

# Fieldnotes



Government of Western Australia  
Department of Mines and Petroleum

Geological Survey of  
Western Australia



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## Canning Coastal Deep Seismic survey data released!

The processed data for the Canning Coastal Deep Seismic survey was officially released by the Minister at the GSWA 2015 Open Day on 27 February 2015.

The raw data and a preliminary interpretation by the Geological Survey of Western Australia (GSWA) of the upper six seconds of this survey were previously released at the Petroleum Open Day on 11 September 2014.

The survey is one of several deep-crustal surveys undertaken collaboratively between the Department of Mines and Petroleum (DMP) and Geoscience Australia (GA), as part of the Federal and State government co-funded National GeoTransect Program. The \$3.65 million survey was funded by the Western Australian State Government's Exploration Incentive Scheme (EIS). Data processing was funded by GA.

The objectives of this survey were to obtain a better understanding of the subsurface geology of the region, and how the Australian continent was assembled as a result of plate tectonic processes over billions of years. Such knowledge assists in identifying areas of petroleum, mineral and CO<sub>2</sub> geosequestration potential, as well as delineating groundwater aquifers.

The survey was conducted in May and June 2014. It stretched 700 km across the full width of the Canning Basin, along the Great Northern Highway, and the Derby and Gibb River Roads (see location map).

Nearly two terabytes of data were recorded by a convoy of about 20 vehicles with a crew of about 40. Three specialized Hemi-50

'vibro-seis' trucks stopped every 40 metres and deployed large metal pads to create minute vibrations barely perceptible to people 100 metres away, but capable of penetrating through the crust and upper mantle to depths of up to 50 km. Reflected seismic energy from each stop was recorded over 600 live channels spread over 12 km.



Australian company DownUnder GeoSolutions Pty Ltd. processed the data, and GA provided the post-processing quality control.

Preliminary interpretation of the data shows there is a good correlation between the subsurface geology and outcrop, with the Proterozoic spine of the Oscar Range visible as strong dipping reflectors. The data also show a subtle change in reflectivity that may be interpreted as the Moho, which appears to undulate between 9 and 12 seconds across the basin. GSWA, with assistance from GA, industry and universities, is commencing a more detailed interpretation of the processed data.

All of the processed data can be downloaded free of charge via WA Petroleum and Geothermal Information Management System (WAPIMS) or, alternatively, the full data package can be supplied upon request on a hard drive (at the cost of the hard drive).

Gravity data were also collected along the survey route, and the raw data can be downloaded via WAPIMS or GeoVIEW.WA.

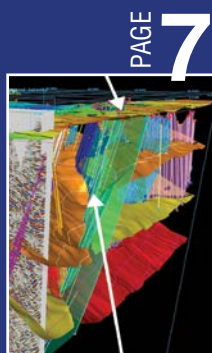
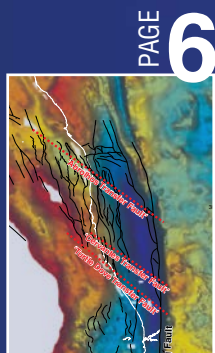
*continued on page 3*



Figure 1. The three Hemi-50 Vibroseis trucks in operation along the Great Northern Highway

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## WA Geology mapping app for mobile devices

The WA Geology application is a free, device-independent Geographical Information Systems (GIS) viewer which views, queries and integrates geological and resource information.



Figure 1. WA Geology interface

This web-mapping application can be opened using a variety of browsers on multiple devices.

Information includes:

- recently updated 1:500 000 State interpreted bedrock geology
- mines and mineral deposits, major Western Australian resources projects, petroleum datasets, and mining tenements
- location of key infrastructure such as towns and roads
- various Statewide image datasets including geophysics, geology and topography.

There is no app to download; only a web browser is required for access. You can also use the location services of your mobile device for GPS tracking.

Find WA Geology at <[www.dmp.wa.gov.au/wageology](http://www.dmp.wa.gov.au/wageology)>. To access, cut and paste the URL into the web browser of your mobile device. Alternatively, scan the QR code using your smart phone.



**Access  
WA Geology**

For more information, contact  
Darren Wallace ([darren.wallace@dmp.wa.gov.au](mailto:darren.wallace@dmp.wa.gov.au)).

## GSWA news in your inbox and postbox

### Subscribe to Fieldnotes

Fieldnotes is a quarterly GSWA publication that provides the State's exploration industry and other geoscientists with updates on our latest work and programs. The publication also provides information on GSWA products and services and is available free from the Information Centre located on the first floor of Mineral House, 100 Plain Street, East Perth 6004.

Find past issues of Fieldnotes on our website at <[www.dmp.wa.gov.au/fieldnotes](http://www.dmp.wa.gov.au/fieldnotes)> or subscribe to receive a hard copy by emailing [publications@dmp.wa.gov.au](mailto:publications@dmp.wa.gov.au).



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# Canning Coastal Deep Seismic survey

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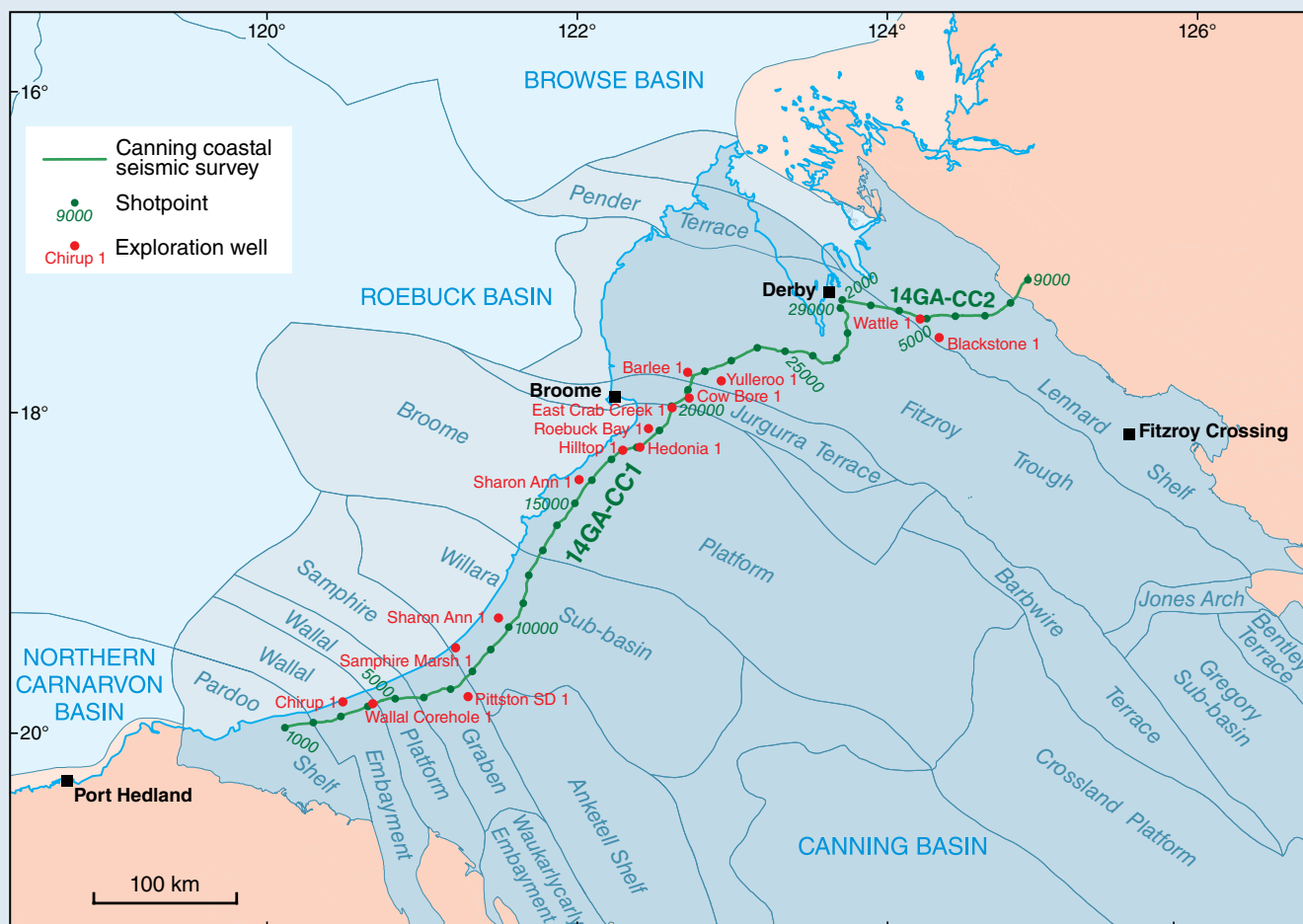


