

Capability Statement

Mining and Mineral Resources

Wardell Armstrong

"No external shareholders. No big, slow parent company. No vested interests. Just great people, independent creative thinking and a passion for helping clients"

"With 430 people, Wardell Armstrong is well placed in terms of size. Large enough to have strength and depth with many experienced specialists working seamlessly together – but also small enough to be sure of giving close personal attention"

We are a multidisciplinary Engineering, Environmental and Mining consultancy with a history going back over 175 years and a reputation for high quality service, both in the UK and Internationally.

Whether your project is under, on or above the ground, we can assemble the right team to provide you with the technical expertise and knowledge you need to help you make it a complete success.

Our People

"Our people are the heart of our business"

What do you look for when you're choosing a consultancy? Most of our clients tell us that it's our people who make the real difference. People who understand what they want to achieve – and have the skills, knowledge and drive to help them get there.

Many are leading authorities in their fields, but they all share the same passion for what they do, and the dedication to helping clients like you to achieve their aims.



What We Do

With a unique mix of practical skills, knowledge and experience we work closely with our clients in the public and private sectors. We support and help them to realise the full potential of their resources and assets, gain increased business and financial returns from the environments they own and operate, and succeed in their ventures in a responsible and sustainable way.



Areas of Expertise

- Civil and Structural Engineering
- Energy and Climate Change
- Environment
- Ground and Environmental Engineering
- Utilities and Infrastructure
- Property and Development
- Mineral Estates and Quarrying
- Geology and Mining
- Mineral Processing and Laboratory
- Planning and Landscape Design
- Sport and Leisure
- Waste Resource Management

Overview

Wardell Armstrong International (WAI) provides a wide range of services for minerals related projects; from preliminary exploration planning and execution, through mineral resource and reserve estimation to international standards (including the JORC Code (2012), NI 43-101 and PERC), scoping studies, preliminary economic assessment, mine design and financial appraisal to pre-feasibility and full feasibility studies. WAI also provides assistance with mine development, start up, expansion, optimisation and closure.

Familiar with the challenges of working internationally in difficult environments and with diverse cultures, we carefully select a team of experts for each assignment that draws on wide international and local expertise. Our multi-disciplinary approach enables us to assign a full range of skills and specialist services to suit each client's individual needs and project requirements.



Exploration Management	Water Management
Mining Geology & Resource Evaluation	Financial Analysis
Mining Engineering & Ore Reserve Estimation	Expert Witness
Geotechnical & Hydrogeological Studies	Mine Closure
Environment, Social Management & Social Responsibility	Process Testwork & Minerals Engineering

Our global reach means that we can serve clients throughout the world, wherever they're located. We've been involved in active projects in over ninety countries, with offices in the UK, Kazakhstan (Almaty) and Russia (Moscow).

WAI has a strong client list, including companies and organisations from the private and public sectors, as well as major financial institutions. We have been engaged in multiple LSE Main Board and AIM listings as well as NI 43-101 Technical reports in line with TSX and Competent Person's Reports in line with ASX.

Our Clients include:

- Empresa Minera Del Caribe
- EBRD
- Eldorado Gold
- Polyus Gold
- Petropavlovsk
- Lydian International
- Kazakhmys
- High River Gold



Why it's Important

Minerals are essential to life as we know it – pervading every aspect of our society. They range from feedstock for the chemical industry and industrial processes to steels and alloys for manufactured goods, clays for ceramics, specialist minerals for electronics, fossil and fissile minerals for energy generation, construction materials, precious and semi-precious metals, gemstones and gold.

WAI understands that mining and quarrying activity can only thrive if the operation and the market are economically viable – and if commercial, environmental and social risks are successfully mitigated and/or managed.

WAI experienced in providing technical expertise and professional management services taking into account the factors essential to a successful mining and quarrying business.

The Value we Add

We help our clients to successfully maximise commercial and economic benefits while meeting international environmental, labour and corporate social responsibility obligations and expectations.

