



FACILITATING COORDINATED
RESEARCH, TECHNOLOGY TRANSFER
AND IMPROVED EDUCATION AND
TRAINING IN THE GEOMECHANICS
DISCIPLINES



2011-2012

BIENNIAL REPORT

Celebrating 20 Years

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JOINT VENTURE PARTNERS

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION AUSTRALIA
Division of Earth Science and Resource Engineering

CURTIN UNIVERSITY
Western Australian School of Mines

THE UNIVERSITY OF WESTERN AUSTRALIA
School of Civil and Resource Engineering

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Cover photograph courtesy of MMG Century's Lawn Hill operation.

Chairman's Foreword



Mr Ian Suckling
chairman

The 2011 and 2012 years saw the Australian Centre for Geomechanics continue to flourish. The ACG took the opportunity to celebrate its twentieth anniversary in 2012, and those who attended were reminded of the outstanding and far-sighted efforts of its founders and staff in establishing at The University of Western Australia (UWA), the group that has become the highly respected, internationally regarded, vigorous and

energetic organisation that is the ACG today. The joint venture partners that contributed to the conception and growth of the enterprise – UWA, CSIRO and Curtin University – have reason to be proud of what the ACG has become, and of its work during those two decades.

The unique operating model developed by the ACG melds its leading research and academic work together with its delivery of technical events; and its production of reference and educational publications, material and services. This model has served the ACG well, being adapted progressively to accommodate changes in its operating environment and market. The ACG's focus on the fields of underground, open pit and environmental geomechanics reflects demand from industry for research and professional development work in these fields, in pursuit of improved safety; higher productivities and efficiencies; and reduced environmental impacts.

The staff at the ACG operates to consistently excellent standards for all that the ACG produces, despite a volume of output that belies the small size of the team. Those who have attended its conferences, seminars, courses and workshops; or purchased its proceedings, guides, handbooks or training materials can attest to their high quality. The ACG's reputation sees its events and publications attract presenters and authors of the highest international standing, and attendees from around the world.

That the ACG's research work attracts sponsorship even during tight times for industry is a reflection of the value of the work and a tribute to the track record of the researchers. Of particular note is the Mine Seismicity and Rockburst Risk Management project, led by Dr Johan Wesseloo in what is its fifth phase and fourteenth year. This project has sixteen industry sponsors from five different countries, attracted by

the growing importance of this area of research. The MS-RAP software developed during this project is widely used and valued, demonstrating ACG's commitment to technology transfer. Professor Ken Mercer and Winthrop Professor Phil Dight are also active in developing and conducting research projects.

The ACG's Board of Management includes representatives of ACG's joint venture partners in Winthrop Professor John Dell from UWA, Dr Steven Harvey from CSIRO and Professor Stephen Hall from Curtin University. Industry is represented by Mark Adams (MMG Ltd), Richard Butcher (Barrick Australia Pacific Ltd), Daniel Heal (BHP Billiton) and me. The board's work is invariably made easy by the efforts of ACG's management, with the focussed leadership of its director, Winthrop Professor Yves Potvin; and the hard work and fastidious administration of business manager Christine Neskudla and her team. The ACG's affairs are run in a manner whereby its progressive activities are supported by a sound, pragmatic business approach. Industry can be confident that funds invested on ACG sponsorships are expended prudently.

Thanks to the efforts of its admirable team, the ACG, having completed twenty fruitful years, is very well placed to continue its great work for decades to come.

A handwritten signature in black ink, appearing to read 'Ian Suckling'. The signature is fluid and cursive, written on a white background.

Mr Ian Suckling – chairman

Director's Report



Winthrop Professor
Yves Potvin
director

The Australian Centre for Geomechanics has reached the important milestone of celebrating 20 years of activities in 2012. From a modest beginning in 1992, the ACG has grown into an internationally recognised centre of excellence in geomechanics. Whilst serving the needs of the local and national mining industry, the footprint of the Centre's activity currently extends broadly around the world.

Without doubt, one of the main vehicles for ACG's world-wide impact is our involvement in the organisation of several international events created by the ACG and presented every year. In 2011–2012, the ACG hosted:

- The 14th International Seminar on Paste and Thickened Tailings, Perth (2011)
- The Fourth International Seminar on Strategic versus Tactical Approaches in Mining, Perth (2011)
- The Sixth International Seminar on Deep and High Stress Mining, Perth (2012)
- The Seventh International Conference on Mine Closure, Brisbane (2012)

During this period, the ACG also co-organised the following overseas events:

- The Sixth International Conference on Mine Closure, Canada (2011)
- The 15th International Seminar on Paste and Thickened Tailings, South Africa (2012)

Each of these events typically attracts between 40 and 90 principle authors and event attendance ranges from 150 to, sometimes, over 400 participants usually from 15 to 20 countries. This extensive international exposure of the ACG is well complemented by significant sales of state-of-the-art technical geomechanics material to over 20 different countries. Our training and further education library now has more than 30 publications and eight training CDs and DVDs on offer. The publications activities have consistently grown during the last decade and generated nearly A\$200 000 in 2012.

Even our domestic course programme, which over the two-year period covered by this report included more than 20 events, has regularly attracted participants from Europe, Africa, Indonesia, Malaysia, Papua New Guinea, New Zealand and South America.

To deliver this comprehensive professional development

programme and technical material, the ACG has built a team of seven talented multi-disciplinary personnel lead by our business manager Christine Neskudla and marketing manager Josephine Ruddle. The unique model of the ACG is based on this "production team", working closely with world-class researchers in mining geomechanics.

I am very pleased to report that in July 2012, after more than a four year search and interview period, the ACG was successful in attracting to its team Professor Ken Mercer, one of the leading specialists in environmental engineering, who also has a very strong background in open pit slope stability. With the addition of Ken, the three main streams of geomechanics at the core of ACG's business; underground, open pit and environmental geomechanics are well positioned to grow under strong leadership.