Figure 2. Location of the Canning Coastal Deep Seismic Survey

Primary Entity: SeismicSurvey

SeismicSurvey

Survey Name	Kind	Line Prefix	survey_id
L205 Canning Coastal Seismic Survey 2014 2DREFL 14GA			S003503

Data Type: Reports

Title	Types	Archive ID	Company	Primary Relation
L205 Canning Coastal Seismic Survey 2014; Gravity Acquisition Final Operations Report	SURVEY REPORT	S10808 A1	GA	S003503A
L205 Canning Coastal Seismic Survey 2014; Seismic Acquisition Final Operations Report	SURVEY REPORT	S10808 A1	GA	S003503A
L205 Canning Coastal Seismic Survey 2014; Seismic Data Final Processing Report	SURVEY REPORT	S10808 A2	GA	S003503A

Data Type: Seismic Data

Name	Types	Company	Tape Number	Primary Relation
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC1; Filtered Field Stack Data; PDF/SEG Y	FLD/PROC	GA	S10808 A1	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC2; Filtered Field Stack Data; PDF/SEG Y	FLD/PROC	GA	S10808 A1	S003503A
L205 Canning Coastal Seismic Survey 2014; All Lines; Navigation Data; ASCII	NAV PROC	GA	S10808 A1	S003503A
L205 Canning Coastal Seismic Survey 2014; All Lines; Observers Logs	OBS LOGS	GA	S10808 A1	S003503A
L205 Canning Coastal Seismic Survey 2014; All Lines; Final Velocity Data; ASCII/SEG Y	VELOCITY PROC	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC1; Post Stack Migration; SEG Y	POST STK	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC1; Pre Migration Stack; SEG Y	STK	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC1; Pre-SDM Stack; SEG Y	PSDM	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC1; Pre-STM Stack; SEG Y	PSTM	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC2; Post Stack Migration; SEG Y	POST STK	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC2; Pre-SDM Stack; SEG Y	PSDM	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC2; Pre-STM Stack; SEG Y	PSTM	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; Line 14GA-CC2; Pre Migration Stack; SEG Y	STK	GA	S10808 A2	S003503A
L205 Canning Coastal Seismic Survey 2014; All Lines; Final Pre-SDM/Pre-STM/Pre-Migration CDP Gathers; SEG Y	GATHERS	GA	S10808 A2	S003503A

Data Type: Other

Title	Tape Number	Types	Primary Relation
L205 Canning Coastal Seismic Survey 2014; Processed Gravity Data	S10808 A1	GRAV	S003503

Figure 3. All SEG Y data in time and depth domains, as well as the processing report, are available for download via WAPIMS.

For more information, contact Charmaine Thomas (charmaine.thomas@dmp.wa.gov.au) and Alex Zhan (alex.zhan@dmp.wa.gov.au).

## WAMEX online reporting facility trialled



A new innovative online system has been developed for the submission of mineral exploration reports. The system was released by the Geological Survey of Western Australia (GSWA) at the end of February 2015.

The new system allows companies and individuals to compile their statutory annual mineral exploration reports online using a wizard.

Each section has an information box detailing the information required. There are tool tips and a short video of the process to assist users.

The report can be compiled over several sessions and is saved but not submitted to the Department of Mines and Petroleum (DMP) until it is complete and the company/individual is happy with it.

It is important that companies and individuals become familiar with this new system of reporting because although it will be voluntary until mid-2016, it will become mandatory as part of DMP's move to complete electronic submission of documents.

The system was developed in response to industry requests for online submission of mineral exploration reports and has several advantages in that it guides the user through the mandatory reporting requirements, automatically acknowledges receipt of the report, provides a copy (in PDF format) to the company, stores the report in GSWA's WAMEX database, and streamlines the process.

The Guidelines for Mineral Exploration Reports on Mining Tenements are being updated as a companion for the new reporting system.

Please note: an external login is required to access this system. This can be obtained via the 'Manage My Account' page on our website.

Access on DMP's website at [www.dmp.wa.gov.au/wamex](http://www.dmp.wa.gov.au/wamex).

For more information, contact Ann Fitton ([ann.fitton@dmp.wa.gov.au](mailto:ann.fitton@dmp.wa.gov.au)), Julia Thom ([julia.thom@dmp.wa.gov.au](mailto:julia.thom@dmp.wa.gov.au)), or Fiona Maccorquodale ([fiona.maccorquodale@dmp.wa.gov.au](mailto:fiona.maccorquodale@dmp.wa.gov.au)).



