

Fieldnotes

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Seven-day field excursion showcases the west Musgrave Province



To showcase the progress of ongoing work in the Musgrave region of central Australia, GSWA and the Ngaanyatjarra Council, together with collaborators from the University of Adelaide's Centre for Tectonics, Resources and Exploration (TRaX), The University of Western Australia's Centre for Exploration Targeting (CET) and Monash University, conducted a seven-day geological field excursion through the west Musgrave Province, 5–11 June 2011. The excursion marks a significant stage in the history of the GSWA/Ngaanyatjarra Council 'west Musgrave Province Mapping Project' and is the first major excursion of its kind to have been carried out through the region. The excursion mixed exploration geologists currently working in the region with current and future local community leaders and provided all with an overview of our emerging understanding of the geological evolution of the area between Warburton and Wingellina. The excursion provided an open and friendly forum within which all groups were encouraged to discuss a range of topics including their interests in the land, contrasting cultural points of view, visions for the land, employment opportunities, and current

practical and perceived impediments to development. Winding its way over 600 km of dirt track and spinifex, and over 300 million years of Earth history, the convoy periodically swelled up to 30 vehicles, depending on weather conditions and local community commitments.

From the geological perspective, the aim of the excursion was to outline the range and amount of data that had become publicly available throughout the course of the west Musgrave Mapping Project. Another aim was to articulate how these data have influenced or changed our emerging understanding of the geological evolution of the region. A comprehensive field guide was presented and has subsequently been publicly released as GSWA Record 2011/4. The field guide provided an account of the geological evolution of the region and descriptions of the excursion stops, and was accompanied by a 1:250 000-scale bedrock geological interpretation map. By common consent, tenement boundaries were dissolved and company geologists were afforded an opportunity to look beyond these boundaries to see and discuss rocks and rock relationships that could potentially influence how they view the geology within their own tenements. Highlights of the excursion included visits to exploration camps at Wingellina (Metals Exploration's Wingellina Ni-laterite deposit) and Nebo-Babel (BHPBilliton's Ni-Cu orthomagmatic sulfide deposit) to view drillcore, including ore intersections.

Many of the excursion stops examined aspects of the Giles Event, which, throughout the period c. 1085–1040 Ma, involved emplacement of the giant layered mafic-ultramafic Giles intrusions and eruption of the voluminous and unusually high-temperature bimodal lavas that formed the Bentley Supergroup. Much of the known mineralization within the region is associated with the Giles Event. However, a critical point emphasized

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Figure 1. Excursion leader Heather Howard introduces the geology of the region north of Wingellina.

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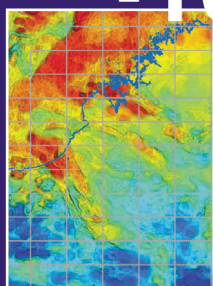
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West Musgrave Field Excursion

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throughout the excursion was that this event is emerging to be an incredibly complicated, dynamic and protracted interplay of deformation and crustal melting during more or less continuous heat and magma flux from a shallowly emplaced mantle. One of the keys to understanding this event, and the associated mineral systems, is to understand the effects that the complex pre-Giles tectonic history had on crustal architecture and on establishing or modifying crustal and mantle sources of magmas and fluids. It now seems likely, for example, that the Musgrave Orogeny, which preceded the Giles Event by <40 million years, was primarily a thin-crustal transtensional event characterized by up to 100 million years of ultrahigh-temperature (>900°C) metamorphism and granite magmatism — possibly with no modern geological analogue. During the course of detailed mapping, large geochemical and geochronological datasets have been established, and structural and metamorphic studies have been conducted. The bearing that these datasets have on elucidating the geological evolution of pre-Giles rocks was demonstrated at several excursion stops and discussed frequently throughout the excursion. Equally important is the post-Giles tectonic history, which significantly deformed and remoulded Neoproterozoic central Australia. As demonstrated at one of the first excursion stops, events such as the c. 570–530 Ma Petermann Orogeny had a dramatic role in dissecting and relocating various crustal blocks within the Musgrave Province. One of the greatest challenges facing explorers in the region is accounting for the effects that these events might have had.

From all perspectives, the excursion was a success. All sides were appreciative of the opportunity to interact, learn and teach, and participants from the local communities provided an impromptu parting gift in the form of a spectacular traditional dance on the last night.



Figure 2. Excursion participants discuss a range of topics surrounding their interest in the land. The camp is in the Blackstone Range.



Figure 3. Examining core at BHP Billiton's Nebo-Babel exploration camp.

West Musgrave Province 1:100 000 GIS and comprehensive Explanatory Notes released

The Musgrave Province straddles the borders between the Northern Territory, Western Australia and South Australia and is a critical region in terms of understanding the geological evolution of Meso- to Neoproterozoic central Australia. It has also recently been the site of significant economic mineral discoveries. The most notable of these discoveries has been the orthomagmatic nickel – copper – platinum group elements (PGE) deposit at Nebo–Babel south of Jameson Community. Nevertheless, the remote location, and historical problems regarding access to this culturally sensitive region have meant that it remains a major target for greenfields exploration.

The west Musgrave Province mapping project began in 2004 and has been strongly supported and facilitated by local Traditional Owners and the Ngaanyatjarra Council. It continues to operate under a formal agreement as a joint GSWA – Ngaanyatjarra Council project. It aims to increase the geological knowledge of the Musgrave Province and to provide comprehensive pre-competitive geoscience datasets to assist and encourage a range of land use activities within the region. This involves the collection, synthesis, and dissemination of geological information and interpretations, particularly through the production of systematic regional 1:100 000-scale geological maps and supporting geophysical, geochronological, geochemical, and structural data. The latest compilation of these datasets has recently been released (West Musgrave Province 1:100 000 Geological Information Series, 2011 update¹) and incorporates comprehensive Explanatory Notes², in GSWA's new format, covering the easternmost four 1:100 000 geological map sheets (BATES, BELL ROCK, BLACKSTONE, and HOLT). Future updates of the Geological Information Series will incorporate the results of three-dimensional models (including whole-of-crust models) of the west Musgrave Province crust, as well as a minerals system and exploration targeting analysis. These are being performed on a collaborative basis by the Centre for Exploration Targeting (CET), at The University of Western Australia, using a range of pre-existing geophysical and geological datasets, including magnetotelluric data collected during the 2010 field season. In addition, in June 2011, GSWA and Geoscience Australia acquired seismic reflection, refraction, gravity, and magnetotelluric data along a traverse that originates in the eastern part of the Archean Yilgarn Craton and traverses both the Neoproterozoic–Paleozoic Officer Basin and the west Musgrave Province. Interpretation of these datasets will take place in late 2012.

¹ Available from Level 1, Department of Mines and Petroleum (see page 12)

² Available online at <<http://www.dmp.wa.gov.au/GSWApublications>>

For more information, contact Hugh Smithies (hugh.smithies@dmp.wa.gov.au).

