides mining operators with precise control over their lighting environment, optimizing performance while helping reduce energy usage.

By delivering lighting that meets the high standards required for safe and sustainable mining, TYRI enables mining operations to run more efficiently and effectively worldwide.

Source: Tyri Lights UK 2024

TYRI LIGHTS



© Epiroc

Wardell Armstrong International: is an independent full-service technical consultancy providing geological, mining, mineral processing and ESG services to the mining industry

Wardell Armstrong International (WAI), a global leader in mining, metallurgical, and ESG consultancy, played a pivotal role in the development of the Vareš Polymetallic Project in Bosnia and Herzegovina. This project, developed by Adriatic Metals, marks a significant milestone as the first new mine to open in Europe in over a decade. WAI's involvement spanned the entire development lifecycle, offering a multidisciplinary suite of services that included metallurgical testing, environmental and social impact assessments (ESIA), and sustainability strategy.

Project Highlights

Comprehensive Support Across the Mine Life Cycle:

- WAI supported Adriatic Metals from initial flowsheet development to advanced geometallurgical variability testing. This work informed process optimisation and ensured efficient extraction of valuable metals.
- The project's **ESG framework**, designed by WAI, secured approval from the European Bank for Reconstruction and Development (EBRD), facilitating critical financing.

Technical Excellence

Metallurgical testwork was conducted at WAI's state-of-the-art laboratory in Cornwall, UK. This included:

- Flowsheet development to optimize processing.
- Variability testing across ore deposits to ensure consistent performance.

Tailings design incorporated advanced water management solutions to meet stringent environmental standards.

Environmental and Social Leadership:

WAI conducted an in-depth **ESIA aligned with EBRD and IFC guidelines**, ensuring compliance with international best practices.

Stakeholder engagement initiatives facilitated community support, addressing concerns and promoting sustainable economic development.

Global Expertise in Action

Drawing on experience in over 90 countries, WAI applied its commodity-agnostic approach to address site-specific challenges. The team's familiarity with precious, base, and battery metals positioned the Vareš project for **long-term success**.

Project Outcomes

The Vareš Polymetallic Project commenced production in 2024, setting a new standard for modern mining in Europe.

ESG initiatives have driven community development programs, creating jobs and supporting local infrastructure.

Approval by EBRD highlighted the project's alignment with sustainable mining practices.

Ongoing Support

WAI continues to support Adriatic Metals at the Vareš Project with ongoing sediment management planning and **tailings storage facility (TSF) design**.

The sediment management plan aims to minimize environmental impacts through strategies for erosion control and rehabilitation, whilst the TSF design includes a phased approach to create a multi-stage, lined, dry stack facility within the project boundary.

Conclusion

WAI's multidisciplinary approach and commitment to excellence ensured the successful development of the Vareš Polymetallic Project. From technical innovation in metallurgical processing to leadership in ESG compliance, **WAI's contributions have positioned this project as a benchmark for sustainable mining in Europe**. Their role underscores the importance of integrated technical and environmental strategies in delivering impactful results for clients and stakeholders alike.



Source: Wardell Armstrong 2025

Watercycle Technologies: revolutionising lithium extraction with the Direct Lithium Extraction and Crystallisation (DLEC™) Process

Watercycle Technologies is a UK climate-tech company, pioneering the selective recovery of critical minerals from primary resources and waste streams including naturally-occurring brines and spent lithium ion batteries.

The global demand for lithium, a crucial component in batteries powering electric vehicles (EVs), smartphones, computers, and renewable energy storage solutions, is growing rapidly. However, traditional lithium extraction methods pose significant challenges such as severe aquifer depletion, long processing times and high carbon emissions. Coupled with China's near monopoly on the supply of refined lithium, these issues pose an existential threat to Net Zero ambitions.

Watercycle Technologies, a spin out from the **University of Manchester**, is tackling these challenges head-on, having developed technology that can extract not just lithium, but other critical minerals such as graphite, nickel and copper from various primary and waste streams. The company embarked on this ground-breaking journey in 2020 and are on a path to ensure that the minerals that underpin Net Zero technologies have a stable and circular supply around the world.

Awarded an Innovate UK Smart Grant in November 2022, they

initiated a pilot of their patented Direct Lithium Extraction and Crystallization (DLEC™) process in collaboration with a lithium resource owner in the southwest of England.

This process utilises Watercycle Technologies' innovative adsorption membranes, allowing lithium to be directly extracted from sub-surface geothermal brines accessed through boreholes more rapidly than alternative bead-based technologies. The lithium-rich solution produced from this stage is then concentrated and crystallised into lithium carbonate within the process, with first production of the crystallised material being successfully achieved in December 2023. The lithium-free brine can then be safely reinjected back into the aquifer, closing the water loop and eliminating the problem of groundwater depletion. The whole process occurs in just hours instead of months or years like current brine processes and enables up to a ten-fold reduction in carbon emissions compared to hard rock processes.