Figure 1. Lodgement interface

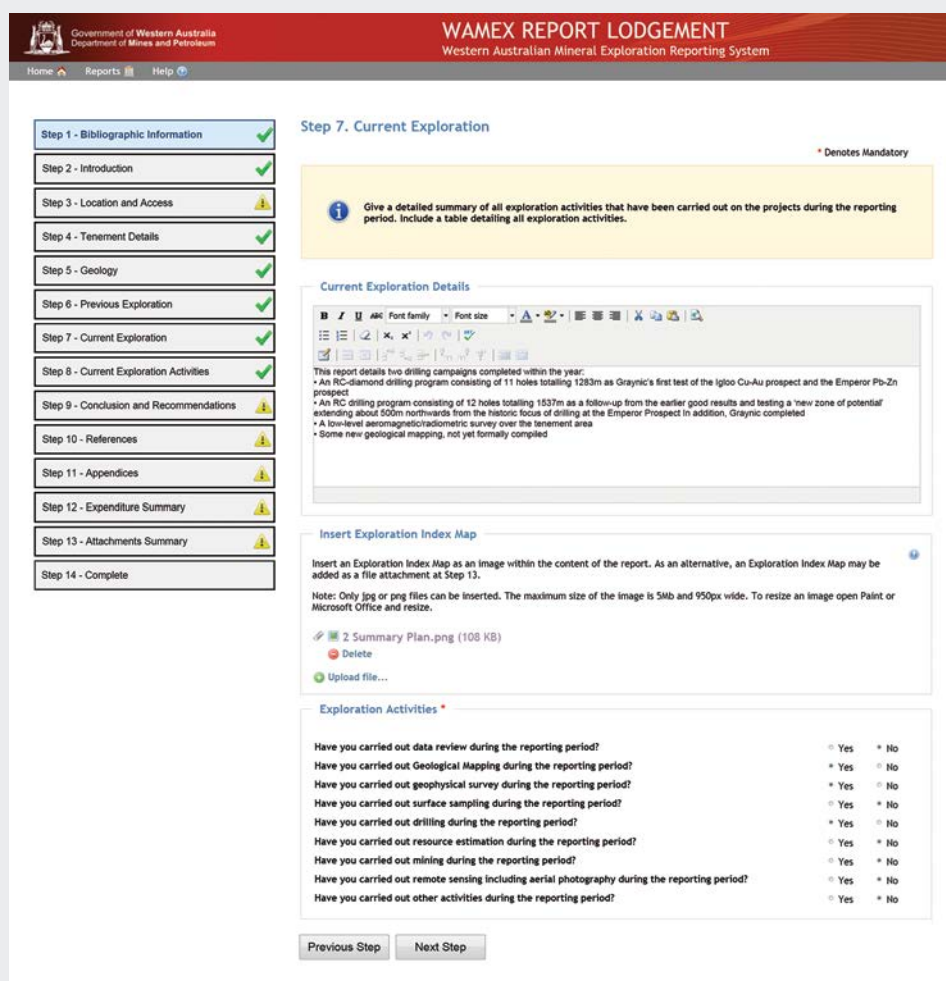


Figure 2. Content of report

## Mafic–ultramafic intrusions of the Giles Event

More than a dozen layered intrusions were emplaced across >100 000 km<sup>2</sup> in the Musgrave region of central Australia at c. 1075 Ma as part of the c. 1090–1040 Ma Giles Event. The intrusions, known as the Giles intrusions, can be broadly categorized into three groups, including intrusions dominated by ultramafic rocks (mainly wehrlite, harzburgite and websterite), olivine-gabbro-noritic rocks, and those dominated by significant troctolitic rocks. The troctolitic Bell Rock, Blackstone, and Jameson–Finlayson intrusions are tectonically dismembered portions of an originally contiguous body, here named the Mantamaru intrusion, that had a strike length of >170 km and

a width of at least 20 km, making it one of the world's largest layered intrusions.

The Giles Event took place after the voluminous granite magmatism and widespread mid-crustal ultrahigh-temperature (UHT) metamorphism of the 1220–1150 Ma Musgrave Orogeny. Between 1078 and 1075 Ma there was rifting, emplacement of the layered Giles intrusions, and then significant uplift. However, the Giles Event itself encompassed a much longer period, which included >50 Ma of voluminous mantle-derived basic and felsic volcanic and intrusive rocks (the Warakurna Supersuite) with