Results of GSWA customer survey 2011

Thank you for feedback on our products and services.

GSWA regularly surveys its customers to gather feedback on the usefulness of its products such as reports, maps, and datasets as well as services delivered through online databases. The results of the 2011 GSWA Customer Survey undertaken earlier this year have provided solid evidence for some trends we suspected anecdotally. Previous surveys were conducted in 1994, 1998, 2003 and 2007.

Although response numbers were down compared to previous surveys, the trend that was noticed in 2007 continued — the greatest proportion of respondents to the 2011 survey were from Australian-based exploration or production companies, followed by individual service-providing contractors and consultants. Most respondents worked in organizations with five or fewer employees.

Compared to 2007, a smaller proportion of you are purchasing hard-copy maps and reports with a higher percentage of customers downloading products on demand. Almost 87% of respondents to the survey now use GIS software to view our

geoscience information, an increase of over 13% from the 2007 survey. MapInfo appears to be the most popular GIS package.

GSWA has a loyal customer base, with more than three-quarters of respondents in 2011 stating that they have been using GSWA products for more than five years. This is a similar proportion to previous years and suggests that we need to introduce more young professionals to our products, or alternatively encourage more to complete GSWA customer surveys!

Respondents who consider that the GSWA products are 'good value for money' increased to approximately 70% from the previous survey's 61%.

Thank you very much to those who completed the survey and particularly for the free-text suggestions at the end of the survey. Two of you won a mixed half-dozen bottles of wine for your input.


For more information, contact Don Flint (don.flint@dmp.wa.gov.au).

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.

Issue September 2011 No 103 is now available at <http://www.ga.gov.au/ausgeonews/>.

In this issue...

 **Hydrocarbon potential of the offshore northern Perth Basin**
New data and knowledge deliver opportunities for petroleum explorers

 **Continental resource and energy systems**
Academy of Science recommendations drive new project

 **New 3D Model of Capel and Faust basins released**
Geological model assists in the assessment of offshore frontier basins

 **Exploring for calcrete-hosted uranium deposits in the Paterson region, Western Australia**
Modelling points to prospective areas

 **Towards future energy discovery**
Completion of the Energy Security Program

New Assistant Director Resources for GSWA

GSWA is pleased to announce that Don Flint is the new Assistant Director Resources within the Geological Survey of Western Australia (GSWA).

Previously, Don's tasks within GSWA included designing and managing the Western Australian database on mines and mineral deposits (MINEDEX), as well as providing policy advice on mineral exploration and development generally.

He joined the department in 1997 after working briefly with World Geoscience Corporation in Orissa (India), and after six and a half years on AusAID contracts with the Mineral Resources Department in Fiji. Prior to that, he worked for many years with the South Australian Department of Mines and Energy in its mineral resources section.

Don Flint has a BSc (Hons) degree in geology from the Flinders University of South Australia, and a Graduate Diploma in Applied Finance and Investment from the Securities Institute of Australia.



New thermal-infrared system for GSWA HyLogger

As a part of the AuScope program, the GSWA HyLogger was upgraded with a new thermal-infrared (TIR) system. The spectral range of the TIR spectrometer is 6000 – 14 000 nm, the bandwidth where anhydrous silicates show their diagnostic spectral signatures due to their molecular fundamental vibrations. Thus, this new generation system (the HyLogger 3) is capable of detecting feldspars, quartz, pyroxenes, garnets, and olivines, as well as many OH-bearing minerals, traditionally sensed in the visible and shortwave-infrared (VNIR–SWIR; 380 – 2500 nm) spectral region.

The TIR system measures bi-directional reflectance of the core using two heat sources (Fig. 1). The background radiation is sampled at the beginning of each tray and eliminated from the reflected signal. The remaining spectrum is calculated relative to a calibrated diffuse reflecting gold standard.

TIR light scattering occurs only on the surface of core, in contrast to the SWIR light that has volume scattering to depth, depending on the refractive index and extinction coefficient of the mineral. Thus the surface condition plays an even more important role in TIR scanning than for SWIR since rough, broken, or weathered surfaces of core and small grain sizes can create spurious spectral features. Grains of size <75 µm are not suitable for TIR logging.

The Spectral Geologist (TSG) software is used for processing of the HyLogging TIR spectral data as well as for VNIR–SWIR data. Mineral interpretation is carried out using a spectral library built on the characteristics of pure minerals that have been validated by XRD analyses. Final data records the three main minerals for each spectral sample (about 8 mm diameter).

A major difficulty in TIR data interpretation is the spectral mixing effect around 9000 – 10 000 nm: all feldspar group minerals,



Figure 1. New TIR system for the NVCL GSWA HyLogger 3-2.

amphiboles, chlorite, kaolinite, muscovite, talc, and quartz have strong reflectance spectra in this interval. Their spectra are non-unique and difficult to un-mix either because the spectra of two minerals are almost the same, or the sample spectrum is modelled equally well by more than one combination of minerals. Crystallographic orientation of minerals also has an influence on the shape and intensity of their TIR spectra. An additional constraint is that there are currently only 104 minerals available in the TIR reference library, a number that obviously doesn't cover the full range of spectrally responsive minerals.

Another way to process TIR data is to create spectral scalars (algorithms) based on diagnostic absorption features for individual minerals or groups of minerals and then mask the surrounding data. This method has been used successfully for determining quartz and carbonate abundances, and it is being developed for feldspars and pyroxenes.

Recognition of igneous rock types based on either the Christensen Feature or the felsic/mafic Index is another option in TIR data interpretation (Fig. 2).

For more information, contact Lena Hancock (lena.hancock@dmp.wa.gov.au or 9470 0307).

