

amira



Annual Report

2024



ACKNOWLEDGEMENT OF COUNTRY

Aligned with the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), we affirm our unwavering commitment to the rights and values of indigenous communities where mining activities are undertaken. This entails respecting their inherent right to self-determination, ensuring that their free, prior, and informed consent is obtained, preserving their cultural heritage, and guaranteeing redress and sustainable practices. We recognize the indispensable role of indigenous voices in these endeavors and pledge to uphold a transparent, inclusive, and mutually beneficial relationship in all mining engagements.

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MESSAGE FROM THE CHAIR

MR. RAJ MATHIRAVEDU

Chair Amira Global

Dear Amira Members,

I am writing to you as the chairman of Amira Global, the leading global network of mineral research organisations. Amira Global was founded in 1959 with the vision of fostering collaboration and innovation in the mineral industry. Since then, we have grown to become a trusted partner for over 200 members across 20 countries, delivering high-quality research projects that address the challenges and opportunities of the sector.

As we move into the new financial year (FY2025), I would like to share with you some of the highlights of our achievements in FY2024 and the broader industry demand and how Amira Global plays a key role in the resources industry. I would also like to express my gratitude for your continued support and involvement in Amira Global.

Amira Global's Purpose

Amira Global's purpose is to enable the mineral industry to prosper by advancing knowledge, developing people, and delivering innovation. We do this by facilitating collaborative research projects that bring together industry, academia, and government to solve common problems and create value for our members and stakeholders. Our research portfolio covers a wide range of topics, from exploration to processing and metallurgy, from sustainability and environment to social and economic development. We also provide education and training programs, networking and knowledge-sharing events, and advocacy and representation for the mineral industry.

The Industry Need for a Collaborative Ecosystem

The mineral industry is facing unprecedented challenges and opportunities in the 21st century. The growing demand for minerals and metals, driven by the global need for electrification, decarbonisation, and digitalisation, requires new solutions and innovations to ensure a secure, efficient, and responsible supply chain. At the same time, the industry must also cope with the increasing complexity and uncertainty of the operating environment, such as the social and environmental expectations, the regulatory and policy changes, the geopolitical and market risks, and the technological and workforce disruptions.

To overcome these challenges and seize these opportunities, the industry needs a collaborative ecosystem that fosters innovation, knowledge, and trust. Amira Global is uniquely positioned to provide such an ecosystem, by leveraging our global network, our proven methodology, and our neutral and independent status.

The World Need for Electrification and Amira Global's Role in It

Electrification is one of the key drivers of the global energy transition, as the world shifts from fossil fuels to renewable sources of power. Electrification offers many benefits, such as reducing greenhouse gas emissions, improving energy efficiency and security, and enhancing quality of life and economic development.

However, electrification also poses significant challenges for the mineral industry, as it requires a massive increase in the production and consumption of minerals and metals, such as copper, lithium, cobalt, nickel, and rare earths. These minerals and metals are essential for the manufacturing of electric vehicles, batteries, wind turbines, solar panels, and other clean energy technologies.

Amira Global plays a vital role in enabling the mineral industry to meet the world need for electrification, by supporting research and innovation that improve the exploration, mining, processing, and recycling of these minerals and metals. We also help the industry to address the environmental, social, and governance issues that arise from the increased demand and supply of these minerals and metals.

Thanking the Members for the Continued Support

None of our achievements and plans would be possible without the continued support and involvement of our members. I would like to thank you for your commitment and contribution to Amira, and for your trust and confidence in our organisation.

Your membership is valuable to us, and we strive to provide you with the best service and benefits. We welcome your feedback and suggestions on how we can improve our performance and deliver more value to you. We also encourage you to participate actively in our research projects, events, and activities, and to share your insights and experiences with our network.

Thanking Vaughan Chamberlain CEO, the Management Team, and the Board of Directors

I would also like to thank Vaughan Chamberlain, our CEO, and the management team, for their outstanding leadership and dedication to Amira Global. They have done a remarkable job in steering Amira into the new future and implementing our strategic plan for 2020-2025. Under the Board and the management team's guidance,

Amira Global has continued to perform well in our research portfolio, our membership base, our financial position, and our organisational capability. We have also strengthened our relationships with our key partners and stakeholders and enhanced our reputation and influence in the industry.

In conclusion, I would like to reiterate my appreciation and admiration for all of you, our members, our CEO, our management team and the Board. You are the heart and soul of Amira, and the reason why we exist and thrive. Together, we can make a positive difference for the mineral industry and the world.

Yours sincerely,
Mr. Raj Mathiravedu
Chair of Amira Global Board



MESSAGE FROM THE CEO

MR VAUGHAN CHAMBERLAIN

Amira Global CEO

Dear Amira Members,

The past year was a fascinating one for me. The Amira Global board asked me to stand in as CEO early in September 2023 and then in May 2024 I agreed to accept the role full time. I have not regretted these decisions for one minute and have relished the opportunity to work with the great Amira team, our enthusiastic members and world leading research teams. A special word of thanks at this point to the outgoing CEO, Jacqui Coombes for the work she did in setting up the business for success and developing a remarkable team.

The highlight of the year was the Exploration Manager Conference (EMC23) held at the Natural History Museum in London, late in September 2023. A total of ninety-six delegates, comprising member representatives, sponsors, members of national geological surveys and researchers from across the globe actively participated in a broad programme entitled "The Next Generation." The active engagement and free and deep discussions highlighted the uniqueness of this conference. The feedback from attendee's was incredibly positive and highlighted the need to make sure we do not miss convening this function in the future. What this space for EMC25, to be held in conjunction with the SEG conference in Brisbane.

Much of my time, this year, was spent with my executive team mapping out the future for Amira. We have realised that we need to be actively designing the future and to contribute to the industry by providing thought leadership. To this end we have developed a series of frameworks to map out potential research directions. We will collaborate with our members and research teams across the globe to expand and further define the frameworks. The frameworks will remain live documents and will be adapted to reflect the drivers and needs of industry. The five frameworks, developed to date, are explored in more detail later in this report. We also recognised the need for multidisciplinary project that bring together aspect of all five frameworks and these too are discussed later in the report.

In the geoscience's portfolio, highlights of the year saw P934C WAXI continuing, while P1016B SAXI concluded, and the next iteration is now being developed. We also saw P1335 GAXI brining in significant sponsorship and starting toward the year end. Meanwhile a series of round tables has helped define the P1336 Global Basins projects with the Australian hub of this research work rapidly reaching the stage when it will be ready for sponsorship. The P1332 East African Exploration Initiative (EAXI) is currently being defined and will be ready for sponsorship toward the end of the fiscal year.

We initiated the development of a Mining framework, and the first phase of this work has been completed. Work continued on the development of a Mineral Processing framework which is designed to fully integrate future research work and supplement the work done in P420 and the next project planned to come into management which is P1331 Refractory Ore's. The Mineral Processing framework was presented to members and other stakeholders in July 2024.

This year also saw the launching of two tailings projects, P1324 Circular Mine and P1288 Predicting Liquefaction as part of the sustainability framework. Two other tailings projects are in the pipeline.

As far as the multidisciplinary project go, we are getting very close to launching P1344 PADI. This multidisciplinary program covers all five of our frameworks. It can primarily be defined as a sustainability project which is designed to develop a network of Universities across Africa and to provide a network of sponsors and providers of grants to develop the universities and enhance post graduate training in Africa. On the technical front the nine-member universities will research aspects of decarbonisation across the whole value chain from exploration to beneficiation to reprocessing of tailings and development of policy.

We are actively managing our project pipeline and the next fiscal year will see many programs and projects brought forward as they are developed via our very successful model. The model sees the Amira team leading the collaboration process which needs the active involvement of members and global research teams to define industry relevant programs supported by well-defined and executed projects.

Yours sincerely,
Mr Vaughan Chamberlain
Amira Global CEO



Who We Are

Amira is an independent global not-for-profit organisation representing members from the resources industry. We seek to enhance, sustain and deliver transformational research and development, innovation and implementation to the benefit of society.

Identifying, recruiting and including globally leading solution providers, Mining Equipment Technology Services companies and research organisations in collaborations to solve industry's challenges set by industry collaborations

Our Purpose

Build Collaborations to ...

ENHANCE

enhance standing of the resources industries amongst stakeholders locally and globally

SUSTAIN

sustainable development of the resources industries that is acceptable to society

DELIVER

delivery of new data, knowledge, technologies, products and services in order to help Members

Amira Global Values

GOVERNANCE

Amira has delivered a trusted platform for collaborative R&D for over 60 years including financial stewardship and transparency for funders.

