

## **LEME Information Dump**

April 2006 report to LEMERs

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### **CHIEF EXECUTIVE OFFICER REPORT**

#### **STEVE ROGERS**

My major activity this month was the Annual Executive Project Reviews. I was highly impressed with the presentations given at all three nodes, especially the brief student presentations – it's not easy to summarise years of work in five minutes. Congratulations to all involved and thanks to the Assistant Directors for organising the program. We are now moving full bore into developing Project Summaries and the Budget for next year. Please get your documentation to your Program Leader in a timely fashion. The deadline at Head Office is 21<sup>st</sup> April. All proposals must come via your Program Leader.

Two major highlights this month have been release of LEME OFR 196 - *Atlas of Regolith Materials of the Northern Territory* and the accompanying Regolith Map of the Northern Territory, and the first sponsors meeting of the AMIRA P778 project 'Predictive Geochemistry in Areas of Transported Cover'. I would like to personally congratulate the LEMERs involved in both these high profile activities. I attended both the release of the Map/Atlas and the AMIRA meeting, and was most impressed by the positive response from industry about the work we are delivering.

Finally, a reminder for those of you that have not registered for the LEME Regolith Symposium in November: 'WE KNOW WHO YOU ARE!!'. I won't mention names, but members of the Executive are on our list! Please, all of you make the effort to attend. This will be the only time we can bring the whole of LEME together in one spot.

Have a great Easter.

Steve

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### **PROGRAM 1 – REGOLITH GEOSCIENCE**

#### **LISA WORRALL**

##### **Highlights**

- NT Regolith Map and Atlas released as public documents at AGES Alice Springs (28<sup>th</sup> - 29<sup>th</sup> March, 2006).
- Radio interviews conducted for ABC Country Hour program (CRC LEME CEO and NTGS Director interviewed at AGES Alice Springs (29<sup>th</sup> March, 2006).

- NT Ministerial press release prepared for Monday 3<sup>rd</sup> April 2006 about the NT Regolith Project products.
- Megan Lech, Adrian Fisher and Karen Hulme have embarked on the first major field trip for the Thomson Orogen Project. The trio left on March 27<sup>th</sup> and returned on April 13<sup>th</sup>. They visited at least 80 sites across the region in order to sample overbank deposits and vegetation for geochemical analysis. The overbank samples will be subject to on site NITON (portable XRF) analysis. The analytical data will be used to generate baseline geochemical maps.
- Martin Smith submitted his PhD thesis entitled 'Towards a geochronology of long term landscape evolution in northwestern NSW.'

### **New business**

- Northern Territory Regolith: A regolith workshop will be held for *CAMECO Australia P/L* (a Darwin based uranium exploration company) between the 9<sup>th</sup> -10<sup>th</sup> May. A Letter of Agreement (LOA) is being prepared.
- Central Gawler: *Minotaur Exploration Ltd* is to provide operational support for student vegetation sampling over the Tunkillia gold prospect under the supervision of Steve Hill.
- Geophysical Signatures of the Regolith: Discussions have taken place between University of Adelaide and DWLBC about a possible post-doc position and contract research on using geophysics to map fluids in fractured rock.

### **Discussions with outside agencies**

- Tanami: Lisa Worrall and other project staff are engaged in ongoing interaction with *Tanami Gold NL* and *Newmont Australia*. A project meeting involving *Barrick Gold*, *Newmont Australia*, *Tanami Gold*, *GSWA* and *NTGS* was held in Perth on the 7<sup>th</sup> of March.
- Tanami: Discussions are underway with NT and WA Water Resources regarding the terms of engagement with the Tanami Project.
- Central Gawler: Discussions held with *Adelaide Resources* regarding their response to the draft regolith map and access to their RC and RAB drill chips.
- Central Gawler: Discussions held with *Minotaur Exploration Ltd* regarding vegetation sampling at Tunkillia.

