

# Fieldnotes

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Government of Western Australia  
Department of Mines and Petroleum

Geological Survey of  
Western Australia



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## The East Wongatha area: 'Seeing through' thick regolith cover

A number of underexplored areas in Western Australia are characterized by thick and continuous regolith cover which obscures bedrock mineralization. Apart from drilling — which is costly and difficult in terms of access — there are few datasets that provide direct information on the nature and extent of bedrock and related mineralization. Regional geochemical surveys are often used as first-pass approaches in mineral exploration, yet the suitability of these surveys has been questioned where the sample medium is genetically unrelated to the underlying bedrock, which is commonly the case in areas of thick regolith cover. The use of fine-fraction regolith chemistry has been tested by GSWA in the East Wongatha area (Fig. 1) to determine if this approach can 'see through' thick regolith cover. This program forms part of GSWA's EIS-funded program to generate datasets in support of mineral exploration in greenfields areas.

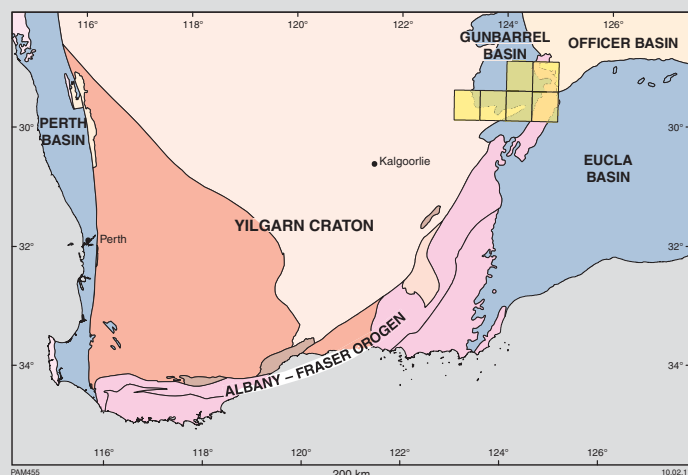


Figure 1. Location of the East Wongatha project area, which spans the eastern margin of the Yilgarn Craton, and parts of the Gunbarrel Basin and Albany-Fraser Orogen.

The East Wongatha area, on the eastern margin of the Yilgarn Craton, is characterized by minimal outcrop (less than 3%) and extensive development of quartz-rich sandplain (>70 %), much of which supports elongate dunes, indicative of eolian input. A regional multi-element geochemistry program carried out in

March 2010 covered approximately 13 000 km<sup>2</sup> at a sample density of 1/16km<sup>2</sup> resulting in 835 samples. The <50 µm fraction (i.e. silt and clay) of each sample was screened out and analysed by aqua regia for 55 elements. Analysing the fine fraction of the sample and using a digest that is largely ineffective in terms of silicates means that the input of any eolian component is minimized, and the presence of any mineralization-derived (exogenic) component is maximized. Data were released in June 2010, on the east Yilgarn update available on USB, along with a regolith-landform map.

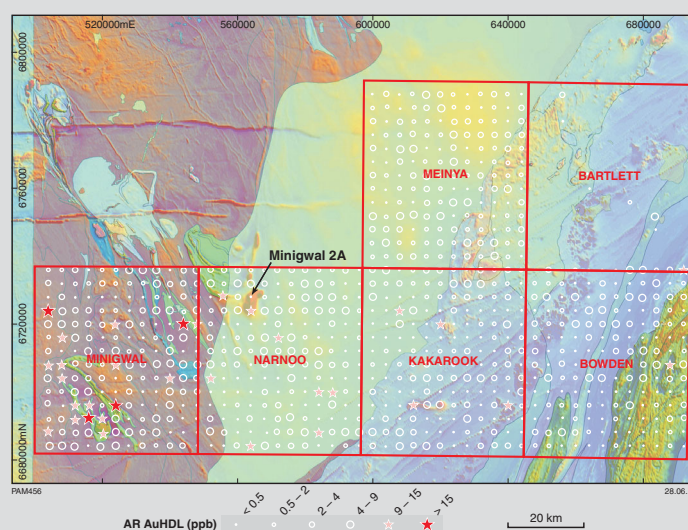
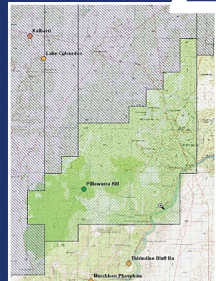


Figure 2. Distribution of gold (parts per billion, ppb) in the <50 µm fraction of regolith from the East Wongatha area. Circle diameter is proportional to gold concentration, with anomalous samples shown as either pink or red stars. Background is total magnetic intensity reduced to pole, with 1:500 000 extent of the Yilgarn Craton, Gunbarrel Basin and Albany-Fraser Orogen interpreted largely from geophysical data.

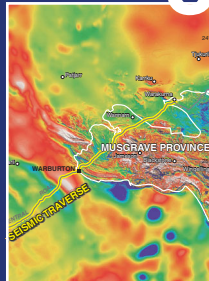
The distribution of gold in this fraction (maximum 29 ppb, lower level of detection 1 ppb) not only shows a strong relationship with greenstones of the Yilgarn Craton (Fig. 2) but anomalous samples are also found over more magnetized rocks (interpreted as greenstones) extending beneath younger sedimentary rocks of the Gunbarrel Basin. Other anomalous samples are found on or close to the margin of this basin with the Yilgarn Craton.

