DAY ONE | MONDAY | 15 OCTOBER 2018

PROGRAMME*

EAST MEETING ROOM 1-3

07:00 REGISTRATION OPEN

07:50 REGISTRATION CLOSE

08:00 Welcome, introduction and opening address J. Jakubec, SRK Consulting (Canada) Inc., Canada

KEYNOTE ADDRESS AND SESSION 1: CASE STUDIES

SESSION CHAIR J. Wesseloo, Australian Centre for Geomechanics, The University of Western Australia, Australia

08:30 KEYNOTE: Optimising for success at the Grasberg Block Cave R. Campbell, Freeport-McMoRan Inc., USA; H. Band, J. Fojar, PT Freeport Indonesia, Indonesia; C. Brannon, Freeport-McMoRan Inc., USA

09:00 Safely re-opening a collapsed extraction level drive in a resource-limited environment NA. Shen, RW. Sinclair, TM. Welsh, Climax Molybdenum, USA

09:30 Sublevel retreat mining in the subarctic: a case study of the Diavik Diamond Mine PA. Lewis, LM. Clark, SJ. Rowles, CP. Auld, CM. Petryshen, AP. Elderkin, Rio Tinto, Canada

09:45 Underground mining at Ekati and Diavik diamond mines J. Jakubec, D. Liagadé, SRK Consulting (Canada) Inc., Canada; B. Boggis, Dominion Diamond Mines UL, Canada; LM. Clark, PA. Lewis, Rio Tinto, Canada

10:00 MORNING BREAK

SESSION 2: CAVING PRODUCTIVITY, GRADE AND VALUE

SESSION CHAIR T. Casten, Freeport-McMoRan Copper and Gold Inc., USA

10:30 Palabora Lift 1 block cave: understanding the grade behaviour T. Dwiering, Dassault Systèmes, Canada; S. Ngidi, J. J. Bezuidenhout, HD. Petzetold, Palabora Mining Company, South Africa;

11:00 Increasing productive capacity in block caving mines K. Shelswell, PO. Labrecque, Labrecque Technologies Inc., Canada; DM. Morrison, Centre for Excellence in Mining Innovation, Canada

11:30 Cave to mill: improving value of caving operations A. Moss, B. Klein, S. Nadolski, The University of British Columbia, Canada

12:00 An approach to evaluating block and panel cave projects for sensor-based sorting applications S. Nadolski, B. Klein, The University of British Columbia, Canada; CJR. Hart, Mineral Deposit Research Unit, Canada; A. Moss, D. Elmo, The University of British Columbia, Canada

12:15 Grade control and segregation at New Gold’s New Afton block cave operation, Kamloops, British Columbia MG. Henning, New Gold Inc., Canada

12:30 LUNCH

SESSION 3: CAVE MECHANICS AND NUMERICAL MODELLING

SESSION CHAIR C. Lilley, Beck Engineering Pty Ltd, Australia

13:30 Three-dimensional simulation of cave initiation, propagation and surface subsidence using a coupled finite difference–cellular automata solution Y. Heber, G. Shanrock, Itasca Australia Pty Ltd, Australia

14:00 Back-analysis of PC1 cave propagation and subsidence behaviour at the Cadia East mine B. Sainbury, Noma Consulting and Deakin University, Australia; D. Sainbury, Noma Consulting, Australia; D. Carroll, Newcrest Mining Limited, Australia

14:30 A re-evaluation of the conceptual model of caving mechanics D. Cumming-Potvin, J. Wesseloo, Australian Centre for Geomechanics, The University of Western Australia, Australia; SW. Jacoba, E. Kearsey, University of Pretoria, South Africa

14:45 Numerical simulations of a centrifuge model of caving D. Cumming-Potvin, J. Wesseloo, Australian Centre for Geomechanics, The University of Western Australia, Australia; ME. Pierce, Pierce Engineering, USA; T. Garcez-Cruz, J. Bousaram, Itasca Consulting Group, USA; SW. Jacoba, E. Kearsey, University of Pretoria, South Africa