GLOBAL ALLIANCES

Amira has provided a platform for key stakeholder alliance across the globe including research institutions, governmental and non-governmental interest groups, and Amira member producing and supply companies.

KNOWLEDGE PLATFORM

Amira is developing a knowledge platform to provide industry decision makers with efficient access to trusted, validated, verified, and aggregated outcomes from global industry R&D outcomes.



DEFRAGMENTED R&D+I2

Amira delivers a coordinated R&D+I2 response to industry challenges, which accelerates dissemination and deployment into industry.

HIGH ROI ON R&D INVESTMENT

Amira's model provides a 15x to 20x multiplier on a company's investment in R&D+I2.

\$1.65B

Industry Focused R&D Delivered

\$350M

New Technologies

\$1B

Optimisation
and Tools

\$500M

Technology Deployment and
Comparison

20

Average Leverage Multiplier
on every dollar Sponsored

750

Collaborative Projects
Delivered

Our highlights

P1335 - Geodynamic Andes eXploration Initiative (GAXI)

- 5 Confirm Sponsors (BHP, Newmont, AngloGold Ashanti, B2Gold and Poderosa)

Two new Amira Tailings projects kicked-off:

- P1342 - Circular Mine Consortium Collaboration with Industries to Reduce Mine Waste – 4 Sponsors: South32, ArcelorMittal, EcoGraf and FLSmidth.
- P1288 - Preventing tailings dam failures: Predicting liquefaction risk – 4 Sponsors: Gold Fields, ArcelorMittal, Boliden and Canary Systems.



Our People

Introducing The Amira Team

AMIRA GLOBAL BOARD



Rajkumar Mathiravedu,
B.Eng. Mechanical
Engineering
M.S. Mechanical
Engineering
MBA General Management

Chief Operating Officer,
Orica Digital Solutions

Mr Mathiravedu joined AMIRA International Limited as a non-executive Director in July 2022. He was appointed Chair of the Amira Global board in June 2023.



Mr Vaughan Chamberlain
Master of Science in
Engineering Mining; BSc
Hons (Geology) Founder, VG
Advisory, Amira Global CEO

Mr Chamberlain joined AMIRA International as a non-executive Director in March 2023.



Kwasi Ampofo PhD Mineral
Economics
Head of Metals and Mining,
BloombergNEF

Dr Ampofo joined AMIRA International Limited as a non-executive Director in February 2022.



Mr Mac Canby, BSc
Geological Engineering, MSc
Geology
Snr VP Exploration, Freeport-
Mc-Mo-Ran Inc.

Mr Canby joined AMIRA International Limited as a non-executive Director in November 2019.



Dr Chris Wijns, BSc
Geophysics, MSc
Geophysics, PhD
Geodynamics
Group Geophysicist, First
Quantum Minerals Limited

Dr Wijns joined AMIRA International Limited as a non-executive Director in November 2015. He was appointed chair of the Board in December 2018 and is a member of the Finance & Audit Committee. He stepped down from position as Chair as of 29 June 2023.

AMIRA GLOBAL BOARD



Dr Ronel Kappes BSc
Engineering, PhD
Metallurgical Engineering
Director Processing,
Newmont Corporation

Dr Kappes joined AMIRA International Limited as a non-executive Director in June 2018. She is a member of Finance & Audit Committee. She is also Member of the nominations committee for AMIRA.



Dr Rikard Maki, PhD
Mechanical Engineering,
Head of Electrification and
Automation, Boliden Mines

Dr Maki joined AMIRA International Limited as a non-executive Director in May 2020



Dr Jared Osborne PhD
Chemical Engineering,
GAICD General Manager –
Technical Development,
Rio Tinto

Dr Osborne joined AMIRA International Limited as a non-executive Director in November 2020



Michael Ravella BSc
Geology, MSc Earth Senior
Vice President Innovation
and Co-Founder, Veracio

Mr Ravella joined AMIRA International Limited as a non-executive Director in April 2021. He is a member of the Finance and Audit Committee

AMIRA AFRICA BOARD



Kwasi Ampofo (PhD Mine Planning & Numerical Modelling) Head of Metals and Mining, BloombergNEF

Dr Ampofo joined AMIRA International Limited as a non-executive Director in February 2022. He was appointed Chair of the Africa board in 2023



Mr Vaughan Chamberlain Master of Science in Engineering MEng; BSc Hons (Geology) Founder, VG Advisory, Amira Global CEO

Mr Chamberlain joined AMIRA International as a non-executive Director in March 2023.



Mr Yves Ilunga (MBA, Certificate in Global Management, Post Graduate Certificate in Advanced Finance, BCom (Hons) & CTA, Accounting Sciences; BCom, Financial Accounting) VP Business Development, Glencore

Mr Ilunga joined AMIRA International as a non-executive Director in October 2021.

THE EXECUTIVE TEAM



Dr Anil Subramanya
GM Australasia VP Geosciences

Describe your role: Leading Amira's growth in Australia and Australasia, and enhancing collaborations across Africa, Europe, and the Americas. Spearheading Geoscience projects for global decarbonisation and digitalisation with a focus on sustainability. Building new tools and techniques and establishing a global knowledge platform for the minerals sector.

Brief career biography: Anil holds a PhD in geochemistry and economic geology with 35 years of global experience, primarily in exploration and development. Passionate about sustainable industry development, he champions early STEM education to nurture talent in the minerals sector. He's known for fostering collaborations between research institutions, industry, and governments

Country of origin: India



Patricio Pastorelli
GM LATAM | Head of Global Alliances

Describe your role: Lead the strategic growth of Amira Global in the LATAM region, as well as the development of the global network of allies and partners to support collaboration for Amira Members.

Brief career biography: Patricio is a business leader with an extensive experience in innovation, sustainable business and ecosystem development within the minerals and metals industry. Prior to Amira, Patricio held managing roles in the Australian Trade and Investment Commission and Fundación Chile developing projects and business across the region.

Country of origin: Chile



Tony Anyimadu
GM Africa | VP Mineral Processings

Describe your role: Operationalize the Africa Board Strategy. Current Focus is to re-organize Amira Global Mineral Processing into 4 programs to include Energy, critical mineral processing, unit processing models extension (old p9), and Extractive Metallurgy; and (ii) embed P-ADI and ACoE to meet the needs of members.

Brief career biography: Tony graduated as a Metallurgical Engineer in 1993 and is an experienced Process Engineer with Anglo and AGA, spanning plant design, production, combined assurance and due diligence, operations and research management. He's been on advisory boards for institutions like UCT Chemical Engineering and SAMMRI and is dedicated to enhancing Africa's mineral value chain.

Country of origin: Ghana



Kim Ong
GM Finance

Describe your role: Make sense of the numbers and tell meaningful stories about them to my stakeholders.

Brief career biography: Kim is responsible for financial governance, compliance, and strategy to drive sustainable growth opportunities. She is passionate about people, accuracy, innovation and results.

Country of origin: Singapore

Kim Ong Resignation in May

PROJECT MANAGERS

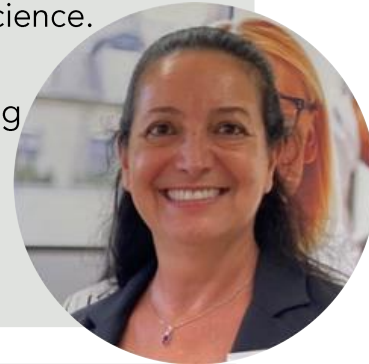
Project Managers

Dr Silvia Black Senior Program Manager

Describe your role: leading operational and strategic initiatives by developing and managing a diverse portfolio of global projects, programs and strategic collaborative initiatives, with Research & Innovation focusing on long-term sustainability across the mineral industry value chain. Currently Silvia is leading the strategic development of Amira Global's Sustainability framework

Brief career biography: Silvia has a BSc (App. Chem.) degree from Curtin University, a Grad. Dip. (Food and Drug Analysis) from University of NSW and a PhD (Extractive Metallurgy) from Murdoch University. She has scientific, analytical and innovation expertise spanning over 35 years in the fields of mining, food, water, education, racing, and forensic and environmental science. With a large portion of her career being in mining, she has long lasting relationships and works collaboratively with government agencies, funding bodies, researchers, industry and industry bodies.

Country of origin: Argentina



Bright Foli Program Manager

Describe your role: Developing and managing projects/program through engagement with academia, industry and allied stakeholders. I support ongoing collaborative R&D projects globally, and I drive emerging programs in Africa.

