Table of Contents

iii Australian Centre for Geomechanics
iv University of Reading
vii Committees
ix Technical Reviewers
xiii Preface

Keynote addresses

3 Why should we ‘think big’ on closure?
   L Tyler, J Heyes, BHP, Australia

5 The action is where the social is! The ecosystem services concept and other ideas for enhancing stakeholder engagement in integrated mine closure planning
   A Morrison-Saunders, Edith Cowan University, Australia; North West University, South Africa

19 Ecology, biodiversity and mining: science and solving the challenges
   L Mucina, Harry Butler Institute, Murdoch University, Australia; JL Tsakalos, PD Macintyre, The University of Western Australia, Australia

35 Designing contextual, efficient, and resilient land regeneration systems for mine closure under conditions of extreme uncertainty and resource constraints
   B Warr, BetterWorld Energy Ltd, Zambia; Stellenbosch University, South Africa

Mine site rehabilitation

53 Achieving restoration targets and addressing completion criteria with remote sensing
   C Richardson, A Grigg, Alcoa of Australia Ltd, Australia; T Robinson, G Wardell-Johnson, Curtin University, Australia

63 Current practice and innovation in decommissioning, rehabilitation and monitoring on Barrow Island: applications for mine closure
   DA Jasper, Stantec, Australia; P Hoffman, Chevron, Australia; NC Banning, Stantec, Australia; GS Wiseman, Stantec, Canada; KE Stanbury, SJ Annison, GR Henderson, Stantec, Australia

75 Process-based erosion modelling for shoreline rehabilitation design of a coal mine pit lake
   CD McCullough, Mine Lakes Consulting, Australia; A van Rooijen, Deltares, Australia; DS van Maren, Deltares, Netherlands

89 Challenges for the closure and natural rehabilitation of bauxite residue disposal sites
   O Torgersrud, Norwegian Geotechnical Institute, Norway; GD Breedveld, University of Oslo, and Norwegian Geotechnical Institute, Norway; G Okkenhaug, University of Life Sciences, and Norwegian Geotechnical Institute, Norway; B Malme, Norsk Hydro, Norway; P Cataldi, Norsk Hydro, Brazil
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>Mine site rehabilitation conditions in Western Australia</td>
<td>ME Kragt, The University of Western Australia, Australia; C Lison, ARC Centre for Mine Site Restoration, Australia; A Manero, J Hawkins, The University of Western Australia, Australia</td>
</tr>
<tr>
<td>111</td>
<td>Land subsidence/rebound change after Hazelwood mine rehabilitation</td>
<td>EP Waghorne, GHD Pty Ltd, Australia; MM Disfani, The University of Melbourne, Australia</td>
</tr>
<tr>
<td>123</td>
<td>A framework to prioritise high-risk abandoned mine features for rehabilitation in Western Australia</td>
<td>I Mitchell, K Hryczyszyn, T Read, Department of Mines, Industry Regulation and Safety, Australia</td>
</tr>
<tr>
<td>133</td>
<td>Geomorphic rehabilitation in Europe: recognition as best available technology and its role in LIFE projects</td>
<td>JF Martín Duque, Complutense University of Madrid and Geosciences Institute, Spain; M Tejedor, C Martín-Moreno, Complutense University of Madrid, Spain; JM Nicolau, University of Zaragoza, Spain; I Zapico, Complutense University of Madrid, Spain</td>
</tr>
<tr>
<td>147</td>
<td>Understanding the Latrobe Valley Regional Rehabilitation Strategy and why it is essential</td>
<td>A Feigl, B Davis, M Pratt, A Kirwan, B Millsom, M Mozina, E Rampal, State Government of Victoria, Australia</td>
</tr>
<tr>
<td>163</td>
<td>Ecological engineering to accelerate mineral weathering and transformation underpins sustainable tailings rehabilitation</td>
<td>L Huang, Y Fang, Y Liu, S Wu, The University of Queensland, Australia; D Parry, Rio Tinto, and The University of Queensland, Australia</td>
</tr>
<tr>
<td>175</td>
<td>Flash flaming technology shows promise to improve seed-based rehabilitation outcomes</td>
<td>E Ling, AL Guzzomi, The University of Western Australia, Australia; DJ Merritt, Department of Biodiversity, Conservation and Attractions, Australia; M Renton, TE Erickson, The University of Western Australia, Australia</td>
</tr>
<tr>
<td>185</td>
<td>Designing for success: applying ecological criteria to restoration at BHP Beenup, Australia</td>
<td>K Meney, L Pantelic, Syrinx Environmental PL, Australia</td>
</tr>
<tr>
<td>199</td>
<td>Improvements to mechanical direct seeder design guided by the optimal sowing depth of soft spinifex (Triodia pungens)</td>
<td>M Masarei, AL Guzzomi, The University of Western Australia, Australia; DJ Merritt, Department of Biodiversity, Conservation and Attractions, Australia; TE Erickson, The University of Western Australia, Australia</td>
</tr>
</tbody>
</table>