At the core of our business is a breadth and depth of expertise in geology, engineering and processing technologies, and operational experience across the full range of mineral commodities – all combined with a sound knowledge of commercial realities, and close links to the London financial markets.

How are we Different?

Extracting mineral resources in a safe, sustainable and environmentally and socially responsible way is essential, and we place particular emphasis on this aspect of the minerals business.

Project finance is increasingly dependent on demonstrating a social licence to operate, and compliance with international standards such as those set out in the Equator Principles.

At the same time, this has to be consistent with commercial realities and operational feasibility. We have the necessary range, breadth and depth of technical and management expertise to be able to balance these issues to ensure success for our clients.



Areas of Expertise

Expert Reports and Due Diligence for:

- Mergers and acquisitions
- Stock market listings (such as IPO on AIM and NI 43-101 reporting)
- Valuation of assets (and liabilities)

Feasibility Studies

- Pre-feasibility studies
- Bankable feasibility studies

Geology and Resources

- Exploration
- Resource evaluation and classification
- Geostatistics
- Resource and reserve statements

Mine Design & Engineering

- Open pit design
- Underground mine design
- Geotechnics, rock mechanics
- Mine scheduling
- Ventilation
- Mine infrastructure

Minerals Engineering

- Process testwork
- Pilot plant
- Hydrometallurgy
- Pyrometallurgy
- Leaching
- Process flowsheet design

Environmental Permitting

- ESIA (environmental & social impact assessment)
- IPPC, air & water permits

Water Resource Management

- Water supply
- Water balance
- Mine water management
- Water treatment

Mine Waste Management

- Tailings design
- Waste dump design and stabilisation
- ARD (acid rock drainage) and contamination assessment and remediation
- Landscaping and reclamation
- Risk assessment and risk management

Operational Management

- Environment and social responsibility
- Mine management
- Life of mine and mine planning
- Technical review and troubleshooting
- Operational performance and improvement
- Health and safety management

CSR

- Artisanal mining
- Community development

Mine Closure and Rehabilitation

- Mine closure plans
- Rehabilitation and reclamation plans
- Social closure and community development
- Costing and assessment of closure bonds and funds
- Environmental liability risk assessment



Our Experience and Track Record

WAI has professionally qualified and experienced specialists in exploration and mining geology, mining engineering, metallurgy and mining processing, rock mechanics and geotechnical engineering and mineral resource estimation, mineral economics and financial evaluation, water management and hydrogeology, mine waste management, environmental and social assessments, sustainability and energy, mine closure and post mining regeneration. We cover multiple commodities and have Competent (Qualified) Persons in:

- Precious metals
- Base metals
- Ferrous metals
- Gemstones
- Energy Minerals – Coal and Lignite, Coal Bed Methane and Underground Gasification
- Industrial minerals and construction minerals

For examples of projects we've undertaken in this, and our other business areas and service areas, please visit our website at www.wardell-armstrong.com.

Results

- Our resource and reserve assessments and mineral expert reports have enabled clients to raise project and equity finance successfully through stock market placings and commercial loans, off-take agreements and streaming deals.
- We undertake open pit, quarry and underground mine design in a wide range of geological and climatic settings, including specifying and scheduling of plant, project phasing and costing. For many clients we also assist with or manage the procurement process on their behalf.
- With our laboratory and pilot plant at Wheal Jane we have the facilities to undertake testwork for mineral processing and metallurgy for a wide range of minerals, enabling the process flowsheet to be optimised and costed.
- We've undertaken environmental and social impact assessments for a wide variety of projects in many different environmental, social and community settings, in accordance with international requirements (notably the Equator Principles). We usually work with local specialists and designers in order to fully understand the constraints and local context, and to satisfy local permitting requirements.
- We've advised clients on corporate social responsibility issues, particularly community relations and contributing to the local economy. We've also helped clients to resolve potential conflicts with artisanal and small scale miners.



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