

CQMRG Newsletter
Issue 36: 03/06
November 2006

Central Queensland Mining Rehabilitation Group Newsletter

Inside This Issue
For Full Details
See Page 2

Goonyella - Riverside
CQMRG Workshop Notes
Page 3

Next CQMRG Workshop
Moranbah North
See Page 36 for Details

Next CQMRG Workshop
Agenda
Page 37

Chairman's Note:

Welcome to the third CQMRG Newsletter for 2006. Christmas is now fast approaching!!

The 2nd CQMRG meeting at BMA's Goonyella-Riverside Mine on 27-28th July 2006 was a very successful event with another strong showing by CQMRG members with again around 45-50 people in attendance. Thanks must go to Tony Peterson, Scott Young and their team at Goonyella-Riverside for volunteering to host the meeting and putting on a great couple of days and the Trivia Night was an entertaining change.

Hopefully everyone has booked their accommodation for the next CQMRG Meeting as we're back up at Moranbah again at Anglo Coal Australia's Moranbah North Mine on 30th Nov and 1st Dec. You should have already received the Notice of the Meeting and the Agenda some time ago (See Upcoming Events Section of the Newsletter for details). Moranbah Mine targets one of the same seams as at Goonyella-Riverside, but as an underground operation rather than as an open cut. This should provide a good contrast of the issues facing these different mining operations.

Looking further ahead past the festive season, our first CQMRG meeting will be at one of Peabody's operations, either North Goonyella or Burton. No date has been decided as yet, but it is likely to be sometime in March 2007. Rio Tinto have volunteered to host the second CQMRG meeting in 2007 at a site and time yet to be finalised. Thank you to Toni Ward from Peabody and Rod Cameron from Rio Tinto for stepping forward and volunteering at the last CQMRG meeting. It's not often happened in recent years, that we actually know where CQMRG is meeting more than one meeting in advance. But those sites that have so far dodged hosting a CQMRG meeting, don't think you have kept "under the radar", remember there's always the 3rd meeting in 2007!

Callide (my site) has embarked on the journey towards progressive rehabilitation sign-off with EPA using Guideline 18 (Rehabilitation Requirements for Mining Projects). As it progresses through early 2007, hopefully, I will be able to get you an update on our experience at the next CQMRG meeting.

With festive and holiday season almost upon us, I would like to thank everyone for their support for CQMRG throughout 2006 and especially to Brenda Berry, without your work behind the scene CQMRG would cease to function. I wish everyone a safe, happy and not too over-indulgent Christmas and New Year.

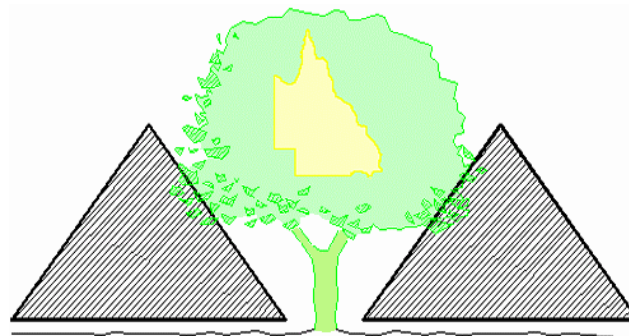
Regards
Brad Cartwright
CQMRG Chairman

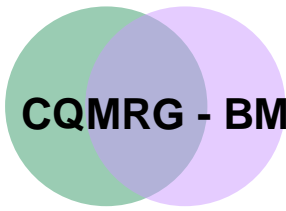
KEEPING THE CENTRAL QUEENSLAND MINING REHABILITATION GROUP IN TOUCH

CO-ORDINATED BY BRENDA BERRY, P.O. BOX 43, MARBURG. QLD 4346
TEL: 07 5464 4595 FAX: 07 5464 4382 MOBILE: 0408 457 896 EMAIL: bbcqmr@gmail.com

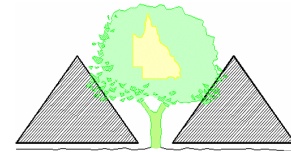

 Inside CQMRG Newsletter Issue No: 36: 3/06 November 2006

		Page
ACARP	Evaluation of Rehabilitation by Stakeholder Panel	13
	Financial Comparison of Waste Disposal Options	14
	Management of Highwalls for Mine Closure	13
	Specification of Overburden for Use as Spoil Cover	13
ACMER	Changed Status	18
	Research Projects	14
CQMRG	Advertising & Submissions	20
	Chairman's Note	1
	Fee Structure	15
	BMA Goonyella -Riverside Workshop	Concept for Isaac River Diversion Attached
		Integrated Water Management System 3
		Remote Telemetry of Enviromental Data 7
		Riverside Rejects Dump Concept Design Attached
		Tailings Dam Management History Attached
		Tailings Management – The Future Attached
		Stage 2 Water Distribution System Attached
	Lest We Forget	20
	Members on the Move and Other Gossip	19
	Merchandise	16
	Moranbah North	Agenda 37
		Details 36
		Directions 40
	Website	12
	2007 CQMRG Membership Form	41
	CQU Internships at a glance	34
	Denley Environmental Consultants	10
	Ecowise	17
	Henderson Geotech	11
	Impending Events	35
	Publications	11
	Queensland Seed Services	15
	SD06:- Operating for Enduring Value Conference	10
	Water in Mining 2006 – Multiple Values of Water Conference Notes	21





CQMRG - BMA Goonyella - Riverside Mine Workshop Notes



Integrated Water Management System

Two risks – One integrated solution

INTEGRATED WATER MANAGEMENT SYSTEM

INTRODUCTION

- **The Problem**
 - Discharge of mine affected water
 - Unsustainable water consumption
- **The Solution**
 - Integrated water management system
 - Capture, extraction and release
 - Efficient storage and distribution
 - Real time monitoring
 - Water management plan
- **Future Improvement**
 - Improved water storage and distribution
 - Further monitoring enhancements
 - Targeted water use efficiency improvements

Discharges to the Isaac River

- Inadequate water management infrastructure
- Unreliable monitoring and measurement
- Uncoordinated site water management
- Extensive runoff from disturbed areas

Unsustainable water consumption

- No monitoring and measurement
- Uncoordinated water management
- No water use efficiency targets
- 6750 ML annual consumption
- 500 L/t coal produced (FY02 and FY03)

Unsustainable water consumption

- Reducing allocations



Water capture, extraction and release

- Direction to single control point - GS4a
- Extraction of water to off stream storage - GS4b
- Controlled release

Water capture, extraction and release

Costs: Capital \$19M Operational \$450k p.a.

Water capture, extraction and release

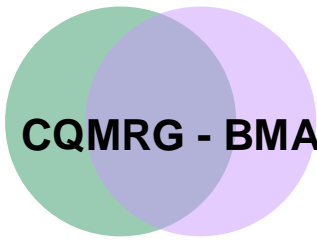
Water capture, extraction and release

Water capture, extraction and release

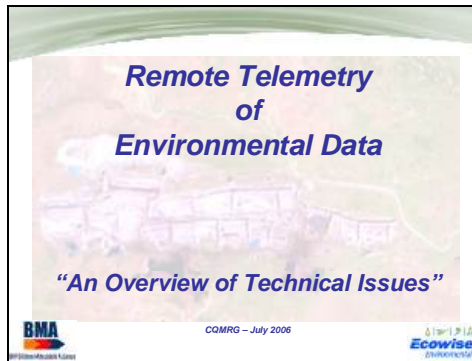
Benefits

- Model indicates an average of 5800ML of water extracted each year
- NPV \$32.7M over 6 year life
- Direct cost savings of approx. \$350k p.a. on maintenance of water trucks
- Potential reduction in financial assurance
- Current realised water extraction of 2000ML in FY06
- Represents a \$6M saving on Burdekin water rates

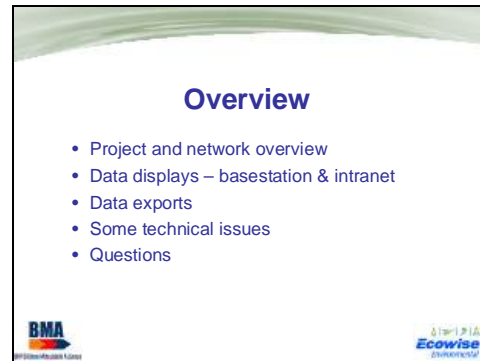




CQMRG - BMA Goonyella - Riverside Mine Workshop Notes Continued



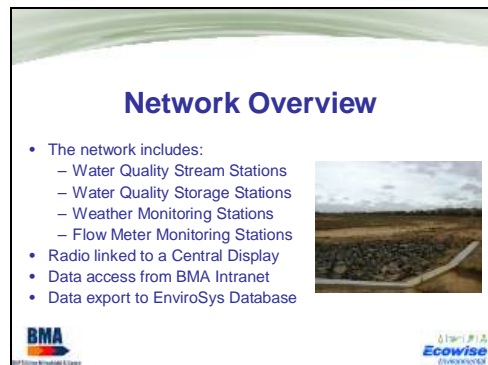
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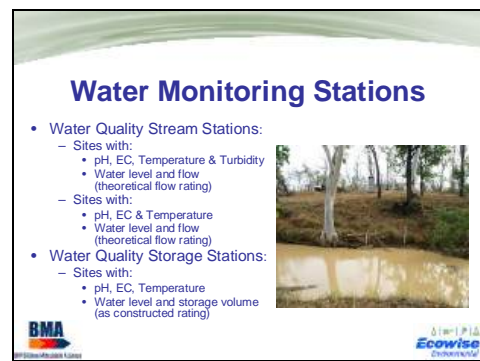
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Slide 5




Slide 6



Weather Monitoring Stations

- Sites with:
 - Wind Speed
 - Wind Direction
 - Temperature
 - Humidity
 - Solar Radiation
 - Rainfall




BMA **EcoWise**

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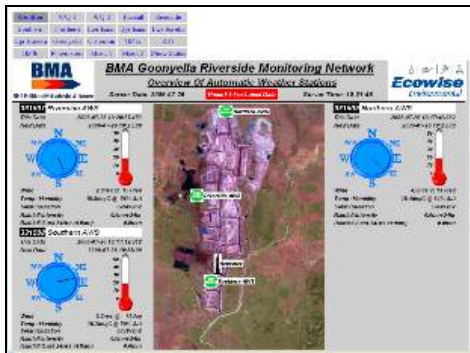
Telemetry Basestation

- Customised display
- Ability to request current data
- Various pages for different needs
- Graphical representation of data
- Calculated data displays
- 7 day displays + current readings
- System maintenance information



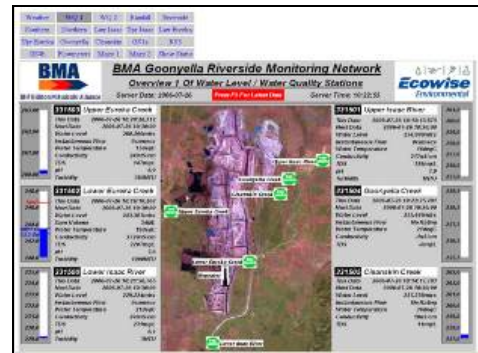
BMA **EcoWise**

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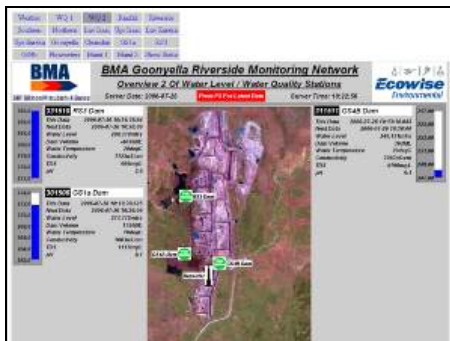
BMA **EcoWise**

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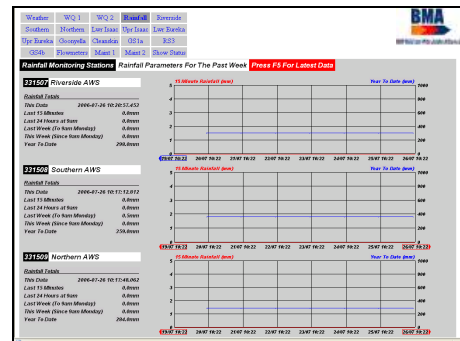
BMA **EcoWise**