Brief Career Biography: Bright holds a Bsc Chemistry degree from the Kwame Nkrumah University of Science and Technology, Ghana, MSc. Oil and Gas Chemistry from the University of Aberdeen, UK and a Project Management Professional (PMP) certification. In the past 10years, he has worked on offshore oil production chemistry projects and implemented downstream fuel integrity programs for governments across the West and Central Africa regions.

Country of Origin: Ghana



Redeemina Comfort Bonnah Program Manager

Describe your role: I oversee a global project portfolio, focusing on strategic and long-term initiatives which aim to promote sustainability across the entire mining industry value chain through collaborative projects. I also work to strengthen Amira's member presence, expand research alliances, and represent Amira during member engagements, prioritizing member needs.

Brief Career Biography: Redeemina holds a BSc. (Hons) in Minerals Engineering and an M.Eng. in Materials Science and Engineering. With over 9 years of experience, she has expertise in mining, and materials science and engineering. She has been involved in collaborative research projects in the mining industry in Ghana, particularly in metallurgy and tailings management establishing strong industry relationships in her capacity as a research fellow.

Country of Origin: Ghana



Hayley McGillivray Senior Program Manager

Describe your role: My role is to support Amira members to address complex challenges that no organisation can handle alone. With a particular passion for the Geoscience area, I enjoy managing the WAXI initiative and working on structures and strategies for new programs.

Brief career biography: Hayley has a background of ten years working as a Geologist in the Mining Industry. During this time, one of her focuses was managing research and development partnerships with research organisations and operational implementation of outcomes. Over the last decade, Hayley has worked with small businesses and Research organisations, facilitating research knowledge transfer into industry. Hayley spent three years delivering the Federal Government Entrepreneurs Program- Innovation Connections. Hayley has extensive experience of research collaborations from Industry, Research and Program delivery perspectives and has built strong operational experience in Innovation, R&D and Commercialisation. Hayley is studying for her PhD in Industry-Research Collaborations and is a program manager at Amira Global

Country of origin: England



THE SUPPORT TEAM

Jacqueline Russell

Project Support Officer & Office Manager

Describe your role: To provide support on project issues throughout the process and life of the project, as well as collaboration with colleagues in whatever is necessary and required. I maintain the databases in our systems related to contacts, contracts, interactions, documentation, and projects. Administratively, I manage legal documentation, financial information, and contracts.

Brief career biography: Jacky worked at CAP (Compañía de Aceros del Pacifico) as an assistant in the Stock department for almost 18 years. She was also in the Accounting and Finance departments of CAP as an assistant and eventually in the Presidency. She arrived at Amira in 2010 as a Project Support Officer.

Country of origin: Chile



Ann Woolley

Global Support Manager

Describe your role: I provide support for all projects from inception to completion which includes project meetings, distributing of reports, presentations, and all other project information relevant to the project. I provide administrative support for the Amira RSA Board and the Amira Global Board. I provide staff training on our various systems and processes. I manage the South African office - accounts, memberships, and finances.

Brief career biography: Ann was a partner in a company Called Ridge Systems as administrative support. She has been with Amira since 2008.

Country of origin: South Africa



Claud Bilson

Communication & Marketing Officer

Describe your role: In my role as a Marketing and Communication Specialist, I am responsible for crafting and executing effective marketing strategies across various platforms. This involves creating compelling content, monitoring analytics to gauge campaign effectiveness, and liaising with stakeholders to ensure cohesive messaging. Additionally, I manage our company's social media presence, engage in media relations, coordinate events, and oversee budget allocations. Through rigorous market research, I stay abreast of industry trends to ensure our strategies are current and impactful.

Brief career biography: Claud is a recent Graduate from Curtin University with a degree in Marketing & Management and a massive background in marketing.

Country of origin: Ghana





amira 

Major Pipeline Programs

AMIRA THOUGHT LEADERSHIP: PROJECT DEVELOPMENT



Research Frameworks

Geoscience
Framework

Mining
Framework

Mineral Processing
Framework

Sustainability
Framework

Innovation
Framework

Pan-African Decarbonization Institute (P-ADI) - P1344

Amira Africa Center of Excellence (P1332)

Amira Geometallurgy Program

Amira Lithium Program

Critical Minerals Program

GEOSCIENCE FRAMEWORK



Data Metallogenica

Long-term precompetitive global series

Long Term, multi-sponsor precompetitive projects which work with Government, Academia and Sponsors to create new regional understanding and knowledge, data and learnings. Including the development of global analogues, bringing across learnings from medium to long term exploration projects in a global setting.

Complimentary medium – long-term exploration

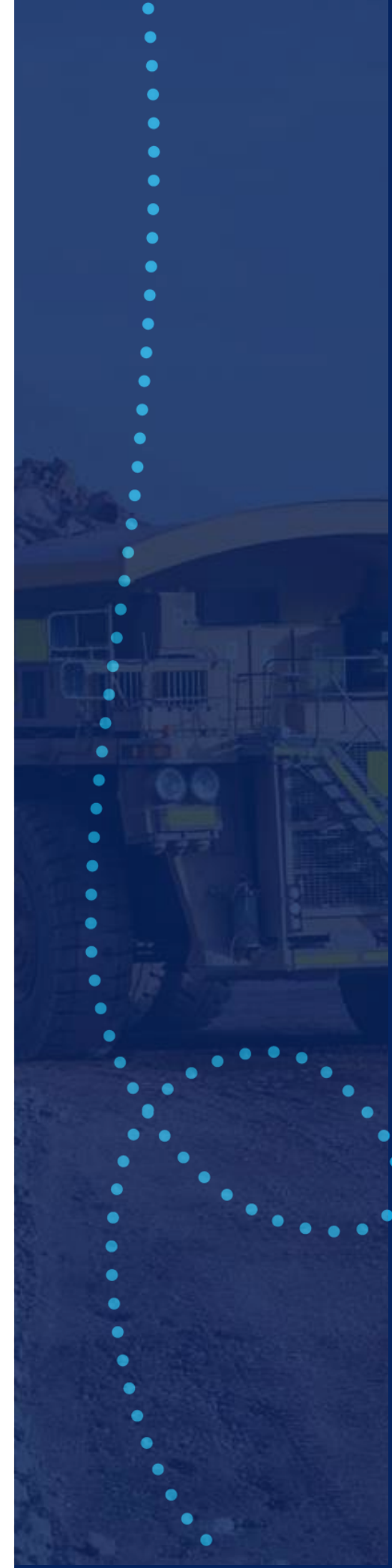
Medium to long term initiatives that create specific knowledge on mineralisation styles, deposit scale knowledge. Typically, collaborations between industry and academia.

Technology R&D Short – medium term

Short to medium term projects which are typically more applied, a higher Technology Readiness Level and specifically involve development of new technology, products or workflows for impact and adoption. It may also include translational adoption of technologies in other sectors. These projects typically include academia, service providers and industry sponsors.

Exploration Managers' Conference

Talent, Capability building, education and training



GEOSCIENCE FRAMEWORK



Data Metallogenica

Long-term precompetitive global series

Researcher/Govt/Industry

P1336 Global Basins Program

eXploration Initiatives

P934C WAXI (West African)
P1061B SAXI (South American)

P1335 GAXI (Geodynamic Andes)

P1356 South Australian Magnetite

P1332 EAXI (East African)

**NAXI (North American)
AXI (Asian)
KCXI (South African)
CAXI (Central African)**

Complimentary medium – long-term exploration

Researcher/Industry

P1249 Complex Ore bodies

P1307 Sedimentary Copper Africa

Global Geometallurgy project

Technology R&D Short – medium term

Researcher/technology provider/Industry

P1187A Multispectral GPR

P1245 Spectral IP

**Drilling Technologies
Geophysical tools
Interoperability
Data Science**

Legend:

