Government of Western Australia
Department of Mines, Industry Regulation and Safety

Geological Survey of Western Australia

RECORD 2023/15

GSWA OPEN DAY 2023

CONFERENCE PROGRAM

FUTURE-FOCUSED GEOSCIENCE

17 November 2023

PERTH 2023

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MINISTER FOR MINES AND PETROLEUM
Hon Bill Johnston MLA

DIRECTOR GENERAL, DEPARTMENT OF MINES, INDUSTRY REGULATION AND SAFETY
Richard Sellers

EXECUTIVE DIRECTOR, GEOLOGICAL SURVEY AND RESOURCE STRATEGY
Michele Spencer

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Acknowledgement of Country
We respectfully acknowledge Aboriginal peoples as the Traditional Custodians of this land on which we deliver our services to the communities throughout Western Australia. We acknowledge their enduring connection to the lands, waterways and communities and pay our respects to Elders past and present.

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Contents

Welcome to GSWA Open Day 2023

Kaya!

I am delighted to extend a warm welcome to the Geological Survey of Western Australia (GSWA) Open Day 2023. This event marks our 25th presentation of geoscientific endeavours, and brings into focus our theme – *future-focused geoscience*.
Kerry-Ann Winmar, a Whadjuk Yorga from the Perth region, will welcome us to Country.

Our past two Open Days witnessed an unprecedented turnout, with tickets selling out well in advance. We have returned to the elegant setting of the Hyatt Regency Hotel in East Perth – the new home of GSWA Open Days.

We have curated an extensive array of presentations that encompass a wide spectrum of geosciences, including dedicated question-and-answer segments at the end of each session. Our panel discussion – Are we making the world a better place? On our evolving role in the green future – tackles important questions that we all must confront.

Complementing these presentations, we have expanded opportunities for immersive interaction with state-of the-art technologies. Our exhibitions feature technology and data that are poised to shape the trajectory of geoscience for years to come. We are committed to enriching the delegate experience and are grateful for your enthusiastic participation.

I am confident that the year ahead will not only surpass our accomplishments from the previous year but also significantly elevate industry's understanding of GSWA data.

Michele Spencer
Executive Director, Geological Survey of Western Australia

Simon Johnson
Director Regional Geoscience

Simon started at GSWA as a mapper in the Capricorn Orogen, progressed to Chief Geoscientist, and is currently Director Regional Geoscience.

Shaping the direction of geoscience at GSWA

National and global geopolitical landscapes have changed rapidly over the last few years. At the centre is the clean energy transition and the aim to achieve net zero emissions by 2050. New industries have emerged, such as the potential for manufactured hydrogen and the geological storage of atmospheric and industrial-generated CO_2.

The economic footprint of Australia's critical minerals sector is growing thanks to this clean energy transition. Underpinning this growth is pre-competitive geoscience data at the earliest stages of the value chain.

All Geological Surveys must adapt rapidly to provide relevant and timely information. Their workforce must be focused on acquiring the geoscience datasets of the future and answering critical geoscience questions that will help drive and sustain emerging industries.

This keynote presentation will outline GSWA's response and the direction of its geoscience program, with the aim of addressing these developing issues into the future.

To find out more, visit:

Or contact us at:
geological.survey@dmirs.wa.gov.au

Australian minerals – our future and pathway to energy transition and decarbonisation

Yulia Uvarova
Senior Principal Research Scientist / Director, CSIRO Mineral Resources

Yulia aspires to support the responsible and sustainable growth of Australia's resources, increase mining productivity, and drive social and environmental performance to benefit the nation and beyond.

As a catalyst to Australia's journey towards net zero emissions, CSIRO enables the nation to transition to a vibrant, resilient and sustainable renewable energy and global development forerunner. This presentation provides an overview of CSIRO's Research and Development. At CSIRO, we partner with industry, government and the research sector to deliver breakthrough innovation across the resources value chain.

Our research aims to address the industry's greatest challenges to benefit Australia and the globe. We are growing our resource base, particularly in critical minerals, and increasing ESG performance. We apply our expert knowledge and specialized research to deliver innovation that solves the challenging, complex problems faced by resource companies, mining equipment, technology and services companies, government, and other industry stakeholders. Our innovation unlocks the value of Australia's natural resources and delivers a more productive, lower cost, socially and environmentally responsible global resource industry.

To find out more, visit:
Or contact us at:
www.csiro.au/en/about/people/business-units/mineral-resources

Fawna Korhonen

Manager Proterozoic Margins

Fawna is the Manager of Proterozoic Margins, which provides pre-competitive geoscientific data and interpretations on the Proterozoic-aged terranes in Western Australia.