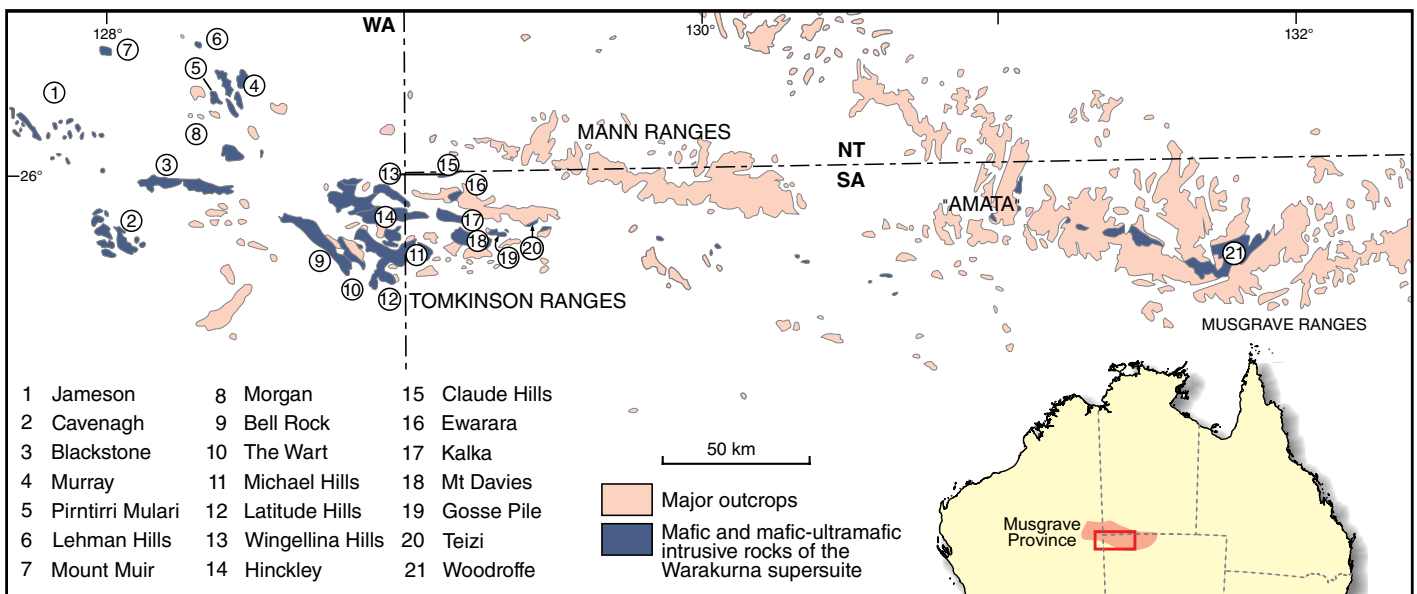


Figure 1. Outcrop map of the Musgrave Province

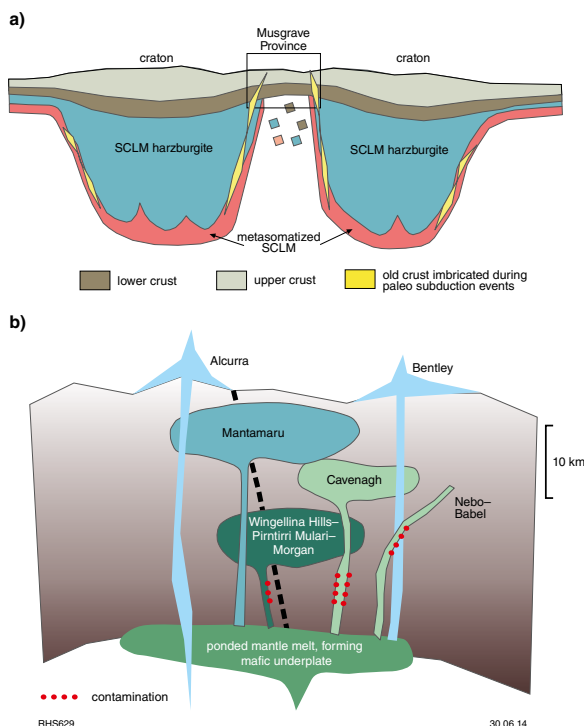


Figure 2. Schematic model of emplacement of the Giles intrusions: a) foundering of crust and new subcontinental lithospheric mantle (SCLM), shown as shapes between the SCLM harzburgite; b) ponding and ascent of mantle melts

no time-progressive geographical trend that might suggest the presence of a deep mantle plume. Magmatism during the Giles Event might instead have been controlled by plate architecture.

The Giles layered intrusions and their immediate host rocks are potentially prospective for: a) platinum group element (PGE) reefs in the ultramafic–mafic transition zones of layered intrusions, and in magnetite layers; b) Cu–Ni sulfide deposits within magma feeder conduits of late basaltic pulses; c) vanadium in the lowermost magnetite layers; d) apatite in the uppermost magnetite layers; e) ilmenite as granular disseminated grains in magnetite layers within the upper portions of the intrusions; f) iron, in tectonically thickened magnetite layers or magnetite pipes; g) Au and Cu, in the roof rocks of the large intrusions; and h) lateritic Ni in weathered portions of the olivine-rich ultramafic intrusions.

**Report 134 Mafic–ultramafic intrusions of the Giles Event, Western Australia: petrogenesis and prospectivity for magmatic ore deposits** is available to download from [www.dmp.wa.gov.au/ebookshop](http://www.dmp.wa.gov.au/ebookshop).

For more information, contact Heather Howard ([heather.howard@dmp.wa.gov.au](mailto:heather.howard@dmp.wa.gov.au)).



## The Perth Basin — a review of its structure and tectonic evolution

The Perth Basin is a deep (up to 12 km) rift basin that formed along the western edge of the Yilgarn Craton during rifting between Greater India and Australia since the latest Carboniferous. The Perth Basin has attracted much exploration for both conventional and shale/tight gas, coal, geothermal and mineral sand resources. More recently, studies by the Department of Mines and Petroleum (DMP) have focused on the potential for Mesozoic rocks to sequester carbon dioxide in the southern Perth Basin.

**Record 2014/14 The tectonic framework of the Perth Basin: current understanding** summarizes and discusses previous interpretations of the basin's structure and tectonic evolution, and tests the assumptions behind these interpretations. Despite the comprehensive review, some major uncertainties in the basin's tectonics still remain, such as when the Darling Fault began to influence deposition in the basin, to what extent basement influenced the architecture of the basin, and the kinematics and timing of rift phases. This last uncertainty may be reduced with improved regional stratigraphic correlations.

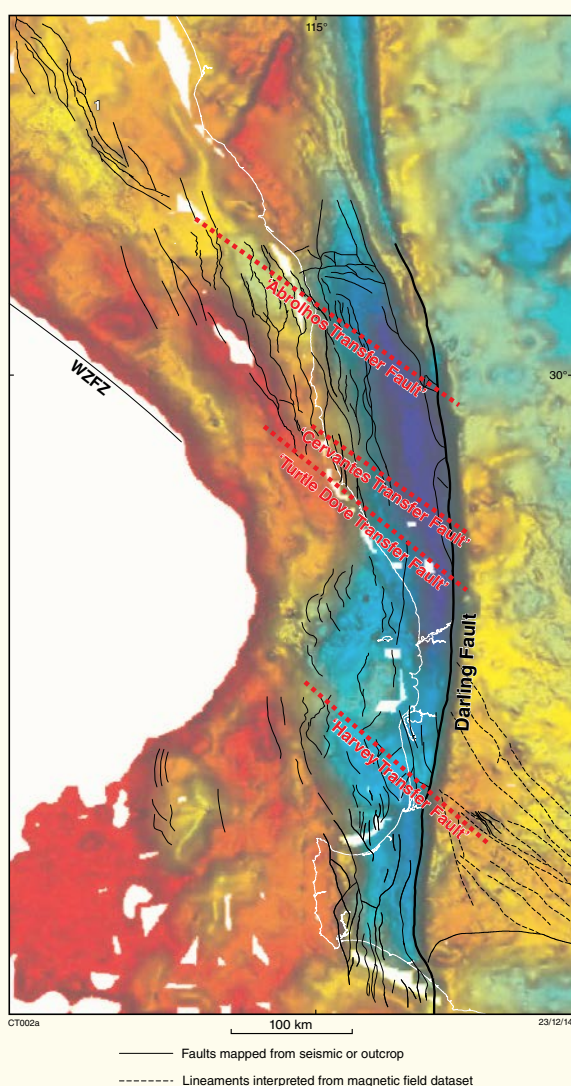


Figure 1. Bouguer gravity anomaly image (modified from Hackney, 2012), mapped faults (black) of the Perth Basin, and inferred locations of 'transfer faults'. This Record calls into question the existence of the 'transfer faults'.