The ACG has two major ongoing research projects: the "Mine Seismicity and Rockburst Risk Management" project, which was initiated in 1999 and currently led by Dr Johan Wesseloo, and the "Effective Stress Approach to Mine Fill", which has been led by Winthrop Professor Andy Fourie since 2007. Numerous short term and focussed research activities on stress measurements, ground support and open pit slope stability are also being pursued by Winthrop Professor Phil Dight, whilst a number of environmental geomechanics research proposals are currently under development by recently appointed Professor Ken Mercer. I am confident that the research programme at the ACG will continue to deliver key technologies for the industry.

Since its inception, the ACG business strategy relies on slow but sustainable growth through its activities, and the persistence in implementing this plan over 20 years is reflected by our current strong financial position. The Centre does not rely on government funding and is entirely self-funded by its activities. The operating budget is now more than \$2 M/annum, reflecting the volume of the Centre's activities. Our current assets now exceed \$1.5 M and the sustainability of our business model is proven.

Although a downturn in the mining industry is broadly predicted and eminent, the ACG is well equipped to continue its activities and assist the industry to maintain best practices in geomechanics.



Winthrop Professor Yves Potvin – director

Mine Seismicity and Rockburst Risk Management Project

As the mining industry exploits deeper deposits, mine induced seismicity and rockbursts are becoming more prevalent and the effective management of rockburst risk becomes increasingly important. This is one of the main drivers behind the ACG's Mine Seismicity and Rockburst Risk Management Project.

This high impact project commenced in 1999, with Phase 4 due to be completed at the end of 2011. The overall goal of the project is to develop new and improved methods to analyse, interpret and manage seismicity and its subsequent hazard. This project also focusses on deriving strategic value from seismic data in several areas, with emphasis on the following:

- Determination of dynamic support capacity.
- Interpretation of rock mass degradation, from seismic data.
- Development of analysis techniques for cave mining situations.
- Seismic hazard assessment.

Development of the software MS-RAP has formed part of all the previous phases of the project. The software has proven extremely valuable as both a research tool and a tool for transferring technology to the sponsor sites. During this phase of the project, a major redevelopment of the software was necessary. Hence, MS-RAP v4 is under development.

Determination of dynamic support capacity

The determination of the in situ support capacity of the dynamic support system is largely unknown. This is due to the extremely complex dynamic interaction between the rock mass and the support system under rockbursting conditions. These conditions cannot be reproduced in a laboratory.

Valuable insight was obtained through a comparative study in which data from different laboratory tests and an in situ blast test were compared. This study provided a good relative strength assessment of the in situ performance of seismic system components and provided information for support design.

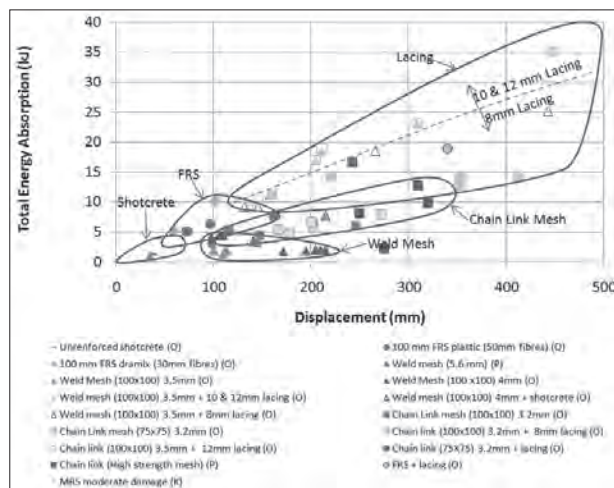


Figure 1 Compilation of drop tests performed on various surface support elements from various sources

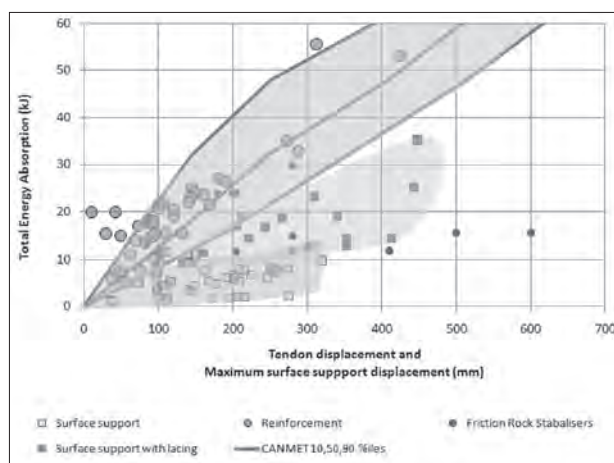


Figure 2 Total energy absorption and displacement of reinforcement and surface support dynamically loaded using drop weight tests compiled from data from various sources

Interpretation of rock mass degradation, from seismic data

Rock mass degradation in brittle rock is generally co-seismic and as such the seismicity can be interpreted as a proxy for rock mass degradation/damage. This part of the project investigated the use of different seismic parameters as that can serve as a proxy for rock mass damage. A comparative study between different possible methods was performed by applying it to three different caving databases. It appears that the results from the different methods are generally similar. The direct interpretation of the seismic parameters with respect to an absolute rock mass damage/degradation state does not appear to be achievable. This work, however, forms a component in the tracking of the cave in block cave mining.