Unlocking 'The Gap' with the National Drilling Initiative

A key frontier region in Western Australia is the central and eastern deserts, informally named 'The Gap'. This region consists of several basement terranes and craton margins, obscured below extensive cover. This cover limits the understanding of the terranes' geology and mineral potential. GSWA is targeting this region for cutting-edge geological investigations as part of the National Drilling Initiative (NDI), utilizing MinEx CRC coiled tubing (CT) drilling technology.

The first Western Australian NDI campaign commenced in August 2023 in the Paterson region. The Paterson, in the northwest of the State, is prospective for sediment-hosted copper and other base metals. Up to 10 stratigraphic boreholes of 500 m deep at the Nifty mine will be drilled at distances up to 25 km along strike. These holes will sample cover and basement geology, including mineralization and alteration, both proximal and distal to the deposit. Samples will provide new geological, geochemical, petrophysical and geochronological data, which will inform models and interpretations of undercover mineral systems.

To find out more, visit:

Or contact us at:
geological.survey@dmirs.wa.gov.au

Session 2

Ben Laidler

Director of Battery and Critical Minerals Industries, Department of Jobs, Tourism, Science and Innovation

Ben's team supports the development of Western Australia's battery and critical minerals sector with the aim of extracting more value onshore from our resources.

Promoting Western Australia as a critical minerals powerhouse

Critical minerals are powering an economic revolution in Western Australia. These minerals are fundamental to a decarbonised world and are in high demand as countries accelerate towards net zero and stake their claim in emerging clean energy markets. Backed by a vast endowment of critical minerals and advanced processing capabilities, Western Australia is expanding its role in clean energy supply chains as a trusted, ethical and cost-effective supplier of critical minerals and high-purity battery chemicals. Billions of dollars have already been invested in growing Western Australia's processing capabilities; however, intensifying competition from other countries means continued investment is far from a sure thing.

Please join me to hear more about our rapidly growing critical minerals industry and efforts to support ongoing investment in this vital sector.

To find out more, visit:

Or contact us at:
www.wa.gov.au/organisation/department-of-jobs-tourism-science-and-innovation

John O'Donnell
Senior Geophysicist

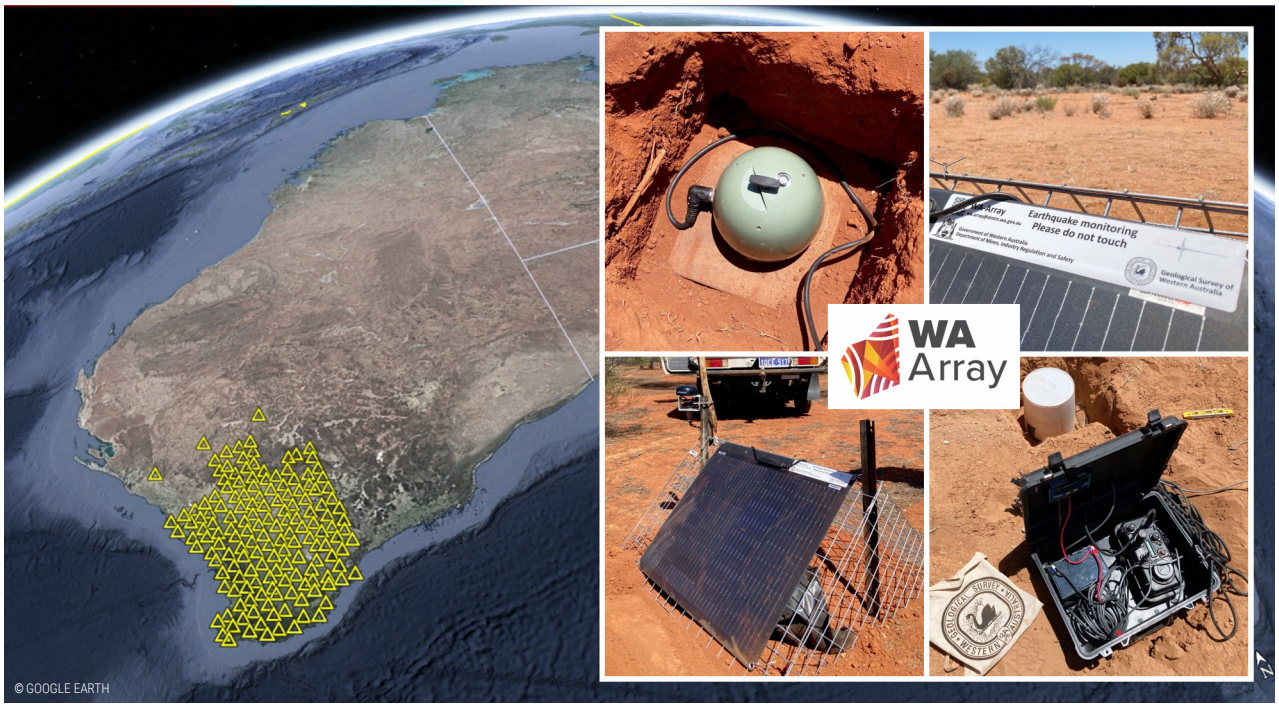
John specializes in illuminating the 3D structure of Western Australia's lithosphere through the use of seismic waves.