- Northern Territory Regolith: Discussions held with *NTGS* senior staff about the options for further collaboration in the NT.
- Thomson Orogen: Liaison with *MMI Technologies* regarding the best sampling techniques required for their samples.
- Eucla Margins: Project staff engaged in ongoing discussions with *Iluka Resources*. A project meeting was held in Adelaide on the 13<sup>th</sup> of March.
- Physiographic regions: Discussions with *ACLEP* regarding funding of Project activities next financial year.
- Physiographic regions: Colin Pain attended the annual meeting of the *National Committee on Soil and Terrain* (used to be the Working Group on Land Resource Assessment) in Hobart. The Committee reaffirmed the importance of regolith as a fundamental data layer in ASRIS, and stressed the importance of a national regolith map and classification. A list of the committee membership for the client database can be provided if appropriate.

### **Exciting new science**

Much of the exciting new science outcomes are subject to confidential agreements.

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## **PROGRAM 2 - MINERAL EXPLORATION IN AREAS OF COVER**

### **RAVI ANAND**

#### **Highlights**

- An interim report on results from the SW Yilgarn Craton was completed and went on open file on 7<sup>th</sup> March (Open File Report 201). Within two days, more than 30 copies of the report and laterite geochemical database were sold to major and small exploration companies, consultants and government agencies.
- A media story about the SW Yilgarn Craton Laterite Geochemical Database appeared in MiningNews.net on 28 February which generated significant interest.
- Following the Synchrotron visit to Chicago in November, Rob Hough again with Chris Ryan, have been successful in attracting funding from the Australian Synchrotron Research Program for a further experiment in March, despite a large number of proposals submitted to use the same beamline. This time they have mapped the *in-situ* trace element distribution of selected vegetation samples.

- Alunite samples from the Poona deposit transported clays were collected to determine if Cu is contained within the alunite crystal structure. If so, then anomalous Cu was formed at 2.1Ma (alunite date) during clay sedimentation and therefore unlikely to have been transported by capillary mechanism.
- David Gray and Ryan Noble undertook a one-week field trip to Honeymoon Well to collect groundwater samples.
- Mehrooz Aspandiar and Siriporn Soongpankhao (Curtin PhD student) went on a day field trip with *Teck Cominco* geologists to a site north east of Meekatharra. The objective was a scoping study to select sites for a metal transfer mechanisms project.

### **New business**

- The CRC LEME Hychips Logger has been deployed at the St Ives mine site near Kambalda for the last three weeks, and more than 45kms of core have been logged. This forms part of a collaborative effort between CRC LEME and CSIRO's Discovery Technology Theme to develop commercial opportunities for spectral mineralogy, through the deployment of a spectral logging facility in the exploration workflow. Income from the trial will be used to further develop software CRC LEME regards as critical for the effective application of spectral mineralogy in exploration through the regolith.
- CRC LEME is collaborating with CSIRO on a trail to further developing commercial opportunities for the use of its Hychips Facility in the Eastern Goldfields. This forms part of a broader strategy to encourage the wider use of spectral mineralogy in exploration by developing a knowledgeable and aware exploration community.

### **Discussions with outside agencies**

- The Geological Survey of Western Australia has agreed to provide an additional \$45k for helicopter-based sampling in the NW quadrant of the Yilgarn Craton to cover areas that are inaccessible by vehicle.

### **Exciting new science**

- PIXI microprobe has revealed very high concentrations of Zn and Cu in Mulga phyllodes and branches growing in tailings dam.
- Further advances have been made in the development of unmixing algorithms for rapidly determining the relative abundance of regolith minerals in samples collected from chips, core or in the field. A critical part of the work has been the identification of procedures for effectively removing the background from reflectance spectra. The approach will

be tested in the identification of kaolinite and mica abundances at the base of the regolith profile in areas where this may help vectoring.

Significant differences have been noted in the application of certain algorithms and spectral indices for regolith material discrimination when using chips vs pulps. For example, pulping results in an overestimate of halloysite vs kaolinite and has significant bearing on interpretation of transported/residual boundary. The results will influence recommendations on sampling/measurement strategies for the commercial application of Hylogging, particularly when dealing with regolith materials.