*continued on page 2*

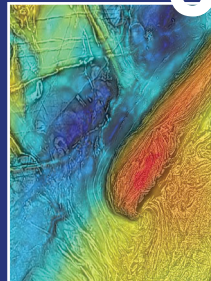
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## GPS tracking in GeoMap.WA

GeoMap.WA, GSWA's award-winning free GIS-viewing tool, provides improved access to a range of geological and other spatial information (see Fig 1). It allows users to visualise, interrogate, and integrate geological maps and images (such as satellite and aerial photographs) and associated text information in an easy-to-use software application.

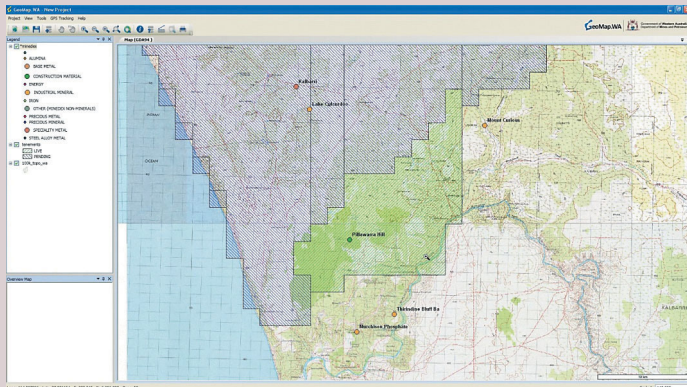


Figure 1. GeoMap.WA interface showing topographic image, live and pending tenements, and MINEDEX points.

This free program can be downloaded from DMP's website at <[www.dmp.wa.gov.au/datacentre](http://www.dmp.wa.gov.au/datacentre)>.

The new software release also includes a significantly updated user interface, database linking, GPS tracking, and plotting features. The GPS function allows live location and tracking against a background map or image.

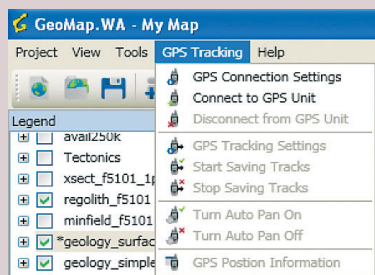


Figure 2. GPS tracking options

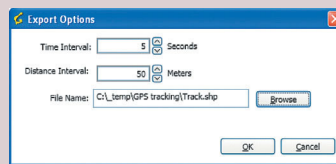
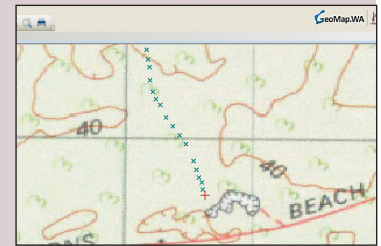


Figure 3. Configure tracking settings

Figure 4. Using Turn Auto Pan On to display the current location



Connect the GPS to the computer and then use [GPS Connection Settings] to establish a connection to GeoMap.WA (Fig. 2).

The GPS tracking settings define when a GPS point will be recorded and into what file the points will be recorded. In Figure 3 the Time Interval is set for every 5 seconds, the Distance Interval is set for 50 metres, and the file name is Track.shp.

Once the Track Settings have been set and you are ready to start tracking, then select 'Start Saving Tracks'.

Select Turn Auto Pan On to display current location and tracking within the map. Figure 4 demonstrates the current location in the centre of the map window.

To stop logging the GPS points click Stop Saving Tracks menu option. This also closes the Track.shp file. The shapefile contains the points as plotted on the screen. It can be viewed in GeoMap.WA and/or in ArcGIS.

For more information, contact Stephen Bandy ([stephen.bandy@dmp.wa.gov.au](mailto:stephen.bandy@dmp.wa.gov.au)).

### STOP PRESS: Awards for GSWA

GeoMap.WA, GSWA's free map-viewing tool has won the 'Spatially enabling Government' category at the Western Australian Spatial Excellence Awards presented jointly by the Surveying and Spatial Science Institute (SSSI) and Spatial Industries Business Association (SIBA) in WA. The award recognised this innovative desktop application for its leading edge technologies and simple-to-follow user guide.

GSWA's 'Redefining the GSWA Map Production process' was a finalist in the same category. The process was recognised for its innovation in moving to a single technology platform for data capture, compilation and output of 1:100 000 and 1:250 000 geological series maps, while still maintaining high-quality standards.

continued from page 1

Drilling data from DMP's open-file company exploration database WAMEX shows that regolith in the western part of the project area ranges from 5 to 121 m thick (average 55 m). If the anomalous gold in the fine fraction of regolith is inherited from buried mineralization, then it must have migrated through this thick regolith cover. More information on the nature of possible fine-fraction gold is provided by analysis of the <50 µm fraction of 50 samples with variable gold content, following digestion with distilled water, which only releases labile or nanoparticulate gold. The strong positive correlation of gold for both aqua regia and distilled water digestion indicates that gold in the fine fraction is preserved as either minute particles and/or in a water-soluble form. If this is the case, then transportation of gold from depth by such processes as seismic pumping or soil gas movement may have taken place.

More speculatively, one sample with anomalous gold is close to the collar of a diamond drill hole (Minigwal 2A; Fig. 2) drilled through approximately 400 m of Gunbarrel Basin sedimentary rocks to test a magnetic anomaly. The hole terminated in banded iron-formation representing Archean basement. If the gold is derived from this basement, then vertical migration through siliciclastic sedimentary rocks and regolith could have taken place.