WA Array – providing valuable insights into the State's subsurface

Spatial correlations suggest a genetic link between craton margins and giant magmatic- and sediment-hosted mineral systems. Much of Australia's ancient geology is shrouded by much younger regolith. GSWA's WA Array is a transportable seismic array designed to map Western Australia's lithosphere in unprecedented detail, thereby facilitating the identification of architectural ingredients of mineral systems (e.g. fertile lithospheric mantle domains, translithospheric faults and shear zones).

Other applications of the data include: analyses of seismic hazards, inform land use decisions, and models of Earth evolution.

The transportable array of 160 seismographs is deployed in a grid pattern at a nominal spacing of 40 km. The array will be relocated annually, with complete coverage of Western Australia achieved over the course of 10 years. Here we present a program update and preliminary results from the inaugural WA Array deployment across southwest Western Australia which spanned November 2022–23.



To find out more, visit:

Or contact us at:
wa.array@dmirs.wa.gov.au

Session 2

Tony Perry
Project Manager

Tony is an experienced data management specialist who has worked in geoscience for over 30 years.

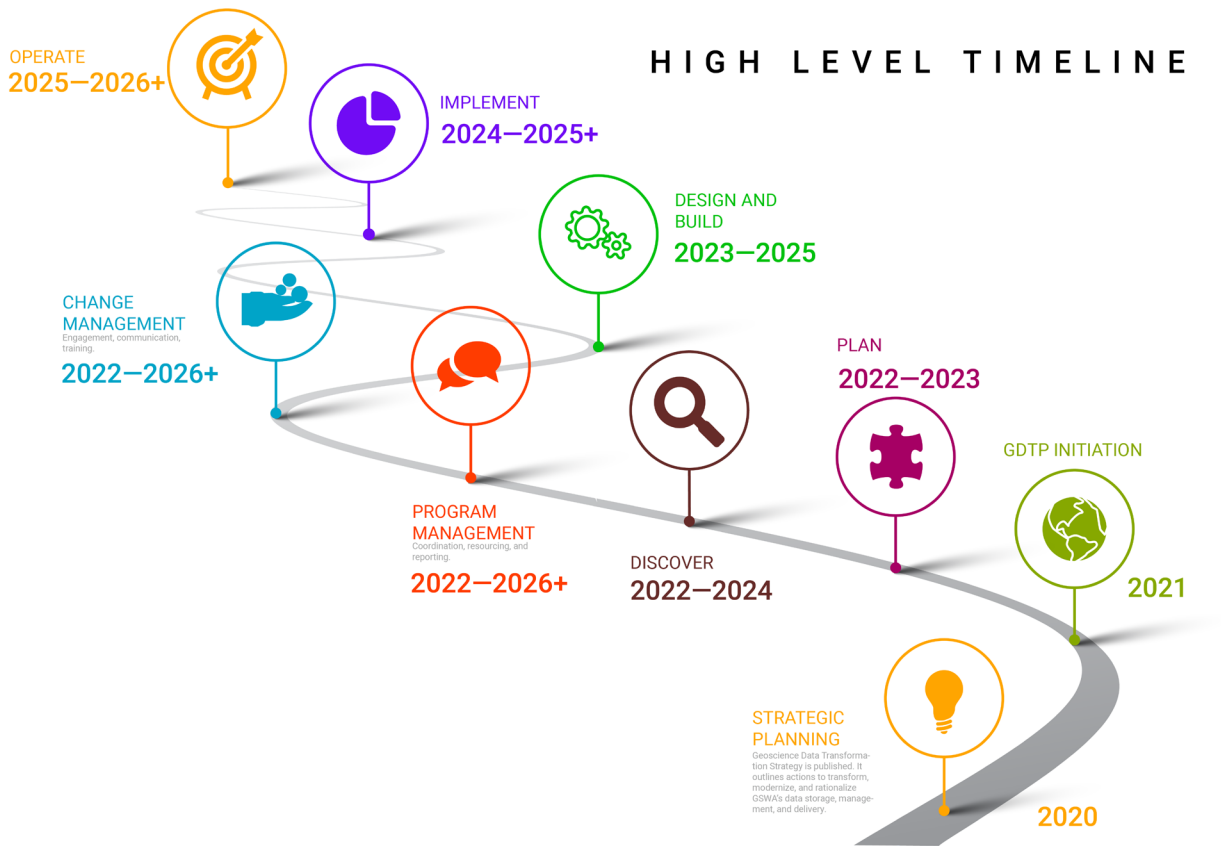
Transforming our data – a journey to discovery

In October 2021, GSWA embarked on a five-year multi-phased project to digitally transform the wealth of geoscience data under its custodianship.