- Plotting and interpretation of the Rose Dam (Freddo) data has revealed some spectacular anomalies in soil and litter in several metals over mineralisation buried below 30m of transported overburden. Mechanisms in forming this anomaly are not, at this stage, fully understood.

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## **PROGRAM 3 – ENVIRONMENTAL APPLICATIONS OF REGOLITH**

### **STEVE ROGERS**

#### **Highlights**

- The work at the Loveday Salt Disposal Basin Restoration Project in the Riverland continues to provide a major insight into geochemical issues associated with the restoration of sulfidic river sediments. Excellent collaborative activities with DWLBC continued.
- Rob Fitzpatrick organised a workshop in Perth dealing with 'Environmental Forensics' (8-9<sup>th</sup> April) highlighting many of the advances in mineralogy and geochemistry developed in CRC LEME. The workshop was attended by delegates from the UK, New Zealand and the US.

#### **New Business**

- We have been informed that the Avon Catchment Council project 'Treatment of Acid Drain waters' with the WA Department of Water has been approved, contract negotiations and project planning are on-going.

#### **Discussions with outside agencies**

- Steve Rogers and Sebastien Lamontagne will be meeting with DWLBC to discuss continuing monitoring activities at Loveday.
- Steve Rogers met with the WA Acid Drainage Phase II team in WA to discuss project planning and work focus for 06-07.

## **Exciting new science**

- Initial results of a survey of natural wetlands and playas in the WA wheatbelt (Acid Drainage geochemistry Phase II) indicates that a greater number than originally thought are naturally acidic (pH3-4). In addition, those that are alkaline generally have low total alkalinity and hence a low acid buffering capacity, thus limiting the potential to use these environments to 'buffer' acid drainage waters.

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## **PROGRAM 4 – SALINITY MAPPING AND HAZARD ASSESSMENT**

### **KEN LAWRIE**

#### **New Business**

Work has continued to develop the new project proposals identified in the February Report:

- Formally requested to develop specifications for a survey and associated follow-up science plan for the Sunraysia area in Victoria by the Goulburn-Broken Catchment Management Authority in collaboration with Mallee and North Central CMAs.
- Formally requested to develop contract for GFS+ work in NSW by Central West CMA.
- Developing science plan for a Beaufort palaeochannel study with AgWA and other catchment partners.

#### **Newly identified externally co-funded projects/sub-projects:**

- CRC LEME has agreed to enter into discussions with BRS to develop a small project in Angas Bremer Plains, and for a more substantive project with BRS and GA in Victoria.
- Invited to develop a project proposal for work in the Avon Catchment in WA. This project would seek to better calibrate salinity risk maps, and assess acid drainage potential. The project would link Program 3 and Program 4 project science and outcomes. Potential investors will attend a meeting in Perth on 3<sup>rd</sup> May to discuss this possible project.

Salinity Dynamics:

- A scoping study will be carried to look at the use of water and salinity sensors to monitor seawater-estuarine groundwater intrusion. The project will be carried out just after Easter in the Pioneer Valley and will be funded in part by QDNRMW, and in collaboration with University of Queensland, will look at the effects of seasonal fresh water flushing on a salinised environment.
- Groundwater and soil profile sampling, including pore fluid determinations, will be carried out with the Fitzroy Basin Association (FBA) during the next few months. This links into the study of salinity dynamics in a dry tropics zone, and has additional funding from the FBA.

### **Discussions with outside agencies**

- Discussions to develop new project proposals have been held with BRS, AgWA, CMAs and State agencies in NSW, SA, WA, Qld and Victoria, as well as the Goulburn-Murray Water, the Queensland Murray Darling Committee Inc and the University of Queensland.
- Discussions are continuing with CRC Salinity to develop a joint project proposal.