Development of analysis techniques for cave mining situations

Seismic data provides a means of tracking the zone of maximum seismic activity, i.e. seismogenic zone. This data has been used, with other data to interpret the cave development over time. Interpretation of the caving process from seismic data is, however, subjective and arbitrary. This project developed a method for tracking the cave development and relating the different seismic character of various zones in the rock mass to different rock mass states. The method combines a threshold seismic rock mass damage parameter with the temporal change in the seismic character of different zones in the rock in order to derive from that an interpretation of the caving state of the rock mass. Although promising results were obtained, further work is necessary to refine the method. The new developments within MS-RAP v4 include the import and analysis of non-seismic data with seismic data.

Seismic hazard assessment

Seismic hazard assessment forms an important part of the software capabilities of MS-RAP. The hazard assessment methods developed in previous phases of the project and implemented into MS-RAP v3 were further developed and refined. Several fundamental changes were made and implemented.

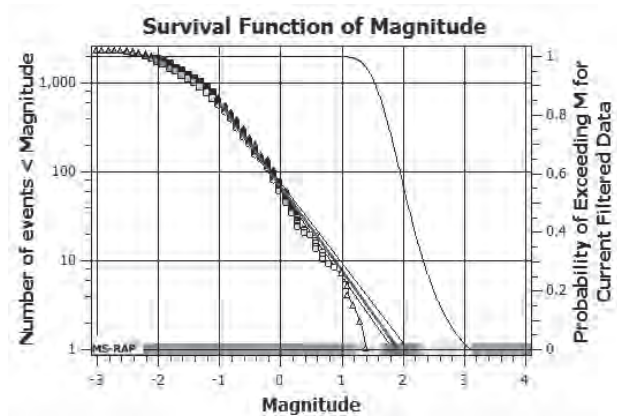


Figure 3 Gutenberg-Richter relationships of data with probabilistic assessment of seismic response

Development of MS-RAP v4

During this period, major effort was invested into the development of the software component. It became necessary to change the development strategy and philosophy for the development of MS-RAP v4. The development strategy changed from a “one size fits all” approach to the development of generic analysis components that can be adapted and altered to enable customisation or development of new analysis methods.

This development strategy change has proven very valuable both from researcher and site user perspectives. From a research point of view, new analysis capabilities were developed that were not previously possible. From a site user point of view, it has proven extremely beneficial as existing analysis methods could easily be adapted to suit specific site conditions better, and in several cases, site specific tools could be built using the generic built-in modules.

Positive feedback about the change in software design philosophy and the changes to the software itself was received from the pre-release users.

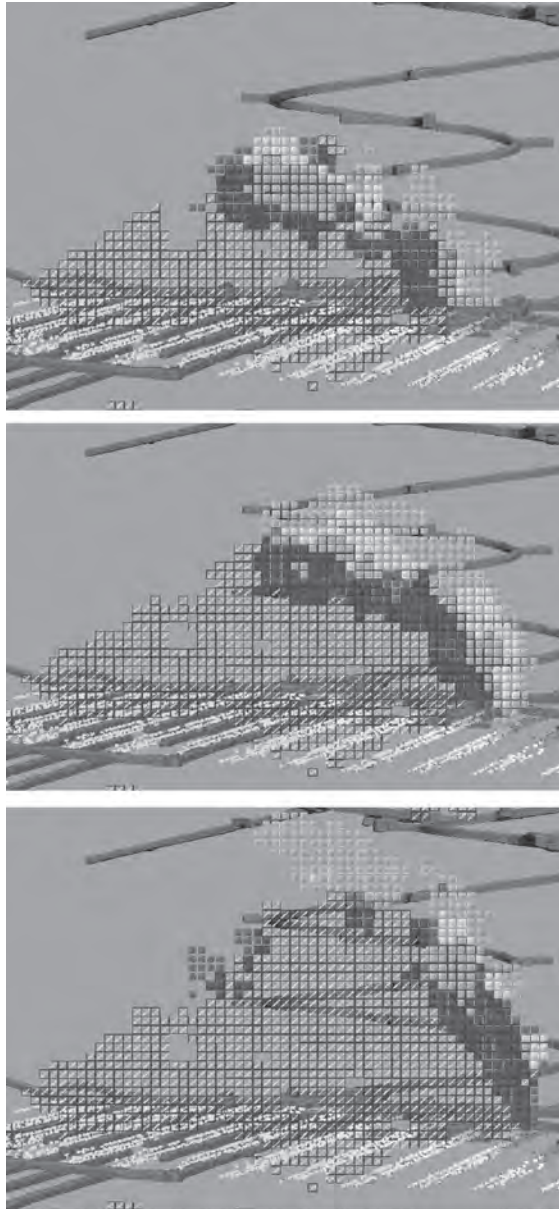


Figure 4 Tracking the seismogenic zones using seismic density parameters

Project sponsors

Acknowledgements

Phase V of this research project is financially supported and assisted by the following sponsors:

Minerals and Energy Research Institute of Western Australia (MERIWA)

Major sponsors

Barrick Gold of Australia Ltd

BHP Billiton Nickel West Pty Ltd

BHP Billiton Olympic Dam Pty Ltd

Independence Gold NL – Lightning Nickel Pty Ltd

Luossavaara-Kiirunavaara AB (LKAB)

Minor sponsors

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Codelco Chile, Division El Teniente

Gold Fields of Australasia, St Ives Mine

Kirkland Lake Gold Inc.

MMG Australia Ltd, Golden Grove Operations

Newcrest Mining Ltd

Newmont Asia Pacific

Perilya Ltd, Broken Hill Mine

Xstrata Copper Kidd Creek Mine

Xstrata Nickel (Cosmos Nickel Project)

Project Team



Dr Johan Wesseloo
Project leader



Paul Harris
Software developer



Winthrop Professor
Yves Potvin

Geomechanics Education and Training Courses

During 2011 and 2012, the ACG's further education and training programme attracted a substantial number of mining professionals. As a leading provider of specialist and advanced training and education for mining personnel and geotechnical practitioners in mining and environmental geomechanics, the ACG successfully supported industry to reach their business and training objectives.