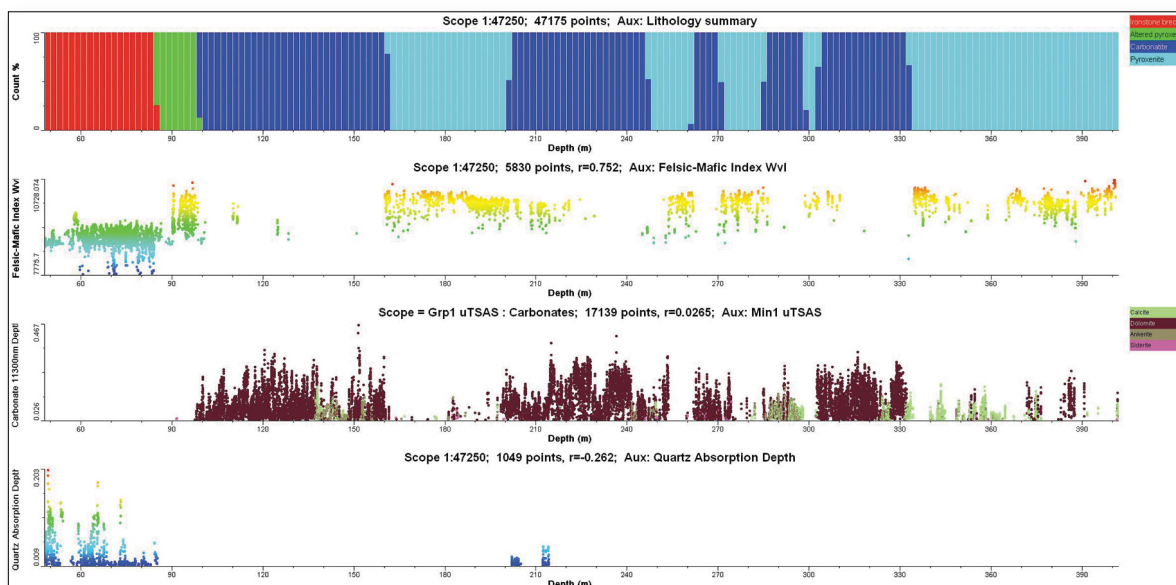


Figure 2. TSG TIR graphic logs for Cummins Range drillhole DD84CDD1: a) main lithology per two-metre interval; b) the felsic/mafic index characterizing igneous rock type (short wavelengths are felsic, longer wavelengths are mafic and ultramafic); c) normalized depth of the 11 300 nm carbonate absorption feature coloured by species; d) normalized depth of the 8625 nm quartz absorption feature.

Streamline submission of mineral exploration information

- UPDATE YOUR MRT SOFTWARE
- NEW VERSION RELEASED JULY 2011

A new software program to help streamline compulsory reporting of mineral exploration data has been developed by the Department of Mines and Petroleum (DMP). It was released on the website in July and can be downloaded free from the Data and Software Centre at <http://www.dmp.wa.gov.au/datacentre>.

DMP's Mineral Exploration Reporting Templates (MRT) software is designed to improve reporting, particularly of analytical data by collecting the same metadata from all companies/prospectors, thus reducing data entry time and errors. It is particularly useful for the submission of surface and drilling data and will be of most benefit to small and medium-sized exploration companies and prospectors.

The MRT program is easy to use, with a 'tips' column on every page that can be used as data are entered. There is also a comprehensive users' guide.

The new MRT program has been distributed to all geological surveys in Australia, to ensure data reporting formats are compatible nationwide.

DMP receives more than 3000 reports a year from almost 500 exploration companies or prospectors. The MRT software will allow DMP to process and upload the data more efficiently into the mineral drillhole and surface geochemistry database that is currently being populated.

There are more than 61 000 sets of data and reports available on DMP's website in the WAMEX database.

The guidelines for reporting and the MRT software can also be accessed here: <http://www.dmp.wa.gov.au/7149.aspx>.

For more information, contact Ann Fitton (ann.fitton@dmp.wa.gov.au).

Mineral Exploration Reporting Templates-Down hole Analysis/ Geochemistry

File Help

New Project New Report Export Files Add Data File Verification List

Select Edit Existing Records

- Flight of Fancy
 - ANNUAL_2010
 - Anthibby Well
 - ANNUAL_2003
 - AW_WASL4_COLL2003A
 - AW_WADL4_GEO2003A
 - AW_WADS4_SURV2003A
 - AW_WADG4_ASS2003A
 - AW_Verification_List_2003

Please enter Downhole Analysis/Geology details and import data.

File Name: AW_WADG4_ASS2003A.txt Edit

Comments:

Lab Job Number: ☐ Multiple job numbers in data
(If more than one job number include as a column in data)

Sample Codes: Edit Sample Codes

Sample Type	Sample Code	Sample Description
Percussion Chips	PC	4m composites
RAB Chips	RAB	4m composites

Sample Preparation: Edit Sample Prep

Sample Code	Prep Desc
AR	Aqua regia

Analysis Codes: Edit Analysis Codes

Analysis/Assay Type	Analysis/Assay Code	Analysis/Ass
AAS		Atomic Abso

Import Downhole Analysis Data File

Import Data File

Column	Units	Accuracy	Data
Hole_id	NA	0	ARB1501,ARB1501,

Tips

File Name is the name your metadata file will be called when it is created.

If there is only one Lab Job Number in the reporting period, enter it in the Lab Job Number field. If not, tick the Multiple Job Numbers box and add a column in your data with the job numbers.

Press Edit Sampling Codes, Edit Sample Prep, and Edit Analysis Codes button to enter the details of the codes and techniques used in your data.

Press the Import Data from File button to enter assay data.

All QA/QC data must be submitted in a separate data file. See the User Manual for more details.

In the Import related QA/QC area, press the Import Data from File to import all QA/QC data relating to the assay data.

Press Save to save these details.

Press the Back To Hole Location button when finished.

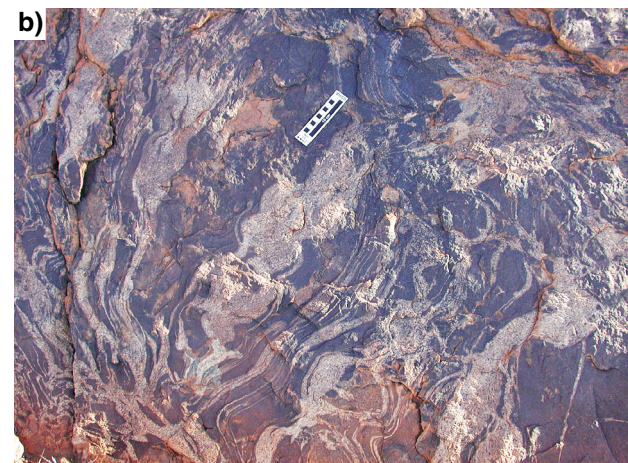
Figure 3. Screen shot of the new Mineral Exploration Reporting Template data entry form.

Redefining the Giles Event

The Warakurna Large Igneous Province outcrops across approximately 1.5 million km² of central to far western Australia. It includes igneous sill complexes and dykes in the Paleoproterozoic Earaheedy Basin, the Mesoproterozoic Edmund and Neoproterozoic Collier Basins (Bangemall Supergroup), and the Capricorn Orogen, with ages ranging from c. 1078 to c. 1058 Ma. The Musgrave Province, in central Australia, includes the easternmost and best exposed portion of the large igneous province in Western Australia. Here, all rocks previously thought to have formed part of this magmatism have been collectively grouped together as part of the c. 1075 Ma Giles Event. These include the layered mafic-ultramafic intrusions (Giles intrusions), massive gabbros, mafic dykes (Alcurra Dolerite) and rare granitic rocks of the Warakurna Supersuite, and the basaltic and rhyolitic rocks the Bentley Supergroup. They have traditionally been interpreted as a bimodal igneous series related to a single thermal pulse — the Giles Event — produced by a mantle plume, which was thought to have impacted the lithosphere beneath the Musgrave Province.