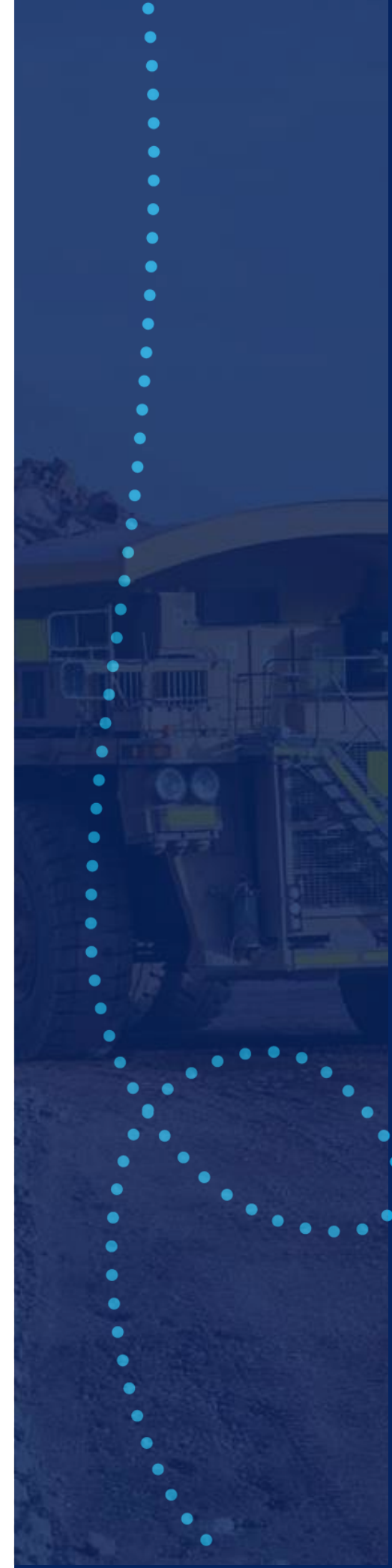
In Management

Under Development

Future Programs

Exploration Managers' Conference

Talent, Capability building, education and training



GEOSCIENCE FRAMEWORK

The geoscience framework has formed a critical visualisation of the varied nature and depth of programs that Amira has curated across the geoscience portfolio. Over the course of the year this framework has been expanded on with initiatives being advanced within the suite of activities.

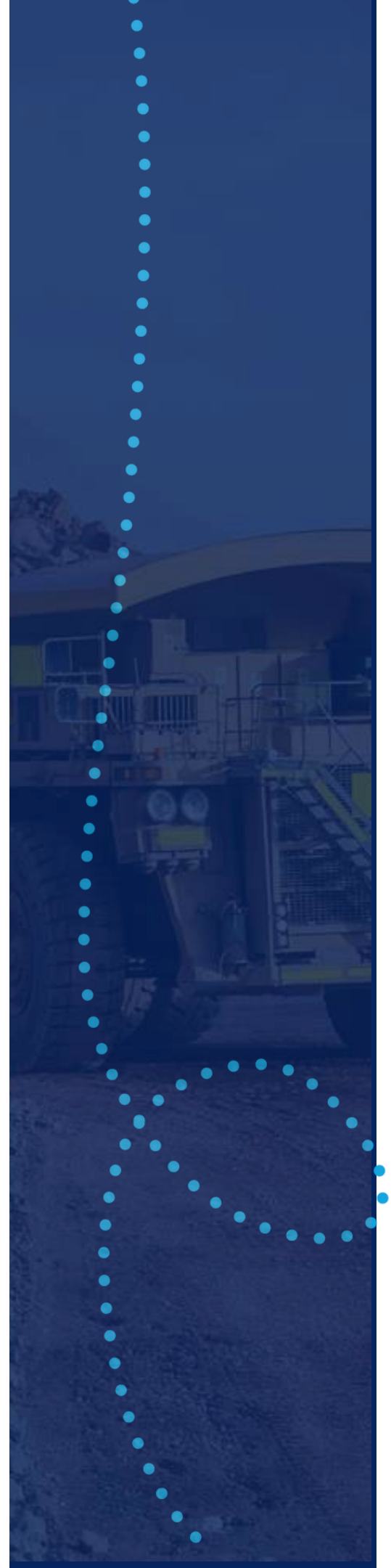
The framework also provides clear reference to the connected nature of the programs and the need to ensure that for maximum impact their relationships to each other in addition to cross cutting initiatives such as Data Metallogenica and CollaboratORE are considered.

One such example is the Global Basins Program which has been designed with a hub and spoke model at its very core. This enables recognition of the step change that global data sharing in the field of basins will bring, both up and down stream in activities while not minimising the role of Data Science, and Technology and that new tools such as AI can bring to the field of data and knowledge preservation. Each spoke provides a regional opportunity to recognise the unique challenges in the specific region faced by Industry, Research and Governments operating within Basin environments.

The eXploration Initiative projects have remained popular with an evaluation of new opportunities being completed to ensure alignment to the 'eXploration Initiative' project requirements and ways of working, these foundational requirements include:

- Long-standing projects at a regional scale.
- Working with geological surveys and researchers to provide new knowledge, data and training to the region.
- Supported by a global research consortium with a focus on in-region capacity building.
- Is co-created with sponsors.
- Is governed by an Advisory Group, if required.

Current eXploration Initiative projects in consideration for development include; CAXI (Central Africa), EAXI (East Africa), KCXI (South Africa), AXI (Asia) and NAXI (North American)



GEOSCIENCE PROJECTS



P934C WEST AFRICAN EXPLORATION INITIATIVE (WAXI) – STAGE 4

The third WAXI project is coming to the end of its second year. The project has 11 industry sponsors, 20 research providers included and 11 Geological Surveys supporting the initiative.

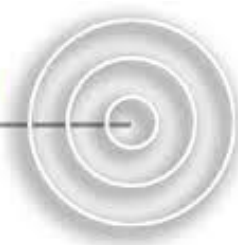
With a focus on the mineral potential of the West African Craton. The aim of WAXI is to augment the exploration potential of the Leo-Man shield. The findings assist exploration companies to focus activities in areas of maximum prospectivity. The project is progressing well and aims to:

- Enhance the exploration potential of the African Craton through an integrated program of research and data gathering into its “anatomy”.
- Help train the next generation of West African explorers.
- Assist local Geological surveys and Universities in the region in their role of providing pre-competitive data and information.

There have been 2 Sponsor Review Meetings held in the last financial year, in addition to quarterly meetings of the WAXI advisory committee.

Seven training courses have been delivered in association with the WAXI project and the Agate Project.

Center for **EXPLORATION
TARGETING**



Research Lead: Centre for Exploration Targeting - University of Western Australia



Program Manager: Hayley McGillivray,
Amira Global



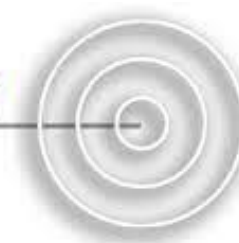
P1061B SOUTH AMERICAN EXPLORATION INITIATIVE (SAXI): STAGE 2

The Amira Global Project P1061 South American eXploration Initiative (SAXI) Stage 1 began in 2018 with a gaps analysis and continued as the just-completed Stage 2, which unraveled the geology and gold resources of greenstone belts in the Guiana Shield, including Amapá. Across Northeast South America there is so much more still to be done to unearth the potential!!

THE NEXT STAGE

Amira Global has begun development of Stage 3 of the South American eXploration Initiative (SAXI-3). SAXI is helping companies undertaking active exploration in the Guiana Shield and neighbouring terranes, with once-in-a-generation opportunity to tackle some of the outstanding questions about tectonics and metallogensis. The driving focus is to help transform the Guiana Shield and surrounding localities from anecdotic exploration location to a globally significant minerals province.

Center for **EXPLORATION
TARGETING**



Research Lead: Centre for Exploration Targeting - University of Western Australia



Senior Program Manager: Dr Silvia
Black, Amira Global

GEOSCIENCE PROJECTS

P1335 GEODYNAMIC ANDES EXPLORATION SOUTH AMERICA

P1335 - The Geodynamic Inheritance & eXploration (GAXI) Project is a four-year 2024-2028 GAXI project that aimed to advance the understanding of the spatial and temporal distribution and genesis of Cu-Mo-Au/Au-Cu and Au-Ag mineral systems and the potential for other associated critical minerals and their exploration targeting along the western margin of South America.

The focus of the GAXI project is directed at the identification, delineation, and characterization of particularly ancient trans-lithospheric fault (TLF) systems that formed during the Pre-Andean evolution of the western Gondwana margin and/or originate from lithospheric weak zones within the Archean-Proterozoic continental interior, and to assess their potential of predicting fertile versus barren structures through time and space.

- Project Leaders/ Chief Investigator, Dr Daniel Wiemer, Economic Geology Research Centre, James Cook University.
- Chief Investigator 2, Prof Steffen Hagemann, Centre for Exploration Targeting, University of Western Australia



Centre for **EXPLORATION
TARGETING**



General Manager LATAM / Head of Global Alliances: Patricio Pastorelli

Research Lead: Economic Geology Research Centre, James Cook University & Centre for Exploration Targeting - University of Western Australia

P1249 EXPLORING, CHARACTERISING, AND OPTIMISING COMPLEX OREBODIES

P1249 project will provide its sponsors with new tools for recognising proximity to high grade ore, and new tools, methods and workflows for translating and upscaling mineralogical, geochemical and hyperspectral data into quantitative mineralogy for complex orebodies of copper, gold, critical and other metals.