THE ACG'S GEOMECHANICS TRAINING AND EDUCATION PLATFORM PROVIDES A SOLID BASE FOR THE TRANSFER OF TECHNOLOGICAL DEVELOPMENTS AND PRACTICES BASED ON KNOWLEDGE GATHERED FROM LOCAL AND INTERNATIONAL SOURCES

2011 EVENTS

Environmental Geochemistry of Mine Site Pollution – An Introduction, Short Course
Brisbane, Queensland, 10–11 March 2011

Shotcrete QA/QC Workshop
Canberra, Australia Capital Territory, 20 March 2011

International Forum on Safe and Rapid Mining Productivity Development
Canberra, Australian Capital Territory, 24 March 2011

Prediction of Beach Slopes Workshop
Perth, Western Australia, 3 April 2011

Rheology Workshop
Perth, Western Australia, 4 April 2011

14th International Seminar on Paste and Thickened Tailings
Perth, Western Australia, 5–7 April 2011

Advanced Application of Seismology in Mines Short Course
Perth, Western Australia, 10–13 May 2011

MS-RAP Version 4 User Training Course
Perth, Western Australia, 16–18 May 2011

Dynamic Support Workshop
Perth, Western Australia, 19–20 May 2011

Ground Support in Open Pit Mining Seminar
Perth, Western Australia, 17 May 2011

Geotechnical Engineering for Open Pit Mines Seminar
Perth, Western Australia, 18–19 May 2011

Data Driven Slope Design Workshop
Perth, Western Australia, 20 May 2011

Advanced Ground Support in Mining Seminar
Perth, Western Australia, 26–28 September 2011

Mine Backfill Seminar
Perth, Western Australia, 29–30 September 2011

Open Pit – Underground Mining Interaction Workshop
Perth, Western Australia, 7 November 2011

Fourth International Seminar on Strategic versus Tactical Approaches in Mining
Perth, Western Australia, 8–10 November 2011

Feasibility Studies - Should be Strategic but Often Tactical Workshop
Perth, Western Australia, 11 November 2011

Blasting for Stable Slopes Short Course
Perth, Western Australia, 16–18 November 2011

Total Tailings Management Seminar
Perth, Western Australia, 7–8 November 2011

2012 EVENTS

Environmental Geochemistry of Mine Site Pollution – An Introduction, Short Course
Perth, Western Australia, 21–22 March 2012

6th International Seminar on Deep and High Stress Mining
Perth, Western Australia, 28–30 March 2012

Stress Measurement Workshop
Perth, Western Australia, 31 March 2012

Advanced Application of Seismology in Mines Short Course
Perth, Western Australia, 15–18 May 2012

MS-RAP Version 4 User Training Course
Perth, Western Australia, 21–23 May 2012

Ground Support Practices from Around the World Workshop
Sudbury, Canada, 10 June 2012

Hydro-geology and Water Management in Open Pit Mining Seminar
Perth, Western Australia, 19 June 2012

Slope Stability in Weak and Soft Rock and Saprolites Seminar
Perth, Western Australia, 20–21 June 2012

Practical Rock Mechanics Short Course (Introduction)
Perth, Western Australia, 20–21 August 2012

Ground Support in Mining Short Course (Introduction)
Perth, Western Australia, 22–24 August 2012

Prevention is Better than Cure: the Causes, Consequences and Control of Soil Erosion in Mine Rehabilitation Workshop
Brisbane, Queensland, 22 September 2012

Sustainable Mining Now and Landform Design Workshop
Brisbane, Queensland, 22 September 2012

Use of Geochemical Data in Addressing Environmental Problems in the Mining Industry Workshop
Brisbane, Queensland, 23 September 2012

2012 EVENTS Continued

Designing for Closure: Appropriate Design Criteria and Methods of Analysis Workshop

Brisbane, Queensland, 24 September 2012

Delivering Effective Rehabilitation: Monitoring and Manipulating the Soil Biota for Success Workshop

Brisbane, Queensland, 24 September 2012

7th International Conference on Mine Closure

Brisbane, Queensland, 25–27 September 2012

Design of Tailings Storage Facilities for Seismic Loading Conditions: Operational and Long Term (Post Closure) Considerations Workshop

Perth, Western Australia, 24 October 2012

Blasting for Stable Slopes Short Course

Perth, Western Australia, 4–6 October 2012

Associated International Events

The ACG has more than 12 years experience in hosting international mining events throughout Australia that have regularly attracted over 150 local and international mining professionals. Our dedicated team of event organisers is skilled and trained to manage and coordinate all aspects of international events including: delegate registration, marketing and promotion, abstract and paper generation, venue coordination, sponsorship, committee, programme development etc.

The ACG also has a dedicated publications team that produces peer-reviewed proceedings for our symposia and conferences. This work is undertaken in-house where we can ensure that the high standard of the publication is maintained. Our team works in close collaboration with the proceedings editors, organising committees, paper authors and reviewers, and printers.

Our team has been instrumental in initiating many highly acclaimed series of international mining conferences, symposia and seminars that are held either annually or regularly throughout the world. In close collaboration with leading mining universities such as The University of Witwatersrand, South Africa, the University of Toronto, Canada, and the Pontificia Universidad Católica, Chile, the ACG is pleased to have been the founding body and/or key collaborator for the following event series:

- >> Sixth International Conference on Mine Closure, Canada, 2011
- >> 15th International Seminar on Paste and Thickened Tailings, South Africa, 2012

For the majority of these events, the ACG has produced technical, peer-reviewed event proceedings that can assist industry personnel to maintain and develop their skills, knowledge and capabilities.