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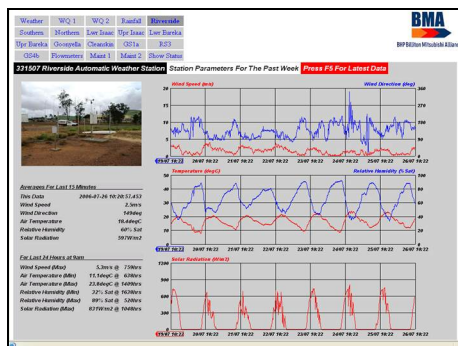
BMA **EcoWise**

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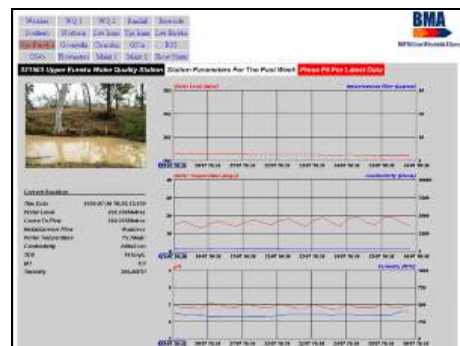
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BMA

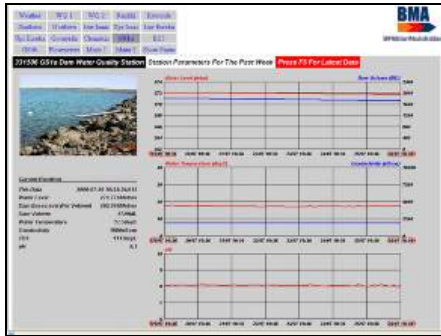
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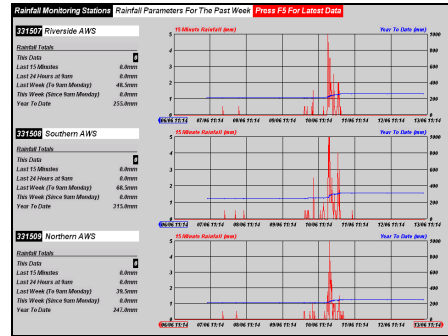
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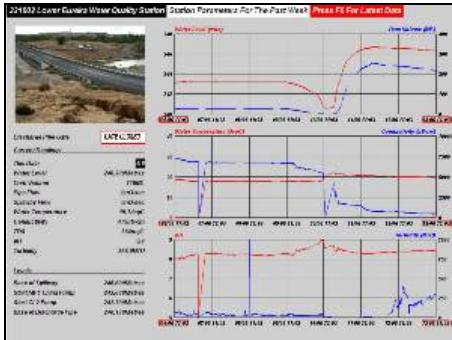




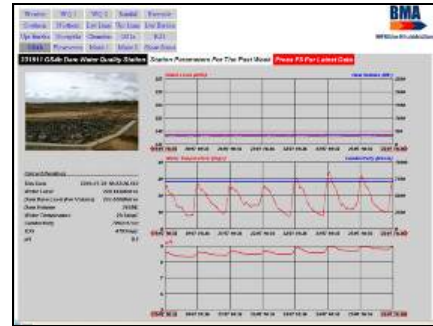
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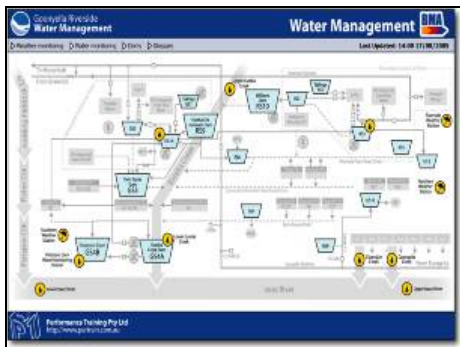
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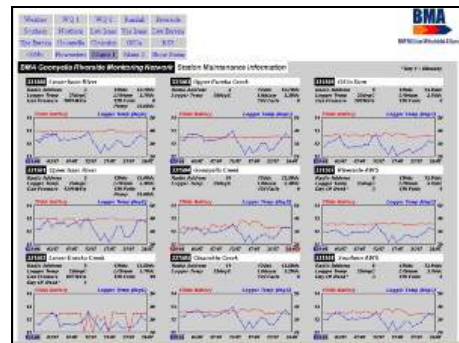
Slide 17



Slide 18





Slide 19



Slide 20

Data Exports to EnviroSys

- Raw data transferred from basestation to Ecwise at 15 minute intervals
- Data transferred to Hydstra
- Data checked for errors (by Hydstra) then exported for uploading
- Validated data (after station servicing) is exported for uploading
- Raw & validated data is stored

Slide 21

Some of Technical Issues

- Maintaining power to the system
- Siltation of monitoring stations
- Low water levels
- Radio frequency interference
- Lightning strikes
- Interfacing to 3rd Party Equipment
- Event commissioning





Slide 22

URS



Slide 23



DENLEY



Environmental
Consultants

DENLEY Environmental Consultants are an environmental consultancy providing services in environmental assessment, management and planning.

We established DENLEY Environmental Consultants in February 2005, recognising and responding to a niche within the current environmental consultancy industry for a company where quality of service, value, integrity and the recognition of our employees as our greatest asset are the leading principles in conducting business.

Core areas of capability:

- EIA & EIS & REF
- Land & coastal management planning
- Land development & regulatory compliance
- Vegetation management

Specialised Fields:

- Biological survey & mapping;
- Geographical Information Systems (GIS);
- Nature and Planning legislation, codes, and policies;
- Pest Management Strategy and planning;
- Revegetation planning, practice and monitoring;
- Threatened Species Conservation Plans;
- Vegetation management, strategy and planning; and
- Visual amenity assessment & impact

CONTACT DETAILS

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Nick Smith: nick@denleyenvironmental.com.au

Administration

Helen Hutchards: helen@denleyenvironmental.com.au

SD06: Operating for Enduring Value Conference was held in Perth 23 – 27 October, 2006. The conference was attended by many delegates from resource companies, community, government and consultants. Papers were presented to cover the ten key International Council on Mining and Metals (ICMM) Sustainable Development Principles that underpinned by 46 elements.

The Plenary Sessions, as always provided much interest and awareness to sustainable development on both Australian and International scale.





henderson geotech

A Member of The MINSERVE Group Pty Limited

Sue Henderson is a geotechnical engineer with nineteen years experience in environmental geomechanics, soil mechanics and site investigation. Her objective is to provide effective technical solutions that also address long term environmental impacts. As an independent consultant, Henderson Geotech can provide personalised service framed within the clients' needs and priorities.

Capabilities include:

- | | |
|-----------------------------------|--|
| • Tailings and rejects management | • Review of environmental liability |
| • Small dam design and inspection | • Environmental management plans |
| • Spoil pile stability analysis | • Borrow searches |
| • Resource waste characterisation | • Geotechnical site investigation |
| • Decommissioning strategies | • Embankment and retaining wall design |

Tel: 07 3399 5020

Fax: 07 3399 5019

shenderson@minserve.com.au

<http://members.ozemail.com.au/~sjhender/>

Publications

Launch of Leading Practice Sustainable Development Booklets

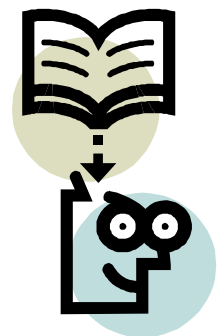
On 25 October 2006, the Department of Industry, Tourism and Resources (DITR) launched the first four handbooks in a series of 14 of the Leading Practice Sustainable Development Program for the Mining Industry. ACMER staff contributed to all four handbooks.

The handbooks cover:

- Community Engagement and Development
- Mine Rehabilitation
- Mine Closure and Completion
- Stewardship

Handbooks on Biodiversity Management, Managing Acid and Metalliferous Drainage, Tailings Management and Working with Indigenous Communities are currently being developed.

For further information visit: <http://www.industry.gov.au/sdmining>.



CQMRG Website

As a lot of you are aware we are still having hassles with sorting out the website and do apologise for all the trouble with it!! As we all know it is 'just there' - up and sort of running sometime. Hopefully you all have been able to access it. And yes we sincerely apologise for the delay in getting it the way we envisage it. There aren't enough hours in the day for any of us involved.

In order to acquire funding to establish and fund a new independent website it was agreed at the CQMRG - Goonyella Riverside Mine Workshop in July that to be a Major Sponsor of the CQMRG Website a one-off fee of \$500 then \$50 per year to be acknowledged as a continuing supporter to keep the website link alive. Minor Contributing Sponsorship of the CQMRG Website a one-off fee of \$200 with a \$25 per year fee to be acknowledged as a continuing supporter to keep the website link alive. If a company sponsors setup but chooses not to continue in subsequent years, they'll still be acknowledge but there won't be a live link anymore.



CQMRG sincerely thank URS and SKM as the first Major Sponsors providing funds to establish a new CQMRG Website. A total of 6 (six) other companies have promised contributions and once these are received we will be able to commence work on the website.

Please bear with us and just remember once the CQMRG Site is fully functioning:

- ❑ You will be able to check your membership details (eventually)!!
- ❑ You will be able to find all of the past newsletters and Brenda won't have to continually resend them!!
- ❑ You will continue to have ready access to Membership application forms for all acquaintances.
- ❑ You will have access to a CQMRG Photo Library. Any old photos will be appreciated.
- ❑ If your company is interested in linking your website to the CQMRG website please discuss with Brad or Brenda. plus Lots more..
- ❑ To do all this we need your help and suggestions or spare time to help out – please contact Brad or Brenda.

Further comments and feedback will be appreciated at the Anglo Coal Moranbah North Workshop in the CQMRG General Business Session as we attempt to finalise our new independent website.





ACARP PROJECTS UPDATE

C14042 Specification of Overburden for Use as Spoil Cover

This project has been investigating what properties make spoil suitable as cover (rock mulch) for other more hostile material, and whether there are attributes of in situ overburden that indicate those properties. The issue has been approached from several directions:

- Literature and database review to establish the desirable spoil properties;
- Inspection, sampling and testing of examples of existing cover spoil at three mines;
- Standard laboratory testing of overburden core from three projects;
- Inspection of old highwalls to compare observed condition with exploration data;
- Development of screening tests for chip and core samples.

All testing is finally completed, and the project is in the write-up stage.

Project Manager: Sue Henderson shenderson@minserve.com.au

C14048 Management of Highwalls for Mine Closure

The aim of this project was to develop and compare various treatment strategies for final highwalls, based on risk management and cost-benefit analyses.

Early in the project, highwalls at ten mines in the Bowen Basin were inspected and five broad modes of failure were identified. Several rehabilitation strategies were proposed to counter these, and associated costs were estimated.

A risk matrix specific to rehabilitation and long-term performance was developed and used in a workshop of selected industry personnel to provide a risk assessment and relative score for each of the strategies. Risk scores and costs were then collated to infer the highest-return strategies for the particular scenario considered.

The final report will have been forwarded to the industry monitor before this newsletter is distributed.

Project Manager: Peter Baker p.baker@bigpond.net.au

C15035 Evaluation of Rehabilitation by Stakeholder Panel

This project aims to establish a process of using a stakeholder-selected panel to evaluate rehabilitation by visual inspection. The approach will be consistent with the EPA's draft Guideline 18 (for progressive rehabilitation), with visual inspection as an indicator.

About a dozen stakeholders attended the initial meeting held at CQU Rockhampton and German Creek Mine (by video-linked). One aim was to have the stakeholders nominate "sub" indicators and success criteria specific to each rehabilitation objective; however this was not completed due to the length and liveliness of discussion. Six stakeholders agreed to serve on the inspection panel that will finish the lists as one of its first tasks.

Communications are presently underway to set dates for two meetings of the inspection panel, firstly to finalise inspection protocols and then to carry out trial inspections. A workshop with government representatives is anticipated after this, to discuss the process and work through various concerns.

A contact list has been set up inform interested parties of the project's progress. The project is based on German Creek Mine as a trial case but comments from other sites are welcomed.

Project Manager: Sue Henderson shenderson@minserve.com.au



ACARP

Australian Coal Association Research Program

ACARP PROJECTS UPDATE CONTINUED

C15063 Financial Comparison of Waste Disposal Options

The aim of this project, which is funded under the ACARP Coal Preparation committee, is to compare costs of five tailings & rejects disposal options for a range of representative scenarios. The five options are”

- Separate disposal;
- Conventional (low density) co-disposal;
- High density co-disposal;
- Tailings dewatered by filter press;
- Tailings treated with high intensity flocculation.

A preliminary Hazard & Opportunity analysis highlighted the residual risk of vehicle accidents in options involving trucking, and the growing risk of water availability on production. Cost models from previous jobs are currently being adapted and extended to allow more accurate modelling of capital and operating costs (including rehabilitation). Several mines have been approached for information on the resource and cost profiles of their CHPP waste disposal systems – if any others are prepared to offer their data, or even their experience of particular systems, please contact the researchers.