The project aims to optimise orebody knowledge and provide the information required for mineralogical domaining and resource definition at the mine scale.

Start Date: February 2021

Duration: 5 years

Research Lead: University of Tasmania, Australia

Sponsors: 15 Companies

Sponsor Review Meeting Completed: 5

Technology Transfer Workshops: 7

Status: Ongoing (Open for sponsorship)



Research Lead: University of Tasmania (CODES), Australia



Program Manager: Bright Foli, Amira Global

MINING FRAMEWORK



Energy & Sustainability

Equipment footprint & efficiency

- **Hydrogen**
- **Battery**
- **Other energy sources: HVO – Hydrotreated Vegetable Oil (Carbon free)**
- **Other energy sources: Atomic**

Selective mining

- **Grade department by size (upgrade by screening)**
- **Ore Sorting**

Mining Systems

- **Block modelling and forecasting of mine seismic hazards**
- **Iron ore standards**
- **Alternatives to the conventional load & haul by shovel & trucks**
- **Geometallurgy and Predictive Modeling**
- **Automation and Robotics**
- **Digitalization and Data-Driven Mining**

Legend:

In Management

Under Development

Future Programs

Talent, Capability building, education and training

MINING ENGINEERING PROJECTS

P1262 - BLOCK MODELLING AND FORECASTING MINE SEISMICITY HAZARD WITH MORE ACCURACY AND BETTER ACCESSIBILITY

This three-year Amira Project aims to address current shortfalls in forecasting seismic hazards for underground excavations using advanced numerical modelling methods.

The project will formulate spatial probabilistic and risk-based descriptions of the largest possible seismic events by area, the probable location of large events, the expected number of subsequent triggered events, and the anticipated peak ground velocities and surface displacements generated at key locations, that have been triggered by mining activities.

The key outputs from this project will be a detailed guideline and a tailored software plug-in that can be used by operational and consulting engineers to design future mines more safely and more economically and, more importantly streamlining the training and knowledge transfer for new engineers.

Start Date: March 2023

Duration: 3 years

Project Lead: Mining One Consultants/Cavroc

Sponsors: 3 Companies

Sponsor Review Meeting Completed: 2

Technology Transfer Workshops: 1

Status: Ongoing (Open for sponsorship)



Research Lead: Mining One Pty Ltd



Program Manager: Redeemina Comfort Bonnah, Amira Global



P1214 "MN-002 IRON ORE STANDARDS COMMITTEE"

P1214 project seeks to provide financial support to Standards Australia, enabling them to fulfill the International Secretariat role for ISO TC 102/SC2 Iron Ore and Direct Reduced Iron – Chemical Analysis. Additionally, the project assists Standards Australia's national mirror committee, MN-002 Iron Ore and Direct Reduced Iron, in their endeavors. By supporting these committees, P1214 aims to ensure that iron ore standards remain up to date, scientifically rigorous, and aligned with global best practices.

The project brings together expert partners, including Standards Australia, BHP, Rio Tinto, FLSmidth, Fortescue Metals Group and Roy Hill, to support the development and enhancement of iron ore standards. The project aims to ensure the safety, consistency, and reliability of iron ore products, services, and systems through voluntary standards at National and International levels.

Start Date: April 2023

Duration: 2.5 years

Project Lead: Standards Australia

Status: Ongoing



Research Lead: Standards Australia



Program Manager: Dr Silvia Black, Amira Global

MINERAL PROCESSING FRAMEWORK



Overarching themes: Techno-Economic Analysis, Efficiency, Throughput, Geometallurgy, Energy Mix, Coarse separation, Data, Ai, Optimization

Real-time process prediction and control through modelling

P1354 -Mineral Processing Unit models (Extension into new units and equipment)

-Comminution and Flotation Models

P1359- Energy, Technology and Data Science

- Coarse flotation
- Ore sorting
- New machines – RIMMS
- Dry processing
- Energy saving, economics & carbon footprint analysis

P1358- Critical minerals & ESG

Metal recovery & extraction flowsheet from:

- primary ore sources
- tailings (iron & sulphide)
- secondary sources (e-waste & industry produced water)

P1357 - Extractive Metallurgy

- Enhanced treatment of Refractory Gold and base metal Ores (P1331)
- Gold knowledge (P420H) - ongoing
- Flotation **Chemistry Aspect**

Talent, Capability building, education and training

Mineral Processing Conference (Every 2 years)

Legend:

In Management

Under Development

Future Programs

MINERAL PROCESSING FRAMEWORK

The purpose of a global Mineral Processing framework is to:

- Create a mineral processing framework that identifies current and future challenges and opportunities.
- Advance Interdependent and cross-collaborative R&D supporting mutual knowledge growth.
- Create global connections between researchers, Industry, government, and funding.
- Defragment research effort to help build complementary and supplementary Research & Development
- Leverages and grows Amira's Mineral Processing Status in the Community
- Develop new programs in response to current feedback from members of mineral processing community. Increase attention on short- and medium-term value enhancement.
- Utilize resources created (P-ADI and CoE) to enhance the cohort of existing and new mineral processing projects.
- Create efficiencies in managing Amira's Mineral Processing portfolio.
- Create links between Mineral Processing portfolio and other allied portfolios and emerging technologies – e.g., Mining, Geosciences, Big Data, productivity
- Provide structure, focus and direction for short to medium term.

Optimizing Mineral Operations with Multi Component Models will provide the capability of developing a platform with multicomponent unit process models for integrated and circuit wide optimization while using a common coding to ensure independent fitting & calibration of individual models in different integrated platforms, including but not limited to the IES through adequate multicomponent data sets collection via site circuit surveys for validation of the multicomponent models.

The responses from current and potential members regarding mineral processing priorities have been summarised in the mineral processing framework depicted in the chart, containing:

Amira's traditional mineral processing activities;

Introduction of mega programs aimed at increasing contact points and serve as catalyst for other Amira programs with our potential sponsors and stakeholders, including P-ADI and ACoE for full value scale processing;

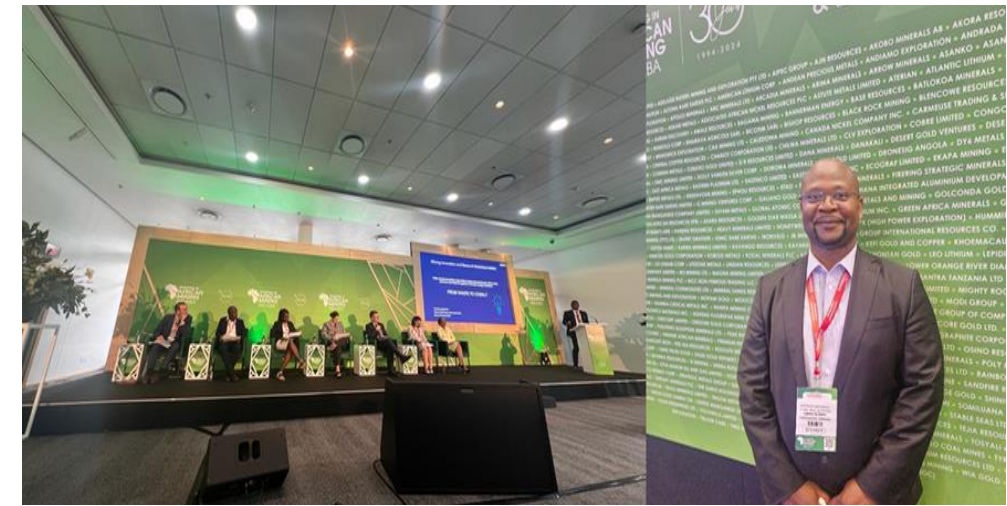
Strategic and technical priorities for producing, supplier and research stakeholders, in mineral processing are changing with new emphases. We, at Amira have recognised these trends and began setting up the organisation to respond to these. Key among these include emphasis on green energy and critical minerals, the efficient use of artificial intelligence, and systems that take advantage of the world class knowledge base within and outside Amira. Programs to this effect include ACAC, AAiPS and the link with CollaborateOre. Very little resources are dedicated to these areas currently, but the right amount of contact is maintained with the global mining community to ensure Amira is ready to deliver to the members' need in the immediate future.