### **Exciting new science**

- In the Chowilla-SE Murray Floodplains project, a correspondence between the spatial ecophysiological response of trees on the floodplain and patterns of ground conductivity has been observed in HEM data across the Bookpurnong 'Living Murray' pilot site. The results suggest that high resolution HEM data could be used to map and monitor change in groundwater condition across the Floodplains of the River Murray.
- In the Corangamite project, Radiometric K and Th responses over Cainozoic basalts were not found to correlate well with the degree of weathering as determined from field observation and surface roughness from the DEM. However, the Th/K ratio shows a moderately good positive correlation ( $r^2 = 0.75$ ).
- In the Salinity Dynamics Project, revised salt output/input ratios for catchments of the Fitzroy Basin, based on accession data curves developed by Richard Cresswell, suggest minimal disruption to most catchment salt balances, in contrast to suggestions from surface water modelling and expectations from the amount of clearing being undertaken.

### **Significant delays, problems**

- Most projects are on track with milestones, outputs. Delays continuing in Salinity Dynamics projects due to problems with drilling rigs, and the lack thereof.

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## **PROGRAM 5 – EDUCATION AND TRAINING**

### **STEVE HILL**

#### **New business**

- The CRC LEME Project Reviews were held in Adelaide, Canberra and Perth between 14<sup>th</sup>-22<sup>th</sup> March. This year's review included short presentations from CRC LEME PhD and Honours students, as well as the Education and Training Program projects (MTEC courses and Virtual Regolith Worlds).
- The CRC LEME Executive and Board Meetings were held in Canberra on 8<sup>th</sup>-9<sup>th</sup> March. Steve Hill presented an overview of E&T Program objectives and associated activities.
- The MCA/MTEC shortcourse (Regolith Geology and Geochemistry) ran successfully at Wilsons Promontory and Phillip Island, Victoria. Staff included Mehrooz Aspandiar, Steve Hill and Ian Roach. 12 students attended including nine Honours students from MTEC partner universities (ANU, Melbourne, UTas) and three PhD students from Adelaide. In this, the third time the course has run, curriculum has been considerably tightened, lectures are given largely in-the-field and students spend most of their time out-doors. As a consequence, they are learning more and are much happier.

#### **ANU**

- Martin Smith (PhD student and LEME scholar at RSES) submitted his thesis.
- Nicole Mikkelson and Fern Beavis (LEME Hons, ANU, 2005) started PhD projects with supervisors David Ellis and Sara Beavis.
- Lisa Bambic, Cynthja Bolton (scholar), Andrew Higgins (scholar), Simeon Hui, Nyemo Mhogolo, Patrick Moody (part-time scholar) and Jason Raapaana (scholar) started Honours.

#### **Adelaide University**

- Michael Neimanis has commenced his PhD project. His research topic is the plant biogeochemistry of uranium mineralisation.
- The Geology and Geophysics discipline staff retreat was held at Port Elliot between the 31<sup>th</sup> March and 1<sup>th</sup> April.
- Jessie Davey and David Haberlah have commenced their PhDs.



- Layla Tucker and David McAvaney have commenced their Honours projects.

## **CUT**

- Four Honours scholarship applicants were received for Curtin University, all from Department of Exploration Geophysics.

The applicants are:

- Russel Eade  
Topic: *Investigation into the geophysical signatures of gold bearing epithermal high sulphidation systems and applications to tropical terrains.*  
Supervisor: Paul Wilkes.
- Erik Kristiansen  
Topic: *Geophysical investigations to assist hydrogeological studies and salinity mitigation in selected rural towns in W.A.*  
Supervisor: Paul Wilkes.
- Owen Davis  
Topic: *Detection of uranium bearing stratigraphy beneath cover.*  
Supervisor: Jason Meyers.
- Jacob Smith  
Topic: *Hardrock seismic to image near-vertical structures*  
Supervisor: Anton Kepic.

## **MCA/MTEC courses**

- Preparations for Regolith Mapping and Field Techniques and Regolith Geology Masters Courses, Fowlers Gap were made.