GSWA Record 2010/6* examines how new geochronology and mapping of mafic and felsic rocks of the west Musgrave Province has resolved a complex sequence of at least eight magmatic pulses with hiati of up to 10 m.y. during the Giles Event. The spatial and temporal distribution of these pulses is consistent with a long-lived intracontinental rift setting, referred to as the Ngaanyatjarra Rift. This rift hosts the layered mafic-ultramafic Giles intrusions, including the giant Bell Rock – Blackstone – Finlay – Jameson intrusion. These intrusions formed before a 10-km wide mafic-felsic magmatic shear zone that marks a period of macroscopic folding, transpression, and basin inversion coeval with the commonly accepted c. 1075 Ma age of Warakurna Large Igneous Province (LIP). The extensive mafic to felsic volcanic rocks of the Tollu Group (traditionally assigned to the Giles Event) were emplaced 25–50 m.y. later. The extended time period (at least 50 m.y.) of magmatism and deformation now attributable to the Giles Event precludes a single mantle plume as its sole cause. Instead, the Giles Event

Figure 2. a) Fine-scale banding in the layered Giles intrusions; b) ductile deformation associated with intrusion of granite into partly solidified gabbro in a Giles-age magmatic shear zone.



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may be the result of a long-lived thermal anomaly underlying the Musgrave Province since the beginning of the 1220–1120 Ma Musgrave Orogeny.

* Available online at <<http://www.dmp.wa.gov.au/GSWApublications>>.

For more information, contact Hugh Smithies (hugh.smithies@dmp.wa.gov.au).

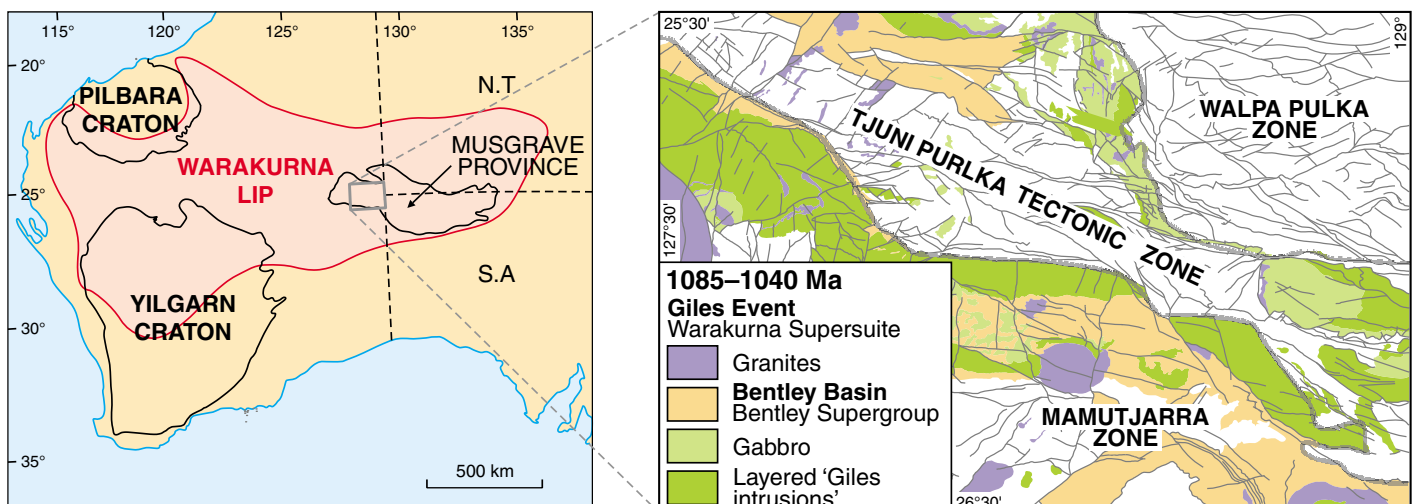
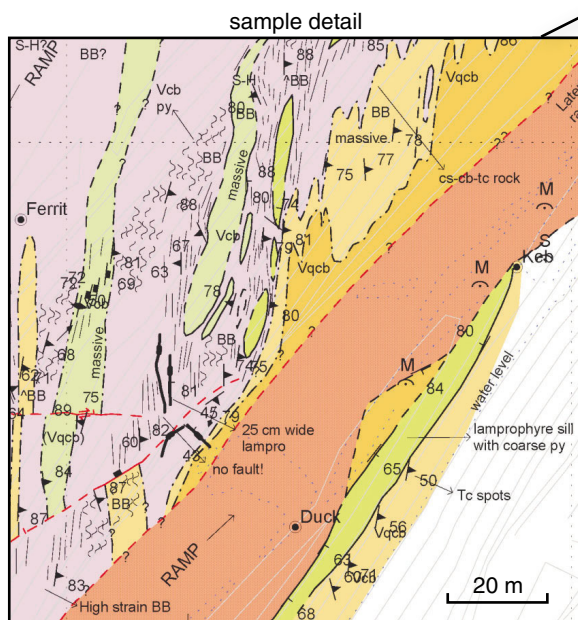
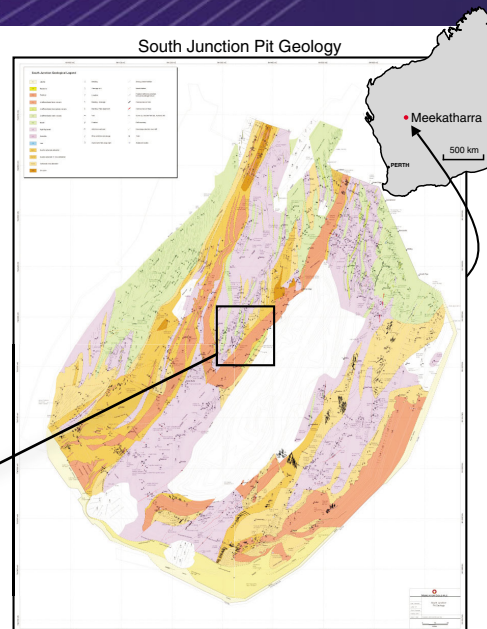


Figure 1. a) Map of WA showing extent of the Warakurna Large Igneous Province; b) detailed map showing igneous products of the Giles Event in the west Musgrave Province.

Maps of the Yaloginda–Bluebird goldfield near Meekatharra

The Yaloginda area, which lies about 15 km south-southwest of Meekatharra in the Murchison Domain of the Youanmi Terrane in the Yilgarn Craton and includes the Bluebird gold mine, has produced more than 1.4 Moz of gold from more than a dozen openpits. Recent detailed structural mapping by a team led by Dr Nick Timms of Curtin University shows that gold mineralization is hosted in a range of rock types and that its location is strongly controlled by complex and heterogeneously



distributed macroscopic structures. The project owners, Reed Resources Ltd, have generously given GSWA permission to publish Dr Timms' maps and report, which have been released as GSWA Record 2011/21: Geological mapping report, Yaloginda area, Murchison region, Western Australia*. The ten openpits in the report have been mapped at a scale of 1:1000, and there is a 1:5000-scale overview regional map covering the northern part of the district. Digital versions of all the maps have also been generated. These maps have been brought into the ArcGIS format by GSWA and will be included in the 2011 update of the Murchison Geological Information Series (GIS).