This presentation will discuss the achievements of the Geoscience Data Transformation Program and its approach towards data integration, defined vocabularies, optimized data and preparations for our journey to discovery.

We will show how we plan to improve searchability by establishing an integrated data lake. You will hear about how we plan to use the VocPrez platform for publishing our vocabularies, and ongoing enhancements for geoscience data through digitization, metadata enrichment and data capture activities.

Learn about our early phase analysis on a portal that will enhance discovery of one of the most extensive and respected geoscience datasets in the world.



To find out more, visit:

Or contact us at:
GDTP@dmirs.wa.gov.au

Session 2

Yasinta Situmorang

Manager Petroleum Exploration Information

Yasinta manages the Petroleum Exploration Information Branch, but you may know us as the WAPIMS team!

Digitizing physical geoscience data for open access

One of GSWA's core business functions is to get geoscience data to the customer. Providing open-access pre-competitive geoscience data reduces the financial risk to explorers and attracts new investment into Western Australia.

Our data collection includes over 400 000 priceless and unique thin sections and residues. Our ambitious goal is to scan and catalogue our physical assets and make them publically available; a goal we are forging into reality with the Geoscience Data Transformation Program. Recently, we acquired two microscope slide scanners to scan all the thin sections in our collection.

Gradually, we will be making this data digitally available to all of our stakeholders – increasing access and reducing the need to borrow physical slides. Join us and learn more about the scanning process, how you'll be able to access them, and when!

Thin section image of evaporite found in BHP Brooke-1 drillhole

To find out more, visit:

Or contact us at:
petdata@dmirs.wa.gov.au

Session 3

Julie Cass
Senior Geologist

Julie is a petrophysicist with over 20 years' experience in the oil and gas industry across Australia and the United Kingdom.

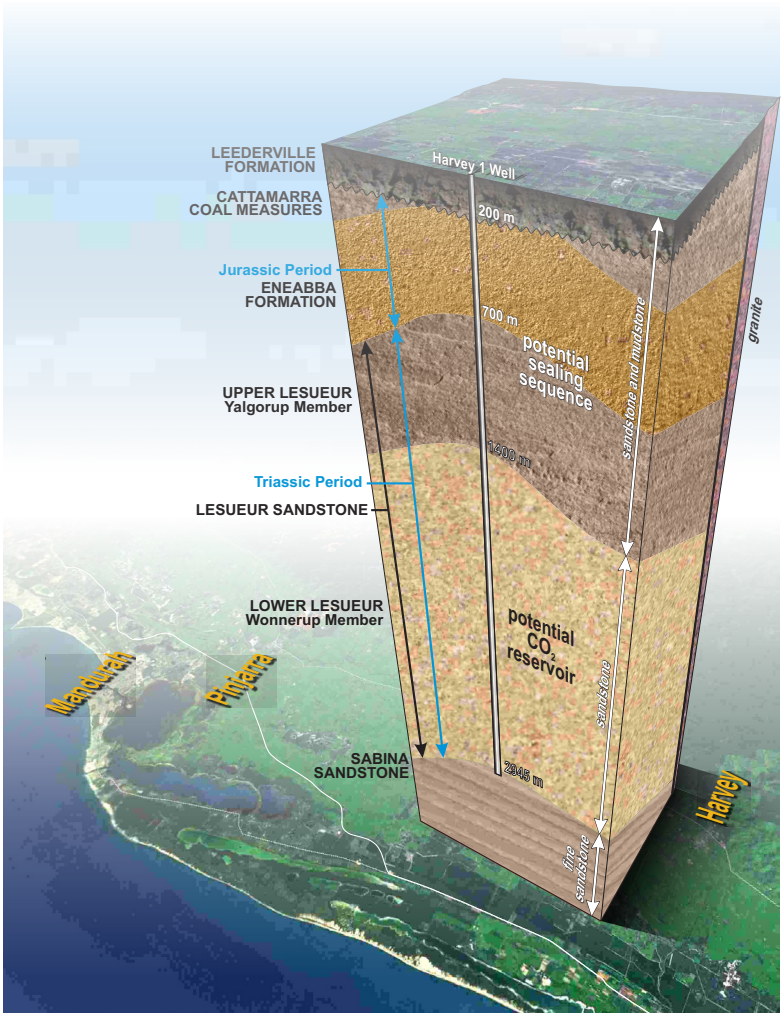
Data wrangling and Western Australia's CO_2 storage atlas

Part of the CO_2 storage atlas of Western Australia project is a recent initiative to convert WAPIMS wireline log data into an AI-ready database. Using Python code, we've wrangled 8070 open-file LAS files into a unified format with consistent depth references, mnemonics, units, xyz coordinates, and well names suitable for AI.