The results of this program indicate that fine-fraction chemistry may have potential for regional geochemical exploration in areas of thick and transported cover. These areas, many of which are arid, are unsuitable in terms of alternative sample media (such as vegetation or groundwater) as sample media are inhomogeneously distributed or absent at the project scale

For more information, contact Paul Morris ([paul.morris@dmp.wa.gov.au](mailto:paul.morris@dmp.wa.gov.au)).



## Co-funded Drilling: Successful Applications Round 3, New Applications Round 4



The successful applicants from Round 3 (2011/12 drilling projects) of the Exploration Incentive Scheme (EIS) Co-funded Exploration Drilling Program were announced in June (Fig. 1). Co-funding offers totalling \$4.5 million were made to 53 projects, nine of which were from prospectors. The major commodities being sought include gold, copper, nickel and iron with a smaller number of projects exploring for PGEs, zinc, lead, uranium and manganese. One oil and gas project and one geothermal project were also among the successful applications.

The application period for the next round of co-funding grants opens on 29 August 2011 and closes at 5 pm WST on 30 September 2011. In a change from previous rounds, over \$5 million will be offered for drilling projects to be undertaken in the next calendar year, 2012. This will be of particular interest to explorers whose field work is undertaken during the winter months. In previous grant offers, some programs could not claim the funding offered as delays in their drilling programs

meant that work was undertaken after the agreement cut-off date of 30 June.

Applications must be made online at <[www.dmp.wa.gov.au/EISdrilling](http://www.dmp.wa.gov.au/EISdrilling)> and be for drilling projects undertaken between 1 January 2012 and 31 December 2012. Applications are open to explorers in all commodities in Western Australia with co-funding of up to 50% of direct drilling costs capped at specific amounts.

More detailed explanations of all the conditions governing the EIS Co-funded Drilling Program can be found on the website at <[www.dmp.wa.gov.au/EISdrilling](http://www.dmp.wa.gov.au/EISdrilling)>.

For more information on all the programs and data releases from the EIS, visit <[www.dmp.wa.gov.au/eis](http://www.dmp.wa.gov.au/eis)> or contact Margaret Ellis, Coordinator Exploration Incentive Scheme, ([margaret.ellis@dmp.wa.gov.au](mailto:margaret.ellis@dmp.wa.gov.au)) and telephone 08 9222 3509.

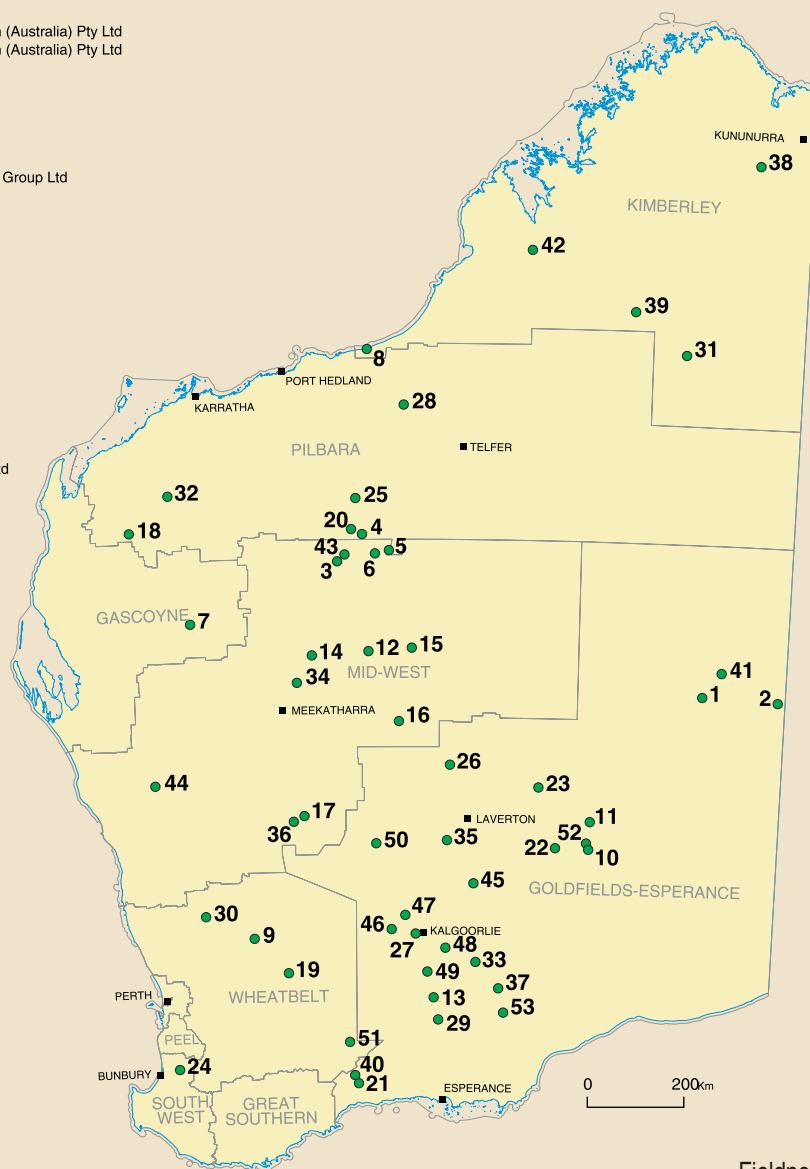
### CO-FUNDED GOVERNMENT — INDUSTRY DRILLING 2011–2012