Mineral Processing Highlights over the last year includes:

- P420 ongoing management
- P260 to re-start as part of the Mineral Processing framework in 2024
- Training and skills transfer as means of disseminating the outcomes of Amira Mineral Processing programs.
- Fundraising drives to include non-traditional funders ongoing
- Development programs to assist some Amira projects to expand

Amira Mineral Processing - Highlights

- 16 Proposals received from UniSA, UTAH; UTAS; Penn-State; Curtin University; University of Ghana, Kwame Nkrumah University of Science and Technology and University of Mines and Technology (all in Ghana); to augment the traditional P9 researchers (UQ, UCT, UFRJ, Chalmers, and Hacettepe Universities) to cover the new breadth of mineral processing topics.
- 4 identical sessions of Roundtable discussion with over 70 attendants from Amira member and non-member key stakeholders to gauge interest across all levels of mineral processing.
- The responses from current and potential members regarding mineral processing priorities have been summarised in the mineral processing framework depicted in the chart, containing:
 - Extension of Mineral Processing Unit models .
 - Extractive Metallurgy programs
 - Critical Minerals & ESG
 - Energy, Technology, Data Science and ESG themes
- Researchers workshop to incorporate industries feedback into the research proposal submitted.
- EOI preparation for all projects have begun, with of the aim of circulating EOI by quarter 4.



Africa Indaba 2024: Amira team showcased projects at the conference



A 3-day Amira Africa Workshop And Technical Session 2023 held in Ghana and present some key Amira projects to our stakeholders in Ghana and West Africa.



WAMPEX/WAMPOC Conference 2024: Amira had valuable discussions with company executives and senior managers from both member and non-member companies.



AMDC (Africa Mineral Development Council) organized workshop 2024 : Amira was given the opportunity to present some projects for funding and discuss other strategic collaborations regarding Amira's programmes including P-ADI and ACoE

MINERAL PROCESSING PROJECTS



P420 GOLD PROCESSING TECHNOLOGY

The Amira Global Project P420 series Gold Processing Technology began in 1994 and has a long and valuable history of delivering new data, technology, and knowledge to the gold mining sector over 30 years.

The current iteration of the series, P420H, is supported by companies in Australasia, North America and South Africa.

The P420H project aims to continue support of the gold industry in achieving operating excellence despite the challenges, both continuing and emerging, being encountered by the industry today:

- Human resources are still the key to successful operation, yet skilled gold metallurgists are in short supply.
- Large high grade, free-milling deposits are becoming less common, and companies are turning to difficult to process (i.e. lower grade, complex and refractory) orebodies to maintain reserves.
- The tools to evaluate, optimise and predict performance are limited for dealing with anything other than well-established technologies or simple free-milling orebodies.



Senior Program Manager: Dr Silvia Black, Amira Global



Research Lead: Gold Technology Group, Curtin University



P1331: ENHANCED TREATMENT OF REFRACTORY AU & BASE ORES

P1331 projects to characterize, research for solutions, conduct techno-economic analyses and trial solutions for various type of “refractoriness” that cover, among others: slimes and clay problems, Antimony and Arsenic in ore issues, Grain size fine dissemination, Sulfide enclosed metals and the like, carbonaceous associations (Laterite with settling and carbon management issues), many more categories that describe mineralogical and metallurgical challenges experienced currently, especially globally

The project will characterize of the extent of “refractoriness” in a way that makes sense for metallurgical route optimization, for Au associations and significant elements and species that have rheology, chemical, and other separation consequences. This include metallurgical classification of all complex ores so that future problems can be predicted

Optimal recovery methods and recovery process proposition will be explored for the orebodies and targeted techno-economic analysis (TEA) will be performed to offer practical solutions.

Skills and technology transfer will be at the forefront of the project, with the new tools, methods and workflows developed



Research Lead: University of Mine and Technology Tarkwa



Program Manager: Bright Foli, Amira Global

MINERAL PROCESSING PROJECTS



P1354 EXTENSION OF MINERAL PROCESSING UNITS MODELLING

Amira P1354 represents the extension of the development of Mineral Processing unit models of the iconic P9 series of projects that began in 1962. This project will focus on automating and optimizing stages and steps that will ultimately lead to a whole of system real time optimization and adaption in implementation.

The project is designed to address key gaps in the optimization of mineral processes through modelling and simulation, incorporating new equipment such as fine crushing. The objective is to develop a platform with multicomponent unit process models for integrated and circuit-wide optimization.

The project will create a platform with multicomponent unit process models for integrated and circuit-wide optimization, providing the capability to manage the mine-to-concentrate value chain by implementing integrated simulation, enabling quicker adaptation to market, societal, and environmental drivers, with a key focus on real-time process prediction and control through modeling.



Research Lead: University of Cape Town,
South Africa



Program Manager: Redeemina Comfort
Bonnah, Amira Global



P1358B DEVELOPMENT OF GEOMETALLURGICAL MODEL FOR EXTRACTION OF CRITICAL MINERALS (CMS) FROM SULPHIDE AND IRON TAILING PILES

P1358B project aims to unlock economic value from iron/sulfide tailings by extracting critical and rare earth elements (REEs) with advanced processing and develop a geometallurgical model and program focused on mineralogical modalities to improve extraction efficiency. The project will involve an integration of state-of-the-art techniques in mineral processing and hydrometallurgy to maximize resource recovery and environmental sustainability.

The project P1358B will primarily focus on :

- Systematical characterization and spatial mapping of tailings.
- Development and optimization of advanced mineral processing techniques.
- Implementation of innovative hydrometallurgical test works.
- Develop specialized process flowsheets and a mineralogy-based geometallurgical model.
- Economic and environmental impact assessments.



Research Lead: University of Tasmania
(CODES), Australia



Program Manager: Redeemina Comfort
Bonnah, Amira Global

SUSTAINABILITY FRAMEWORK



Legend:

In Management

Under Development

Future Programs

ESG & Improved Economics

Reduced Waste – Improved Water Management – Communities – Safety– Clean Energy – Reporting

Tailings

- P1217 - Monitoring Technologies
- P1310 - Dewatering Technologies
- P1288 - Preventing Tailings Dam Failures: Predicting Liquefaction Risk
- P1342 - Circular Mine to Reduce Mine Waste
- P1287 - Fibre-optic Sensors – Strain, Temperature & Seismic

Decarbonisation & Clean Energy

- P1344 - Pan African Decarbonisation Institute (P-ADI)
- Amira Lithium Program
- Non-Battery Green Energy Storage

Communities & Safety

- Drill Pad Void Safety
- Corrosion

Governance Tools

- Natural Capital Accounting (NCA)
- Guidance to Stds
- Monitoring Potential Groundwater Dependent Vegetation

Talent, Capability building, education and training

SUSTAINABILITY PROJECTS



P1342 CIRCULAR MINE CONSORTIUM COLLABORATION WITH INDUSTRIES TO REDUCE MINE WASTE

P1342 project aims to fast-track full re-use of mine tailings and refinery residue to upscaling and commercialization, with a focus to achieve reduced mine waste footprints, develop a new resource for raw materials and help the mining and other industries to improve their operational model.

It includes development of a decision support tool and practical guidelines for sustainable mine waste management that can be applied by the mining industry at large, which will also address technical, collaborative, environmental, regulatory, community and legislative aspects.

Start Date: May 2024

Duration: 3 years

Research Lead: Circular Mine Pty Ltd

Sponsors: 4 Companies

Status: Ongoing (Open for sponsorship)



Research Lead: The Circular Mine Consortium



P1287 REAL-TIME TAILINGS MONITORING USING THE LATEST FIBRE-OPTIC SENSORS

P1287 project will use the latest fibre-optic sensing technology integrating three technologies (DTS, DSS and DAS) inside one cable. Temperature, strain and acoustic/seismic are monitored in real time to assure the integrity of tailings dams (TSF). The technology allows direct imaging with improved spatial resolution and large volumetric coverage – a combination that cannot be achieved with conventional sensors.

The primary objective of this research proposal is to demonstrate how fibre-optic sensing technologies incorporating seepage, seismic imaging and strain monitoring in a single real time platform facilitate the analysis of integrity of TSF walls and adjacent tailings..

Estimated Start Date: December 2024

Duration: 3 years

Research Lead: Sisprobe

Status: Open for sponsorship



Program Manager: Dr Silvia Black, Amira Global



Research Lead: Sisprobe

SUSTAINABILITY PROJECTS



P1288 PREVENTING TAILINGS DAM FAILURES

P1288 project will undertake new research and facilitate knowledge transfer and training activities to help the mining industry prevent failures of tailings storage facilities (TSFs). Particular attention will be given to methods and tools used to assess liquefaction susceptibility as well as the reductions in strengths and stabilities of TSFs post-liquefaction. The research will target poorly understood characteristics of TSFs including:

- varying states of saturation
- high concentrations of fine particles
- physical changes with age which occur through internal mechanical and geochemical processes
- and how they can be dealt with in assessments of liquefaction propensity.