Project Manager: Eugene Gallagher gcs@minserve.com.au

Environmental contact: Sue Henderson shenderson@minserve.com.au



ACMER Research Projects

Dr Owen Nichols, former ACMER Research Program Manager, will continue to liaise with sponsor companies and researchers involved in the four research projects listed below (follow the links for further information). The financial management of the projects will be undertaken by the Centre for Mined Land Rehabilitation (CMLR).

- A Risk Assessment of the Effects of Cyanide-Bearing Tailings Solutions on Wildlife
- Designing Effective Store-release Covers for the Long-Term Containment of Mine Waste
 - The Role of Vegetation (Stage 2)
- Optimising the Collection, Storage and Germination of Native Plant Species
- Standard Protocols for the Long-Term Prediction and Monitoring of Mine Water Quality

For details of current and past projects visit: <http://www.acmer.uq.edu.au/research/programs.html>



CQMRG FEE STRUCTURE

CQMRG Members present at the final CQMRG Meeting for 2001 at Moura Coal Mine on November 16, 2001 agreed that the format for CQMRG Membership should be changed. This was the first change and increase in dues since they were first implemented at the Blair Athol Coal Meeting on November 15, 1996.



It was agreed to proceed with:

Individual Membership - \$30 per calendar year, receives newsletters and attends seminars at \$20 per seminar.

Associate Membership - Other people in the same organisation **at the same site or office** - \$10 per calendar year, attend seminars at \$20 per seminar.

Sponsor Membership - \$60 per year for an organisation, for that they can nominate 2 individual members, with full privileges and their support would be acknowledged in each newsletter. They can nominate additional Associate Members at \$10 per calendar year.

Non-Member or non-financial Member - is welcome to attend seminars at a fee of \$30 per seminar, does not receive the newsletter

To those that have paid their Membership for 2006 we thank you for your efficiency. The CQMRG Membership Form for 2007 is on the back page of this CQMRG Newsletter.

If you have any queries please do not hesitate to contact Brad Cartwright, CQMRG Chairman or Brenda Berry, CQMRG Co-ordinator



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- ✓ Central Queensland specialists, 20 years experience
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- ✓ Seed coating and treatment
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To discuss your rehabilitation program or to arrange a site meeting please contact:

Craig McLean

craigm@qldseed.com

Ph: 07 4159 4730

Mobile 0429 485 494 www.qldseed.com

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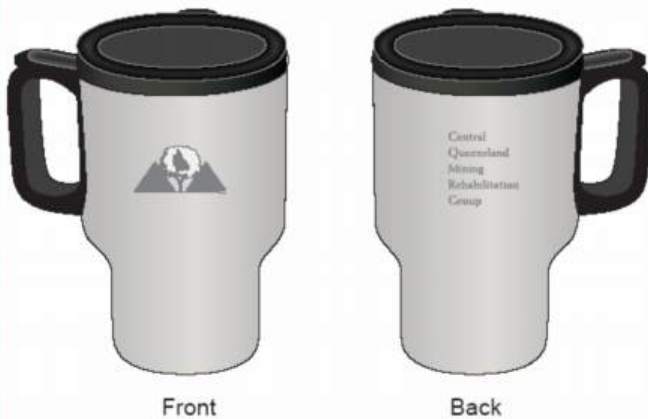


CQMRG Merchandise

No office should be without one!

Stainless Steel Thermo Mug

Only \$15



Only a Few Left

- ★ Stylish stainless steel mug with engraved CQMRG logo
 - ★ Large capacity but still fits most cars
- ★ Double wall construction for great thermal performance
 - ★ Slide across drink seal

Must have for ALL CQMRG Members, Associates and Travelers!

CQMRG STICKERS

In 1995 as a means of promoting the CQMRG and our industry CQMRG produced collectable Stickers. There are still a limited number available.

Why not purchase them for \$4 for a pack of 5?

**Get YOUR MUG and stickers at the
CQMRG – Anglo Coal Moranbah North Workshop**





The quality and quantity of water on mine sites is a critical issue for environmental managers. With a diversity of sites and monitoring requirements, managers are required to source good quality information about their water to make informed decisions to meet operational and regulatory requirements. Quality data allows environmental managers to make cost-effective decisions saving both time and money. The increased focus on ecological health places added demands on environmental managers to understand their local ecosystem through targeted, well focused monitoring and research.

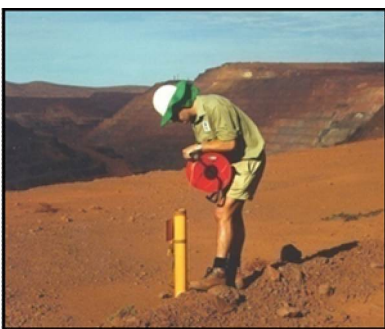
Our Key Environmental Disciplines Include :

- [Aquatic Ecology and Biomonitoring](#)
- Stream, dam & discharge water monitoring & weather stations
- [Algal identification, enumeration and management](#)
- Data delivery contracts
- Data collection, management and reporting
- [Dust & noise monitoring and management](#)
- Sample collection and in-situ monitoring
- [Water and sediment quality](#)
- Instrumentation services including repairs, sales & rental
- [Contract environmental personnel](#)
- Reporting and communication



Benefits of Ecowise

[Ecowise](#) has extensive experience in the design, operation, data management & reporting of environmental programs for environmental management of mining operations in Australia and overseas. Ecowise does not just sell equipment but delivers quality data by working with our clients to develop effective maintenance programs that ensure the monitoring system continues to operate as designed. The use of telemetry (radio, GSM & satellite) and specialised data processing packages enables Ecowise to deliver quality assured data to our client's desktop in a format that meets their operational & regulatory requirements. The design of monitoring programmes and systems to meet the specific site conditions and data requirements further strengthens the quality of the information provided.



[With](#) a team of experienced field staff located in key mining areas (Pilbara WA, Bowen Basin QLD, and Hunter Valley NSW) Ecowise has hands on experience in the operation of monitoring systems, data management and reporting to ensure our clients throughout Australia and overseas have access to proven technology and technical support. Our technical support group, including instrumentation, telemetry and software technicians, provide additional backup to the regional offices by testing equipment and working with a diverse range of suppliers to deliver quality monitoring instrumentation suitable for remote field application. Ecowise has a commitment to working with our clients to ensure that they have data that meets their needs and their monitoring programs are robust and reliable. Ecowise aims to continuously improve the quality and delivery of the data and embrace new technology (once proven).

Contact us on:

Brisbane Ph: 3854 0233 / Gladstone Ph: 4976 9666 / Rockhampton Ph: 4921 2599 / Mackay Ph: 4944 0177

www.ecowise.com.au or email: qld@ecowise.com.au





Changed Status of ACMER

As previously advised by the ACMER Board, as a consequence of a change in funding as of 30 June 2006, ACMER's activities, key staff and other assets and brand name have been transferred to the Sustainable Minerals Institute (SMI) at the University of Queensland. This action will ensure continuity of the key environmental technology transfer activities and of existing ACMER research projects.

Since the announcement of the changed circumstances relating to ACMER, the organisation has been gratified by the large number of messages of support received from industry, government, consultants, academics and NGOs within Australia and overseas. This support augers well for the future of ACMER in its new home.

In welcoming ACMER staff, who transferred across to SMI on 5 September 2006, Professor Don McKee (Director of SMI) affirmed his support for ACMER's Technology Transfer Program and indicated that ACMER, as a unit within SMI, would work with other Centres within the Institute to deliver relevant training and educational courses to the minerals industry.

As the retiring Executive Director, I would like to take this opportunity to thank the members of the ACMER Board especially the Chairman, Dr Ian Gould, for their past guidance and support and particularly over the past few months of transition.

Emer Prof L Clive Bell

Please note New ACMER Contact Details:

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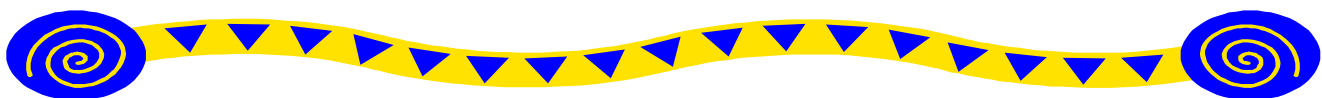
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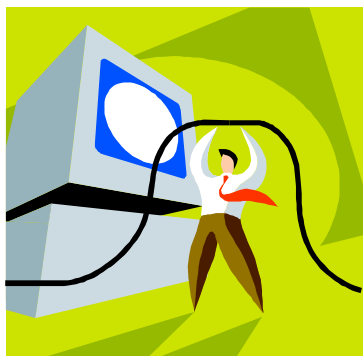


Members on the Move and other gossip....

- **Sean Milfull** joined Oaky Creek Coal in September as the Environment & Community Manager. He previously worked 2 years for Gemco at Groote Eylandt and prior to that at BMA Goonyella Riverside Mine. We welcome Sean back to Central Queensland and CQMRG.
- **Cameron Pocknee** has sailed off into the sunset.
- **Darren Springer** has left EPA.
- **Sara Cooke** has moved on from Curragh to CCI in Emerald where she is managing the office and developing their Enviro business.
- **Emer Prof Clive Bell**, Executive Director of ACMER, has retired but will still be involved in a limited capacity in ACMER's activities.
- **Carol Stirk**, from ACMER, is now Personal Assistant to Mark Berry, Group Leader for Mining Geoscience at CSIRO's Division of Exploration and Mining at QCAT, Pullenvale.
- **Greg Parrish**, former Sustainable Development Research Program Coordinator ACMER, has formed a consulting company and, at the request of Xstrata, has facilitated an in-house workshop for the company on social dimensions of mine closure and is involved in stakeholder engagement activities. He has also been engaged as a facilitator in NSW on catchment management issues.
- **Keith Eigeland**, former part-time Research Program Manager ACMER, has been appointed to the full-time position of Water Conservation Manager with the Queensland Public Service.
- **Dr Owen Nichols**, part-time Research Program Manager ACMER, has rapidly picked up additional consulting contracts with mining companies, and is also assisting in the management of the four remaining ACMER Research Projects.
- **Jim Grayson**, part-time Business Manager ACMER, has retired.



Advertising & Submissions



With a dedicated audience, advertising in the CQMRG newsletter is certainly the preferable place to advertise. We thank those that continue to contribute and from feedback they receive believe it to be worthwhile.

As a comparison a 6.5 cm x 8 cm ad in a journal costs \$200.00 plus and that isn't a target market. One A4 page is \$100, and ½ an A4 page is \$50.

Thanks to those that have contributed 'electronically' but please be reminded that submissions are to follow the following guidelines:

- Text is to be submitted in Word 6.0 or later. Definitely No PDF or PowerPoint Presentations – they can't be simply inserted into a Word document.
- Images to be reduced to 256 colours and 300 - 600 DPI resolutions (attempt to keep individual images below 70KB).
- Articles are not to be commercially orientated (any article too commercially orientated will be considered as an advertisement)

Advertising submissions are to follow the same guidelines for text and images.

SORRY but we have to keep reminding you because it is still happening - we are still receiving monstrous crazy formatted articles that need lots of editing.

IMPORTANT NOTE: Unless Brenda has received advice **by January 31, 2007** to withdraw or change your advertisement the previous advertisement will be run and invoiced accordingly. Submissions of articles and advertisements can be made directly by email to Brenda bbcqmrq@gil.com.au or with electronic images on disk or CD direct to Brenda (Definitely NO BUGS PLEASE!) with payment upon receipt of invoice to CQMRG, PO Box 43, Marburg. QLD 4346.

Lest we forget:

This is our 36th CQMRG Newsletter but it always continues to be a battle to collect articles and information. Please don't wait until you are reminded that there is a newsletter is on its way! **DO IT NOW.**

We encourage you as CQMRG Members to be part of this publication and welcome your ideas, views and concerns. Please forward your contribution to Brenda on email: bbcqmrq@gil.com.au.



Once again Sincere Thanks:

to the 'faithfully dedicated' CQMRG members that support each and every meeting, help our group to continue and do lots of behind the scene work.



Water in Mining 2006

Multiple Values of Water

Brisbane, 14-16 November 2006

Conference Notes by Associate Professor David J Williams
The University of Queensland
Email: D.Williams@uq.edu.au

Official Opening by Craig Wallace MP, Minister for Natural Resources & Water:

- Mining occupies 0.06% of Queensland's land mass, consumes < 5% of the state's water, and employs 1 in 14 Queenslanders, to produce > 10% of the state's revenue.
- The Burdekin to Moranbah pipeline will supply 16,800 MLpa to the Bowen Basin Coalfields, with the potential to increase this by a further 6,000 MLpa.
- We must find a way to use the poor quality water produced in the processing of coal seam gas.
- BMA at Goonyella Riverside is researching the use of a dust suppressant that will potentially save 90% of the water used for haul road watering for dust suppression.