ON THE HORIZON

Seventh International Symposium on Ground Support in Mining and Underground Construction

Perth, Western Australia, 13–15 May 2013

Following on from previous symposia held in Sweden, 1983; Canada, 1992; Norway, 1997; Australia, 1999; Australia, 2004; and South Africa, 2008, the ACG is delighted to host Ground Support 2013 in Perth, May 2013.

www.groundsupport2013.com

International Symposium on Slope Stability in Open Pit Mining and Civil Engineering

Perth, Western Australia, 25–27 September 2013

Slope Stability 2013 will provide a forum for open pit mining and civil engineering practitioners, consultants, researchers and suppliers worldwide to exchange views on best practice and state-of-the-art slope technologies.

www.slopestability2013.com

Financial Statement 2010 - 2012

BALANCE SHEET AS AT 31 DECEMBER 2012

	2012 A\$	2011 A\$	2010 A\$
Cash	1,714,059	1,606,557	1,278,143
Receivables	0	0	21,440
Total current assets	1,714,059	1,606,557	1,299,583
Plant and equipment	52,417	56,560	69,971
Total non-current assets	52,417	56,560	69,971
Total assets	1,766,476	1,663,117	1,369,554
Creditors and borrowings	0	0	419
Provisions (leave liabilities)	238,742	235,760	183,692
Total current liabilities	238,742	235,760	184,111
Net assets	1,527,734	1,427,357	1,185,443
Shareholder's equity			
Partner contributions	243,980	243,980	243,980
Retained profits/acc (losses)	1,283,754	1,183,377	941,463
Total shareholder's equity	1,527,734	1,427,357	1,185,443

The balance sheet should be read in conjunction with the accompanying notes.

PROFIT AND LOSS FOR THE YEAR ENDED 31 DECEMBER 2012

	2012	2011	2010
	A\$	A\$	A\$
Income			
Affiliate membership fees	110,000	60,000	71,000
Project administration	52,753	78,552	76,779
Project income – staff time	117,933	170,048	148,835
Project income – reimbursements	15,588	85,938	125,724
Event fees and sponsorships	1,510,536	1,283,375	997,714
Publications and training materials	141,740	117,675	119,462
Publications sponsorships	50,884	7,273	55,438
Interest	22,523	21,536	12,010
UWA student and research allocation	47,880	48,000	47,000
Industry funded special projects	38,040	40,849	47,985
Total income	2,107,877	1,913,246	1,701,947
Expenses			
Personnel	1,160,433	862,428	879,232
Provisions – personnel	238,742	235,760	183,692
Office space incl. furniture and computers	10,021	9,121	3,107
Project and contract related expenses	116,882	121,460	133,312
Events, training and royalties	570,295	486,691	455,719
Travel, conferences and MV allowances	25,197	24,067	20,996
Operating overheads incl. printing	60,293	58,011	67,288
Professional services	20,000	20,000	12,000
Depreciation	13,773	13,411	13,663
Loss on trade-in of vehicle	13,266	0	8,478
Student related expenses incl. special projects	23,987	24,075	1,675
Total expenses	2,252,889	1,855,024	1,779,162
Net profit (loss)	-145,012	58,222	-77,215
Opening retained earnings	-135,559	-193,781	-116,566
Closing retained earnings	-280,571	-135,559	-193,781

The profit and loss account should be read in conjunction with the accompanying notes.

Financial Statement

2010 - 2012

STATEMENT OF CASHFLOWS

Year Ended 31 December 2012

	2012 A\$	2011 A\$	2010 A\$
Cash flow from operating activities			
Receipts from customers	2,085,354	1,913,150	1,710,197
Payments to suppliers and employees	-1,987,109	-1,606,272	-1,626,675
Interest received	22,523	21,536	12,010
Net cash flows from/(used in) operating activities	120,768	328,414	95,532
Acquisitions of plant and equipment	-13,266	0	-8,478
Net cash flows from/(used in) investing activities	-13,266	0	-8,478
Cash flows from financing activities			
Net increase/(decrease) in cash held	107,502	328,414	87,054
Add: Opening cash brought forward	1,606,557	1,278,143	1,191,089
Closing cash carried forward	1,714,059	1,606,557	1,278,143

The statement of cash flows should be read in conjunction with the accompanying notes.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS AT 31 DECEMBER 2012

I Summary of Significant Accounting Policies

The financial statements have been prepared in accordance with the historical cost convention. Cost in relation to assets represents the cash amount paid or the fair value of the asset given in exchange.

The financial statements have been made out in accordance with applicable accounting standards.

The accounting policies adopted are consistent with those of the previous year unless otherwise specified.

(a) Depreciation

Depreciation is provided on a straight line basis on all tangible fixed assets, other than freehold land, at rates calculated to allocate their cost or valuation less estimated residual value, against the revenue derived over their estimated useful lives.

As of 2007, in line with The University of Western Australia's policies, equipment purchases of less than \$5,000 in value are no longer recorded as an asset. The at cost plant and equipment value was amended accordingly in 2008.

(b) Income Tax

Tax effect accounting procedures are not applied as the Australian Centre for Geomechanics is a tax free research and education centre run on a not for profit basis.

(c) Income Recognition

Government grants are recorded as income when received.

Membership fees are recognised as income in line with the membership period covered in the subscription.

(d) Employee Entitlements

Provision is made for long service leave and annual leave estimated to be payable to employees on the basis of statutory and contractual requirements. Vested entitlements are classified as current and non-current liabilities.

The contributions made to superannuation funds by the entity are charged against profit.