We are optimizing the WAPIMS wireline log and other geological datasets, which will be used for mapping the reservoir quality in each basin. This enhanced data accessibility streamlines the process of both traditional and AI-based CCS subsurface assessments.

Regional depth maps to reservoirs with potential for sequestration in diverse geological periods are being compiled. Completed examples from the Perth and Officer Basins along with temperature models will be used to highlight the impact on the assessment of CCS prospectivity.

We encourage you to engage with the new datasets, which will contribute to Western Australia's emergence as a leading CCS investment hub.



To find out more, visit:

Or contact us at:
carbon.strategy @dmirs.wa.gov.au

Session 3

Charlotte Hall
EIS Coordinator

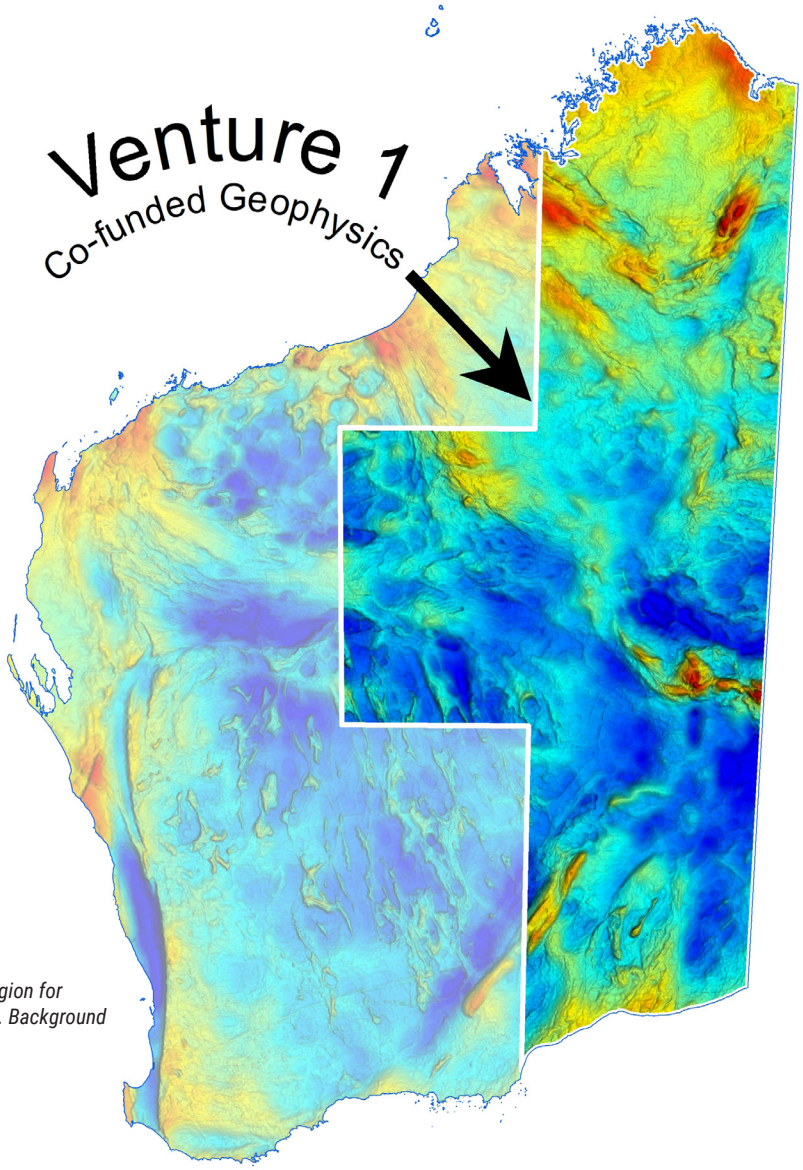
Charlotte is the Coordinator of the Exploration Incentive Scheme. She also worked for 10 years at the Kalgoorlie office mapping the Eastern Goldfields.

EXPLORATION INCENTIVE SCHEME

Co-funded geophysics for mineral exploration

Allow the Exploration Incentive Scheme (EIS) to help you venture into a new program of government-industry co-funding – geophysics co-funding!

To accelerate your discovery of hidden mineral deposits in unexplored or underexplored regions of Western Australia, the EIS will be offering grants to co-fund 50% of actual costs, up to a capped value of $250 000 per project. Here is the chance to think about extending that 2D seismic line a little further to ensure you cross that predicted regional fault, or fly a larger gravity program. Don't miss out capturing that anomaly that partially appears at the edge of a smaller program when we can help take you further.