#### GENERAL

- 1 Anglo American Exploration (Australia) Pty Ltd
- 2 Anglo American Exploration (Australia) Pty Ltd
- 3 Atlas Iron Ltd
- 4 Atlas Iron Ltd
- 5 Atlas Iron Ltd
- 6 Atlas Iron Ltd
- 7 Aurora Minerals Limited
- 8 Ausprey Resources Pty Ltd
- 9 Australia Minerals & Mining Group Ltd
- 10 Beadell Resources Ltd
- 11 Beadell Resources Ltd
- 12 Cazaly Resources Ltd
- 13 Chrysalis Resources
- 14 Chrysalis Resources Ltd
- 15 Dragon Energy Ltd
- 16 Echo Resources Limited
- 17 Empire Resources Ltd
- 18 Empire Resources Ltd
- 19 Enterprise Metals Limited
- 20 Fortescue Metals Group
- 21 Galaxy Resources Ltd
- 22 Gold Road Resources Ltd
- 23 Gold Road Resources Ltd
- 24 Green Rock Energy
- 25 Hancock Prospecting Pty Ltd
- 26 Independence Group NL
- 27 La Mancha Resources Australia Ltd
- 28 Laconia Resources Ltd
- 29 Matsa Resources Limited
- 30 McVerde Minerals Pty Ltd
- 31 New Standard Onshore Pty Ltd
- 32 Northern Star Resources Limited
- 33 Oroya Mining Limited
- 34 Rubianna Resources Ltd
- 35 Salisbury Resources Limited
- 36 Sirius Resources NL
- 37 Sirius Resources NL
- 38 Speewah Metals Ltd
- 39 TPL Corporation Limited
- 40 Traka Resources Limited
- 41 Traka Resources Limited
- 42 UXA Resources Ltd
- 43 Ventnor Resources Limited
- 44 West Peak Iron Limited

#### PROSPECTORS

- 45 CocksRocks Pty Ltd
- 46 Greg Jorgensen
- 47 Harold Dowling
- 48 Christopher Potts
- 49 Ladislav Stanko
- 50 Stuart Hooper
- 51 Sulphide Resources Pty Ltd
- 52 Sulphide Resources Pty Ltd
- 53 Wild Side Pty Ltd & Westover Holdings Pty Ltd



## New seismic insight into the central Yilgarn Craton ...

The Youanmi deep seismic reflection survey was acquired across the northern Yilgarn Craton in May and June 2010 (Fig. 1). The survey was funded through the Exploration Incentive Scheme (EIS). Acquisition and interpretation is being managed by Geoscience Australia (GA) and the National Research Facility for Earth Sounding (ANSIR) through the National Geoscience Agreement. This traverse builds on the existing network of deep-crustal seismic traverses, and improves the understanding of the crustal structure of Western Australia.

Three individual seismic lines, along with complementary magnetotelluric (MT) data, were acquired along the Youanmi traverse. The processed seismic data and images for one of the lines, 10GA\_YU2, were released in June 2011 (Fig. 2). The data for the other two lines, 10GA\_YU1 and 10GA\_YU3, will be released in early 2012. MT data will be released when processing and interpretation have been completed.

The main objectives for the Youanmi traverse were to:

- 1 image deep structure in the Narryer Terrane, the oldest component of the Yilgarn Craton, and the region that contains the oldest known crust in Australia
- 2 image the contact between the Narryer Terrane and the adjacent, highly mineralized Murchison Domain of the Youanmi Terrane
- 3 investigate the nature of granite–greenstone contacts and the overall shape, depth, and structure of greenstone belts
- 4 compare the nature, orientation, and crustal penetration of mineralized and unmineralized structures
- 5 develop a 3D image of the mafic–ultramafic Windimurra Igneous Complex
- 6 image the Ida Fault, the boundary between the Youanmi Terrane and the Kalgoorlie Terrane in the Eastern Goldfields Superterrane, and compare the deep structure in the adjacent terranes
- 7 link with previously acquired deep-crustal seismic traverses in the Eastern Goldfields Superterrane.

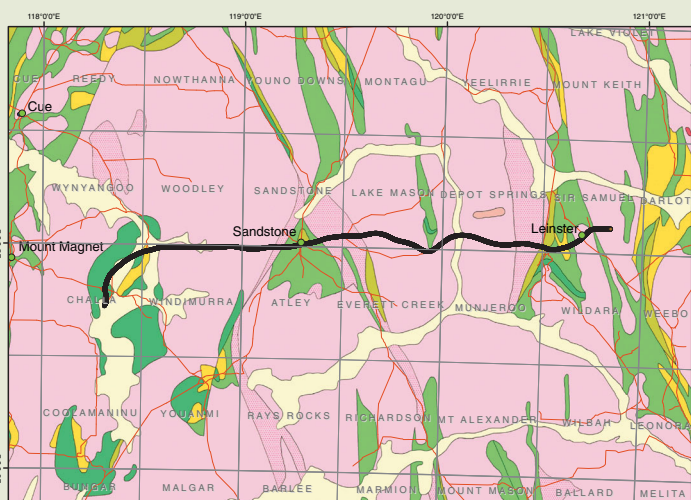


Figure 1. Youanmi deep seismic reflection survey line 10GA\_YU2

In addition, combined deep seismic reflection and refraction, magnetotelluric and gravity surveys, stretching along the Great Central Road for approximately 487 km, from Tjukayirla Roadhouse to Warakurna (Fig. 3) began in late May and were completed in June. This National Geoscience Agreement project is co-funded through Geoscience Australia's Onshore Energy Security Program and the Exploration Incentive Scheme. The surveys profile the western Officer Basin, one of Australia's underexplored sedimentary basins, and the underlying boundary between the Yilgarn Craton and the Musgrave Province, and supplement the Youanmi deep crustal reflection and MT survey and the 2001 Yilgarn deep crustal seismic survey. Combined, these surveys create a comprehensive dataset that crosses most of central Western Australia.