Financial Statement

2010 - 2012

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
AT 31 DECEMBER 2012 (continued)

	2012 A\$	2011 A\$	2010 A\$
2 Operating Profit/(Loss)			
a. The operating profit/(loss) before income tax is arrived at after charging/(crediting) the following items			
Depreciation – plant and equipment	13,773	13,411	13,663
Provision for employee entitlements	238,742	235,760	183,692
b. Included in the operating profit/(loss) are the following items of operating revenue			
Affiliate membership fees	110,000	60,000	71,000
Industry funding special projects and reimbursements	53,628	126,787	173,709
Project administration and staff time	170,686	248,600	225,614
Course fees and sponsorships	1,510,536	1,283,375	997,714
Publications and training materials	141,740	117,675	119,462
Interest – other persons/corporations	22,523	21,536	12,010
Publications contracts and sponsorships	50,884	7,273	55,438
UWA student and research allocation	47,880	48,000	47,000
Total revenue	2,107,877	1,913,246	1,701,947
3 Receivables			
Other debtors	0	0	21,440
Total receivables	0	0	21,440
4 Plant and Equipment			
At cost	136,223	103,905	103,905
Provision for depreciation	-83,806	-47,345	-33,934
Total plant and equipment	52,417	56,560	69,971

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
AT 31 DECEMBER 2012 (continued)

	2012 A\$	2011 A\$	2010 A\$
5 Creditors and Borrowings (current)			
Trade creditors and accruals	0	0	419
6 Provisions (current)			
Employee entitlements	238,742	235,760	183,692
7 Partner Contributions			
CSIRO opening/closing balance	60,320	60,320	60,320
WA School of Mines opening/closing balance	60,320	60,320	60,320
UWA Geomechanics opening/closing balance	60,520	60,520	60,520
UWA Geology	60,320	60,320	60,320
DMP* (previously DoIR) opening/closing balance * contribution mainly provided in-kind	2,500	2,500	2,500
Total partner contributions	243,980	243,980	243,980
8 Statement of Cash Flows			
Reconciliation of net profit/(loss) to the net cash flow from operations			
Net profit/(loss)	-145,012	58,222	-77,215
Changes in assets and liabilities			
– Other debtors	0	21,440	20,260
– Trade creditors and accruals	0	-419	-53,346
– Employee entitlements provision	238,742	235,760	183,692
Depreciation	13,773	13,411	13,663
Loss on trade-in of vehicles	13,266	0	8,478
Net cash flow from operating activities	120,769	328,414	95,532

We gratefully acknowledge the support of Ms Blanche De Atta – Faculty of Engineering, Computing and Mathematics, The University of Western Australia, who provided support in the preparation of the asset register.

Publications

The Australian Centre for Geomechanics provides industry with an excellent source of geomechanical knowledge through event proceedings, research reports and relevant industry publications. In response to industry need for high quality, comprehensive and state-of-the-art information, the ACG produces peer and technically reviewed event proceedings.

WINTHROP PROFESSOR YVES POTVIN (DIRECTOR)

Books (Editor):

Potvin, Y., in Proceedings of the Sixth International Seminar on Deep and High Stress Mining, 28–30 March 2012, Perth, Western Australia, ISBN 978-0-9806154-8-7, 503 p.



Potvin, Y., in Proceedings of the Fourth International Seminar on Strategic versus Tactical Approaches in Mining, 8–10 November 2011, Perth, Western Australia, ISBN 978-0-9806154-6-3, 375 p.

Book chapters:

Hadjigeorgiou, J., **Potvin, Y.**, Chapter 8.6. Hard Rock Ground Control with Steel Mesh and Shotcrete, SME Mining Engineering Handbook, Society for Mining, Metallurgy, and Exploration, Inc., Peter Darling Ed., ISBN 978-0-87335-264-2, 2011, pp. 573–595.

Journal papers:

Potvin, Y., Dight, P.M., Wesseloo, J., Some pitfalls and misuse of rock mass classification systems for mine design, Journal of the Southern African Institute of Mining and Metallurgy, Vol. 112, No. 8, August 2012.

Tarasov, B., **Potvin, Y.**, Absolute, relative and intrinsic rock brittleness at compression, Transactions of the Institution of Mining and Metallurgy: Section A, Mining Technology 2012, DOI 10.1179/1743286312Y.0000000015, May 2012, Vol. 121, No. 4, pp. 218–225.

Hudyma, M., Beneteau, D., **Potvin, Y.**, Evaluating seismic source mechanism with phasor analysis, Geotechnique Letters, Vol. 2, No. 3–7, ICE Publishing, <http://dx.doi.org/10.1680/geolett.11.00022>, February 2012.

Hadjigeorgiou, J., **Potvin, Y.**, A Critical Assessment of Dynamic Rock Reinforcement and Support Testing Facilities, Rock Mechanics and Rock Engineering Journal, Springer Wien Publisher, DOI 10.1007/s00603-011-0155-4, June 2011.

Proceedings of conferences, symposia and seminars:

Potvin, Y., Grant, D., Mungur, G., Towards a practical stope reconciliation process at Olympic Dam, in Proceedings of the Sixth International Conference on Mass Mining, 10–14 June 2012, Sudbury, Canada, pp. 1–11.

Potvin, Y., Dight, P.M., Wesseloo, J., Some pitfalls and misuse of rock mass classification systems for mine design, in Proceedings of the Second Southern Hemisphere International Rock Mechanics Symposium, 15–17 May 2012, Symposium Series S71, South African Institute of Mining and Metallurgy, Sun City, Pilanesburg, South Africa, pp. 181–194.

Tarasov, B., **Potvin, Y.**, Absolute, relative and intrinsic rock brittleness at compression, in Proceedings of the Sixth International Seminar on Deep and High Stress Mining, 28–30 March 2012, Perth, Western Australia, ISBN 978-0-9806154-8-7, pp. 313–324.