Venture 1 release area. Location of the region for applications (Venture 1) in February 2024. Background is 400 m gravity map of Western Australia

To find out more, visit:

Or contact us at:
eis@dmirs.wa.gov.au

Session 3

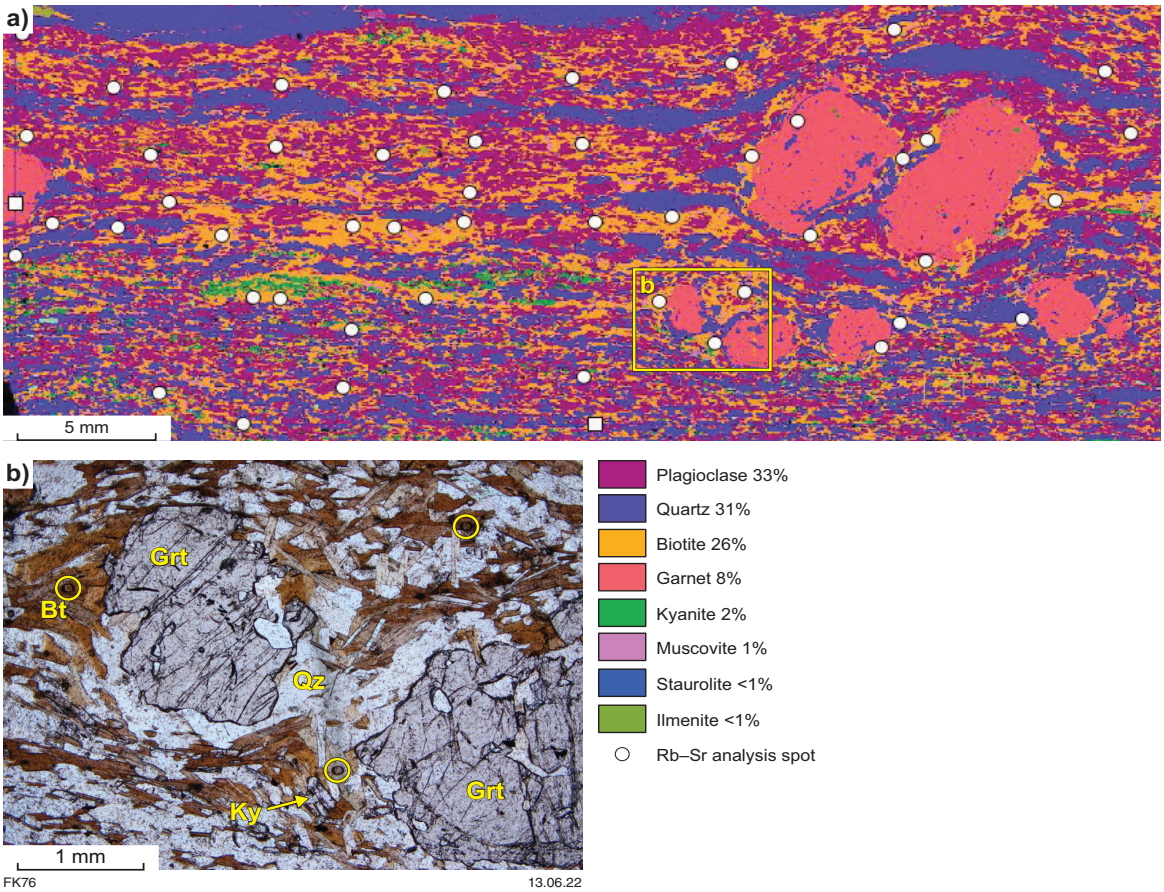
Imogen Fielding
Senior Geochronologist
Phosphate Geochronology

Imogen is a Senior Geochronologist who determines ages of minerals, rocks and geological events that are used to understand the geological evolution of Western Australia.

The dating game: novel geochronology sheds light on a broad range of geological processes

GSWA routinely conducts U–Pb analyses of zircon and monazite, which provide age determinations that are fundamental for understanding Western Australia's geological evolution. These minerals generally form under high temperature conditions and can be absent in certain rock types. Recent technological advances have expanded the isotopic systems that can now be measured, opening up lithologies and geological events that were previously difficult to date. Geochronological methods that are now being routinely implemented include Rb–Sr dating of biotite and muscovite, and Lu–Hf dating of garnet.

Such novel geochronological methods can constrain a wide range of geological processes, including mineralization, alteration, hydrothermal fluid flow, low- to medium-temperature metamorphism, deformation, exhumation, and diagenesis. These analyses can often be done in situ, preserving the mineralogical relationships in a sample, together with simultaneous measurement of trace elements that can be used to assess, for example, fertility, mineral systems footprints, and pressure–temperature conditions.