The data released comprise a PDF image of the preliminary migrated seismic line cross section, together with ArcMap GIS shapefiles of the seismic shot points and the common depth points (CDP) shown on the cross section image. CDP data are also presented in Microsoft Excel format.

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

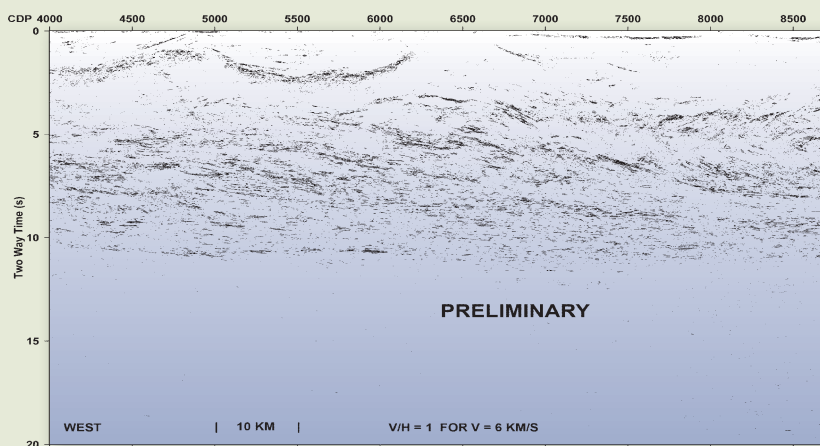


Figure 2. Preliminary migrated seismic section for Youanmi Seismic Survey (L196) line 10GA-YU2. S due to weathering and elevation have been applied, so that T=0 corresponds to a datum of 450m AHD.