Start Date: May 2024

Duration: 3 years

Research Lead: University of New South Wales

Sponsors: 4 Companies

Status: Ongoing (Open for sponsorship)



UNSW Global

Research Lead: University of New South Wales Global



P1217 EVALUATION OF TAILINGS STORAGE FACILITIES MONITORING TECHNOLOGIES

In the aftermath of the recent spate of Tailings Storage Facilities (TSF) failures, there has been a significant increase in activity relating to the monitoring of TSFs. A focus of this project is to provide an independent evaluation of a range of monitoring technologies and their suitability for the application of providing advance warning of potential instabilities of TSFs. This will be achieved through an integrated programme of laboratory and field testing as well as physical and numerical modeling of sponsor selected sites. Monitoring equipment vendors will be able to contribute to the project through provision of their technologies for site testing.

Start Date: July 2020

Duration: 4.5 years

Research University of WA

Sponsors: 18 Companies

Status: Ongoing



Program Manager: Dr Silvia Black, Amira Global



CSIRO | The University of Western Australia | Joint Venture

Research Lead: Australian Centre for Geomechanics

AMIRA INNOVATION FRAMEWORK

collaborateore

Global Innovation Advisory Board

Workstream 1

Crowdsourcing & Scouting

Overview

Facilitating industry partnerships with low to mid TRL (3 to 7), high-impact adjacent innovation

Solutions

1. Technology scouting & Landscape.
2. Technology Testing & Validation.
3. Technology Benchmarking.

Workstream 2

Pilots, Integration & Operational Testbed

Overview

De-risk mid TRL (4 to 7) technologies through a structured process that will deliver key data to inform techno-economics and scaled deployment.

Solutions

1. Technology Pilots.
2. Scaling and Implementation.
3. Technology Integration.
4. Full operational testbed.

Workstream 3

Strategic Partnerships

Overview

Accelerate collaboration and innovation across Amira members

Solutions

1. Cross-Member Collaborations
2. Cross-Industry Collaborations

Industry and Amira Member Needs & Challenges

AMIRA Technology Portfolio

Innovation Forum Events / Innovation Communities

R&D+i Ecosystem Partnerships

Some of our Allies in R&D and Innovation



GLOBAL ALLIANCES PROGRAM

Key highlights of the year in terms of new alliances is Amira Global becoming an Ecosystem Partner of the World Economic Forum, participating in the design calls the Uplink Sustainable Mining Challenge, this challenge calls for groundbreaking technologies across regions and industries to maximize the recovery of metals and minerals from ores and non-primary sources, reducing the need for fresh extraction to meet future raw material demands.

- The World Economic Forum is the International Organization for Public-Private Cooperation. It provides a global, impartial and not-for-profit platform for meaningful connection between stakeholders to establish trust, and build initiatives for cooperation and progress.
- UpLink, is the World Economic Forum's open innovation platform and was designed to nurture a world in which anyone, anywhere, with high-impact, high-quality solutions is empowered to scale action for people and planet.

Also, Amira Global sign a collaboration agreement with one of the biggest deep tech platform in US, Newlab This collaboration leverages Amira's thematic expertise and research in tandem with Newlab's well-established track record in innovation, technology, and commercialization to achieve two key objectives: i. Create an engine for technical innovation while future-proofing the infrastructure that will be built out over the next decade and ii. Mobilize advanced technology companies to co-develop solutions and collaborate around place-based pilot projects.





amira

Multidisciplinary Projects

AMIRA MULTIDISCIPLINARY PROGRAMS



Overarching themes: Fostering productive interconnectedness throughout the mineral value chain

Pan-African Decarbonization Institute (P-ADI) - P1344

- Exploration and geology
- Micro Certification
- Sandwich programs
- Decarbonisation & renewables research
- Critical minerals research
- Industry-focus approach
- Africa skills enhancement

Amira Africa Center of Excellence (P1332)

- Exploration and geology
- Physical Infrastructure
- Competency & skills development
- Flowsheet development
- New mining & processing project support
- Toll processing & refining

Geometallurgy projects

- Geometallurgy, Data Science and Technology projects
- Data based grindability maps
- AI platforms for Mineral processing

Amira Lithium Program

- Exploration & Geometallurgy,
- Primary Resources Products
- Refined Products
- Recycled Products

Critical Minerals Program

- Exploration of Potential Host Rocks for Critical Mineral
- Petrographical and Mineralogical Characterization of Critical Minerals
- Innovations in minerals recovery from primary and secondary sources

Talent, Capability building, education and training

PAN-AFRICAN DECARBONISATION INSTITUTE

The Pan-African Decarbonisation Institute (P-ADI) will provide leadership for Africa to participate meaningfully in the decarbonisation of its mining value chain. It will contribute industry focused research to the development of the whole value chain, transforming energy systems and sectors globally, and ensure economic, environmental and community return is maximized for Africa's new energy resources.

The Institute will connect world class research capability with the needs of the Africa and global industry to build knowledge, and to develop processes and decarbonisation applications using Africa's talents. The P-ADI program will:

1. Secure funding for this work to be done.
2. Develop the youth of Africa – who are significant part of the world's future skills trust.
3. Develop the research institutions of Africa
4. Serve as a global model for academic collaboration

Participants: The P-ADI program will be hosted by research institutions in 5 African countries namely Morocco, Ghana, Zambia, Democratic Republic of Congo (DRC) and South Africa. The host research institution will collaborate with Global partners, mainly research institutions in Australia, Europe, North and South America.

Duration: Initial 5 years. Expected to be renewed for subsequent 5-year cycles

P-ADI offers sponsors an opportunity to be part of a unique Africa Skills development program.

Early pilot projects under P-ADI:

- Critical Minerals, Industrial Policy, and a Just Energy Transition in Africa – *Commenced, led by University of the Witwatersrand*
- Recovery of Cobalt from Cu-co Smelter Slug
- Carbon footprint and mitigation methods for sustainable cobalt and copper mining in the Democratic Republic of Congo, CARCOM
- Innovation in Lithium-Ion Battery Technology - creating a continental 'AFRO-HACKATHON' to re-engineer different batteries.

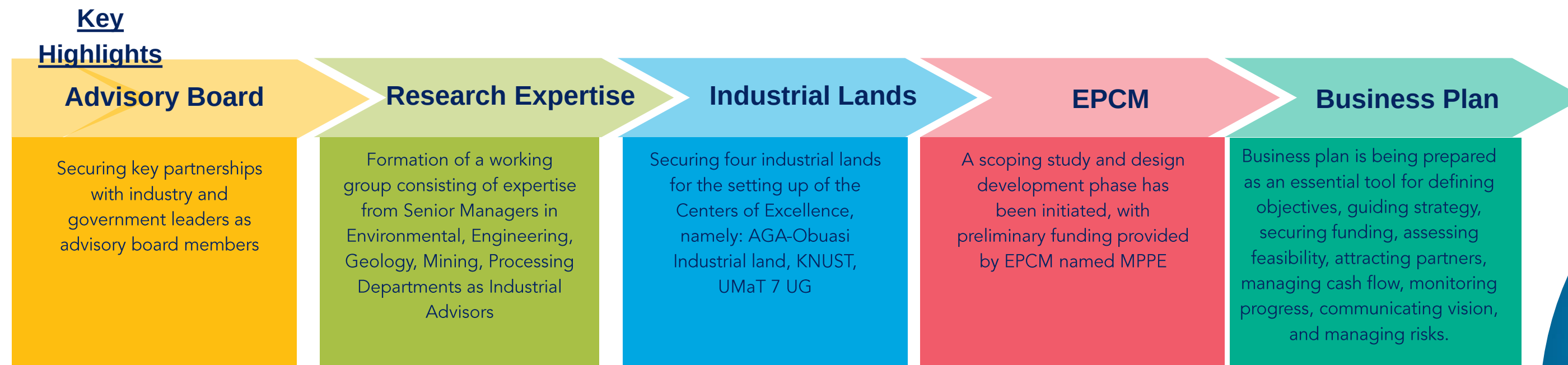


AMIRA AFRICA CENTRE OF EXCELLENCE

The future of mining lies in the ability to nurture talents now. The Africa Center of Excellence is committed to fostering the development of researchers through the strategic design of research programs, which include regular training, development opportunities benchmarking, and industry application. The Africa Center of Excellence is seamlessly integrating a network of testing facilities, pilot plants, and research centers to enhance the core sciences of geosciences, mineral processing, and extractive metallurgy. This infrastructure not only supports comprehensive investigations but also establishes a physical presence for numerous other Amira projects across Africa. This coordinated approach benefits our members in the mining industry by providing immediate access to valuable resources.