Rb–Sr analysis spot locations in biotite from a kyanite-bearing garnet semipelitic schist

To find out more, visit:

Or contact us at:
geochronology@dmirs.wa.gov.au

Session 3

David Martin
Manager State Geoscience

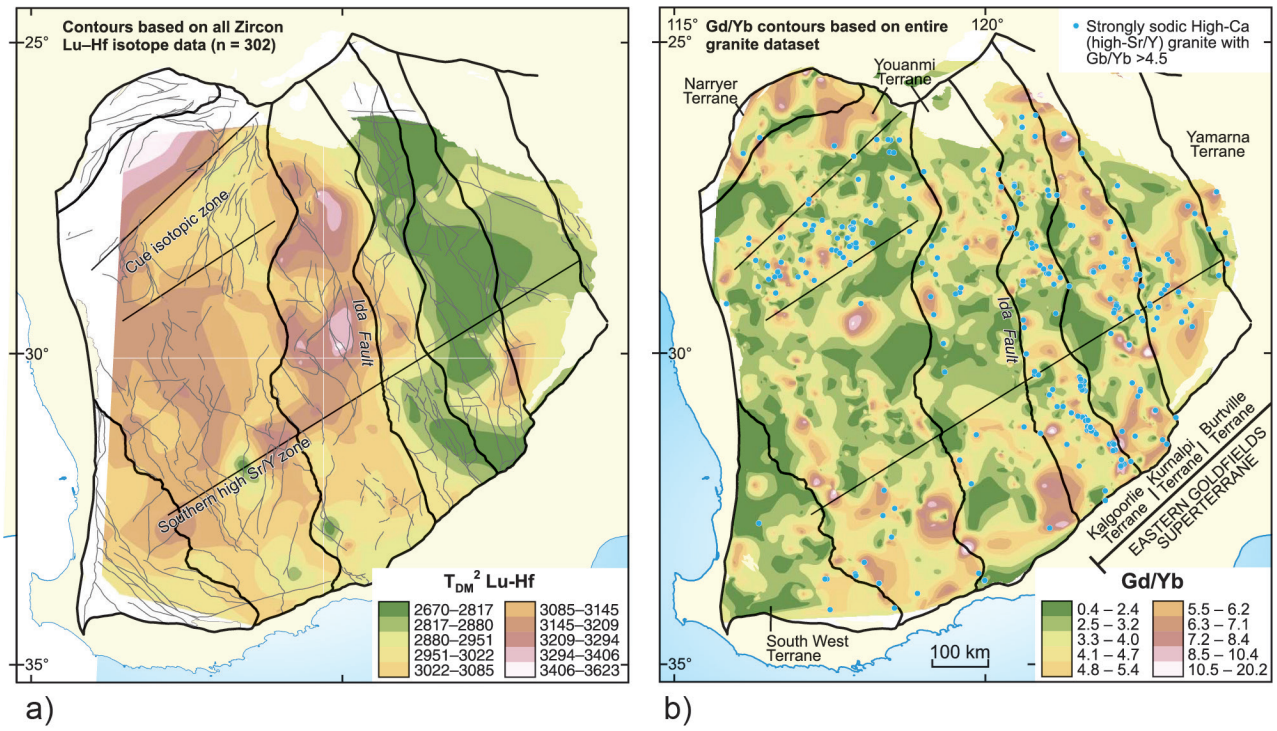
Dave is responsible for the collection and maintenance of statewide geoscience datasets fundamental to understanding Western Australian geology.

Integration of isotopic and seismic data in the Yilgarn and Pilbara Cratons

The world-renowned Pilbara and Yilgarn Cratons are important focus areas for GSWA field and laboratory activities. These cratons reveal the evolution of Earth's earliest continents, and how and why that evolution incorporated the world's most significant lithium, nickel, gold and iron mineral systems.

The ability to integrate new insights from geochemical and isotopic mapping, and seismic surveys, and to reference this back to well-mapped surface and near-surface geology, increases GSWA's understanding of how these cratons and their margins have evolved.

We will present examples of how our work has helped to better define the Neoarchean to Proterozoic margin of the East Pilbara Terrane and the internal architecture of the Yilgarn Craton. This includes crustal scale seismic reflection surveys, passive seismic arrays, isotope maps of neodymium, hafnium and oxygen, and whole-rock geochemistry. The presentation will also showcase ongoing and future work in these cratons.