## ...and the Musgrave Province

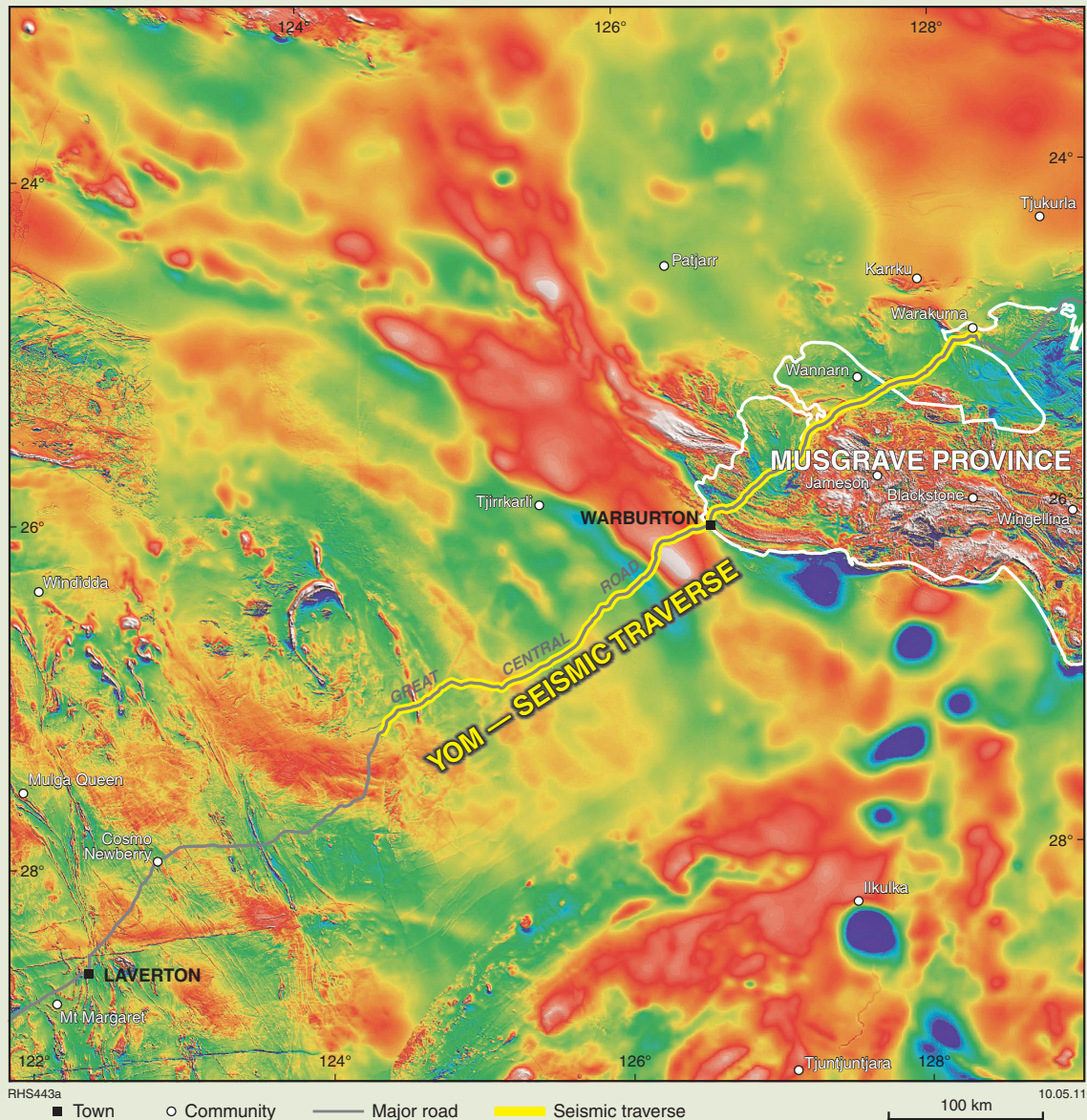
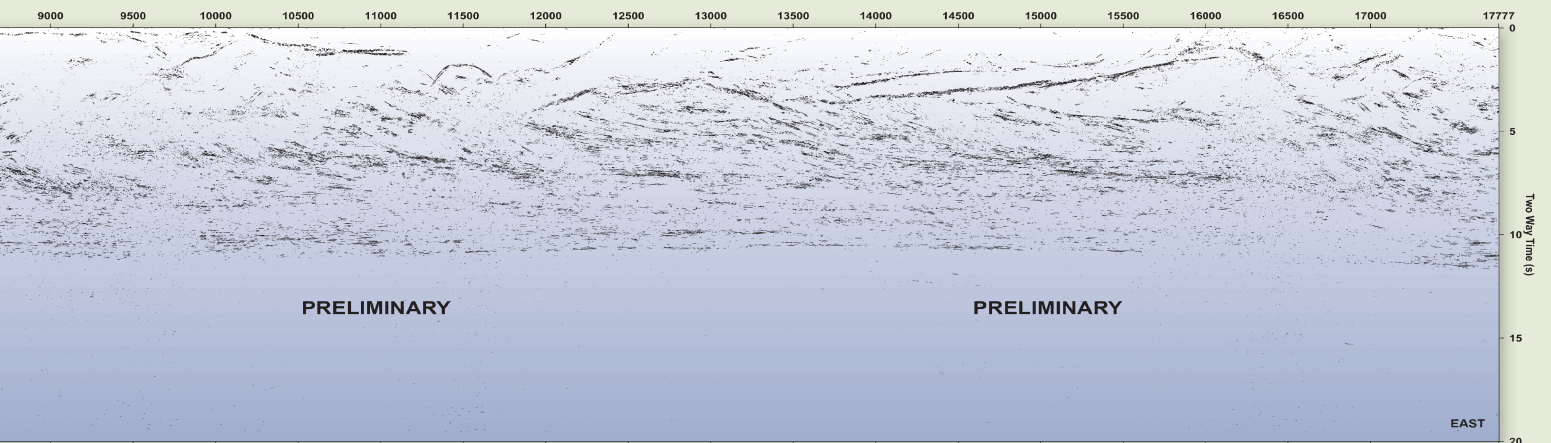


Figure 3. Location of the Yilgarn–Officer–Musgrave seismic traverse overlain on a total magnetic intensity image.



Statistics corrections to remove time delays  
HD.



## ALBANY–FRASER FIELD TRIPS

The Geological Survey of Western Australia is offering two field trips in September 2011 to examine the relationship of the Albany–Fraser Orogen to the Yilgarn Craton margin.



Both trips will be self-drive, self-cater, tag-along style. Note that bush camping and long driving distances will be necessary. The trips will run back to back with a night in Kalgoorlie in between. Participants may choose to do just one trip or both.

### *Trip 2*

**Tropicana in a regional context**

***Tropicana area***

***Leaders: Catherine Spaggiari, Chris Kirkland, and Mark Doyle (AngloGold Ashanti)***

16 September: Depart Kalgoorlie for Tropicana. Tropicana JV manager AngloGold Ashanti will co-lead this trip and provide an opportunity to view mineralization and host rocks in drillcore at Tropicana. We will also examine the surrounding regional geology before driving back to Kalgoorlie on 21 September.

### *Trip 1*

**Highlights of Albany–Fraser geology**

***Esperance to the Transline***

***Leaders: Catherine Spaggiari and Chris Kirkland***

Meet in Esperance on 11 September. Outcrop visits 12–15 September, finishing in Kalgoorlie. The field trip will cover all major lithotectonic units of the orogen, including Archean, Paleoproterozoic and Mesoproterozoic components, and examine structure, geophysics, geochronology, and geochemistry.

For more information and to express interest, please email Catherine Spaggiari ([catherine.spaggiari@dmp.wa.gov.au](mailto:catherine.spaggiari@dmp.wa.gov.au)) or phone 9222 3491. The number of vehicles may have to be limited.



# Western Australia regional geophysical surveys 2010–11: July update

## Data access

Download final data releases from the Geoscience Australia Data Delivery System at <[www.ga.gov.au/gadds](http://www.ga.gov.au/gadds)>.

Download preliminary and final grids and images from the GSWA website at <[www.dmp.wa.gov.au/geophysics](http://www.dmp.wa.gov.au/geophysics)>.