Expected Impact in the Mining Space

- The Amira Africa Centre of Excellence aims to promote efficient and sustainable mining practices by offering technical expertise and resources.
- Align and support development of complementary and supplementary research across Africa and connect current and emerging talent into the global research landscape.
- Aim to foster collaboration and knowledge sharing among industry stakeholders at both local and international levels, encompassing government agencies, mining companies, and research institutions.
- Attract investment and facilitate the growth of the mining sector in Ghana and the broader West Africa subregion.
- Aspires to establish a robust platform for capacity building and skills development within the mining industry.
- Connect Mineral resource operators, Mining Equipment, Technology and Service providers, end users and build critical mass across Africa to address decarbonization.



Key Institutional Partners



LITHIUM PROGRAM



ESG

Improved Recoveries – Improved Economics – Reduced Water Consumption – Communities - Reduced Power Consumption

Supply Chain

Upstream

Downstream

**Exploratio
&
Geometallurgy**

Primary Resources Products
From Li Minerals Brines
Mineral Concentrates Li_2CO_3 LiCl

Refined Products

LiOH Metallic Li

**Active Materials
&
Batteries
Manufacturing**

**Recycled
Products**

P1362
Exploration
enhancement by
machine learning

P1348 Lithium Production Technologies

1. Li Minerals – Comminution, Beneficiation, Process Improvement
2. Brines – DLE
3. LiOH Refinery
4. New Technologies
 - x_Projects

New Technologies
Evaluation, development and
piloting

Commercially
sensitive field

P1344E
Recycling of
Scraps and
End-of-life
Batteries

Talent, Capability building, education and training

Working for Members

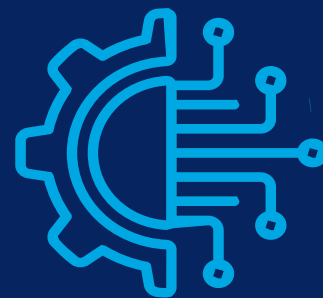
AMIRA'S ENDURING STRENGTH...

Technical sciences that underpin the mine value chain

- Creation of knowledge, data, information
 - Development and testing of new technology
 - Development of skills, capability, leadership
 - Setting of standards and benchmarking
 - Roadmaps that envisage future developments and needs
- ... for over six decades



GEOSCIENCES



MINING
ENGINEERING



MINERAL PROCESSING
AND EXTRACTION

OUR MEMBERS



OUR RESEARCH PARTNERS

- AARHUS UNIVERSITY
- AGC WOODWARD-CLYDE PROPRIETARY LIMITED
- ALCOA WORLD ALUMINA
- ALFORD MINING SYSTEMS
- AMC CONSULTANTS PTY LTD
- ANSTO (AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANISATION)
- ANTON DE KOM UNIVERSITEIT VAN SURINAME
- AQUAMEDIA
- AQUAMIN SCIENCE CONSORTIUM
- ARROW GEOSCIENCES
- ATC WILLIAMS PTY LTD
- AUSTRALASIAN SPATIAL DATA EXCHANGE CENTRE
- AUSTRALIAN CENTRE FOR GEOMECHANICS
- AUSTRALIAN CENTRE FOR MINING ENVIRONMENTAL RESEARCH
- AUSTRALIAN COAL INDUSTRY RESEARCH LABORATORIES LTD
- AUSTRALIAN MINERAL FOUNDATION AWN PTY LTD
- BOOJUM RESEARCH
- Botanic Gardens and Parks Authority, WA
- British Geological Survey
- BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES (BRGM)
- CANMET
- CAPE PENINSULA UNIVERSITY OF TECHNOLOGY
- C-CORE
- CENTRAL CHEMICAL CONSULTING PTY LTD
- CENTRE FOR EXPLORATION TARGETING - UNIVERSITY OF WESTERN AUSTRALIA
- CENTRE FOR GLOBAL METALLOGENY - UNIVERSITY OF WESTERN AUSTRALIA
- CENTRE FOR MINED LAND REHABILITATION
- CENTRE FOR ORE DEPOSIT AND EARTH SCIENCES (CODES)
- CENTRE FOR SUSTAINABLE RESOURCE PROCESSING CRC
- CENTRO DE TECNOLOGIA MINERAL (CETEM)
- CHALMERS UNIVERSITY OF TECHNOLOGY
- CHEMISTRY CENTRE (WA)
- CHEMTRONICS LIMITED
- COPPERBELT UNIVERSITY
- CSIR, GHANA
- CNRS-INSU (Institut National des Sciences de l'univers)
- Codelco/IM2
- Coldblock Technologies Inc
- COLORADO SCHOOL OF MINES
- Colorado State University
- CRC - AUSTRALIAN MINERAL EXPLORATION TECHNOLOGIES (CRC AMET)
- CRC - LANDSCAPE ENVIRONMENTS AND MINERAL EXPLORATION (CRC LEME)
- CRC PREDICTIVE MINERAL DISCOVERY (PMD*CRC)
- CREATIVE PROCESS INNOVATION PTY LTD
- CSIRO
- CURTIN UNIVERSITY
- CZECH GEOLOGICAL SURVEY
- DEAKIN UNIVERSITY
- DEEP EXPLORATION TECHNOLOGIES COOPERATIVE RESEARCH CENTRE
- DEPARTMENT OF MINES AND ENERGY QUEENSLAND
- DICKSON RESEARCH PTY LTD
- DICTUC
- DR R ENRIGHT
- DUBLIN INSTITUTE FOR ADVANCED STUDIES
- DYI TECHNOLOGIES
- E2V TECHNOLOGIES
- Ecole Nationale d'Ingenieurs
- ElectroMagnetic Imaging Technology Pty Ltd
- Elliott Geophysics International Pty Ltd
- Energetics Inc
- Energetics Pty Ltd
- ENERGY RESEARCH CENTRE OF THE NETHERLANDS
- ENTERPRISE TRANSFORMATION PARTNERS
- ENVIRONMENTAL GEOCHEMISTRY INTERNATIONAL P/L
- EWL SCIENCES PTY LTD
- FEDERAL UNIVERSITY OF MINAS GERAIS (UFMG)
- FOOTPRINT COMMUNICATIONS
- FREELANCE GLOBAL LIMITED
- FULLAGAR GEOPHYSICS PTY LTD
- GEARING DYNAMICS
- GEMOC
- GEOELECTROCHEMICAL SURVEYS PARTNERSHIP
- GEO-LOGIC RESOURCES CONSULTING
- GEOLOGICAL SURVEY OF BRAZIL (CPRM)

OUR RESEARCH PARTNERS

- GEOLOGICAL SURVEY OF CANADA
- GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
- GEOSCIENCE AUSTRALIA
- GEOTHERMAL INSTITUTE - UNIVERSITY OF AUCKLAND
- GEOWISDOM PTY LTD
- GET GEOSCIENCES ENVIRONNEMENT Toulouse
- GK Williams Cooperative Research Centr
- J A & D M FREW
- JAMES COOK UNIVERSITY
- JELLORE TECHNOLOGIES
- JULIUS KRUTTSCHNITT MINERAL RESEARCH CENTRE (JKMRC)
- KISKA METALS CORPORATION
- KLONDIKE EXPLORATION SERVICES
- KPMG AUSTRALIA
- LABORATOIRE DES MÉCANISMES ET TRANSFERTS EN GÉOLOGIE
- LAKEHEAD UNIVERSITY
- LAMONTAGNE GEOPHYSICS (AUSTRALIA) PTY LTD
- LAURENTIAN UNIVERSITY
- LEARNING CURVE PTY LTD
- LEVAY & CO ENVIRONMENTAL SERVICES
- MACQUARIE UNIVERSITY
- MCGILL UNIVERSITY
- MENNINNIE DAM JOINT VENTURE
- MIKE WORTLEY CONSULTING
- MINCAD SYSTEMS PTY LTD
- MINE SMITH PTY LTD
- MINERAL CONTROL INSTRUMENTATION LIMITED
- MINERAL DEPOSIT RESEARCH UNIT - UNIVERSITY OF BRITISH COLUMBIA
- MINERAL MAPPING PTY LTD
- MINERAL SPECTRA MAPPING
- MINERALS AND ENERGY RESEARCH INSTITUTE OF WESTERN AUSTRALIA (MRIWA)
- MINING3
- MINING ONE
- MINTEK
- MINTY GEOPHYSICS
- MIRARCO MINING INNOVATION
- MIRO - MINERAL INDUSTRY RESEARCH ORGANISATION
- MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY
- MONASH UNIVERSITY
- MOUNT ISA MINES
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