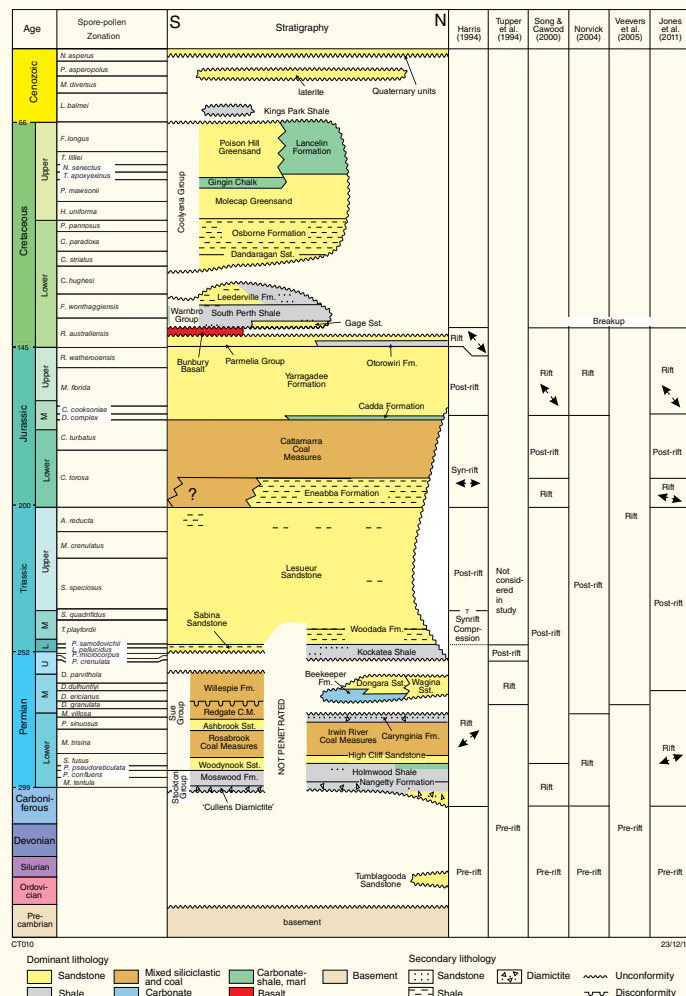


Figure 2. Comparison of tectonic regimes proposed to have driven basin development

This Record is a prelude to an ongoing study that critically assesses important deep intersections of the basin, including petroleum wells, water bores and mineral drillholes. This will help improve regional stratigraphic correlations, especially in the southern and central Perth Basin. Carefully integrating the deep drillhole data with seismic data will allow identification of time-equivalent surfaces across the basin, which is needed to understand the spatio-temporal evolution of basin subsidence and uplift. Currently, there are major uncertainties in identifying time-equivalent packages across the basin. Although this problem is partly due to poor biostratigraphic and seismic resolution, it is also due to a heavy reliance on lithostratigraphy by previous workers, which is compounded when formation names are designated to drillhole data inconsistently across the basin. A consistent stratigraphic nomenclature applied across the basin will provide a solid base for future research on the tectonics of the basin, and more broadly Gondwanan tectonics and paleogeography.

Record 2014/14 is available to download from [www.dmp.wa.gov.au/ebookshop](http://www.dmp.wa.gov.au/ebookshop).

For more information, contact Charmaine Thomas ([charmaine.thomas@dmp.wa.gov.au](mailto:charmaine.thomas@dmp.wa.gov.au)).





## The EIS-funded GSWA–CSIRO WA Regional Researcher Initiative

One of the objectives of the Exploration Incentive Scheme (EIS) is to promote strategic research with industry. As part of achieving this goal, \$900 000 was allocated to the Western Australian Regional Researcher Initiative over the first five years of EIS, aimed at the rapid transfer of new geoscience concepts, skills and technologies into the Western Australian minerals exploration industry. The researchers funded by GSWA were employed by CSIRO. Funding for two research projects (M410 and M411) was secured from the Minerals Research Institute of Western Australia (MRIWA) as well as exploration company sponsors. The third project is fully funded by the Geological Survey of Western Australia (GSWA) from EIS.

The two EIS/CSIRO/MRIWA/Industry-funded projects have been completed and the co-branded CSIRO–MRIWA–GSWA reports are published as **Report 144 Greenfields geochemical exploration in a regolith-dominated terrain: The Albany–Fraser Orogen/Yilgarn Craton margin** and **Report 145 High grade Au deposits: Processes to prediction** (MRIWA Report No. 305 and MRIWA Report No. 304 respectively). They are available for download from the eBookshop at <www.dmp.wa.gov.au/ebookshop>.

**Report 144** by Ignacio Gonzales-Álvarez et al. seeks to establish a regolith framework for mineral exploration in a region that has significant differences compared with the neighbouring Yilgarn Craton. Mineral exploration interest has been sparked by the discovery of the 7.89 M oz Tropicana gold deposit and the Nova Ni–Cu deposit. Use was made of new exploration technologies including ASTER geoscience products, HyLogger spectral scanning and airborne electromagnetic (AEM) datasets.

Regolith covers about 85% of the total surface area and can reach thicknesses of up to 150 m. The paleoclimate ranged from humid and subtropical from the Mesozoic to the

Pliocene, shifting during the Quaternary to arid and semi-arid. Consequently, weathering profiles in the Albany–Fraser Orogen are the result of successive climatic overprinting. Weathering profiles obscure the surface expression of the basement geochemistry, and therefore blur or obliterate the geochemical footprint of mineral systems at depth.

A conceptual model of the Albany–Fraser Orogen as a paleocoast with numerous islands and estuarine zones driven by transgression–regression events is proposed. ‘On inland’ and ‘on island’ weathering profiles vary in maturity and saprolite development, with or without transported cover derived from exotic marine sedimentary rocks and limestones, and clastic detritus from the Yilgarn Craton. These areas are more reliable for understanding geochemical anomaly–basement relationships, whereas the ‘marine inundated’ areas would require a more detailed investigation, due to the role of marine reworking of weathering profiles.

Within this framework, four different regolith settings have been identified with the landscape changing from a topographically high, dissected Yilgarn surface geomorphology with thick saprolite and inverted paleochannels, to a nearly flat terrain dominated by sand dunes and thin saprolite towards the coast.

Mapping the paleocoasts, islands and estuarine zones, as well as the region of influence of marine limestones and sedimentary rocks, significantly improves the planning and implementation of exploration campaigns in the region. These features have been shown to have a major impact on conventional regolith development and vertical trace-element mobility.

Case studies are described that were carried out at Sipa Resources Ltd Woodline Au Project, and in the Neale area based on Beadell Resources Ltd Hercules and Atlantis Au prospects.