The DLEC™ process stands out for its efficiency, speed, and reduced environmental impact compared to traditional extraction methods. By crystallising lithium directly from brine water, Watercycle Technologies has achieved a significant milestone in advancing the UK's lithium supply chain.

The importance of this Watercycle's work extends beyond technological achievement. With global lithium demand projected to reach 3.8 million tons by 2035, Watercycle Technologies' DLEC™ process addresses a critical need for a sustainable and efficient lithium supply chain. The unique modular solution developed by Watercycle Technologies, in partnership with HTS Engineering Group, offers scalability and minimal environmental footprint, allowing for deployment as new sites are opened in the UK, Europe and around the world.

Source: Watercycle Technologies 2024



Weir: an engineering business that provides mission critical equipment to the world's mining industry. Founded in Glasgow in 1871, today Weir operates in over 50 countries globally.

The comminution revolution

Our planet's future depends on the transition to renewable energy, and that transition can only happen with the metals and minerals our mining customers deliver.

The mining industry is in a period of change – it recognises the need to scale up and clean up to deliver more of the critical metals needed for the energy transition, and produce them in a more sustainable way.

Weir is at the heart of that change, as the strategic partner that our customers can call on as they lean into their biggest challenges – to move less rock, use less energy, use water wisely and create less waste.

And comminution is a key part of that. Comminution is a key mining process where large rocks are crushed to powder so that the vital metals can be extracted. It is hugely energy and carbon intensive, responsible for around 3% of global electricity consumption every year. Traditional technology, such as tumbling mills, is inefficient so there's a big opportunity to bring about a technology transformation to one of the most energy hungry parts of the mine.

At Weir, we are redefining comminution – with innovative combinations of proven technologies, including our world-leading ENDURON® HPGR (high pressure grinding rolls).

Our mining technology solutions can cut energy use by around 40% and operate water-free. But this is not the mine of the future – it's the mine of today. Already operating at the Fortescue Metals Group's Iron Bridge facility in Western Australia, Weir's transformative comminution process demonstrates the substantial opportunity for the global mining industry to make a material contribution to CO₂ emissions reduction.

Through combining our deep customer insight, world class engineering and materials science, enabled by intelligent automation, we are delivering the innovative end-to-end solutions that are accelerating the transition to more sustainable mining.

Source: Weir Group PLC 2025



WSP: guiding the Fen REE project in Norway through the feasibility process

WSP is currently engaged with Rare Earths Norway (REN) to help guide the development of one of Europe's most promising Rare Earth Element (REE) deposits, the Fen Project (Fen). Fen is a carbonatite hosted REE mineral deposit, located in Telemark, Norway, and is considered an exciting prospect for locally produced, European REEs. REN's vision is to become an important supplier of mixed rare earths concentrate in Europe, enabling the green industrial transition and climate change mitigation.

The global demand and strategic value of REE are increasing. They are essential for digital technologies, renewable energy, steel, magnets and batteries. More than ever, governments are seeking to secure ethical supplies. Looking forward, industry and governments need to responsibly mine, process and recycle REE, including recovery from historic mine tailings and other waste products.

WSP has been involved in the Fen Project since 2020, helping to guide the REN team through initial data compilation and pre-concept studies, into the planning and execution of exploration drilling and chemical analysis to better define the underground geology. In 2023, **WSP geologists from the UK** visited the site to undertake a week of workshops and deliver training with the REN geology team to develop geological logging procedures to better define the potential Mineral Resource.

During 2024, WSP completed the maiden Mineral Resource for the project, indicating that the Fen resource is the largest REE deposit evaluated in continental Europe, with significant potential upside.

WSP experts from the UK, Australia and Canada have since completed work on mine design, planning, metallurgy, and mine waste disposal, with a focus on risk mitigation and gaining support for the project from local authorities.

In addition to in-house mining professionals, WSP has partnered with **Zenito Limited**. Zenito is a UK-based multidisciplinary engineering consultancy specialising in the design of mineral processing plants and associated infrastructure and will help to develop options for the processing of REE-ore into a saleable concentrate. Together with Zenito, WSP will look to take the Fen project from concept to reality as an important supplier of locally sourced critical minerals essential to the green transition.

Source: WSP 2024





Department for Business and Trade

The UK's Department for Business and Trade is an economic growth department. We ensure fair, competitive markets at home, secure access to new markets abroad and support businesses to invest, export and grow. Our priorities are the Industrial Strategy, Make Work Pay, the Trade Strategy and the Plan for Small Business.

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This brochure contains case studies of solutions and innovations from the UK mining sector. It is not meant to be an exhaustive or complete representation of all relevant UK organisations and shows just a selection of the available mining capability and expertise in the UK.

This brochure is intended as an initial engagement tool to support dialogue with other countries, companies and industries; encouraging these parties to take a closer look at the UK.

This document is not a policy position paper from UK Government.

Parties interested in learning more about the UK mining offer, or suppliers tailored to their needs should contact their local Embassy, High Commission or Consulate to start a discussion or, if they are UK-based, contact ResponsibleMining@businessandtrade.gov.uk



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