SESSION 1 – NATIONAL POLICY – KEYNOTE PRESENTATIONS

David Trebeck on Implications of the National Water Initiative for the Australian Mining Industry:

- The National Water Commission and National Water Initiative (NWI) administers a \$ 1.8 billion fund, including \$ 490 million funding announced under the Water Smart Program (out of total expenditure of \$ 1.3 billion).
- The ongoing and expanding drought is accelerating the implementation of the NWI.
- Water trading in the southern Murray-Darling Basin will commence next year.
- Water is critically political.
- Water is a normal business input.
- The NWI will provide greater certainty of water supply to the mining industry, promoting planning, trading (to liberate water previously tied to the land), accounting, and pricing (transparency and efficiency) reform.
- Mining is not part of many NWI projects, however, coal seam methane produced water will be treated to augment the supply for Dalby.
- Desalination at Wyhalla is being investigated to supply the Olympic Dam expansion and other water users.
- Mining uses about 3% of extracted water nationally, but can be the dominant user regionally or locally.
- Water extraction must be sustainable.
- Water recycling and reuse must be optimised, and be cost-effective, with potential for its resale.
- Cadia Mine draws water from a river and a purpose-built dam, recycles effluent from Orange, recovers water from tailings, and captures site water and seepage.
- Future mining and mining expansion brings water challenges.

Hon Malcolm Turnbull MP on Water Policy:

- Malcolm Turnbull brings passion to the NWI.
- The success of the Australian mining industry is a tribute to ingenuity and dedication, not down to luck.
- Water is in short supply almost everywhere in Australia, apart from the NT, due to a reduction in rainfall over southern Australia.
- Inflows into the Murray River this year are < 10% of the long-term average.
- The Murray River is very flat, dropping only about 200 m over its length from the Hume Weir to its mouth.
- Options for maximising the water available from the Murray River being considered include enforced episodal flows (via the storage of water and deliberate reduction in the river level) to reduce exposure to evaporation, and a weir at Wellington to secure supply to Adelaide.
- The NWI gives Australia a blueprint for water reform.
- Coal seam methane produced water will be treated by reverse osmosis, at a cost of \$ 10 million, to reduce its salinity from over 5,000 mg/l salt, adding 2 GLpa to Dalby's supply.
- Desalination at Wyhalla is being investigated to supply the Olympic Dam expansion and other water users a total of 66 GLpa.
- Water is not limitless and will get more scarce.
- In particular, groundwater reserves must be preserved.
- Groundwater is mobile, and there is a connection between ground and surface waters (the rivers supplying the groundwater and the groundwater feeding surface waters).



SESSION 2 – MINE CASE STUDIES

Catherine Cooper on Improving Raw Water Use Efficiency at Endeavour Mine, Cobar:

- Endeavour is a 23-year old underground lead, zinc and silver mine, experiencing 390 mmpa average rainfall and 2,548 mmpa average pan evaporation.
- The tailings go to a CTD tailings storage facility, with excess water evaporated (to go to underground paste backfill in the future, but at a raw water cost).
- In the past, 1 t of raw (river) water was used to process 1 t of ore, with huge losses en route.
- The main water users are the mill and the underground mine, the former using about twice the latter.
- In the mill, the main water users include gland seals (mechanical seals require no water), lead and zinc filters, miscellaneous uses (now using mainly recycled process water), and reagent mixing (mainly lime, now using recycled process water).
- Underground, water users include the Jumbo drill (even when idle; now discontinued), and various sprays.
- A 37% improvement in raw water efficiency has been achieved.

Mark Brown on Challenges for Mining Posed by Emerging Water Protection Legislation in Former Soviet Union Countries:

- The Former Soviet Union had little or no water protection policy.
- “Polluter pays principle” and “permits to pollute” were first introduced by the Russian Federation, but allowable discharges were set at existing discharge levels, with little improvement.
- International assistance has advanced this, and there has been a shift towards pollution prevention.
- Armenia's Lake Sevan, one of the largest alpine lakes in the world, was drained by 20 m for irrigation and hydro power purposes, but now has its own protection law, including protection against future mining and mineral processing activity.
- The emerging legislation can be confusing and challenging, against future mining and industrial activity based on the precautionary principle, and is poorly supported by data and understanding of the behaviour of the natural systems.

David Bills on Wellington Dam Catchment:

- Wellington Dam was built as a 186 GL drinking water supply dam, but has become increasingly saline and is now only used for irrigation purposes.
- The Wellington Dam is supplied by the 2,830 km² Collie catchment, with an average yield of 100 GL/year.
- The average salinity in the dam is 1,000 mg/l (mainly NaCl, plus Fe), raised by abandoned mines (pH 3 lakes), mine dewatering (at about twice the sustainable rate, affecting both ground and surface waters), and agricultural (mainly forestry ~ 70%) salinisation (due to acidity of laterite soil cover, with pH typically in the range from 5 to 6, occasionally down to 4).
- The Collie Water Advisory Group was formed and has recommended the use of water from mine dewatering (24 to 30 GLpa) for power station cooling and river supplementation; agricultural revegetation and the pumping of saline water to completed mine voids; and the establishment of the Centre for Sustainable Mine Lakes, to promote neutralisation and alternative void end uses (aquaculture and recreation).
- Mine handback criteria for water need to be finalised.
- Mine dewatering is a temporary, necessary part of mining, which could be considered different from “abstraction”.
- Government should encourage water recycling, treatment and reuse.
- Boundary issues between adjoining mines need to be arbitrated.

SESSION 3 – MULTIPLE VALUES OF WATER I

Kristina Ringwood on the Value of Water in Rio Tinto:

- The current climatic trends may not be temporary, and we need to develop a long-term water strategy, backed up by better data.
- Water is about people – drinking and sanitation water supply is a critical issue in developing countries in which Rio operates, as well as in some developed countries.
- Mining is not the first priority for water supply, there is a trend to full cost pricing for water, and Rio needs water to do business and to manage the risk of inadequate water supply.
- Surprisingly, given the dry climate and current drought, Australia still has cheap water.
- Mining is a high value added user of water, but waste water quantity and quality must also be considered.
- At Comalco, there are periodic deficits of water requiring water saving and recycling, and threatening loss of production; while at ERA there is excess water, leading to excess dirty water to handle.
- Rio's value of water project has the objectives: (i) improving water performance – standard, target and diagnostic; (ii) assessing the value of water – water value assessment tool and hydro-political impact assessment; and (iii) engaging sustainable water use.
- It represents a strategic approach accompanied by the development of appropriate tools.



Geoff Herman on Zero Environmental Water Impacts:

- Water impacts are about visibility, actual and perceived, including NIMBY.
- Earth's hydrosphere contains 1.4 million km³ of water, of which only 2.5% is fresh, two-thirds of that tied up in ice and permanent snow, and most of the rest is in groundwater, with only 0.26% of fresh water on the surface. Of this, < half is renewable and only 5% is consumed annually, representing 0.16% of all water.
- Mines are large individual users of water, but recycle water 2 to 3 times, and up to 7 times.
- Mines use small amounts of water/\$ of output (13 to 23 L/\$ up to \$ 366 L/\$ for bauxite), c.f. 379 to 7,458 L/\$ for agriculture (wheat to rice).
- Evaporation losses can be up to 60%, and mines may evaporate dirty water in preference to treating it (more costly).
- Appreciating the true value of water is the key to it's optimal use and minimising environmental water impacts.
- Minimise use, recycle and reuse.

Chris Moran on Linking the Values of Water to Sustainability:

- Economically, the value of water to humans is it's marginal utility.
- Marginal utility – the more you need water, the more valuable it is.
- But, if your water allocation is met, the priority of use is unimportant.
- When allocations are deficient or a new allocation is required that cannot be met, water allocations can be traded, usually for money.
- However, there are other measures of trade than money, such as social and environmental values, and there should be a minimum level of access to water for basic needs.
- Water targets are prescriptive and precise, but are not comparable, and their contribution to sustainability and the value they place on water are unknown or unclear.
- Water targets may have nothing to do with sustainability, operational expenditure can provide some sustainability benefit or, at the highest level, you could have sustainability-driven expenditure.
- There is a need for a measure of the contribution to the bottom line of sustainability-driven expenditure.
- Water is not included in risk assessment, but rather the cost of water is assessed.
- The risk of inadequate water supply is not just about the cost of water, i.e. water may not always be available at any cost.

Greg Morris on the 30 to 60 Year Transition in the Life of Cadia Mine:

- Cadia Mine's main uses of water are in flotation to recover gold, and for dust suppression (on haul roads and on the tailings, aerially, as required).
- Water quality is monitored in 140 bores and at 26 surface water locations.
- Cadia Hill pit is being extended to Cadia East pit and underground.
- Water is as good as gold to Cadia, and must be balanced against production requirements, with an additional 8 ML/day of water required to meet future projections.
- Both water volume and reliability are required.
- The biggest water loss is evaporation off the tailings storage facility (and seepage?), which could be reduced through tailings thickening or paste.
- Rainfall is down, with only 30% of annual rainfall this year, lowering the storage in the purpose-built dam, which must also provide environmental flows.
- Up to 10 ML/day of effluent water is sourced from Orange, but the effluent volume is reducing due to the drought and raised water rates.
- Climate change projections predict a reducing supply.

SESSION 4 – MULTIPLE VALUES OF WATER II - COST, PRICE AND VALUE**Simon Scott on Securing Water Entitlements in Queensland:**

- Water security is important for risk management and investment decision-making.
- The dimensions to water security are certainty, predictability and control.
- Water is attached to land, and entitlements include allocations, licences and permits, in order of reducing security.
- Water restrictions relate to emergency provisions such as water supply shortages or water quality issues, drought management, etc.
- Queensland water entitlements can, under exceptional circumstances and following notice, be restricted, reduced or withdrawn, generally without compensation.
- The NWI aims to improve both the certainty of appropriate water entitlements and the environment (flows and quality).
- The NWI envisages risk-sharing of water entitlements.
- If the Commonwealth were to take over water entitlements from the State, compensation is unlikely.



Robin Evans on Beyond NPV Applied to Water in Mining:

- NPV versus Multiple values of water, the theme of the conference.
- “NPV is OK, we just haven’t looked hard enough” – full life-cycle cost, eco-efficiency and departmentalisation are not fully accounted for.
- “It’s not about the cost of water, it’s about the cost of not having water” – using quantitative risk assessment and real Options and Value at Risk (VaR) approaches.
- “How do we impact on other’s activities?” – using input-output and cost-benefit analyses.
- “What is the value of water to others if no market exists?” – using environmental or ecological economics, contingent valuation or choice modelling.
- “Let’s work out the value(s of water) together” – using multi-criteria approach or citizen juries.
- Desalination in the central Queensland Coalfields – not (yet) considered cost-competitive – hidden costs include maintenance, use of reagents and brine disposal – but an analysis of 8 sites suggested that desalination was competitive at half of the sites.
- Water supply through desalination can reduce the variability.
- Social and environmental values include use and availability of water in mining towns in aiding recreation and staff retention, and provision of water for biodiversity.
- The mining industry’s values need to align more with those of society in general.

Aaron Staci on Trading Water Access Entitlements (Allocations) in Queensland:

- Water trading won’t see an end to the drought.
- Water Resource Plan – comprising environmental flow objectives, water allocation security objectives, and monitoring.
- Resource Operations Plan – comprising dam operation, water sharing, and licence and trading rules.
- Resource Operations Plan.
- Water Allocation (supplemented and unsupplemented, like a Land Title).
- Supply Contract (delivery and payment).
- There are currently about 8,000 water allocations in Queensland, totalling 1.382 million ML, registered on the Water Allocations Register.
- Queensland currently allows water trading under (i) permanent, (ii) seasonal and, (iii) leases.
- There are rules to protect the environment and other users: (i) permitted, (ii) prohibited and, (iii) other.
- Trading data are to be reported monthly on the web.
- The current cost of water in Queensland varies from \$ 365 to \$ 7,500/ML (averaging \$ 1,400/ML), depending on the catchment and use.