* Available online at <<http://www.dmp.wa.gov.au/GSWApublications>>.

For more information, contact Stephen Wyche (stephen.wyche@dmp.wa.gov.au).

CAPRICORN SEISMIC and MT Workshop 2011

PERTH 23 November 2011

NEW RESULTS TO BE RELEASED

This one-day workshop will present the results of new seismic and magnetotelluric data collected along the Capricorn seismic traverse in Western Australia. The workshop will be held by the Geological Survey of Western Australia, in conjunction with AuScope, Geoscience Australia (GA), the National Research Facility for Earth Sounding (ANSIR) and Adelaide University.

Wednesday 23 November 2011
Mineral House, 100 Plain Street East Perth
FREE – Registration is required
Contact: Deenikka (08) 9222 3634 deenikka.preedy@dmp.wa.gov.au



Temporal and hafnium isotopic evolution of the Glenburgh Terrane basement

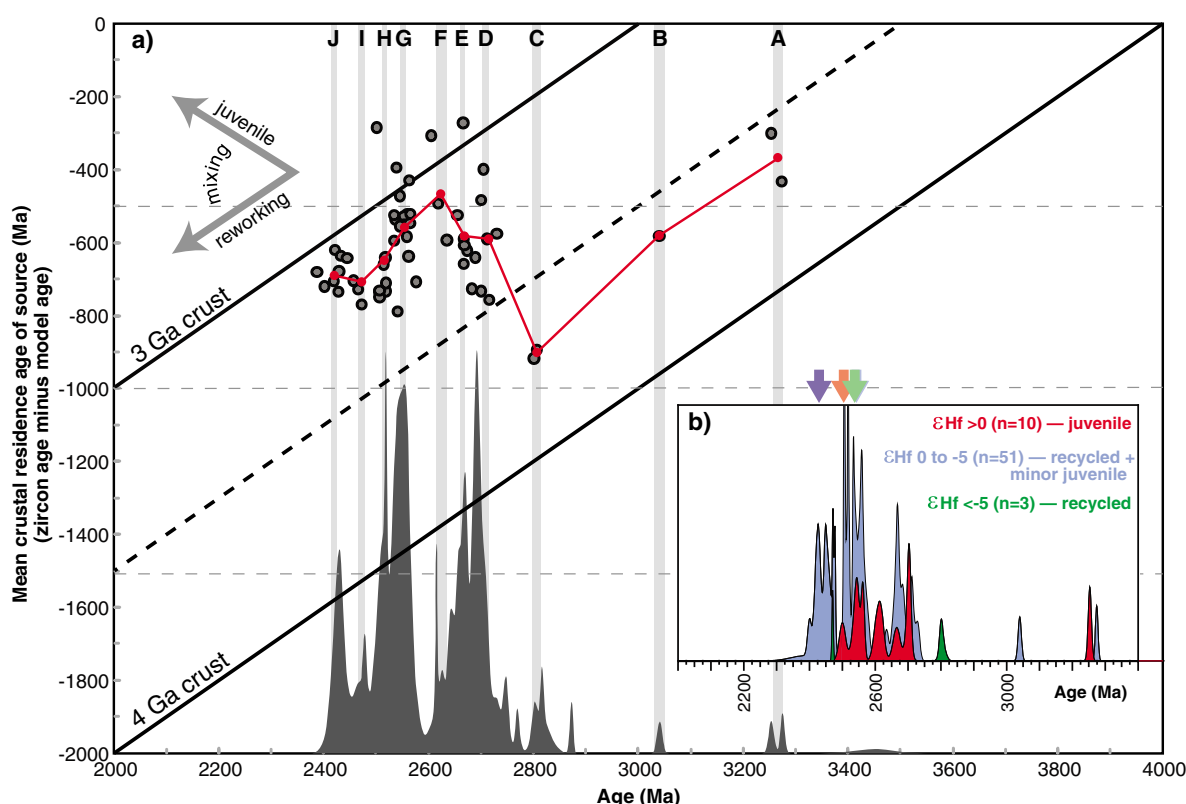
The Gascoyne Province lies at the western end of the Capricorn Orogen, and includes a range of Neoarchean to Paleoproterozoic gneisses and metasedimentary basins that record not only the amalgamation of the Archean Pilbara and Yilgarn Cratons to form the West Australian Craton, but nearly one billion years of intracontinental crustal reworking. The oldest crust in the province is the Glenburgh Terrane, which is a wedge-shaped tract of Archean to Paleoproterozoic rocks, lying between the Archean Yilgarn and Pilbara Cratons. Various lines of evidence suggest that this terrane is exotic to both the Pilbara and Yilgarn Cratons and that it played a key role in the assembly of the West Australian Craton. It is thought that the Glenburgh Terrane first amalgamated with the Pilbara Craton during the 2215–2145 Ma Ophthalmian Orogeny, and this combined entity then collided with the Yilgarn Craton during the 2005–1950 Ma Glenburgh Orogeny to form the West Australian Craton. Understanding the origin and tectonomagmatic evolution of the Glenburgh Terrane and its pre-collisional tectonic relationship to the Pilbara and Yilgarn Cratons is essential for understanding the timing and assembly history of the West Australian Craton, and the tectonic evolution of the Capricorn Orogen.

termed the Halfway Gneiss, as derived from both magmatic and inherited zircons. The protoliths of the Halfway Gneiss have crystallization ages between 2555 and 2430 Ma, and contain inherited zircons as old as 3447 Ma. Together with hafnium model ages (for both magmatic and inherited zircons) as old as 3700 Ma, these indicate an ancient Archean source. The Hf-isotopic compositions of numerous magmatic and inherited zircons indicate a major period of crustal growth between 2730 and 2600 Ma, possibly in a continental-margin arc. However, much of the Halfway Gneiss formed between 2600 and 2430 Ma, mainly by the reworking of 2730–2600 Ma crust. Comparison of the crystallization history and isotopic evolution of the Halfway Gneiss with both the Pilbara and Yilgarn Cratons demonstrates that the Glenburgh Terrane is exotic to both these cratons and supports the view that the West Australian Craton was assembled during a multi-phase, punctuated, pre-1950 Ma tectonic history.

* Available online at <<http://www.dmp.wa.gov.au/GSWApublications>>.