Jarufe, J., **Potvin, Y.**, Wesseloo, J., Application of the limit equilibrium strength to the seismic assessment of shear related seismicity, in Proceedings of the Sixth International Seminar on Deep and High Stress Mining, 28–30 March 2012, Perth, Western Australia, ISBN 978-0-9806154-8-7, pp. 389–400.

Potvin, Y., Some observations on underground mining strategies, in Proceedings of the Fourth International Seminar on Strategic versus Tactical Approaches in Mining, 8–10 November 2011, Perth, Western Australia, pp. 195–204.

Potvin, Y., What have we learnt about managing rockburst risks?, in Proceedings of the 11th AusIMM Underground Operators' Conference, The Australasian Institute of Mining and Metallurgy, 20–23 March 2011, Canberra, Australia, pp. 227–232.

WINTHROP PROFESSOR PHIL DIGHT (PROFESSOR OF GEOTECHNICAL ENGINEERING)

Journal papers:

Wang, H., Dyskin, A.V., Hsieh, A., **Dight**, P.M., The mechanism of the deformation memory effect and the deformation rate analysis in layered rock in the low stress region, *Computers and Geotechnics*, Vol. 44 (2012), pp. 83–92.

Potvin, Y., **Dight**, P.M., Wesseloo, J., Some pitfalls and misuse of rock mass classification systems for mine design, *Journal of the Southern African Institute of Mining and Metallurgy*, Vol. 112, No. 8, August 2012.

Proceedings of conferences, symposia and seminars:

Potvin, Y., **Dight**, P.M., Wesseloo, J., Some pitfalls and misuse of rock mass classification systems for mine design, in *Proceedings of the Second Southern Hemisphere International Rock Mechanics Symposium*, 15–17 May 2012, Symposium Series S71, South African Institute of Mining and Metallurgy, Sun City, Pilanesburg, South Africa, pp. 181–194.

Dight, P.M., Dyskin, A.V., Wang, H.J., Hsieh, A., Deformation rate analysis for stress reconstruction at shallow depths, in *Proceedings Rock Engineering & Technology for Sustainable Underground Construction (Eurock)*, 28–30 May 2012, Stockholm, Sweden, 14 p.

Dight, P.M. and McKenzie, R. Quality control aspects of shotcrete in mining – The round determinate panel test, in *Proceedings of the 11th AusIMM Underground Operators' Conference*, The Australasian Institute of Mining and Metallurgy, 20–23 March 2011, Canberra, Australia, pp. 187–190.

Jiang, J.J., **Dight**, P.M. and Pano, K. Slope stability study of the main pit footwall, Koolan Island, Mt Gibson Iron, in *Proceedings of the International Symposium on Rock Slope Stability in Open Pit Mining and Civil Engineering (Slope Stability 2011)*, E. Eberhardt and D. Stead (eds), 18–21 September 2011, Vancouver, Canada, on CD.

Company and internal report

Dight, P.M., Hsieh, A., Kempainen, K., Johansson, E., Hudson, J.A. (2012) A test case of the deformation rate analysis (DRA) Stress Measurement Method, POSIVA Research Document, Report No. 2012-1, Posiva Oy Finland, Published 28/08/2012, at http://www.posiva.fi/en/databank/working_reports, 26 p.

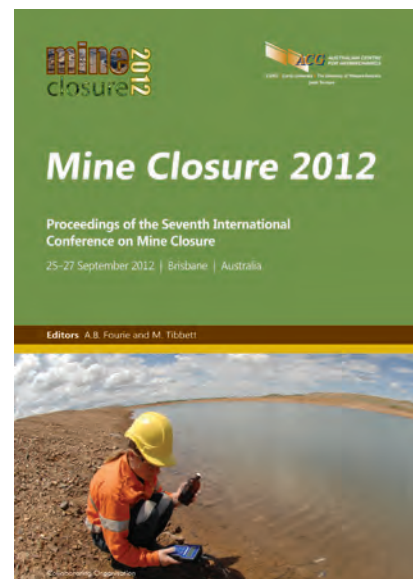
Government report:

Dight, P.M., Trefry, M., Independent Review of Uranium Mining Regulation (UAG), Prepared for the Department of Mines and Petroleum, Western Australia, DMP0281009-A, Uranium Advisory Group, April 2012, 86 p. The documents can be found on the DMP website, through the following links: <http://www.dmp.wa.gov.au/9997.aspx> and <http://www.dmp.wa.gov.au/822.aspx>

WINTHROP PROFESSOR ANDY FOURIE

Books (Editor):

Fourie, A.B., Tibbett, M. and Beersing, A., in *Proceedings of the 6th International Conference on Mine Closure*, Lake Louise, Alberta, Canada, 2011, Australian Centre for Geomechanics, Perth, Western Australia, Vol. 1, 644 p., Vol. 2, 567 p.



Jewell, R.J., **Fourie**, A.B. and Paterson, A., in *Proceedings of the 15th International Seminar on Paste and Thickened Tailings* held April 2012, South Africa, Australian Centre for Geomechanics, Perth, Western Australia, 358 p.

Jewell, R.J., **Fourie**, A.B., in *Proceedings of the 14th International Seminar on Paste and Thickened Tailings* held on 5–7 April 2011, Australian Centre for Geomechanics, Perth, Western Australia, 568 p.

DR JOHAN WESSELOO (PROJECT LEADER)

Journal papers:

Potvin, Y., Dight, P., **Wesseloo**, J., Some pitfalls and misuse of rock mass classification systems for mine design, *Journal of the Southern African Institute of Mining and Metallurgy*, Vol. 112, No. 8, August 2012.

Wesseloo, J. Empirical methods for assessment of seismic system sensitivity. *Mining Technology*, Volume 120, Number 2, Maney Publishing 2011, pp. 105–111(7).