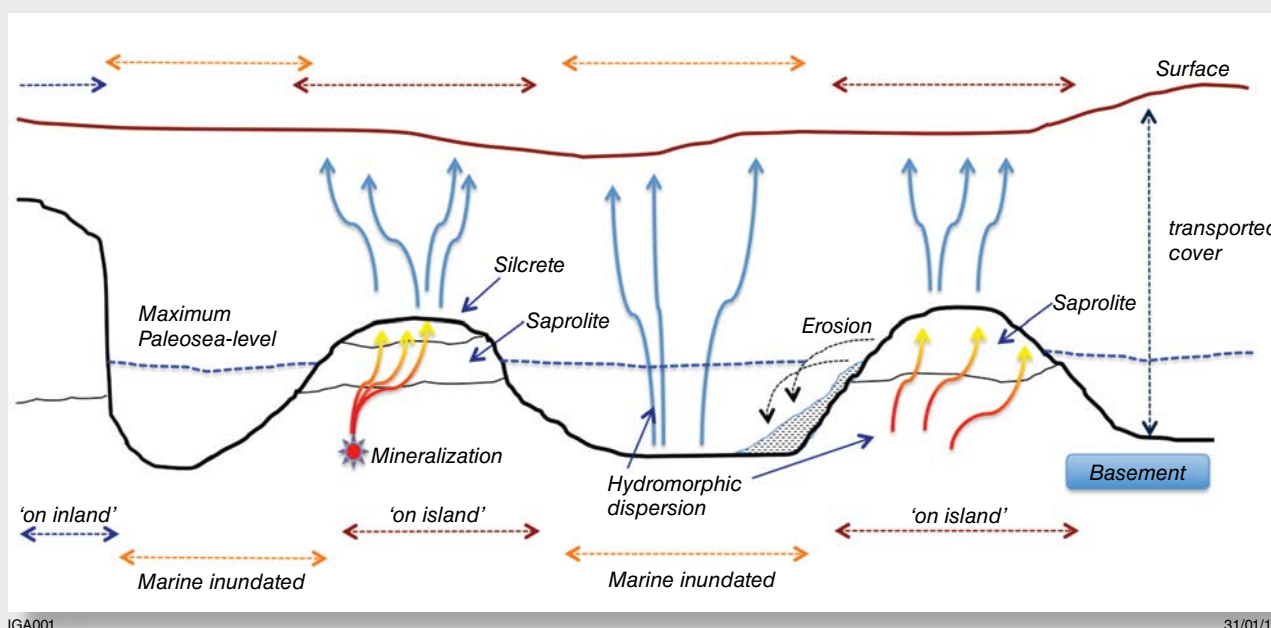


Figure 1. Sketch of the effect of sea transgressions and regressions generating ‘on inland’ and ‘on island’ areas together with ‘marine inundated’ zones, and the implications for vertical trace-element dispersion for the basement geochemical signature



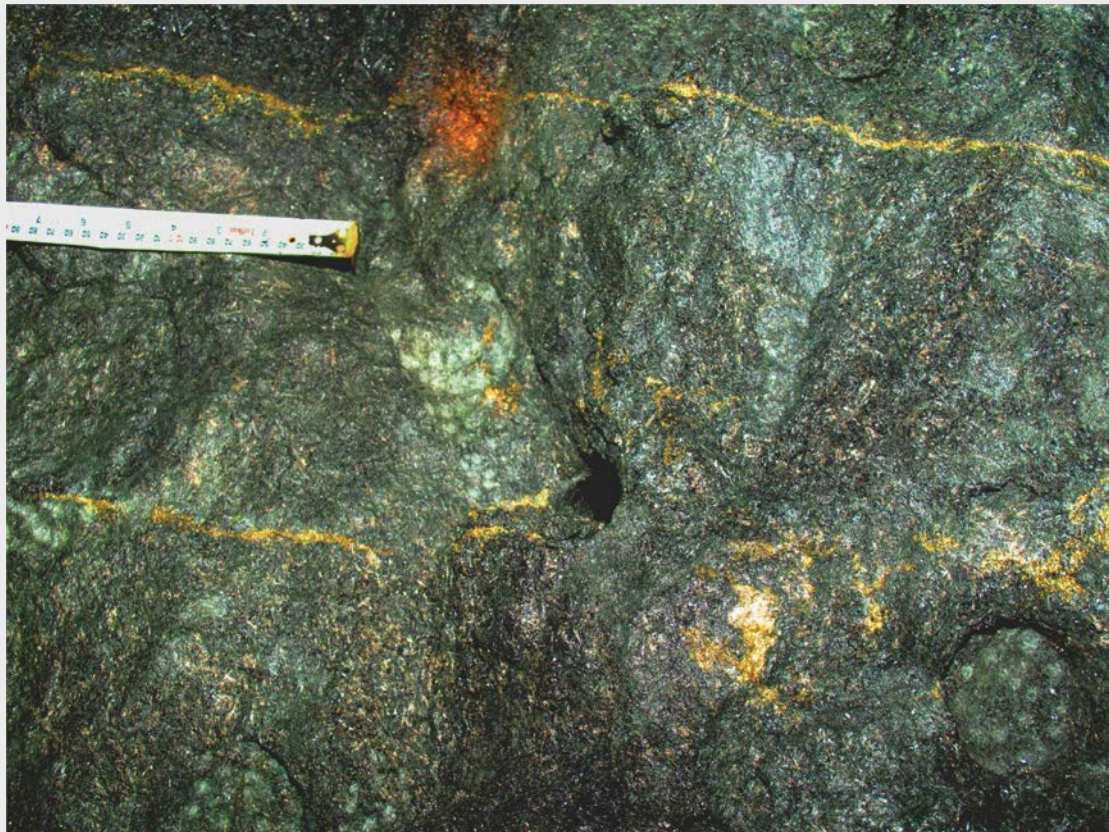


Figure 2. Gold veins from the Wattle Dam Au deposit

The Woodline Au Project was selected to understand the gold anomalies in calcrete, displaced from mineralization. The Neale area was the main study site, and was used to improve understanding of trace-element mobility from the basement through the regolith profile.

**Report 145** by John Walshe et al. documents progress in understanding the processes that controlled high-grade gold deposition and their application to targeting in the brownfields environment. The project focused on macro-scale 4D alteration and chemical gradient mapping; micro-scale gold characterization, transport and deposition; and a study of the very high grade Wattle Dam deposit.

Field campaigns conducted on the Argo–Apollo–Athena–Hamlet–Yorick (AAAHY) corridor at St Ives and at the Wattle Dam deposit created integrated pXRF, hyperspectral, stable isotopic and minor mineral datasets that define the lithological architecture and map the critical chemical gradients controlling Au deposition. Variations in stable isotope ratios ( $\delta^{13}\text{C}_{\text{carbonate}}$  and  $\delta^{34}\text{S}_{\text{sulfide}}$ ) map redox gradients, and zoning in minor Ti-phases (titanate, ilmenite, rutile) identify volatile-rich zones ( $f\text{CO}_2(\text{g})$

+  $f\text{CH}_4(\text{g})$ ) with low water activity. Gradients in pH and sulphur activity appear to be related to redox and water activity gradients.

Gold deposition occurs at high pH and volatile pressure ( $f\text{CO}_2(\text{g})$  +  $f\text{CH}_4(\text{g})$ ) and low water activity across a range of redox and sulfur activity conditions. These constraints provide a basis for mineral-systems targeting of high-grade Au resources. Proxies developed from the multi-element and spectral data allow mapping of reduced and oxidized pathways at a range of scales. Target areas are identified on the basis of coincident reduced-alkaline domains and oxidized, S-rich fluid domains in suitable architectural settings.

The fieldwork was supported by detailed Scanning Electron Microscopy (SEM) mapping of minor mineralogy, paragenetic studies and trace-metal mapping with the Australian synchrotron. The tools developed to map redox gradients and gradients in anhydrous volatile pressure can be adapted for routine use in brownfields exploration. Hyperspectral proxies for isotopic mapping could accelerate mapping of redox gradients.

For more information, contact  
Ian Tyler ([ian.tyler@dmp.wa.gov.au](mailto:ian.tyler@dmp.wa.gov.au)).