GSWA Report 110* documents the temporal and hafnium-isotopic evolution of Glenburgh Terrane basement gneisses,

For more information, contact Simon Johnson (simonpaul.johnson@dmp.wa.gov.au).



a) Event signature plot of Hf-isotope data for zircons from Halfway Gneiss samples, where the mean magma source residence time (zircon age minus TDMcrustal) is plotted against age. Inherited and magmatic zircon analyses from the Halfway Gneiss that are <5% discordant are shown as a probability density distribution (n=141; dark grey area). Light-grey vertical lines show the ages for which the Hf-isotope data are averaged; b) Probability density diagram showing the relative abundance of zircons with $\epsilon\text{Hf} > 0$ (juvenile source), $\epsilon\text{Hf} 0$ to -5 (mixed source), and $\epsilon\text{Hf} < -5$ (recycled source).

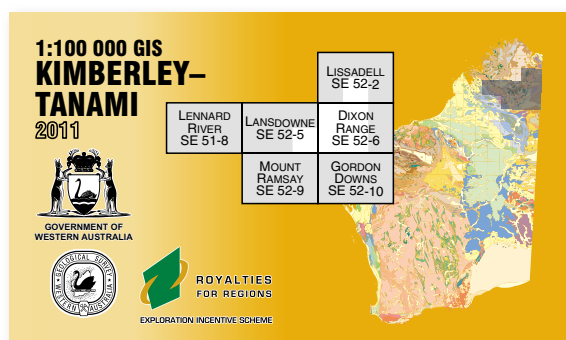


Figure 1. Cover of the new Kimberley–Tanami 1:100 000 Geological Information Series digital product, released on USB flash drive.

KIMBERLEY–TANAMI 2011											
						ELGEE 4465	DUNHAM RIVER 4565	ARGYLE DOWNS 4655			
						LISSADELL					
						CHAMBERLAIN 4464	SE 52-2 BOW 4564	LISSADELL 4654			
									Data coverage:		
									Angelo	Lapitz	
									Antrim	Lennard	
									Argyle Downs	Leopold Downs	
									Bedford	Lerida	
									Bohemian	Linacre	
									■ Bow	Lissadell	
									Chamberlain	■ McIntosh	
									Cow Creek	Mount Cummings	
									■ Dixon	Mount House	
									Dockrell	■ Mount Remarkable	
									Dunham	Nicholson	
									Elgee	Osmand	
									Ellendale	Ramsay	
									Elma	Richenda	
									Glenroy	Ruby Plains	
									Gordon Downs	Tableland	
									Halls Creek	■ Tungunary	
									Hooper	■ Turkey Creek	
									■ Interpreted geology and structure		

Figure 2. Index of 1:100 000 and 1:250 000 sheets covered by the latest release, and planned for future releases.

Kimberley–Tanami 1:100 000 Geological Information Series 2011 release

As part of the Exploration Incentive Scheme, a Kimberley–Tanami 1:100 000 Geological Information Series digital package has been released (Fig.1) *. This includes a new 1:100 000 interpreted bedrock geology dataset covering TUNGANARY, MCINTOSH, DIXON, MOUNT REMARKABLE, TURKEY CREEK, and Bow in the central part of the Paleoproterozoic to Paleozoic Halls Creek Orogen in the east Kimberley (Fig. 2). This is the first release by GSWA of a digital 1:100 000 geology dataset covering part of the Kimberley region. The area covered includes some of the spectacularly exposed layered mafic–ultramafic intrusions of the east Kimberley, such as the McIntosh intrusion (Fig. 3), which are prospective for Ni, Cu, and PGE, as well as the Argyle diamond mine. The 2012 release will be expanded to include coverage of the 1880–1840 Ma Halls Creek Group and the c. 1843 Ma Koongie Park Formation on HALLS CREEK, RUBY PLAINS, ANGELO, and DOCKRELL, which are prospective for commodities including Au, Ag, Cu, Pb, Zn, and REE. Further releases are planned to build coverage of both the Halls Creek and the King Leopold Orogens (Fig. 2).

Between 1986 and 1995 a remapping program was carried out by GSWA in the Kimberley, starting in the west Kimberley, and moving to the east Kimberley in partnership with what was then the Bureau of Mineral Resources (BMR, which became AGSO, and is now GA) under the National Geoscience Mapping Accord. This work has been published as 'paper' second and third edition 1:250 000, and first edition 1:100 000 Geological Series maps. Regional-scale 1:500 000 geological maps of the King Leopold Orogen and the Halls Creek Orogen were also produced. Other than the 1:500 000-scale maps, which form part of a State-wide geology dataset, none of this mapping has been available in digital format previously.

Included in the package are field observation sites and information recorded by both GSWA and GA geologists, petrography sites and information, whole rock geochemistry, and both GSWA and GA geochronology sites and information. Also included are available geophysical imagery, mineralization sites, and exploration information, together with Landsat TM satellite imagery and digital elevation model imagery from the Shuttle Radar Topography Mission.

* Available from Level 1, Department of Mines and Petroleum (see page 12).

For more information, contact Ian Tyler (ian.tyler@dmp.wa.gov.au) or Julie Hollis (julie.hollis@dmp.wa.gov.au).