Geotechnical considerations

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>211</td>
<td>Geotechnical risk management for open pit mine closure: a sub-arctic and semi-arid case study</td>
<td>PJH de Graaf, The De Beers Group of Companies, Anglo American, South Africa; M Desjardins, De Beers Canada Inc., Canada; P Tsheko, Anglo American Metallurgical Coal, South Africa</td>
</tr>
<tr>
<td>235</td>
<td>Geotechnical considerations for the stability of open pit excavations at mine closure: some scenarios</td>
<td>I de Bruyn, D Prado, J Mylvaganam, D Walker, SRK Consulting (Australasia) Pty Ltd, Australia</td>
</tr>
<tr>
<td>249</td>
<td>Toward a common practice in the selection of earthquake ground motion criteria for the design of critical mining facilities at closure and post-closure</td>
<td>M Martínez, Golder Associates S.A., Chile; A Hull, Golder Associates Inc., USA</td>
</tr>
</tbody>
</table>
263 Stabilising an underground void: monolithic construction using self-consolidating concrete
A Pakula, R Preston, D Kennard, Golder Associates Ltd., Canada; C MacInnis, Crown-Indigenous Relations and Northern Affairs Canada, Canada

275 Mine waste characterisation: the benefits of applying practical geological knowledge
G Wesley, S Mackenzie, Mine Earth Pty Ltd, Australia; G Campbell, Graeme Campbell & Associates Pty Ltd, Australia

287 Informed mine closure by multi-dimensional modelling of tailings deposition and consolidation
H Zhou, A Amodio, N Boylan, Norwegian Geotechnical Institute, Australia

Social aspects and communities

305 Social aspects of mine closure: the elephant in the room
J Edwards, A Maritz, SRK Consulting (South Africa) (Pty) Ltd, South Africa

317 Discounting social mine closure planning
M January, 3 Circle Consulting, South Africa; H Lee, International University of Japan, Japan

333 Life post-closure: perception and use of rehabilitated mine sites by local communities
K Svobodova, The University of Queensland, Australia

345 Interesting case studies of conscious uncoupling
D Aheto-Tsegah, Golder Associates (Gh) Ltd, Ghana

355 Innovative community engagement for the quantitative risk assessment for a mine closure and reclamation plan
L Christoffersen, SRK Consulting (Canada) Inc., Canada; S Reinecke, M Shoesmith, Stratos Inc., Canada; E McKennirey, Crown-Indigenous Relations and Northern Affairs Canada, Canada; L Pilgrim, D Rae, Wood PLC, Canada

Landforms

371 Mine landforms in Western Australia from dump to landform design: review, reflect and a future direction
HWB Lacy, Mine Closure Management Services Pty Ltd, Australia

385 Tailings storage facility landform evolution modelling
H Thomson, SRK Consulting (Australasia) Pty Ltd, Australia; L Chandler, Æthos Consulting, Australia