# Exploration Incentive Scheme

## EIS creates billions in benefits to WA



The key finding of a comprehensive economic impact study\* into the State Government's Exploration Incentive Scheme (EIS) conducted by ACIL Allen Consulting for the Department of Mines and Petroleum has confirmed the Scheme's strong multiplier effect on the State's economy.

Every \$1 million invested in the EIS stimulates exploration activity which generates \$10.3 million in benefits for Western Australia.

The multiplier factor of roughly one to 10 was actually a conservative estimate based only on the direct effects of increased exploration activity and associated employment stimulated by the Scheme.

Modelling that assesses the economic impact of discovery and commercialization of new mines as a result of increased exploration predicts considerably higher returns. Under this scenario, the modelling results in a further \$13.4 million of benefits for every \$1 million invested, bringing the total impact figure to \$23.7 million.

New pre-competitive geoscience had been highlighted by the review as the main driver of exploration investment by the private sector.

The Scheme's flagship is the Co-funded Drilling Program that refunds up to 50% of costs in drilling in greenfields areas, however, data releases from GSWA rival the drilling program in importance and each new release stimulates exploration activity.

A \$33 million EIS commitment made in 2009 to geophysical and geochemical surveys had resulted in nearly the whole State being covered by airborne magnetic and radiometric survey data. New data has led to innovative mineral system studies in a number of areas, including most recently the Gascoyne Province, in the Capricorn Orogen, the Musgrave Province, the West Arunta Orogen, and the Yilgarn Craton.

The State Government has renewed its commitment to the EIS by approving annual funding of \$10 million over three financial years from July 2014 until June 2017.

This brings total funding for the Scheme to about \$130 million.

The Co-funded Drilling Program has offered about \$54 million to more than 500 projects, of which about \$21 million has already been refunded to more than 265 completed projects.

\* ACIL Allen Consulting; Exploration Incentive Scheme, Economic Impact Study 2015 at <[www.dmp.wa.gov.au/eis](http://www.dmp.wa.gov.au/eis)>.

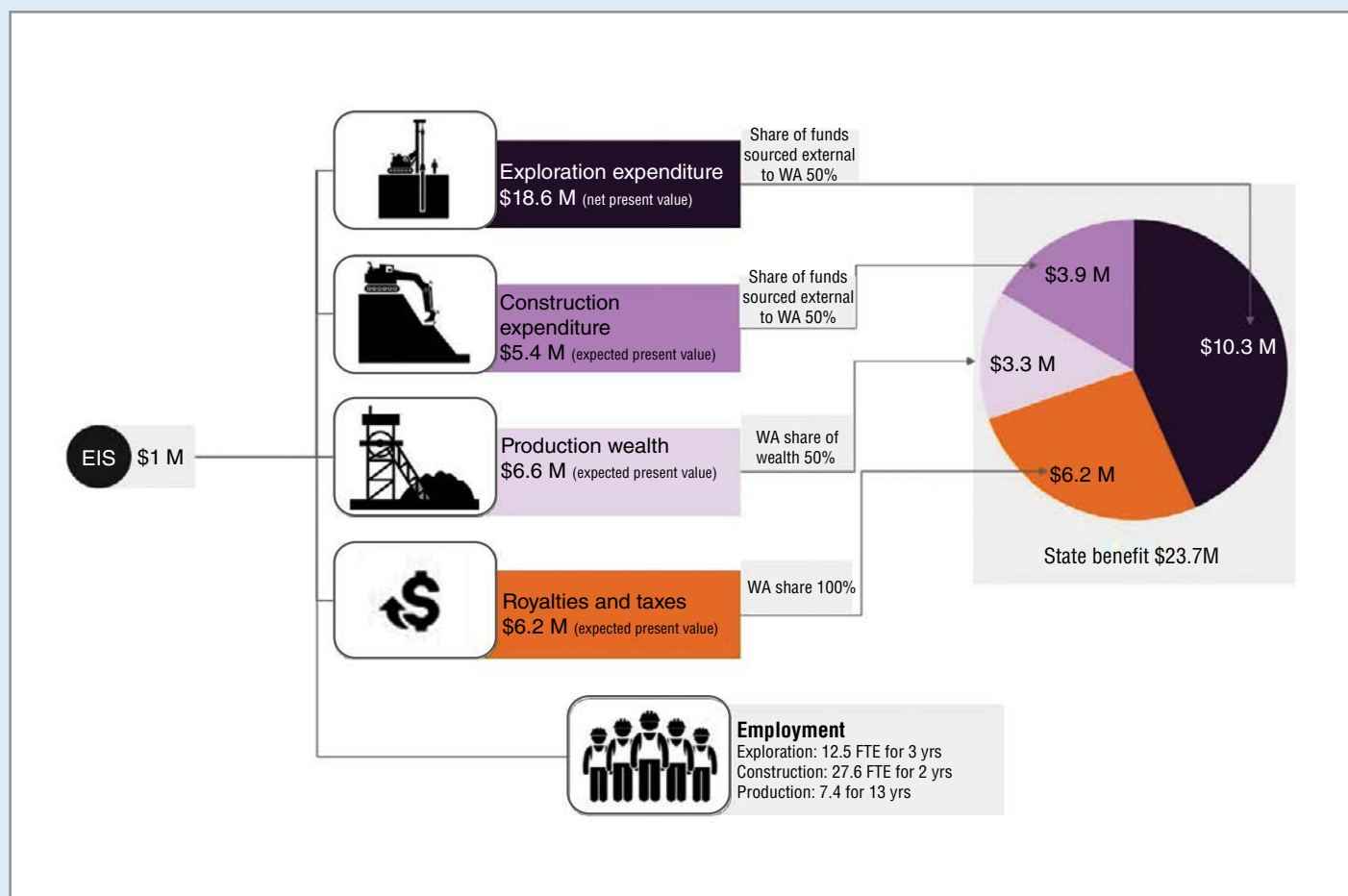


Figure 1. Exploration Incentive Scheme benefit summary

For more information, contact  
Rick Rogerson ([rick.rogerson@dmp.wa.gov.au](mailto:rick.rogerson@dmp.wa.gov.au))



## GSWA regional geophysics surveys: 30 March 2015 update

### Data downloads

Final data releases from the Geophysical Archive Data Delivery System are at <[www.ga.gov.au/gadds](http://www.ga.gov.au/gadds)>.

Grids and images from the GSWA website are available from <[www.dmp.wa.gov.au/geophysics](http://www.dmp.wa.gov.au/geophysics)>.

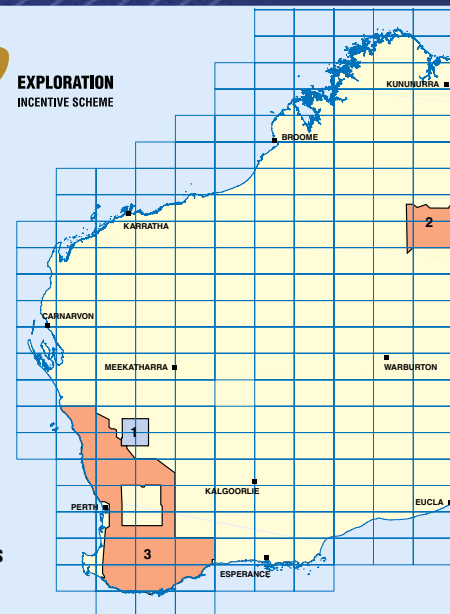
Subscribe to the GSWA eNewsletter for alerts of preliminary and final data release dates.