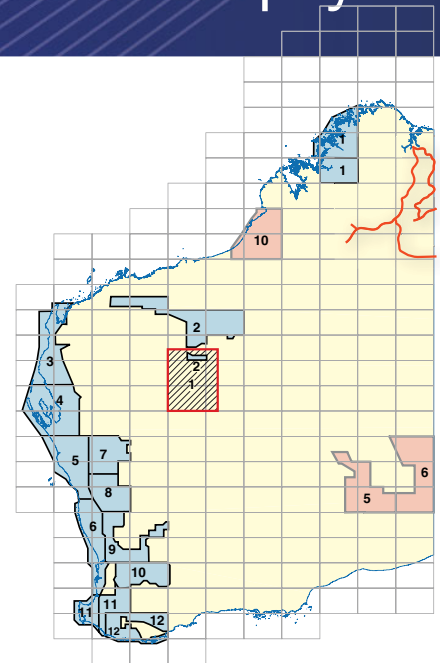
Survey outline shapefiles available online at <[www.dmp.wa.gov.au/geophysics](http://www.dmp.wa.gov.au/geophysics)>.

Subscribe to the GSWA mailing list to keep informed of preliminary and final data release dates.

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



- Airborne surveys 2010–11
- Airborne surveys 2011–12
- Gravity surveys 2011–12
- Gravity traverses



## Airborne magnetic and radiometric surveys

ID	Area/Name	Lines	Size (km)	Status	Start	End	Release
<b>2010–11 Program</b>							
5	Jubilee 2010	200 m; N/S	180 000	Processing	Jun-10	Jun-11	Sep-11*
6	Waigen–Mason 2010	400 m; N/S	113 000	Checking	Jun-10	Aug-11	Aug-11*
10	Lagrange–Munro 2010	400 m; N/S	103 000	Processing	Sep-10	Jun-11	Sep-11*

\* (Data from the seven other surveys in the 2010–11 program have been released — see access details below)

<b>2011–12 Program</b>							
1	West Kimberley 2011	200–800 m; E/W	142 000	Survey	Jun-11	Oct-11*	Dec-11*
2	South Pilbara 2011	400 m; N/S	134 000	Contract	Jul-11*	Sep-11*	Nov-11*
3	Carnarvon Basin North	400 m; E/W	106 000	Contract	Jul-11*	Sep-11*	Nov-11*
4	Carnarvon Basin South	400 m; E/W	123 000	Contract	Feb-12*	May-12*	Jun-12*
5	Perth Basin North	400 m; E/W	96 000	Survey	Jun-11	Sep-11*	Nov-11*
6	Perth Basin South	400 m; E/W	84 000	Survey	Mar-11	Jul-11*	Aug-11*
7	Murgoo	200 m; E/W	128 000	Survey	Mar-11	Jul-11*	Sep-11*
8	Perenjori	200 m; E/W	121 000	Contract	Sep-11*	Jan-12*	Apr-12*
9	Moora	200 m; E/W	141 000	Contract	Jun-11	Dec-11*	Feb-12*
10	Corrigin	200 m; E/W	114 000	Contract	Sep-11*	Feb-12*	May-12*
11	Cape Leeuwin–Collie	400 m; E/W	101 000	Survey	Mar-11	Aug-11*	Oct-11*
12	Mt Barker	200 m; N/S	123 000	On Hold**	Apr-11	Apr-12**	Jun-12*

\*\* Survey suspension over winter wet season

## Ground gravity surveys

ID	Area/Name	Spacing	Size (stns)	Status	Start	End	Release
1	Peak Hill–Collier 2011	2.5 km grid	9 100*	Contract	Jul-11*	Nov-11*	Dec-11*
2	Kimberley Road Traverses	400 m	7 600	Contract	Jul-11*	Nov-11*	Dec-11*

Information current at: 1 July 2011

\* Estimated date

## AusGeo News

AusGeo News is Geoscience Australia's (GA's) quarterly news magazine. Each issue comprises geoscience-related features, brief articles about GA's research and initiatives, news about geoscience products and spatial data, and a calendar of coming seminars and conferences.

### June 2011 Issue No. 102



#### The 2011 Acreage Release for offshore petroleum exploration

Release includes large areas in frontier regions



#### Broken Hill and Mount Isa: linked but not rotated

Release includes large areas in frontier regions



#### Satellite imagery assists flood emergency response and recovery

International support for Geoscience Australia's contribution



#### Onshore Energy Security Program update

Delivering data and improved scientific understanding

Click on <[www.ga.gov.au/ausgeonews/ausgeonews201106/](http://www.ga.gov.au/ausgeonews/ausgeonews201106/)> to view AusGeo news and learn more about these stories.

Western Australia's Petroleum and Geothermal Information Management System (WAPIMS) has been rated the best in the world by the Fraser Institute Global Petroleum Survey.

DMP's WAPIMS database won the prestigious accolade against 135 investment destinations.

### Corrigendum

It was reported in Fieldnotes April 2011 Number 58, page 4 that the Eucla 1 drillhole is at 700 m. It is in fact, 220 m. We apologise for this error.