Jackie Robinson on Modelling Water Demand in Mineral Extraction and Processing:

- Ecological economics is about integrating the environment and economics.
- In Australia, water is constrained, and water trading and recycling are being added.
- In 2001, the mining industry consumed 2% of all water use (c.f. 70% for agriculture), with 64% of that by metalliferous mines, 23% by coal mines, 90% was self-extracted, to produce gross value added of \$ 34 million, 27% of total exports, and 79,000 direct employees.
- Critical issues are a secure water supply, valuing loss of production, and valuing environmental impact.
- The demand for water is a “derived demand”.
- Microeconomic theory – how do firms behave in response to the price of water? – willingness to pay for water affected by constrained supply and demand.
- Water is a very small component of total costs.
- How high does the price of water have to rise before the mining industry responds by reducing water demand (through more efficient use, recycling and treatment)?
- The main motivation for reducing demand seems to be the increasing view that water supply will become more limited.
- The State Contingent approach to assessing ecological economics is preferred over NPV.

Peter Noonan on the Role of Government-Owned Corporations in Developing New Water Infrastructure:

- Mines often need to remove/use groundwater.
- In Queensland, groundwater availability is irregular, hence mining relies on surface water, e.g. coal mines.
- Surface water availability in Australia is highly variable, requiring large storage volumes.
- In the Fitzroy River, 90% of the annual flows pass in 14 days of the year.
- Large dams take 5+ years to construct.
- Dam sites are few and far between.
- Pipelines are common for delivering water to mines – 1,000 km of pipelines service the Bowen Basin Coalfields (the cost of water from the Burdekin to Moranbah pipeline will be about twice the current cost [\$ 2,800/ML c.f. \$ 1,400/ML], but the water will only be available to those mines that initially signed up for it).
- Key issues for dams include hydrology, which is difficult to predict, regulation, network issues, technical issues, timing, and commercial issues.



Peter Noonan continued

- Most water allocations are on the basis of fixed and variable charges, not “take or pay”.
- Government-owned corporations must act commercially, separate from government.
- It's up to government to decide the extent to which the cost of water infrastructure should be incorporated into the cost charged for water.

SESSION 5 – WATER, PEOPLE AND PARTNERSHIPS I**KEYNOTE – Dave Salmon on a South African Perspective on Water in Mining:**

- Gold, diamonds, coal and platinum dominate South Africa's mining industry, with a total of almost 1,000 mines employing almost 3% of the population.
- South Africa has a generally semi-arid climate, becoming wetter from west to east (75 to 1,200 mmpa average rainfall, becoming more erratic).
- Mining uses 2.6% of water withdrawals, but can be the dominant user locally.
- Historically, little value has been placed on water, which has been plentiful and inexpensive, with mining having had a preferential right to water.
- Business risks from water are it's scarcity and excess.
- South African factors include it's political, social and economic transformation, it's new democracy and legislation, the management of catchments, globalisation following it's isolation, addressing the needs of people impacted by apartheid, and the poor public perception of mining (driven by abandoned mines, and the industry's arrogance, particularly towards water).
- The South African legal framework, underpinned by the Constitution, ensures the right to a safe environment, including water, and is arguably 10 years ahead of many developed countries.
- A waste Discharge Charge System is expected to be in place by 2007, which will charge for discharged nutrients, salinity, pH, metals and organics – this will drive mine waste water minimisation, recycling, and treatment and reuse.
- Water is not owned, there is only a right to use it.
- Water use licences cover abstraction (including mine dewatering, since this will impact on the overall hydrological balance), storage, discharge, evaporation and streamflow reduction, and mining water users will be charged.
- Water entrained (lost) in tailings (and waste rock), “virtual water”, is also considered.
- Under Integrated Water Resource Management principles, a water demand and conservation strategy for mining is proposed from early 2007, with guidelines under the hierarchy: pollution prevention, reuse/ reclamation, treatment and discharge.
- A minimum 25 L/person/day, within 200 m of their home, will be legislated as a right (the world average is 150 L/person/day, rising to 400 L/person/day).
- There is a number of Sustainable Development-based, public-private partnerships being supported by mining companies, aimed at win-win solutions for the community, the mining company and the environment – they entail making water a business, including the treatment and reuse of waste water (either mine waste water or sewage effluent) – the financial benefits to the mining company are a no-brainer, not to mention the benefits to the community and the environment.
- The value of water in South Africa is being realised through new legislation, Integrated Water Resource Management and Sustainable Development principles, and the reducing access to (and hence increased cost of) water.

Wendy Mey on Collective Mine Water Reclamation and Reuse:

- BHP Billiton aims to create sustainable value – committed to sustainable development, and wishes to be the company of choice, known for creating zero harm.
- South Africa is divided into 19 water management areas.
- One of these, the Olifants (Elephants in Africans) River Catchment, experiences 500 to 800 mmpa average rainfall, reaching 1,000 mmpa in the mountains, and high evaporation, supports coal mining and power generation (a large water user), and borders the Kruger National Park.
- Available water in the Olifants River Catchment is already fully utilised, and over-committed in some areas.
- About 77% of South Africa's primary energy needs are provided by coal.
- 28% of coal production is exported.
- 70% of coal production is concentrated at 11 collieries.
- Recharge rates are 12-20% of rainfall for open cast coal mines, 5-7% for longwall underground mines, 2-3% for bord-and-pillar underground mines, and 1-2% naturally.
- The higher recharge rates for mines removes surface water from the catchment, and exposure to the mine workings makes it saline and acidic.
- Water management and mining are integral, providing the opportunity for collective mine water reclamation, treatment, return to the catchment, and reuse.
- Collective action makes sense due to the connectivity of the mines.
- The standards for discharge to the environment are currently a little lower than drinking water standards.



KEYNOTE – Paul Greenfield on Healthy Waterways:

- If you are serious about water you must be serious about partnerships.
- All aspects of ecosystems have merged and must be considered together, not in isolation.
- This talk is not about mining, although 15 Mm³ of sand is to be extracted from Moreton Bay to create the new runway, impacting the study area.
- Political leadership at a local level, ongoing and open communication, and an ongoing and open commitment are essential.
- The 12-year old Healthy Waterways project covers the coastline from Noosa to the NSW border, Moreton Bay, and all of the catchments feeding this coastline and bay, which are supporting an increasing population.
- Healthy Waterways is about the quality of the ecosystem, but this encompasses water quality and a range of other interconnected issues.
- There is a need to balance uses and values – community values had got ahead of the legislation, leading to a partnership of state government agencies, local government, universities, land care, and community groups.
- People wish to live, work and play in SE Queensland.
- A balanced research, monitoring and management (including political leadership) approach is required.
- Conceptual modelling is key to representing historical, current and future scenarios, demonstrating the case for improved management (of, e.g., water reuse, effluent treatment and reuse, and sediment control) to maintain the ecosystem.
- You can't divorce water supply, the ecosystem, effluent treatment and sediment control.
- The dominant source of sediment is gully erosion.
- Communication is vital, in the case of Healthy Waterways via an annual Report Card, grading catchments, the bay and the coastline from A to F.
- Funding of about \$ 500 million has been committed the work under Healthy Waterways.
- Indirect potable reuse will become essential.
- There is a Quality versus Quantity tension e.g., rivers need water too.
- There are outdated planning approaches and very ineffective transfer mechanisms.
- You have to start doing something!
- The roles of the different partners must be respected, with the community, through their representatives, empowered.

SESSION 6 – WATER, PEOPLE AND PARTNERSHIPS II**Peter Günther on Sustainable Water Treatment to Provide Potable Water:**

- The open cast and underground coal mines operated in close proximity by two large competing companies (Anglo Coal and BHP Billiton) in the Witbank area in the north eastern part of South Africa interact hydrologically.
- 150 Mm³ of water is stored in the underground mines; more than is stored in the Witbank dam, which is over-allocated and projected to have a shortfall of 20 ML/day.
- Underground mining takes place between flooded workings above and below, with some breakthrough via unplugged boreholes, and flooding of the workings following mining since there was no other place available to store the excess water.
- The volume of water stored underground is projected to rise exponentially, threatening ongoing mining operations, while the available water supply fails to meet the growing demand.
- In water treatment, corrosion by the saline, acidic water is problematic.
- The acidity varies with the amount of buffering available, with the pH varying from 2.5 to 7.5.
- A variety of water treatment systems was investigated at pilot scale, culminating in the selection of a combination of neutralisation and reverse osmosis.
- The proposal was for a 20 ML/day desalination plant to treat mine water, at a capital cost of about R 300 million, expandable to 60 ML/day over the plant's 20-year life.
- Three underground mines will feed water to the water treatment plant, with excess pumping capacity from each of the mines to ensure supply.
- Sludge (to be disposed to a 30 to 40 ha storage) and brine (to be produced at a rate of 10 m³/hour, and evaporated from evaporation ponds) management are key.

David Brereton on Water, Communities and Mineral Resource Development:

- The paper is about the social dimension of water, and the relationship between the associated social and business risks.
- Social risk – exists when there is a potential adverse social impact, such as actual or perceived loss of amenity, economic loss, loss of livelihood, and health and safety risks.
- Social risks ("outrage") can translate into business risks.
- Examples include the possibility of longwall mining impacting the Nepean River, diverting the Macarthur River to allow an open pit, West Wyong gas development impacting a recreational area, and nickel processing impacts at Townsville; and Ok Tedi, Marcopper and Yanacocha internationally.
- Understanding community responses – water has psychological and cultural associations; water has wide legitimacy as a rallying issue; and community responses are shaped by trust and perceptions of the fairness of processes and outcomes.



David Breerton continued

- Managing and mitigating social risks requires communication and consultation (including with stakeholders that are “painful” to engage), matching responses to the risk, and controls that are “social” as well as technical.
- In relation to water, the aim is to minimise negative social impacts and maximise positive social opportunities.

Tim Sparks on Collie River Diversion and Salinity Recovery:

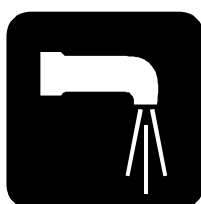
- This paper presents a regulator’s perspective.
- Integrated solutions, partnerships, sharing knowledge, and keeping the community informed and engaged are key.
- The Collie catchment contains 7,000 GL of water, and has progressively been cleared (now 28% cleared – the salinity of the catchment is very sensitive to clearing, which results in salinity accumulating on the surface and washing into streams during times of runoff) and mined for coal, resulting in a rise in salinity levels (up to 1,000 mg/l) in Wellington Dam (built in 1933 to store up to 86 GL), restricting its use to irrigation.
- Irrigation is by flooding in an effort to reduce the impact of salinity, but evaporation is up to 30%.
- Controls were proposed to address the rising salinity, including bans on further land clearing from 1976.
- 72% (90,000 tpa) of the salinity comes from a small sub-catchment, which has little flow.
- This prompted the interim storage of saline streamflows in a mine void, the diversion of saline water to the sea via an existing mine pipeline, and the potential treatment of saline water for industrial use, while maintaining environmental flows of acceptable salinity.

Sue Leveret on an Occupational Health and Safety Perspective on Water Systems in Mining:

- OH&S hazards related to water systems in mining tend to take a back seat to mining, processing and the environmental water hazards.
- Mining industry workers are exposed to water from a range of treated and untreated sources.
- Underground workers, in particular, are exposed to water (possibly contaminated), leading to foot disorders and eye complaints.
- Hazards associated with water include truck skidding (68% of reported incidents); burns, electrical and ground failure (9% each); and personal injury through slips (5%).
- Blue green algae may present OH&S issues.
- More proactive, rather than reactive, approaches to OH&S water hazards are required.

SESSION 7B – TECHNICAL – MINING AND MINERAL PROCESSING**George Levay on a Systematic Approach to Water Quality Management in Mineral Processing:**

- Water quality management in mineral processing falls into two major categories: (i) production-related (corrosion, scale and efficiency) and, (ii) environmental pollution.
- Grinding, flotation, dense medium separation, gravity concentration, and hydrometallurgy processes all require large volumes of water.
- Water is a low cost and efficient medium for reaction and transport during processing.
- Water can potentially be recycled from milling, processing, the tailings storage facility, and from sewage effluent, with or without treatment.
- Water recycling can adversely affect mineral processing due to the accumulation of fines, inorganics, organics, microbiological species, and gases; consumption of reagents; and scale.
- Process water pH and Eh, salinity, adsorption and/or precipitation on suspended particles, dissolved chemicals and metals, chemical interactions, interface effects, chemical/microbiological interactions, chemical species affecting frothing, and influences on dissolution of the ore can impact processing.
- Treating mine waste water to make it suitable for recycling to the plant may be impossible and/or cost-prohibitive.
- Single-commodity low grade ores, e.g. gold, processed by a single process stream, e.g. cyanide, better lend themselves to water recycling.
- The more complex the ore, particularly where a number of commodities and/or impurities is involved, and the more complex the processing, particularly where a number of process streams is employed, the more problematic is water recycling.
- Selective flotation is particularly sensitive to process water quality.