Survey outline shapefiles are available online at <[www.dmp.wa.gov.au/geophysics](http://www.dmp.wa.gov.au/geophysics)>.

For more information, contact  
David Howard ([david.howard@dmp.wa.gov.au](mailto:david.howard@dmp.wa.gov.au)).



□ Airborne mag/spec surveys  
□ Ground gravity surveys



ID	Area/Name	Method	Configuration	Units	Status	Start	End	Release
1	Yalgoo 2015	Mag-Rad	100 m; E/W	108 000 km	Quotation	May-15*	Jul-15*	Oct-15*
2	Ngurrurpa 2015	Gravity	Grid 2.5 km	5000 stns	Quotation	May-15*	Jul-15*	Oct-15*
3	SW Yilgarn 2015 <sup>(2)</sup>	Gravity	Roads 2 km	TBD	Quotation	Jun-15*	Aug-15*	Nov-15*

Mag-Rad = Magnetic/Radiometric; G = Gravity

\* Estimated date

1. Contract area(s) to be defined within overall boundary

Information current at: 30 March 2015

## Advancing VMS prospectivity of the Yilgarn Craton

The Archean Yilgarn Craton in Western Australia appears to be poorly endowed in volcanogenic massive sulfide (VMS) deposits. However, some conspicuous examples, such as Golden Grove, indicate that the geological processes required for their formation were present, and that other factors may be hindering exploration success. With this in mind, exploration for VMS deposits in the Yilgarn Craton is best directed towards environments that display characteristics similar to discovered deposits. As the Glenview prospect in the Weld Range greenstone belt shows similar characteristics to Golden Grove, this prospect represents one example.

Core logging and thin-section analysis of samples from both Glenview and Golden Grove show similar volcano-sedimentary stratigraphies, dominated by subaqueous felsic volcanic rocks, some probably deposited at water depths greater than 500 m. SHRIMP U–Pb dating of zircon in a sample near Glenview returned an age of  $2977 \pm 3$  Ma, which is similar to reported ages of 2960–2945 Ma for Golden Grove. The lithogeochemistry of host rocks in both regions indicate that they formed in active continental margins (Fig.2), which are conducive to VMS formation, and that they are potentially fertile for VMS mineralization (Fig.1).

HyLogger spectral scanning of drillcore from Golden Grove indicated changes in the species of chlorite and white mica that provide measurable vectors towards sulfide mineralization. In relation to distance from sulphide mineralization, chlorite becomes Fe rich over a metre scale, whereas

paragonite becomes the dominant white mica over a scale of tens of metres. Changes in the variability of specific absorption features related to white mica are also found to be effective vectors indicating mineralization, with the diagnostic aluminium hydroxide group (AlOH) absorption feature becoming less variable in mineralized drillcore. Applied to Glenview, these vectors indicate favourable conditions for mineralization in the eastern portion of the Glenview prospect, where drillholes contain abundant paragonite and display markedly less variation in the wavelength of the AlOH absorption feature related to white mica.

Read more on this topic in **Report 141 Assessing the potential for volcanic-associated massive sulphide mineralization at Weld Range, using Golden Grove for comparison**. This Report is available to download from <[www.dmp.wa.gov.au/ebookshop](http://www.dmp.wa.gov.au/ebookshop)>.

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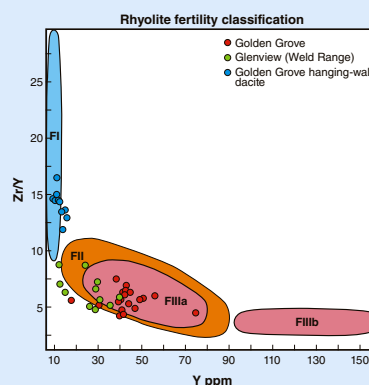


Figure 1. Felsic fertility plot. Fields from Leshar et al. (1986). The diagram shows that felsic volcanics from both the Weld Range and Golden Grove are considered prospective for VMS mineralization.

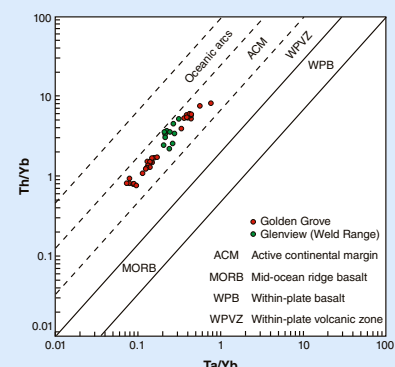


Figure 2. Tectonic setting discrimination diagram. Modified from Schandl and Gorton (2002). The diagram suggests that felsic volcanic rocks from both the Weld Range and Golden Grove formed in an active continental margin setting.

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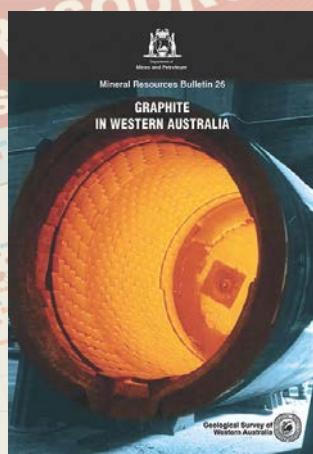
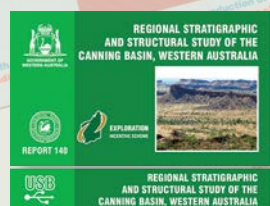
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## Training in online systems 2015

GSWA offers FREE training in its databases and online systems. The training is in the form of a presentation with hands-on interaction in most systems.

Topics include:

- navigating the Department of Mines and Petroleum's (DMP) website
- searching for geoscience publications
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- WA Geology mapping app
- bringing it all together with the interactive map viewer, GeoVIEW.WA and GeoMap.WA, a standalone GIS viewer for Windows.

### Perth

The Perth training has been divided into separate sessions: one for prospectors (morning), and one for mining companies/geologists (afternoon).

**Venue:** Mineral House, 100 Plain Street, East Perth

- Thursday 11 June
- Thursday 29 October

### Kalgoorlie

The Kalgoorlie training is open to all.

**Venue:** Room 102 (computer lab), Goldfields Institute of Technology, Centre for Engineering and Mining Training (CEMT), Australian Prospectors and Miners Hall of Fame

- Thursday 18 June
- Thursday 5 November

### Register

To register, send an email to <publications@dmp.wa.gov.au> including your details (name, company name, telephone number), the location and date of the training you wish to attend.

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