397 Whole-of-landform erosion assessment using unmanned aerial vehicle data
M Braimbridge, S Mackenzie, Mine Earth, Australia; M Lyons, T Clarke, Regis Resources Limited, Australia; B Bow, Atlas Iron Pty Ltd, Australia

407 Roy Hill waste landform design and construction process
V de San Miguel, T Stone, Roy Hill Iron Ore Pty Ltd, Australia; M Braimbridge, S Mackenzie, Mine Earth Pty Ltd, Australia
A case for consequence categories to guide the closure design of landforms
P Chapman, A Kemp, Golder Associates Pty Ltd, Australia

Developing a rehabilitation standard for landform stability for a uranium mine in northern Australia
JBC Lowry, MJ Saynor, Department of the Environment and Energy, Australia

Closure planning and stakeholders

How can frameworks inform water quality objectives for the closure of the Ranger mine?
M Iles, Energy Resources of Australia Ltd, Australia

Clarifying closure scenarios through integrated planning at the Cerrejón mine in Colombia
J Ricaurte, Cerrejón Coal Mine, Colombia; CD Grant, Anglo American, Australia; A Freitas, Golder Associates Brasil Consultoria e Projetos Ltda., Brazil; PR Botha, Anglo American, South Africa

The Pardoo mine: closure planning, implementation and five years of performance monitoring data
S Gregory, S Mackenzie, Mine Earth Pty Ltd, Australia; B Bow, Atlas Iron Pty Ltd, Australia

A stakeholder advisory committee as a mechanism to guide the preparation of a regional mine rehabilitation strategy: two years in, what have we learnt?
S Lloyd, Latrobe Valley Mine Rehabilitation Advisory Committee, Australia

New uses for old infrastructure: 101 things to do with the ‘stuff’ next to the hole in the ground
SJ Finucane, K Tarnowy, Bioscope Environmental Consulting Pty Ltd, Australia

Foresight in hindsight
PJ Lombard, GHD Pty Ltd, Australia

Risks

An interjurisdictional approach to designing residual risk policy
A Shrivathsa, S Cooper, Queensland Government, Australia

A framework for identification and planning of environmental research needs to inform rehabilitation of Ranger Uranium Mine
MA Welch, RE Bartolo, AJ Harford, Department of Environment and Energy, Australia

Mine closure residual risk management: identifying and managing credible failure modes for tailings and mine waste
J Sanders, H McLeod, A Small, Klohn Crippen Berger Ltd., Canada; C Strachotta, Klohn Crippen Berger Ltd, Australia

The multi-risk vulnerability of global coal regions in the context of mine closure
K Svobodova, JR Owen, E Lebre, M Edraki, A Littleboy, The University of Queensland, Australia

Risk profiling and control of spontaneous combustion for coal mine closure
B Williams, K Donaldson, Flinders Power, Australia; B Beamish, B3 Mining Services, Australia
Analysis of dry cover systems composed of tropical soils for mining waste
DA Perotti, Universidade de São Paulo, Brazil; GFN Gitirana Jr, Universidade Federal de Goiás, Brazil; MD Fredlund, SoilVision Systems Ltd., Canada

Tailings covers

Six years of cover performance data for leading practice store and release cover trials at Century Mine
PL Defferrard, New Century Resources Limited, Australia; TK Rohde, SGM Environmental Pty Limited, Australia

Will tree colonisation increase the risks of serious performance loss of engineered covers under climate change in Québec, Canada?
Y-D Botula, M Guittonny, B Bussière, Université du Québec en Abitibi-Témiscamingue, Canada; É Bresson, Polytechnique Montréal, Canada

Tailings storage facilities store-and-release cover design for the Cobar region
NP Jamson, TK Rohde, SGM Environmental Pty Ltd, Australia

Coal ash waste categorisation to determine a regulatory capping profile for coal ash pond rehabilitation
PS Fridell, C Pearson, Environmental Resources Management Australia Pty Ltd, Australia; F Woskoboenko, HRL Technology Group Pty Ltd, Australia; R Brooker, MK Schenkel, ENGIE Australia Pty Ltd, Australia