Darren Mathewson on Tailings Dewatering, Dry Screening and Water Clarification for Reduced Water Usage:

- The key issues in the management and disposal of mine water are reduced water usage, tailings storage issues, and discharging excess water.
- Processing uses 400 to 1,000 L of water/t of feed, with up to 3,800 L/t used in refineries.
- Dry screening works well at low and high moisture contents, and is aided by flip-flow, eliminating the need for wet screening.
- Only 30 to 60% (or even less) of tailings water is recycled.
- Surface tailings storage facilities occupy a large footprint, may cause contaminated seepage, and tailings should ideally be placed as dry as possible, allowing capture of the process water from the thickener.
- Tailings slurry has a low, fluid-like, yield stress; paste has a moderate yield stress; while filter cake has a high, soil-like, yield stress.
- Thickened and paste tailings is produced by thickening.
- Belt press filters bridge the gap between paste and filter cake, and have found application in dewatering coal tailings.
- Pressure filtration produces a cake.
- The Lamella principle can be used to produce high water clarity, but this application is uneconomic for general dewatering.
- Continuously-washed sand filters are also applied for water clarification, often to produce drinking water quality.
- Reverse osmosis is a higher-cost water purification system.

Véronique Lévy on Water Use in Mining:

- Water – can't mine and process without it and too much water makes extraction difficult and creates a dirty water discharge problem.
- Surface water pollution is highly visible.
- Water is an asset, providing opportunities.
- Efficient water management, requiring the water balance of the entire site to be clearly defined, reduces costs.
- Evaporation and seepage to the surface and foundation from mine waste facilities (tailings storage facilities and waste rock dumps, due to rainfall ponding and infiltration) are typically poorly defined.
- Water treatment requires thickening, clarification and filtration, with the addition of neutralisers, flocculants, and anti-scaling agents, and sludge and brine disposal.

Toddy Syaifullah on Water Issues in DOZ Block Cave Mine, PT Freeport, Indonesia:

- Excess water in the underground mine has created safety and contamination problems.
- Freeport experiences 5,500 mmpa average rainfall.
- The open pit supplies 200,000 tpd of ore and the DOZ Block Cave Mine 50,000 tpd.
- Geotechnical issues in the DOZ Block Cave Mine include rockburst hazard, coarse fragmentation, and increasing wet muck (30% < 30 mm, with a water content > 8.5%).
- The wet muck is a consequence of mining intersecting water-bearing strata, and rainfall infiltration through earlier cave zones, wetting-up the fine-grained ore.
- The wet muck risks injury, slows production, and creates stability issues.
- The production of wet muck has been increasing due to increasing infiltration into the mine, leading to about 10% of the 300 drawpoints producing wet muck, which have had to be closed or sacrificed to ongoing wet muck production.
- Wet muck mitigation has included dewatering drilling (20,000 m/year, dewatering under gravity and recycled to the mill), and the planned diversion of surface water from the cave zone.

SESSION 8 – POLICY**Malcolm Balfe on a Framework for Strategic Water Management in Mining:**

- In the mining-intensive state of WA, mining uses about 26% of extracted water, although a substantial proportion of that is hypersaline.
- The aim of the Framework for Strategic Water Management in Mining is to promote a strategic approach to the efficient management of water, and to value water as a vital business, community and environmental asset.
- The context of water needs to be well understood for the aim to be achieved.
- The objectives of the Framework come under valuing water, strategic water planning, implementation and engaging stakeholders.
- The Framework seeks corporate commitment, and encourages partnerships.
- The Framework includes a number of case studies from across Australia, which highlight recycling, treatment and reuse, partnering and regional opportunities for social benefits.



Justin Carpenter on Mining Implications of the Regulation of Overland Flow in Queensland:

- Overland flow may derive from rainfall or groundwater.
- The “take” of overland flow in Queensland is increasing, prompting water reform and sustainable management (Water Resource Plans for each catchment in Queensland), with relevance to mining.
- Water Resource Plans covering a number of catchments in Queensland are in place, with others to follow.
- The Water Resource Plans include notified existing allocations, licences and permits, but a moratorium on further takes was imposed while the Water Resource Plans were being developed.
- Future takes of overland flow will likely be limited, and in the future are likely to be obtained through trading.
- Any future works to facilitate takes of overland flow must be approved by the Queensland EPA.
- Clean runoff should be diverted around areas disturbed by mining to preserve its quality, and not be taken without approval.
- Dirty mine water may be intercepted and stored, and used for any purpose, in preference to clean water being used, where possible, e.g. for dust suppression watering.
- A self-assessable code is likely for the mining industry, with a requirement for better-defined future water needs.

Randall Cox on the Queensland Great Artesian Basin Water Resource Plan:

- The Great Artesian Basin (GAB) covers 20% of Australia, and while it contains a large volume of water, the sustainable use is a small proportion of this.
- Recharge is mainly along its eastern edge, and it flows under gravity at 1 to 5 m/year from NE to SW from bedrock highs to the north, discharging from springs, mainly in SA (there are some springs in Queensland from re-emerging recharge).
- The oldest water in the GAB is about 2 million years old.
- Recharge rates have varied over geological time.
- The GAB comprises many aquifers, some sub-artesian requiring pumping.
- From 1879, the GAB was drilled to supply open drains, mainly for cattle watering.
- From 1954, all new bores needed to be controlled, but the existing bores remained, resulting in ongoing flows and pressure drops (up to 120 m drawdown).
- There is an ongoing program of capping and piping pre-existing bores, which has seen some pressure recovery.
- Mining use of GAB water ~ 3%.
- The aims of the GAB Water Resource Plan are to maintain pressure recovery to protect springs and existing water users, with some reallocation provided that this does not impact springs and existing users; and to protect local spring and streamflows.
- Some monitoring will be required to ensure that these aims are met.
- The current extraction rate is about 300,000 ML/year.
- The general reserve is set at 23,000 ML/year, which is available for possible allocation, with 10,000 ML/year held in the State reserve.
- While water is not being separated from land, some seasonal trading and sharing can be arranged.
- Coal seam gas extraction allows water extraction, but there is a requirement to not impact the GAB.
- Refer to: www.nrw.qld.gov.au .

Andrew Barger on Water, Like Liquid Gold:

- There is growing community concern about mining water use, outdated community perceptions, and important challenges to address, highlighting the need for a mining industry water strategy, which is being driven by the Queensland Resources Council.
- The principles included are: local, potable, full cost, transparency, community, value, and variability.
- The challenges include providing certainty of supply, water pricing, valuing cultural heritage, agricultural reform, resource management charges, regulation (including who pays), realising efficiency gains, price discrimination (average prices in Queensland are \$ 35/ML for agriculture, \$ 122/ML for urban users, and \$ 329/ML for mining), and cost-reflective pricing (water use versus revenue).
- There is variable water use efficiency and management across the industry.
- The QRC is taking this strategy to the community at a local level.

Peter Lilly – If You Can’t Laugh You Can’t Lead:

- *The Seven Heavenly Virtues of Leadership*: humility, compassion, wisdom, integrity, passion, courage and humour.
- The mining industry is learning to be humble, dropping the past arrogance (not the tall poppies, but the ones that act tall) – humility is not a sign of weakness, you can be both humble and strong.
- Compassion is about our ability to see the world through another’s eyes – a confidence about who we are.
- Wisdom involves experience and knowledge and its critical and practical application – corporate wisdom involves hiring the able and empowering them.
- Integrity involves a steadfast adherence to a moral/ethical code – honesty – more of a journey than a destination.
- Passion involves a source of unlimited, enabling energy to produce extraordinary results.
- Courage is the quality of mind that enables us to overcome difficulties with resolve.



Peter Lilly continued

- Humour is a quality of perception that enables us to experience joy even when faced with adversity – to laugh at yourself.
- Aim high to attain your purpose!
- Leadership is required to sustain the mining industry.
- To this list could be added commitment, and the ability to recognise and pursue opportunities.

SESSION 9 – TECHNICAL – PERFORMANCE ASSESSMENT**KEYNOTE – Paul Younger on the Water Footprint of Mining Operations in Space and Time:**

- The aim is to develop an index on direct and indirect water use over the life-of-mine, to gain and retain the “social licence to operate”.
- Is not the EIA enough? – it often takes insufficient account of the hydrogeological impact in space and time of mining operations over the life-of-mine, but could do.
- • Rather than hydrogeology, use the terms water footprint (total volume of water used) and “virtual water” (volume of water required to produce a given commodity).
- 140 L of water is used to produce one cup of coffee, and 16,000 L of water is used to produce 1 kg of beef.
- Australia’s average water footprint is 1,400 m³/person/year.
- Taylor (1858) – an average 7 to 8 t of water was pumped/t of coal extracted, and up to 30 t of water/t of coal extracted, in the UK (to achieve dewatering).
- • In the Latrobe Valley brown coal mines, about 2 t of water is removed to extract 1 t of brown coal, which is 2/3rds water; hence 8/9ths of what is extracted is water.
- A switch to dry processing would increase the energy input (carbon footprint).
- What units should be used to measure the water footprint? – simply area or volume/area/time, comparable to rainfall.
- During the mine life-cycle, water use waxes and wanes.
- The area affected by mine dewatering ~ one of order of magnitude greater than the area of the pit, with additional area required to support processing and other water extraction, plus virtual water.
- The temporal dimension of the water footprint – the water footprint does not end at the end of extraction, since any acid drainage will continue for many years, and any pit lakes and other storages result in ongoing evaporation, i.e. an ongoing water footprint.
- The minor Odiel River in Spain contributes 8% of the world’s zinc discharge to the environment.
- Post-closure water footprint or remnant water consumption will generally be a small proportion of the operational water footprint or consumption.
- Water footprints and multiple values of water can be linked in terms of \$/area of water footprint.
- The total water footprint could be 30 times the mine site area during operation and perhaps 6 times the mine site area post-closure.
- Believe in the mine water after-life, but it's not necessarily hell.
- paul.younger@ncl.ac.uk.

Terry Norgate on Sustainable Water in Mineral and Metal Production:

- Water for mineral and metal production is obtained from groundwater (80%, including hypersaline groundwater in the WA Goldfields), surface water (15%) and mains water (5%).
- Life Cycle Assessment (LCA) is a method of analysing water consumption in mineral and metal production, including both direct and indirect consumption.
- On the basis of m³ of water used to produce 1 t of metal, steel at 2.9 m³/t uses the least, while gold at 252,087 m³/t uses the most.
- Aluminium is the greatest user of water overall.
- Water consumption W (m³/t) decreases linearly with increasing ore grade G (%) to a log₁₀ scale ($W = 167.7 G - 0.9039$).
- Nickel (pyro) produces the highest economic return from water, and stainless steel the least.
- On average, mineral and metal production generates \$ 83/m³ of water used, surpassed only by services, with industrial activity about half that, and agricultural activity <<.
- Australia exports 4,000 GL (4 Gm³) more water than it imports.
- NWI reforms are likely to place pressure on the minerals industry to reduce raw water use.
- The water used for mineral and metal production must be fit for purpose.
- The average contribution of recycled water varies between 40% and 80%.
- Dry processing brings with it dust problems.
- Global temperatures could increase by 3 oC (2 to 4.5 oC) by 2050, accompanied by reduced rainfall in places and increased evaporation.



Claire Côte on Systems Modelling for Water Management in the Bowen Basin Coalfields:

- With the escalating production of saleable coal, water has become a growth-limiting resource in the Bowen Basin.
- There is no relationship between the proportions of raw and worked water (surface runoff and underground water) used in the Bowen Basin.
- Mine site water balance modelling would be helpful, but at what level (conceptual through systems to scientific)?
- A systems model captures the essence of the water balance, capable of highlighting the risks of raw and worked water supplies running dry or overflowing.

John Merritt on Sustainable Water Management at Capcoal Mine:

- Capcoal Mine has reduced raw water use to about 5% of the total water required.
- Capcoal is committed to the zero discharge of mine water.
- Worked water must be fit for purpose, which requires that it's salinity (EC) remains at the current 10,000 to 12,000 $\mu\text{S/cm}$.
- Water must be managed using a risk-based approach.
- A graphical presentation of the risk-based worked water balance was adopted.
- Alarm levels are set at the minimum and maximum worked water storage levels.
- Indicator parameters used in Capcoal's water status reporting include the equivalent hydrological footprint (350 km²), the ratio of net total site water consumption to tonnes of saleable coal (830 L/t), the ratio of net total site water consumption to net water supply (2.0 in drought, 1.3 typically, and 0.4 under flood), the time to empty available water storages (3.6 years in drought and 7.3 years typically), and the time to fill available water storages to spillway levels (5.0 years under flood).
- The tool provides a protocol to report to site and to corporate management.