## RECORDS

2011/7 Geology and putative microfossil assemblage of the c. 3460 Ma 'Apex Chert', Western Australia — a field and petrographic guide  
by MD Brasier, OR Green, JF Lindsay, N McLoughlin, CA Stoakes, AT Brasier, and D Wacey

2011/8 Paleontology and field observations of the ~2720 Ma Tumbiana Formation in the northwest Pilbara, Western Australia  
by JM Coffey, MR Walter, SC George, and AC Hill

2011/10 State geoheritage reserve R50149 (Trendall Reserve), North Pole, Pilbara Craton, Western Australia — geology and evidence for early Archean life  
by AH Hickman, MJ Van Kranendonk, and K Grey

2011/14 Permian–carboniferous geology of the northern Perth and southern Carnarvon Basins, Western Australia — a field guide  
by AJ Mory and DW Haig

2011/15 Hyperspectral alteration mapping of early Archean hydrothermal systems in the North Pole Dome, Pilbara Craton  
by AJ Brown, TJ Cudahy, MR Walter and AH Hickman

2011/16 Permian, Carboniferous and Upper Devonian geology of the northern Canning Basin, Western Australia — a field guide  
by AJ Mory and RM Hocking

2011/17 Collie coalfield and Lake Clifton — a field guide  
by AS Millar, AJ Mory, DW Haig, and J Backhouse

2011/18 P–T–t evolution of the Fraser Zone, Albany–Fraser Orogen, Western Australia  
by CW Oorschot

2011/19 Thermal conductivity of core specimens DMP001–DMP027  
by Hot Dry Rocks Pty Ltd

2011/20 Programme & Abstracts: The XVII International Congress on the Carboniferous and Permian  
edited by E Håkansson & JA Trotter

## NON-SERIES BOOKS

GSWA guide for authors 2011–12

GSWA guide for editors 2011–12

Spelling and other useful stuff 2011–12

Western Australia atlas of mineral deposits and petroleum fields, 2011  
by RW Cooper, PB Aboysinghe, DJ Flint, CA Strong, and JH Haworth

## GEOLOGICAL MAPS

COOPER WA Sheet 4445 1:100 000 Geological Series map  
by P Evins, RH Smithies, HM Howard, M Werner, and WD Maier

LOCKIER WA Sheet 2048 1:100 000 Geological Series map  
by SP Johnson, S Sheppard, and CBE Krapf

MOUNT EGERTON WA Sheet 2448 1:100 000 Geological Series map  
by HN Cutten, AM Thorne, and OA Blay

MULGUL WA Sheet 2548 1:100 000 Geological Series map  
by AM Thorne

TEANO WA Sheet 2449 1:100 000 Geological Series map  
by OA Blay, AM Thorne, and HN Cutten

GLENBURGH WA Sheet 2147 (2nd edition) 1:100 000 Geological Series map  
by SA Occhipinti, S Sheppard, and SP Johnson

LANDOR WA Sheet 2247 (2nd edition) 1:100 000 Geological Series map  
by S Sheppard, SA Occhipinti, and SP Johnson

## NON-SERIES MAPS

Iron ore deposits of the Pilbara region, 2011  
by RW Cooper and DJ Flint

Iron ore deposits of the Yilgarn Craton, 2011  
by RW Cooper and DJ Flint

WEST MUSGRAVE PROVINCE Plate 1, 1:250 000 Geological Series map  
by RH Smithies, HM Howard, P Evins, and M Werner

All maps and books are available as a free PDF and as GIS files on our website.

## NON-SERIES DIGITAL PRODUCTS

ICCP promotions package

Petroleum state acreage release 2011

Iron ore deposits of the Pilbara region, 2011  
by RW Cooper and DJ Flint

## DATA PACKAGES

\$55 unless otherwise indicated

South East Canning pre-interpretation seismic and well data package  
\$132 (external hard drive)

Compilation of geochronology information, 2011 update

East Albany–Fraser and southeast Yilgarn Geological Exploration Package, 2011  
by C Spaggiari

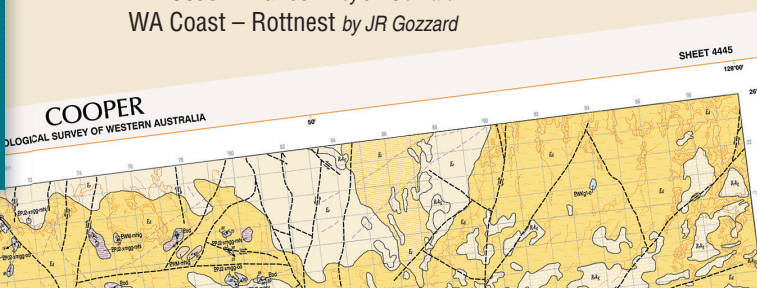
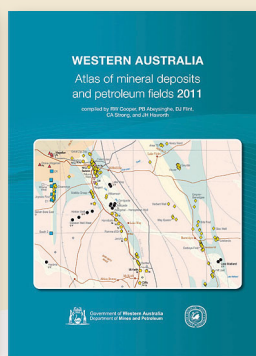
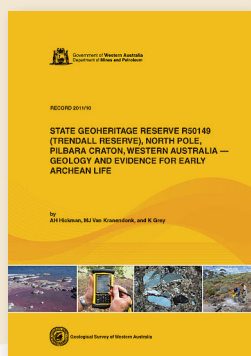
Kimberley–Tanami 1:100 000 Geological Information Series, 2011  
by S Sheppard

Sea to Scarp: Applied geology for land-use planning in the southern Swan Coastal Plain by JR Gozzard

WA Coast – Cape Naturaliste by JR Gozzard

WA Coast – Lancelin by JR Gozzard

WA Coast – Rottneest by JR Gozzard



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