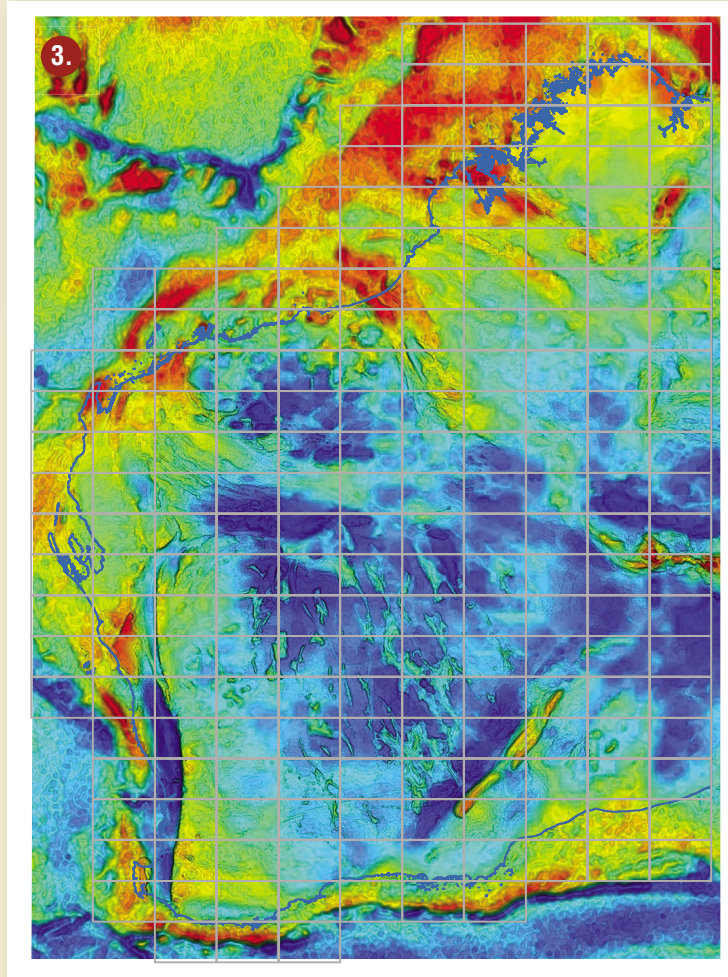
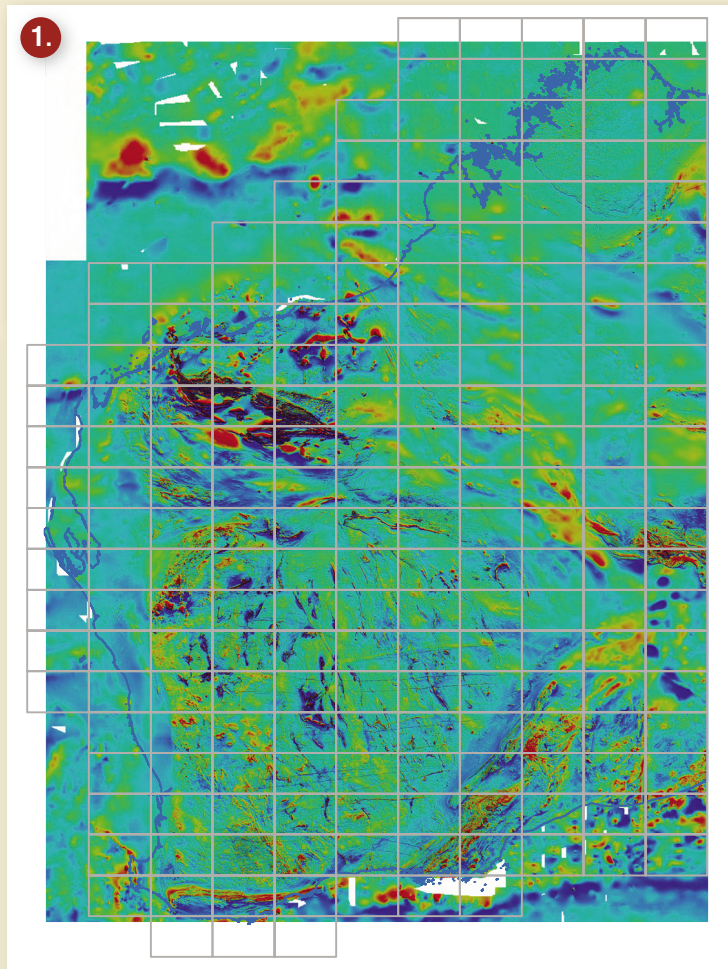


Figure 3. The layered mafic–ultramafic McIntosh intrusion in the east Kimberley.

WA state geophysical images

1. Magnetics (2011 – version 2)

Includes all regional GSWA surveys delivered to date. Also includes 380 open-file company datasets plus some recently released offshore data from Geoscience Australia. The final cell (pixel) size is approximately 80 metres. The image was generated from a colour palette (red high, blue low) using histogram equalization. To emphasize the expression of high-frequency anomalies, an artificial illumination was applied from the northeast.



2. Radiometrics (2011 – version 2)

Includes all regional GSWA surveys delivered to date plus selected open-file datasets. The final cell (pixel) size is approximately 100 metres. The image is displayed as a ternary image of radiometric data. Potassium, thorium and uranium elements are displayed as red, green and blue.

3. Gravity (2011 – version 4)

Created from data in the National Gravity Database as at August, 2011. Includes all regional GSWA surveys delivered to date. The final cell (pixel) size is approximately 400 metres. The image was generated from a colour palette (red high, blue low) using a linear histogram. To emphasize the expression of high-frequency anomalies, an artificial illumination was applied from overhead (0° azimuth, 90° elevation).

Images are available online at <<http://www.dmp.wa.gov.au/geophysics>>.

For more information, contact John Brett
(john.brett@dmp.wa.gov.au).

Western Australia regional geophysical surveys 2011: October update



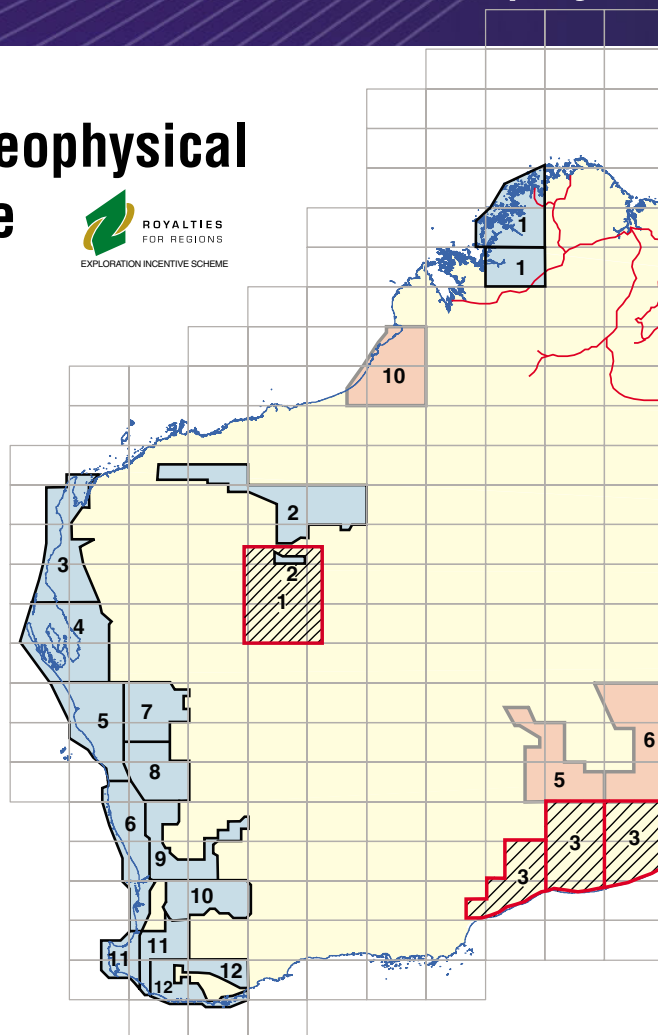
Data access

Download final data releases from the Geoscience Australia Data Delivery System at <www.ga.gov.au/gadds>.

Download preliminary and final grids and images from the GSWA website at <www.dmp.wa.gov.au/geophysics>.

Survey outline shapefiles available online at <www.dmp.wa.gov.au/datacentre>.

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).