## **2006-7 project proposals**

- At the project review meeting it was decided to change the name of the *Virtual Regolith Worlds* project to more accurately represent the project's new direction. A suggested new name for this project was *Regolith Teaching & Training Materials (Regolith TTM)*.
- E&T pre-project proposals were submitted for: MTEC courses; VRW; and, extra operating budgets for AU students that presently do not receive CRC LEME scholarship funding.

## **Students finishing and taking positions**

- Mark Paine (CUT PhD) is now working with Rio Tinto (based in the Pilbara).
- Sarah Gibbons (AU Hons, 2005) is now working with Newmont Australia, at The Granites in the Tanami, NT.

- Jennifer de Livera (ANU, Hons, 2005) started work with environmental consulting firm, Parsons Brinckerhoff, Adelaide.

### **Discussions with outside agencies**

- Kevin Tuckwell (MCA) met with Steve Hill on 28<sup>th</sup> February to discuss the future of the MTEC program and CRC LEME core party involvement in its upcoming rebid.
- Tony Belpario (*Minotaur Exploration Ltd*) has discussed with Steve Hill the possibility of providing in-kind analytical and field support for Jack Lowrey (AU Hons to commence mid-2006) biogeochemistry Honours project at Tunkillia.

### **Exciting new science**

- Student science outcomes and outputs incorporated into Research Program reports.

### **Future planning**

- MCA courses (combined Regolith Geology and Mineral Exploration Masters Course and Regolith Mapping and Field Techniques Honours Course 3<sup>rd</sup>-14<sup>th</sup> April).
- CRCA conference in Brisbane (May 17-19 2006). Including the CRCA Education & Training workshop.
- CRC LEME 5<sup>th</sup> year review: program data submitted late May; Review 19<sup>th</sup> -20th July (Perth).
- CRC LEME Regolith Symposium, Hahndorf (November 2006).

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## **ASSISTANT DIRECTOR CANBERRA**

### **KEN MCQUEEN**

#### **Highlights**

- A Welcome in the New Year BBQ for old and new members of CRC LEME was held at the Department of Earth and Marine Sciences, ANU, on the evening of the 23<sup>rd</sup> February. About 20 LEMERs attended and apparently enjoyed themselves. Many thanks to students Luke Wallace, Lloyd Isaacson, Vidura Jayaratne, Kevin Kinnison and to Sarah O'Callaghan for running the BBQ, and to Bear for co-ordinating the event.

- A CRC LEME Connection was held on the 23<sup>rd</sup> of February which was well attended.
- Gerry Govett (Official LEME Visitor) visited the Canberra node on the 1<sup>st</sup> March.
- The program for the Canberra reviews was prepared. Thanks to all the Program and Project Leaders for providing input.
- ANU PhD Student Martin Smith submitted his PhD thesis on 1<sup>st</sup> March. Well done Martin.

### Discussions with outside agencies

- On 17<sup>th</sup> February, Ken McQueen represented CRC LEME at the launch of the special issue of the Australian Journal of Mineralogy on Cobar Minerals. Keith Scott has an article in the current issue on secondary minerals from Elura (Endeavour Mine). This was also a good opportunity to meet with a number of industry personnel working in the Cobar and central west region.

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## ASSISTANT DIRECTOR ADELAIDE

### JOHN KEELING

#### Highlights

- Explorers Conference, Adelaide, December 2005. With the upsurge in palaeochannel uranium exploration in SA, company presentations referenced Baohong Hou's palaeodrainage distribution and cross sections in five of 19 presentations. *Southern Gold Ltd* (Steve Biggins, Managing Director), *InterMet Resources* (Gary Ferris, Managing Director), *Monax Mining Ltd* (Mike Schwarz, Managing Director), *Minotaur Exploration Ltd* (Tony Belperio, Chief Geologist), *Stellar Resources Ltd* (Chris Anderson, Executive Director). *Iluka's* Eucla Basin heavy minerals presentation was also a highlight and this discovery was aided directly by Hou's stratigraphic revisions and heavy mineral accumulation models.
- John Keeling attended the CRC LEME Board meeting in Canberra on 9<sup>th</sup> March as an observer representing Paul Heithersay, PIRSA, who was in Canada attending the Prospectors and Developers Congress. Used the opportunity to discuss Curnamona Minex progress with Dirk Kirste and deliver data on a new project proposal on asbestos in soil to Tony Eggleton.
- Exploration Through Cover Committee meeting – members Andreas Schmidt-Mumm (CRC LEME/AU, Kevin Wills (Flinders Diamonds),