SESSION 10A – TECHNICAL – WATER SUPPLY AND SURROUNDING ENVIRONMENT**Nick Takos on the Rio Tinto Floating Module:**

- There have been 9 serious droughts since 1960, with the potential to close down mining operations.
- Water losses from tailings include evaporation, entrainment and seepage, and from a water storage via evaporation and seepage.
- Losses can be reduced by covering the pond to reduce evaporation (the subject of this paper), thickening the tailings to reduce entrainment (a high % solids is required), and lining the facility to reduce seepage (expensive).
- Covering water storage reduces evaporation losses by up to 70%.
- Covers include floating balls (expensive), floating covers (expensive, requiring skilled operators, and prone to damage), a chemical mono layer (cheap, but requires re-application every few days due to wind losses), shade cloth (requires anchorage and a frame), and the Rio Tinto floating module.
- The Rio Tinto floating module is 1.15 m in diameter (providing up to 80% coverage), weighs about 3 kg, can support 3 kg, has >> 5 year life, can withstand up to 70 kph winds, and reduces algal growth.
- The Rio Tinto floating module is to be trialled on a water storage dam at North Parkes Mine.

Scott Rathbone on Open Pit Mining Adjacent to Ephemeral Creek and Spring Systems:

- Open pit mining for iron ore requires dewatering, which potentially impacts on adjacent ephemeral creek and spring systems due to the interconnection between the surface and groundwater regimes.
- The study was important because of local community concerns, the need for state government approvals, and to ensure effective dewatering planning.
- The aim of the study was to demonstrate that the impact of dewatering on the ecosystem was understood.
- The methodology involved modelling drawdowns numerically, and monitoring groundwater levels and vegetation.
- The modelling showed that the proposed pit dewatering and rates would not significantly impact the springs.
- The multiple (layered) values of water – economic, social, environmental, reputation, biodiversity, etc.
- Consideration of the layers varies depending on location, it's context, and time.

Tony Marszalek on Quantification of Mine-Related Effects on Streamflows at the Ridgeway Mine:

- There are increasing regulator expectations of water impact predictions and their accuracy.
- The Ridgeway Mine lies beneath a ridge and block caving will impact on streamflows in the headwaters of two creeks.
- The hilly terrain limits streamflows.
- Of concern is the impact of the mine on the downstream baseflow.
- However, the baseflow cannot be measured, it is calculated.
- Further, there are non-mine effects, including vegetation, stream transmission losses, seasonal effect and farm dams.
- Data accuracy is poor at low flows.
- For a micro-catchment, the measured baseflow averaged only 1.3 mL/s (very small but, unusually, occurs over most of the year)– this was required to be modelled!
- Initial modelling produced a poor fit, but subsequent modelling using a larger model produced a reasonable fit. The Ridgeway Mine has the potential to affect baseflow, which is very small due to the small catchments impacted by the ridge location of the mine.



Shaun Davidge on Modelling of Off-Stream Storage for northern Bowen Basin:

- Eungella Dam is a major supplier to the northern Bowen Basin, providing a maximum allocation of about 47,500 ML/year (allowing for distribution evaporative and seepage losses), including allocations to coal mines.
- Without rain, Eungella Dam was projected to empty by mid-2005.
- Potential interim solutions included a pipeline from Burdekin Falls Dam, raising Bowen Weir, raising Eungella Dam, new dams, a pipeline from the south, and the Gattonvale offstream storage at Bowen Weir with limited capacity of 5,400 ML.
- Offstream storage was considered the most viable option to provide short-term water certainty, but could not guarantee supply more than 98.5% of the time.
- IQQM was incorporated into GoldSIM to provide a more usable model of water availability, allowing operator input and providing graphical presentations of results.

SESSION 11A – TECHNICAL – GROUNDWATER AND COAL SEAM GAS**Robert Wallis on Examples of Groundwater Sustainability Issues in Mining:**

- Case Study 1 – GMA Garnet and Ilmenite Mine on the west coast of WA faces environmental issues:
 - Water is sourced via a borefield from groundwater derived from infiltration into the limestone escarpment to the east of the site, at 600 ML/year.
 - Boreholes upslope and downslope of the borefield monitor salinity.
 - On the downslope side of the site is a sensitive wetland, which must be protected.
 - The plant site causes some rise in the watertable, despite dewatering prior to stockpiling of the commodity and sand to 70% solids.
- Case Study 2 – Aggregate extraction in Sydney faces economic issues:
 - Groundwater supplies are limited due to losses and competing users.
- Case Study 3 – Lake Kepwari near Collie represents social sustainability:
 - Rapid flooding of a former coal mine void covered sulphides and provided a recreational facility.

Depak Adhikary on an Integrated Approach to Mine Groundwater Simulation and Prediction Applied to Longwall Mining:

- Integrated site characterisation is carried out automatically, based on downhole logging, to produce a 3-D geotechnical model.
- The hydrogeological model, based on piezometers and borehole information, is added to this.
- 3-D numerical modelling is then carried out using COSFLOW.
- COSFLOW is a 3-D coupled mechanical-fluid flow model, which allows for mining-induced strata fracture and deformation, changes in water and gas permeability and pressures, and changes in effective stresses.
- Parameters required by COSFLOW include strata thicknesses, water table and aquifer elevations, rock mass parameters (from downhole logging), and laboratory parameters.
- Monitoring allows model calibration of predicted flow and pumping rates.

Ralph Guinness on True Water Uses of Coal Seam Gas Water:

Coal Seam Gas (CSG) extraction produces a lot of water.

CSG is being developed in a region (Surat Basin) suffering a prolonged drought, with no recharge to the aquifers, which are salinising.

CSG is held within coal cleats, and is released as water is extracted, in separate boreholes, one for water extraction and one for gas extraction.

Where coal seams are thin, vertical boreholes are used, and where coal seams are thick, the boreholes slope into the seam.

Limitations to CSG water use are government bureaucracy, community perceptions, soil impact (excess salinity destroys soil structure), plant (salt levels are limited to < 1,200 mg/L) and animal physiology (6 to 8 g of salt/day is required by cattle), and cost (Australia's gas suppliers receive a much lower price for their product than those overseas).

The produced water from a single borehole peaks rapidly (to 15 ML/day) then drops off exponentially.

Superimposing a grid of boreholes, to drawdown the watertable and draw out gas, extends the peak water flows, but these reduce as gas flows rise then decline, lasting for 15+ years.

The produced water quality is up to 17,000 mg/L salt, and typically 4,000 to 7,500 mg/L, the same as corresponding bore water.

Potential uses for produced water include the augmentation of town water supplies (after reverse osmosis), supply (at up to 8,000 mg/L) to feed lots, irrigation for cotton, and fish farming.

Reverse osmosis, though expensive, provides a proven means of producing potable water, and is to be used to supply 2.65 ML/day to supplement Dalby's water supply, funded by Arrow, and the Federal and State Governments for a total cost of about \$ 10 million.



David Free on an Overview of Water Provisions in Queensland's Petroleum Legislation:

In the Bowen Basin, the coal seams are deeper and are overlain by sandstone aquifers, which provide groundwater for stock watering, and there is no conflict between groundwater users and coal miners.

In the Surat Basin, there is potential conflict between groundwater users and CSG producers, since they are tapping into the same aquifers.

The CSG producers have an unfettered right to extract water to produce CSG, but there are "make good provisions" for impact on surrounding water bores.

It is estimated that 40 GL/year of CSG water is being produced, corresponding to 200,000 t of salt/year.

Origin's Spring Gully evaporation pond includes shallow monitoring bores to check for lateral seepage of saline water, plus deeper bores to check for deep seepage towards the aquifers.

Origin may eventually need 400 to 800 ha of evaporation ponds, with no other users in the area, but a future power station may use some of the water.

The re-use of produced water is the State Government's preferred option.

SESSION 12 – WAYS FORWARD – CONFERENCE OUTCOMES**Don McKee on Reflections from Water in Mining 2003 and 2006:**

Registrants have risen from 160 in 2003 to 200 in 2006.

Mining company registrants are about 1/3rd in 2006.

Water is now a more urgent national issue, commanding greater public awareness.

2003 to 2006 has seen the establishment of the NWI.

We have a de facto Federal Water Minister in the Hon Malcolm Turnbull MP.

Water is now a strategic issue within many companies.

It remains difficult to attract papers about water in mining and processing operations.

Themes:

2003	2006
Legacy issue	Little discussed
Security of supply	More so
Opportunity for CSG water	Dalby
Site water management	Emphasis maintained
Technical innovations (e.g. dry processing)	Not as much emphasis

2006 themes:

- o Security and price
- o Financial and insurance risk
- o Value of water
- o Power of legislation
- o Partnerships and people
- o Water and sustainable development
- o Improvements in water usage efficiency may carry an energy/ greenhouse penalty.

The importance of water – "Water is as important as the ore body" – Peter Lilly.

Discussion:

Environmental offsets warrant a paper.

Pay more attention to communicating information to the community.

Mining can be disguised/sold as habitat replacement.

When do we start looking at "water credits"?

A borehole capping project undertaken by Olympic Dam had the effect of "saving" the equivalent water extracted, but was carried out more to maintain aquifer pressures.

Water efficiency targets are difficult to establish, apply, and report.

Concern over the impact of the NWI on mining, particularly for smaller mining companies.

Water usage efficiency may not carry an energy/greenhouse penalty.

Understand the implications of the NWI for the mining industry, and integrate mining into the NWI.

Is there a differential between small and large mining companies?

Coming from Freeport and its excess water, it's pleasing to see the work being done on recycling in a dry climate.

Economic issues, perhaps somewhat absent from this conference due to the relative absence of mining and processing operators, need to be better addressed.

The cost and time pressures that mine planners and operators find themselves under tend to narrow their focus onto their core concerns.

There is a need to communicate better to the various tiers of the mining industry.

The partnerships in the South African coal mining industry are very encouraging, and give impetus to the Australian industry to do likewise, given the dire shortage of water, although the legislative regimes are quite different.

There are similarities between the Australian and South African systems, except that in Australia they are embodied in guidelines, whereas in South Africa they are now embodied in legislation.

The direction of the Queensland water legislation is encouraging.



Discussion continued:

Water remains cheap, and Australian mines are remote. While new mines face major issues in gaining access to water, existing mines have little incentive to conserve water.

Handover or closure must take into account the handover and costs of running high-tech water treatment plants.

Themes for the next conference:

- o Finding uses for CSG produced water
- o Resource use
- o Participation of mine operators
- o Discharging water.

CQU Internships at a glance



Central Queensland University now facilitates an Internship Program for Science students specialising in Industrial Chemistry and Environmental Science. The program, starting at the end of first year studies, places students with suitable organisations for a 3 month vacation employment. At the completion of this 3 month period both student and employer have an opportunity to decide whether or not to extend the relationship into the Internship Program (designed by the Industry partner with the assistance of CQU), which will see them complete approximately 8 more months of the Internship program over the next two years of their degree.

Upon completion, the student will effectively have 11 months of work experience in their related field and the employer will have an excellent opportunity to employ this student upon graduation who has extensive knowledge of their systems and processes as well as the all important 'work experience' to complement their theoretical knowledge.

CQU are committed to developing programs with employers that will provide their students with real work experience to ensure they produce world class graduates with all the skills they need to excel in their chosen field. If you would like to access high achieving students early in their degree and develop them into work ready graduates, please contact the Internship Coordinator for further information.

Samuel McCoombes
Internship Coordinator
Ph: (07) 4930 6964
s.mccoombes@cqu.edu.au



Impending Events...

November 2006

- **Registrations are Closing for ACMER's introductory/ refresher Course on 'Environmental Management for the Minerals Industry'** to be held 28-30 November 2006 in Darwin, Northern Territory.

For an information and registration brochure visit:

<http://www.acmer.uq.edu.au/training/attachments/EnvMgtDarwin.pdf>.

For a copy of the program visit:

<http://www.acmer.uq.edu.au/training/attachments/ProgramEnvManagementCourse.pdf>



- Anglo Coal (Moranbah North Management) will host the **third CQMRG Workshop for 2006**. The meeting will start at lunch time on the Thursday November 30th, 2006 at the Black Nugget Hotel, with the mine tour and wrap up to be conducted Friday December 1st, 2006 on site at Moranbah North Mine. For information please refer to details and agenda in this newsletter or RSVP to Brenda by November 24, 2006 on email: bbcqmrq@gil.com.au.

