Mine Closure 2019

ACG AUSTRALIAN CENTRE FOR GEOMECHANICS

CSIRO | The University of Western Australia | Joint Venture

Mine Closure 2019

Proceedings of the 13th International Conference on Mine Closure

3–5 September 2019 | Perth, Australia

Volume One



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Editors

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Australian Centre for Geomechanics

The Australian Centre for Geomechanics (ACG) was formally established in 1992 as a University of Western Australia research centre in order to promote research excellence and continuing education in geomechanics, with particular emphasis on its application to the mineral and energy extraction sections of Australia's resources industry.

The Australian Centre for Geomechanics is an unincorporated Joint Venture involving:

- CSIRO Mineral Resources
- The University of Western Australia — Civil, Environmental and Mining Engineering

The ACG draws together staff knowledge, experiences and expertise from within the two groups forming the Centre and facilitates a multi-disciplinary approach to research and education in geomechanics. Research undertaken by the ACG attracts both national and global support and the outcomes of the projects are utilised to promote safer mining and environmental geomechanics practices, operating efficiencies and to meeting community expectations for sustainable mining practices.

With the guidance of strong industry representation on the Board of Management, and close collaboration with senior representatives of the mining industry, research, training and further education activities are tailored directly to the needs of industry. The ACG Board expects the Australian Centre for Geomechanics to be the focal point for industry on geomechanics issues and to address the needs of industry through a collaborative interdisciplinary approach.

Online Repository of Conference Proceedings



Accessing geomechanical excellence

Since 2005, the ACG has published conference papers across the geotechnical mining spectrum, including: underground and open pit mining, paste and thickened tailings and mine closure. To make many of these papers more accessible for industry and academia, the ACG launched the Online Repository of Conference Proceedings in 2017. This repository aims to provide the mining geomechanics fraternity with open access, peer-reviewed conference papers that may assist readers to maintain and develop their skills, knowledge and capabilities.

Aside from allowing users to freely download many past and current conference papers, the site features many useful functions. This highly interactive and searchable repository provides importable citation information in various formats, links to the paper authors' profiles on ORCID, ResearchGate and LinkedIn, as well as the ability to share papers on social media.

The 13th International Conference on Mine Closure papers are available on the repository.

Setting a high standard for technology transfer and accessibility, this valuable online resource will continue to develop and grow with future ACG geomechanical mining events.

papers.acg.uwa.edu.au

University of Reading

The University of Reading was established in 1892 and is now ranked in the top 1% of universities worldwide with a world-class reputation for the quality of its research, teaching and links to business. The university's School of Agriculture, Policy and Development is ranked amongst the top 20 universities globally for agriculture and forestry and aims to provide graduates the knowledge to address the major challenges and opportunities in the sector for the 21st Century. Research within the school focuses on, and integrates aspects of, food production, the sustainability of agro-ecosystems, soil science, restoration ecology, food security, adaptation and mitigation to climate change, food chains and health, animal welfare and behaviour, poverty alleviation, international development, and consumer behaviour and choice.

Research in the area of soil and land remediation mainly takes place within the Centre for Agri-Environmental Research (CAER). CAER was founded in 2000, a move that integrated the university's strengths in agricultural and environmental research, resulting in a facility that consists of the wide ranging set of disciplines that are necessary to address issues related to sustainable agriculture.

The Centre carries out high-quality scientific research with the aim of reconciling the often conflicting demands of land use and environmental protection, as well as developing partnerships with researchers, funding agencies, industry, policy makers, users and stakeholders that enable the application of knowledge and expertise to the design of sustainable agricultural landscapes. CAER enjoys state-of-the-art facilities, with laboratories and teaching facilities in addition to the University's own farm and farm-based research sites that occupy more than 850 ha. This creates a variety of opportunities to link agricultural production and environmental research. The School's Analytical Laboratory provides facilities for a wide range of analyses of soil, plant and animal materials.

Other related work also occurs within the wider remit of the cross-faculty Soil Research Centre (SRC). The SRC is built on a long legacy of soil research at the University of Reading over the last 100 years. Our expertise includes land rehabilitation, biogeochemistry, ecology, hydrology, plant sciences, microbiology, palaeoecology, archaeology, geography, earth observation, modelling, economics and social sciences. This diversity reflects the multiple challenges of understanding the dynamic processes within the Earth's critical zone. Soil is part of Earth's natural capital, where interactions between climate, geology, plants, organisms, water and humans control the supply of ecosystem goods and services, such as food, water and climate regulation, which make human life possible.

The University of Reading has a diverse and thriving postgraduate community in a wide range of environmental topics, including land remediation and ecosystem services and offers an MSc in Environmental Pollution and BSc and MSc in Environmental Management.

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Preface

The 13th International Conference on Mine Closure returns to Perth, Australia where it was first held in 2006. Since then, mine closure has become a necessary focus of mining and, with a global revival in the mining industry, the topic of mine closure is now more relevant than ever. Minimising financial costs while satisfying stakeholder expectations and achieving sustainable closure are now considered essential in planning the mining process.

The material presented at this year's mine closure conference, and the information contained in the conference proceedings, will provide assistance to owners, operators and consultants who are currently facing the challenges of managing, or planning for, closure of mines. The themes covered in this year's conference once again deal with key, perennial issues such as planning and financing mine closure with consideration of issues such as community engagement, rehabilitation and remediation providing key topics. Fundamental matters such as how to achieve much sought after relinquishment, and the vexing issue of how to deal with and manage legacy sites, along with concerns of ongoing liabilities, are all considered in the conference and these proceedings. The section on stakeholders and community engagement emphasises the priority that ever more companies are giving to considerations of social performance. Finally, a number of well-documented case studies provide information on how specific and sometimes unique challenges have been addressed.

The papers within the proceedings feature information and ideas that will be of continuing interest and use by planners, designers, contractors, operators, owners and regulators alike. In a rapidly evolving field such as mine closure, the benefits of having a truly international representation of delegates, such as at Mine Closure 2019, is evident from the quality and variety of topics covered in these proceedings.

These proceedings are also freely available from the ACG Online Repository of Conference Proceedings courtesy of Open Access Sponsors: GHD Pty Ltd and Mine Earth Pty Ltd. The papers can be accessed by scanning the QR code or from papers.acg.uwa.edu.au/mc2019.

Professor Mark Tibbett, University of Reading, UK
Co-editor and Conference Co-chair

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