John Keeling (CRC LEME/PIRSA), David Giles (AU). Date set for next one day symposium on 23<sup>rd</sup> June 2006 at Adelaide University.

- pmd\**CRC* – workshop held on 23<sup>rd</sup> February about fluid flow and geochemical modelling Central Gawler Gold District. The focus was on reverse engineering of fluid flow at Tarcoola and Tunkillia gold deposits. New ideas presented by Warren Potma on modelling fluid flow in the Gawler Craton post extrusion of the Gawler Range Volcanics and Hiltaba Suite granite emplacement. These have direct bearing on application of the HyMap and HyLogger to map mineral alteration and its signature in weathered bedrock.
- Iron Oxide-Copper-Gold (IOCG) deposits on the Gawler Craton workshop held on 24<sup>th</sup> February GA/PIRSA which focused on regional settings and exploration characteristics. Details of the presentations to be posted on the GA website, Gawler Craton Project.
- Report on the mineralogy of a natural occurrence of asbestos in the Barossa Valley determined for PIRSA Mining Regulations and Rehabilitation was prepared with analyses by CSIRO Land and Water and Adelaide Microscopy (AU). Project pre-proposal prepared for consideration under Program 3.
- CRC LEME project reviews held in Adelaide on 14<sup>th</sup> -15<sup>th</sup> March. Thanks to all those who participated at the three venues. The standard of the PhD student presentations was a particular highlight. The powerpoint presentations have been compiled and forwarded to HO for future reference.
- John Keeling joined Mark Paine and members of the Eucla Basin project team at *Iluka's* office in Adelaide on 20<sup>th</sup> March for the presentation of the project's 3<sup>rd</sup> quarterly report.
- Report on asbestos mineralogy from old workings near Rowland Flat in the Barossa Valley was prepared in conjunction with Mark Raven and Stuart McClure (CSIRO Land and Water) for PIRSA Mining Regulation and Rehabilitation. The asbestos is unusual, but possibly not rare, and is believed to be highly carcinogenic. Understanding the mineralogy, weathering characteristics and incorporation into soil has been proposed as a new project in Program 3 for 06-07, using facilities and expertise at ANU and CLW. Field site visit was made with Tony Eggleton on 27<sup>th</sup> March.
- Anna Petts and Jess Davey have resurrected fortnightly CRC LEME student and staff meetings in Adelaide at AU. All Adelaide LEMERs are encouraged to attend.

## **Discussions with outside agencies**

- Meeting with CRC CARE (Contamination Assessment and Remediation of the Environment) for discussions and a tour of capabilities. CRC CARE commenced July 2005 with HQ at University of South Australia, Mawson Lakes Campus. Discussions on use of natural and modified regolith materials for the remediation of contaminated sites. Potential uses of electrochemical techniques for soil decontamination.
- John Keeling attended meeting with Rob Fitzpatrick and the members of the Australian Soil Science Society about staging a joint Australian Clay Minerals Society session at the ASSS national soils conference at Adelaide in December 2006. Proposal being drafted. CRC LEME staff participation anticipated.
- Discussions held with Tony Poustie, Dominion Mining Ltd, on the results of the CHIM surveys over the Challenger Gold Mine. Draft paper prepared for Exploration Geophysics was tabled and a copy supplied to *Dominion* for comment.

## **Future activities**

- South Australia Resources and Investment Conference 1-3 May, Hilton Hotel Adelaide. Planning for CRC LEME contributions to be given on day 3 – ‘Unlocking SA’s Mineral Wealth (Technical Forum).’