March 2007

- **Biodiversity Offsets for the WA Minerals Industry, in association with the WA Chamber of Minerals and Energy** (Workshop) to be held 29-30 March Perth, WA (ICMM/Enduring Value Principle 7)

For information contact ACMER Course Coordinator Sustainable Minerals Institute (SMI) The University of Queensland St Lucia. QLD Tel: + 61 7 3346 4502 Fax: +61 7 3346 4507 Email:

m.whitta@acmer.uq.edu.au Web: www.acmer.uq.edu.au

May 2007

- **An Integrated Approach to Sustainable Mine Closure and Completion** (Workshop) scheduled for 2-4 May 2007 in the Barossa Valley, South Australia (ICMM/Enduring Value Principle 6)
- **Practical Environmental Monitoring for the Minerals and Quarrying Industries** (Short Course) scheduled for 28 May – 1 June Perth, WA (ICMM/Enduring Value Principles 4, 6 and 7)

For information contact ACMER Course Coordinator Sustainable Minerals Institute (SMI) The University of Queensland St Lucia. QLD Tel: + 61 7 3346 4502 Fax: +61 7 3346 4507 Email:

m.whitta@acmer.uq.edu.au Web: www.acmer.uq.edu.au

June 2007

- **The Potential for Plantation Forestry for Mining in Queensland** (Workshop) to be held on 21-22 June 2007 in Brisbane, Qld (ICMM/Enduring Value Principles 6 and 7)

For information contact ACMER Course Coordinator Sustainable Minerals Institute (SMI) The University of Queensland St Lucia. QLD Tel: + 61 7 3346 4502 Fax: +61 7 3346 4507 Email:

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July 2007

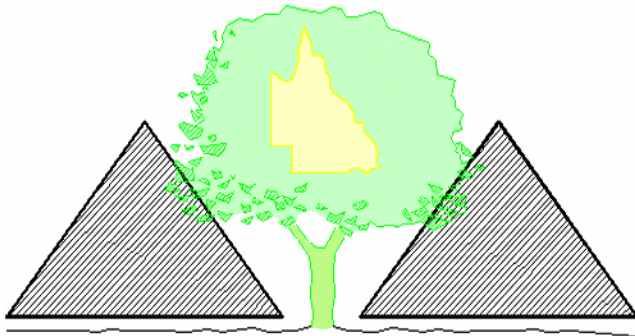
- **Innovations in Environmental Management for Mining Operations** (Workshop) scheduled for 18-20 July, 2007 on the Gold Coast, Qld (ICMM/Enduring Vale Principle 4 and 6)

For information contact ACMER Course Coordinator Sustainable Minerals Institute (SMI) The University of Queensland St Lucia. QLD Tel: + 61 7 3346 4502 Fax: +61 7 3346 4507 Email:

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November -December 2007



Central Queensland Mining Rehabilitation Group Workshop Details



Moranbah North Coal



Date: Thursday 30th November and Friday 1st December, 2006

Hosts: Anglo Coal Moranbah North Mine

Cost: \$20.00 for Individual, Associate and Sponsored CQMRG Members.
(Includes both Thursday and Friday)
\$30.00 for Non-Member or Non-Financial Delegates.
(Includes both Thursday and Friday)

Complimentary Thursday Night BBQ – Moranbah Golf Club
(For any special dietary requirements please contact the Rachel Mitchell directly on 07 4968 8670)

RSVP: By **Friday November 24th, 2006** to Brenda – preferably by Email: bbcqmrq@gil.com.au.

Anglo Coal (Moranbah North Management) will host the third CQMRG Workshop for 2006. The meeting will start at lunch time on the Thursday at the Black Nugget Hotel, with the mine tour and wrap up to be conducted Friday morning on site at Moranbah North Mine.

A complimentary BBQ will be provided by Moranbah North at the Moranbah Golf Club on Thursday night.

Anglo Coal Moranbah North Mine has 25 rooms booked in the Grosvenor camp for the CQMRG. The cost is \$55 per night which includes breakfast. To book your **accommodation** please contact Rachel Mitchell directly on 07 4968 8670 **ASAP**.

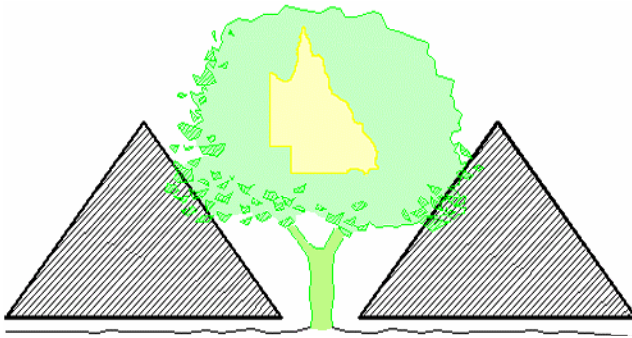
Everyone needs to bring personal PPE / Safety Requirements for the Moranbah North Site Tour on Friday:

- Steel cap safety boots
- Hard Hat
- Safety Glasses
- Your CQMRG Coffee Mug (a couple are still available to purchase at the Workshop)

Limited PPE (vests, hard hats and glasses) will be available for loan on Friday. NO PPE = NO MINE TOUR. Please advise Brenda of any requirements.

On arrival at site please sign in as a visitor at the main administration building front desk. You will be directed to the meeting room from there.





Central
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Workshop Agenda



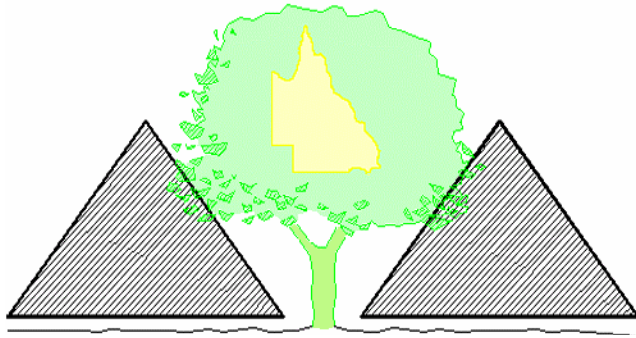
Moranbah North Coal

DATE: THURSDAY, 30TH NOVEMBER, 2006

12:00 pm	Black Nugget Hotel Mills Avenue Moranbah	CQMRG Workshop Registration
12:30 pm	Brad Cartwright CQMRG Chairman	Welcome
12:35 pm	Leslie Merton Environmental Adviser Moranbah North Mine	Introduction to Moranbah North Coal
12:45 pm	Rachel Mitchell Graduate Environmental Adviser Moranbah North Mine	Moranbah North/CH4 Gas Pipeline Project
1.00 pm	Sue Henderson Henderson Geotech	Moranbah North Co-Disposal
1:15 pm	Gil Fletcher LRS Environmental	Moranbah North Subsidence Management
1:30 pm	Larelle Fabbro Central Queensland University	ACARP Project – Blue Green Algae
2.00 pm	Niall Carey SKM	Dust Management and Monitoring
2:15 pm		Afternoon Tea
2:35 pm	John Merritt SHEC Manager Anglo Coal Australia	Moranbah South/Grosvenor Project Overview
2.55 pm	David Breton Sustainable Minerals Institute	ACARP Project – Cumulative Impacts on Communities from Mining
3.15 pm	John Torpy CEO Belyando Shire Council	Moranbah Community Issues
3.35 pm	Peter Johnston Principal Engineering - Civil & Environmental Alcan Engineering Pty Limited	Paste Tailings – A Better Way
3.55 pm	Geoffrey Smith Fitzroy Basin Association	Launch of “Biodiversity Values”
4.00 pm	Brad Cartwright CQMRG Chairman	CQMRG General Business
4:15 pm	Close	

(Subject to Change)





Central
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Moranbah North Coal



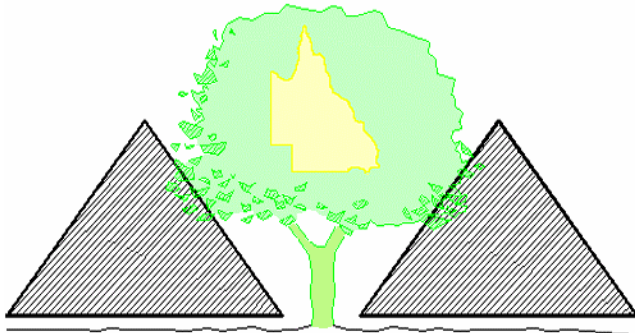
DATE: THURSDAY, 30TH NOVEMBER, 2006

5.30 pm	Moranbah Golf Club Leichhardt Drive, Moranbah	Pre Dinner Drinks
6:30 pm		Complimentary BBQ
Late		Close



(Subject to Change)





Central Queensland Mining Rehabilitation Group Workshop Agenda



Moranbah North Coal

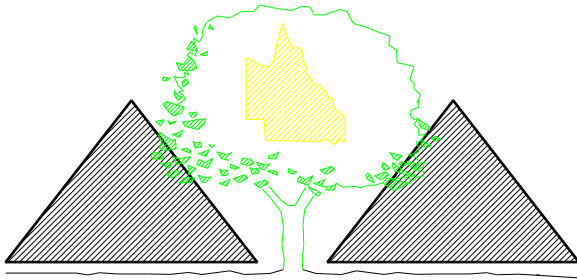


DATE: FRIDAY, 1ST DECEMBER, 2006

8.30 am	Moranbah North Mine	CQMRG Workshop Registration
8:45 am	Rachel Mitchell Graduate Environmental Adviser Moranbah North Mine	Welcome to Site
9.00 am	Leslie Merton Environmental Adviser Moranbah North Mine	Isaac River Subsidence
9:20 am	Rohan Lucas Senior Environmental Engineer & Geomorphologist Alluvium Consulting	Isaac River Bank Stabilisation
9:45 am		Morning Tea
10:00 am		Mine Tour
1:00 pm		Lunch
1:45 pm	Brad Cartwright CQMRG Chairman	Close

(Subject to Change)





CQMRG 2007 MEMBERSHIP

It was agreed by CQMRG Members present at the final CQMRG Meeting for 2001 at Moura Coal Mine on November 16, 2001 that the format for CQMRG Membership should be changed.

Individual Members will pay membership dues of \$30.00 per calendar year. They will receive three newsletters, any notices, have a printed CQMRG name tag for seminars and be able to attend seminars for \$20.00 per seminar. This is the first increase in dues since they were first implemented at the Blair Athol Coal Meeting on November 15, 1996.

Other people in the same organisation at the same site or office as an Individual Member can become Associate Members for \$10.00 each per calendar year. They will receive CQMRG notices, have printed CQMRG name tag for seminars and be able to attend seminars for \$20.00 per seminar, but will not receive the newsletters directly.

Organisations can also choose Sponsor Membership for \$60.00 per calendar year. For this they can nominate two Individual Members, with full privileges, and their support will be acknowledged in each newsletter. They can also nominate additional Associate Members at \$10.00 each per year.

Anyone who is not a paid up Member is welcome to attend seminars, at a fee of \$30.00 per seminar, payable on the day.

Please note that your **CQMRG 2007 Membership** is **DUE January 1, 2007**. To those Members that have forwarded their membership fees, thank you for your efficiency and please disregard this notice. If you have not **please complete the following form** and **forward with monies payable to Central Queensland Mining Rehabilitation Group to CQMRG, P.O. Box 43, MARBURG. QLD 4346** or bring with you to the Moranbah North Workshop on 30th November and 1st December 2006.

INVOICE (please retain for your records)

NOTE: CQMRG is not an enterprise and does not charge GST. If the amount of this invoices > \$50, a Statement of Reason for not quoting ABN will be forwarded with the receipt.

Sponsor Member	\$60.00
Individual Member(s).....	(No.)..... \$30.00 ea. =.....
Associate Members	(No.)..... \$10.00 ea. =.....
Amount Due.....	



PLEASE FIND ATTACHED MY 2007 CQMRG MEMBERSHIP PAYABLE TO:

**CENTRAL QUEENSLAND MINING REHABILITATION GROUP,
P.O. BOX 43,
MARBURG. QLD 4346.**



NOTE: Please photocopy form for additional members

NAME	SPONSOR MEMBER	\$60.00
COMPANY/SITE	INDIVIDUAL MEMBER.....	\$30.00
ADDRESS	ASSOCIATE MEMBER	\$10.00
TELEPHONE.....	MOBILE.....	
FAX.....	EMAIL.....	

CQMRG 2007 MEMBERSHIP TOTAL ATTACHED \$

(Note: A receipt is issued upon receipt of the monies)