Revegetation after closure

Too much of a good thing: phosphorus over-fertilisation in rehabilitated landscapes of high biodiversity value
M Tibbett, R O’Connor, MI Daws, University of Reading, UK

Combining seed burial, land imprinting and an artificial soil crust dramatically increases the emergence of broadcast seed
MP Dobrowolski, Iluka Resources Limited, and The University of Western Australia, Australia

A case study of seed-use technology development for Pilbara mine site rehabilitation
TE Erickson, The University of Western Australia, Australia; M Muñoz-Rojas, The University of New South Wales, Australia; AL Guzzi, M Masarei, E Ling, AM Bateman, OA Kildisheva, AL Ritchie, SR Turner, The University of Western Australia, Australia; B Parsons, Greening Australia, Australia; P Chester, Rio Tinto (Iron Ore Division, Western Australia), Australia; T Webster, S Wishart, BHP Western Australia Iron Ore Pty Ltd, Australia; JJ James, University of California, USA; MD Madsen, Brigham Young University, USA; SR Abella, University of Nevada, USA; DJ Merritt, Department of Biodiversity, Conservation and Attractions, Australia

Applied phosphorus has long-term impacts on vegetation responses in restored jarrah forest
MI Daws, University of Reading, UK; AH Grigg, Alcoa of Australia Ltd, Australia; RJ Standish, Murdoch University, Australia; M Tibbett, University of Reading, UK

Target Ecosystem Assessment Model: a process to develop target revegetation prescriptions in the mine closure landscape
B Logan, V Futoransky, S Dietrich, BH Flemming, V Wilson, L Waterman, Paragon Soil and Environmental Consulting Inc., Canada
Harnessing ecological processes in the Ranger Uranium Mine revegetation strategy
P Lu, I Meek, Energy Resources of Australia Ltd, Australia

Growth of rye grass and clover in artificial topsoils: a case study
L Mundodi, M Yellishetty, V Wong, A Walmsley, Monash University, Australia; J Missen, N Anderson, AGL Loy Yang, Australia

A ground up approach to revegetation in the arid zone
G Christie, B Horner, AT Scanlon, J Lemon, Succession Ecology Pty Ltd, Australia; B Williams, Flinders Power, Australia

Bang for your buck: revegetating arid sites using coloniser species
B Horner, G Christie, Succession Ecology Pty Ltd, Australia; B Williams, Flinders Power, Australia; AT Scanlon, J Lemon, Succession Ecology Pty Ltd, Australia

Policies and standards

An update on the development of mine closure and reclamation standards by the International Organization for Standardization
DP Murphy, Golder Associates Pty Ltd, Australia; M Nahir, Crown-Indigenous Relations and Northern Affairs, Canada; C Didier, French National Institute for Industrial Environment and Risks, France

Environmental regulatory oversight: transitioning from an operational to rehabilitation framework
JP Miller, Department of Environment and Energy, Australia

Introducing the International Council on Mining and Metals’ Integrated Mine Closure Good Practice Guide
D Brock, International Council on Mining and Metals, UK; B Weeks, Golder Associates Inc., Canada; J Heyes, BHP, Australia

A repurposing framework for alignment of regional development and mine closure
DP Murphy, Golder Associates Pty Ltd, Australia; J Fromm, R Bairstow, Pilbara Development Commission, Australia; D Meunier, Jacobs Australia, Australia

Mine rehabilitation in the Latrobe Valley, the start of a long journey: the Commissioner’s role
R Mackay, Latrobe Valley Mine Rehabilitation Commissioner, Australia; R Hastie, H Lilley, M Mathew, Office of the Latrobe Valley Mine Rehabilitation Commissioner, Australia

Does the integration of environmental impact assessment and mine closure planning deliver effective mine closure plans in Western Australia?
R Getty, SRK Consulting (Australasia) Pty Ltd, Australia; A Morrison-Saunders, Edith Cowan University, Australia; North West University, South Africa

Proceedings Author Index