Proceedings of conferences, symposia and seminars:

Wesseloo, J., Hudyma, M.R. and Harris, P. A community based seismic system for obtaining regional and local seismic data of strategic importance, in *Proceedings of the Fourth International Seminar on Strategic versus Tactical Approaches in Mining*, 8–10 November 2011, Perth, Australia, pp. 159–168.

Hudyma, M.R. and **Wesseloo**, J. Strategic and tactical use of a community based regional seismic monitoring system, in *Proceedings of the Fourth International Seminar on Strategic versus Tactical Approaches in Mining*, 8–10 November 2011, Perth, Australia, pp. 169–177.

Pope, N., **Wesseloo**, J. and Owen, M., Assessment of re-entry analysis procedures at an Australian mine, in *Proceedings of the Fourth International Seminar on Strategic versus Tactical Approaches in Mining*, 8–10 November 2011, Perth, Australia, pp. 141–157.

Potvin, Y., Dight, P.M., **Wesseloo**, J., Some pitfalls and misuse of rock mass classification systems for mine design, in *Proceedings of the Second Southern Hemisphere International Rock Mechanics Symposium*, 15–17 May 2012, Symposium Series S71, South African Institute of Mining and Metallurgy, Sun City, Pilanesburg, South Africa, pp. 181–194.

Jarufe, J., Potvin, Y., **Wesseloo**, J., Application of the limit equilibrium strength to the seismic assessment of shear related seismicity, in *Proceedings of the Sixth International Seminar on Deep and High Stress Mining*, 28–30 March 2012, Perth, Western Australia, ISBN 978-0-9806154-8-7, pp. 389–400.

RICHARD JEWELL (PROFESSOR)

Jewell, R.J., Fourie A.B. and Paterson, A., in *Proceedings of the 15th International Seminar on Paste and Thickened Tailings held April 2012*, South Africa, Australian Centre for Geomechanics, Perth, Western Australia, 358 p.

Jewell, R.J., Fourie, A.B., in *Proceedings of the 14th International Seminar on Paste and Thickened Tailings held on 5–7 April 2011*, Australian Centre for Geomechanics, Perth, Western Australia, 568 p.



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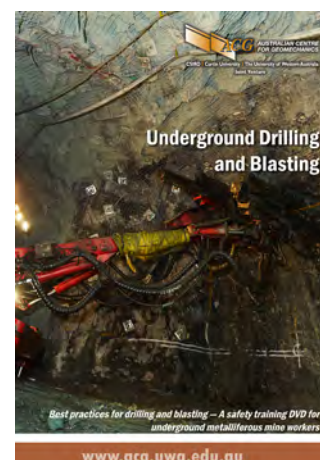
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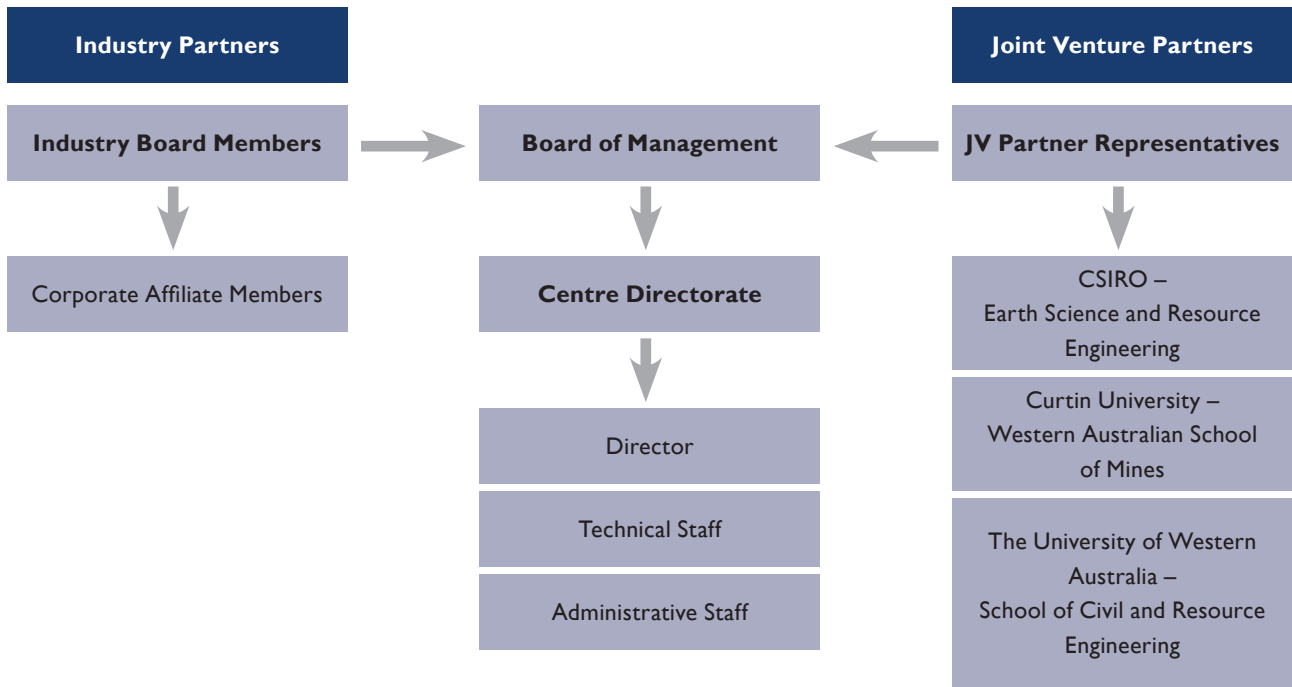
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Australian Centre for Geomechanics
PO Box 3296 - Broadway | Nedlands, Western Australia | Australia 6009
Ph: +61 8 6488 3300 | Fax: +61 8 6488 1130 | info-acg@uwa.edu.au | www.acg.uwa.edu.au