The Hf_{zircon} isotope map for the Yilgarn Craton contoured for two-stage depleted mantle model ages (T_{DM}^2)(a), and the Gd/Yb contours of the Yilgarn granite geochemical data including locations of strongly sodic High-Ca granites (b) reveal east-northeasterly trends that persist across interpreted tectonic boundaries, thereby challenging existing models of craton amalgamation

To find out more, visit:

Or contact us at:
geological.survey@dmirs.wa.gov.au

Session 3

David Hamdorf
Senior Geologist
Mineral Resources

As part of the Land Use Planning team, David maintains access to Western Australia's mineral and energy resources for explorers and developers.

Creating a circular economy for mine waste and tailings in Western Australia

The prevention of injury to the land is the main focus for the assessment and approval of new mines. The circular economy goes one step further to ask if post-mining materials can be used to avoid stacking mine wastes and tailings on the land as new landforms. As a Geological Survey, we can apply geoscience tools to investigate post-mining materials as we would for any other rock. Mineral system data can be used to predict the occurrence of accessory minerals that may now be critical minerals in a decarbonised economy. Quantitative mineralogy can be used to measure the mineral composition of tailings and to look for unrecovered critical minerals.

Mapping the geology of mine wastes and tailings allows us to provide essential pre-competitive geoscience data for the circular economy, stimulating further research and industry investment.

Plutonic gold mine TSF 1, 2 and 3 (photo by ESRI)

To find out more, visit:

Or contact us at:
landuseplanning@dmirs.wa.gov.au

Panel discussion

Are we making the world a better place? Our evolving role in the green future

The path towards net zero is complicated and the consequences will impact future generations. Energy security is national security; the emerging landscape of renewables allows us to re-examine priorities, value chains, and trade. Demand for minerals critical to the 'green future' has doubled in the past five years. Western Australia is a major supplier of lithium, nickel, cobalt and rare earth elements – minerals fundamental to decarbonisation and net zero.

Global investment decisions are increasingly shaped by ESG factors – environmental, social and governance; embracing these factors should ensure projects have many future benefits. Australia is highly reliant on fossil fuels for domestic energy needs; these non-renewable energy sources cannot be replaced sustainably. Australians favour net zero, decarbonisation, and banning new fossil fuel projects to mitigate climate change.

Do we understand the problems and solutions? What roles should we aspire to in a sustainable future? How can we bring about meaningful change and leave a positive legacy?

Our panel members will engage in a dynamic discussion to explore the challenges, solutions, and roles we must aspire to in building a sustainable future.

The panel

Richard Chopping

Manager Geoscience Mapping Through Cover

Richard is a geophysicist with a focus on applying geoscience to benefit society through mapping Western Australia's minerals, energy and water resources.

Annette George

Professor and Head of the School of Earth Sciences The University of Western Australia

Annette has worked as a teaching–research academic at UWA for 30 years specializing in sedimentary basin analysis with application to basin-hosted resources.

Jai Thomas

Deputy Director General Coordinator of Energy Department of Mines, Industry Regulation and Safety

Jai leads DMIRS' Energy Policy Group, including Energy Policy WA and the Strategic Business Innovation division.

Marina Costelloe

Branch Head Mineral Systems Geoscience Australia

Marina leads the minerals component of Geoscience Australia's $225 million Exploring for the Future Program.

Jon Hronsky

Director Western Mining Services

Jon is a Principal of Western Mining Services, a consultancy group that provides strategic-level services across the global mineral exploration industry.

Nicole Roocke

Chief Executive Officer Minerals Research Institute of Western Australia

Before joining MRIWA in 2018, Nicole spent 15 years coordinating industry input on government regulatory and policy issues within the resources sector.

GSWA data – world-class, authoritative, reliable

Mines and Mineral Deposits (MINEDEX)

A spatial and textual database providing comprehensive data on mining and exploration sites and projects in Western Australia. MINEDEX provides data on the location and geology of mineralized sites, commodities, project structure, status, ownership and history, mineral resource estimates and production data, environmental registrations, and site operators. It also includes an inventory of abandoned mine sites.

www.dmirs.wa.gov.au/minedex

Western Australian Petroleum and Geothermal Information Management System (WAPIMS)

A petroleum exploration database containing data on wells, geophysical surveys, titles, and other related exploration and production data. The system also contains the core library (Perth and Kalgoorlie) database. Users must be registered against a company to access the online submission system. The data received are strictly confidential; only data lodged by the company you are registered for will be displayed.

www.dmirs.wa.gov.au/wapims

Mineral exploration reports (WAMEX)

Mineral explorers are required to report annually on their exploration projects under Western Australian legislation. After a period of confidentiality, the exploration reports and data are made publicly available; these are referred to as open-file (public) reports. Mineral exploration open-file reports are stored in the WAMEX database. Reports can be accessed and downloaded free of charge.

www.dmirs.wa.gov.au/wamex

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www.dmirs.wa.gov.au/datacentre

GSWA experts are available to discuss data access and lodgement with you.

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