Airborne magnetic and radiometric surveys

ID	Area/Name	Lines	Line-km	Status	Start	End	Release
2010-11 Program							
5	Jubilee 2010	200 m; N/S	180 000	Processing	Jun-10	Jun-11	Nov-11*
6	Waigen-Mason 2010	400 m; N/S	113 000	Processing	Jun-10	Jan-11	Nov-11*
10	Lagrange-Munro 2010	400 m; N/S	103 000	Processing	Sep-10	Jun-11	Nov-11*

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

2011-12 Program							
1	West Kimberley 2011	200 – 800m; E/W	142 000	Survey	Jun-11	Jan-12*	Mar-12*
2	South Pilbara 2011	400 m; N/S	134 000	Contract	Mar-12*	May-12*	Jul-12*
3	Carnarvon Basin North	400 m; E/W	106 000	Survey	Jul-11	Oct-11*	Jan-12*
4	Carnarvon Basin South	400 m; E/W	123 000	Contract	Jan-12*	May-12*	Jul-12*
5	Perth Basin North	400 m; E/W	96 000	Survey	Jun-11	Dec-11*	Feb-12*
6	Perth Basin South	400 m; E/W	84 000	On Hold**	Mar-11	Dec-11*	Mar-12*
7	Murgoo	200 m; E/W	128 000	Survey	Mar-11	Nov-11*	Feb-12*
8	Perenjori	200 m; E/W	121 000	Contract	Oct-11*	Dec-11*	Mar-12*
9	Moora	200 m; E/W	141 000	Survey	Jun-11	Jan-12*	Apr-12*
10	Corrigin	200 m; E/W	114 000	Contract	Jan-12*	May-12*	Jul-12*
11	Cape Leeuwin-Collie	400 m; E/W	101 000	On Hold**	Mar-11	Dec-12*	Mar-12*
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	Stations	Status	Start	End	Release
1	Peak Hill-Collier 2011	2.5 km grid	9 100	Survey	Aug-11	Dec-11*	Feb-12*
2	Kimberley Road Traverses	400 m	7 600	Survey	Aug-11	Sep-11	Nov-11*
3	Eucla Blocks	2.5 km grid	14 700	Proposed	Oct-11*	Dec-11*	Feb-12*

Product releases

Any prices include GST

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RECORDS

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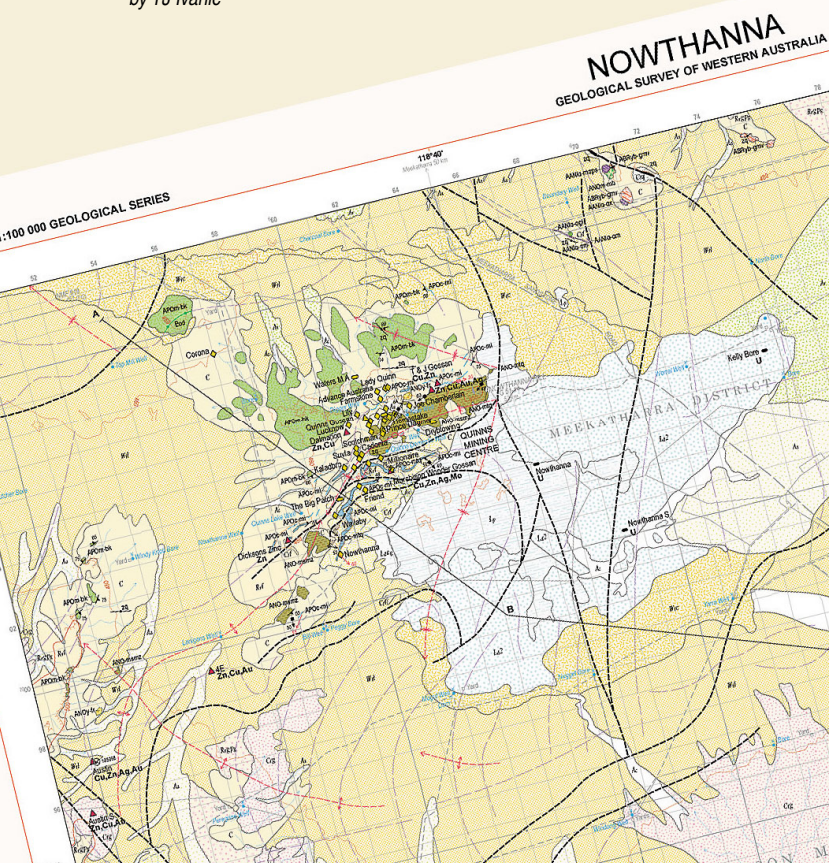
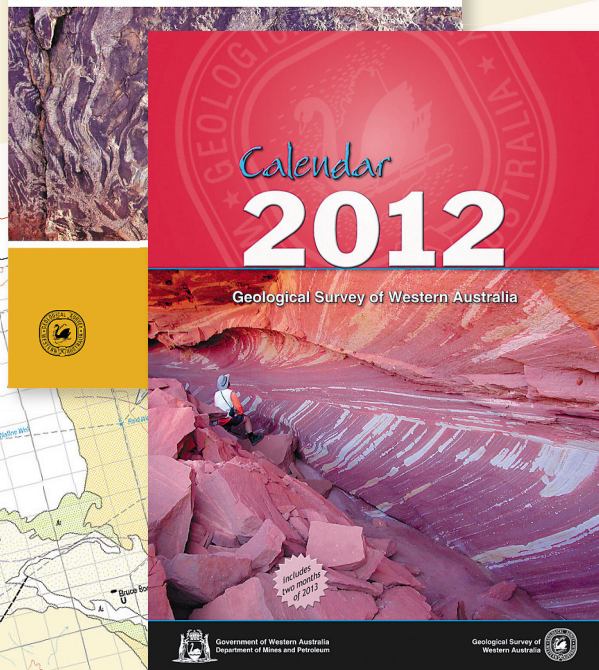
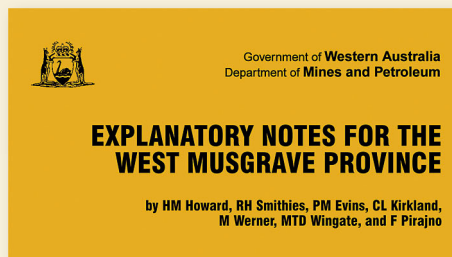
by TJ Ivanic

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Geology and Petroleum Prospectivity of State Acreage Release Area L11-5, Canning Basin, Western Australia

Geology and Petroleum Prospectivity of State Acreage Release Areas T11-3/L11-6 and L11-7, Northern Carnarvon Basin, Western Australia



Almost all printed publications are now also available free as PDF files on our website at <http://www.dmp.wa.gov.au/GSWApublications>. Further details of geological publications and maps produced by the Geological Survey of Western Australia can be obtained at <http://www.dmp.wa.gov.au/GSWA>.

Hardcopy publications including products on CD, DVD, and USB are available from the Information Centre, First Floor, Mineral House, 100 Plain St, East Perth, WA 6004, AUSTRALIA Phone: +61 8 9222 3459; Fax: +61 8 9222 3444 or can be purchased online from the bookshop at <http://www.dmp.wa.gov.au/ebookshop>.