15:00 Suggested methods for estimation of confined strength of heterogeneous (defected) rocks B. Bahrani, Dalhousie University, Canada; PK. Kaiser, Laurentian University, Canada; A. Garkum, Dalhousie University, Canada

15:15 Review and simulation of passive seismic tomography in block cave mining S. Ghaychi Afrouz, EC. Westman, Virginia Polytechnic Institute and State University, USA

15:30 AFTERNOON BREAK

SESSION 4: DRAW CONTROL/FRAGMENTATION (1)

SESSION CHAIR L. Manca, Newcrest Mining Limited, Australia

16:00 Hang-up analysis and modelling for Cadia East PC1-S1 and PC2-S1 R. Castro, Advanced Mining Technology Center, University of Chile, Chile; D. Cuello, Newcrest Mining Limited, Australia

16:15 Integrated simulation and optimisation tools for production scheduling using finite element analysis caving geomechanics simulation coupled with 3D cellular automata S. Andry, Monash University, Australia; T. Bui, T. Dwiering, Dassault Systèmes, Canada; J. Auster, Newcrest Mining Limited, Australia; R. Hocking, QZ Minerals Limited, Australia

16:30 Presence of natural fracture as an indicator of operational difficulty for cave operations M. Munkhchuluun, Oyu Tolgoi LLC, Mongolia; D. Elmo, S. Nadolski, The University of British Columbia, Canada; A. Moss, Sonal Mining Technology, Canada; B. Klein, The University of British Columbia, Canada

16:45 Influence of rock mass veining and non-persistent joints on secondary fragmentation during block caving L. Dorador, E. Eberhardt, D. Elmo, The University of British Columbia, Canada

SESSION 5: MINE PLANNING (1)

SESSION CHAIR K. Crook, Rio Tinto, Australia

17:00 Underground roadway design considerations for efficient autonomous hauling R. Thompson, Curtin University Western Australian School of Mines, Australia; H. Molekhia, Curtin University, Australia

17:15 Influence of the undercut height on the behaviour of pillars at the extraction level in block and panel caving operations F. Hormazabal, R. Alvarez, A. Ruso, D. Kevedo, SRK Consulting (Chile) S.A., Chile

17:30 Optimisation of the undercut level elevation in block caving mines using a mathematical programming framework R. Noriega, Y. Pourrahimian, WL. Victor, University of Alberta, Canada

17:45 Principal sponsor presentation: Beck Engineering

17:55 DAY ONE CLOSE

* This programme is subject to change. For updates, please visit www.caving2018.com
**PROGRAMME**

**DAY TWO | TUESDAY | 16 OCTOBER 2018**

**EAST MEETING ROOM 1-3**

### KEYNOTE ADDRESS AND SESSION 6: SUBLEVEL CAVING

**SESSION CHAIR** AGL Davies, New Gold Inc., Canada

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>08:00</td>
<td>KEYNOTE: Key geotechnical knowledge and practical mine planning guidelines in deep, high-stress, hard rock conditions for block and panel cave mining. <em>D Cuello,</em> G Newcombe, Newcrest Mining Limited, Australia</td>
</tr>
<tr>
<td>08:30</td>
<td>Early cave management at the Carrapateena sublevel cave. <em>R Hocking,</em> G Balog, <em>T Ormerod,</em> H Pearce, OZ Minerals Limited, Australia</td>
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<tr>
<td>09:00</td>
<td>Design of a new layout for sublevel caving at depth. <em>C Quintero,</em> Lueossavaare-Kiirunavaara Aktiebolag (LKAB), Sweden</td>
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<td>09:30</td>
<td>Full-scale experiments to measure the effect of crosscut height on recovery in sublevel cave mines. <em>AD Campbell,</em> Beck Engineering, Australia</td>
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<tr>
<td>09:45</td>
<td>Effects of blast ring burden and explosive density on fragmentation and ore recovery in sublevel cave mines. <em>AD Campbell,</em> Beck Engineering, Australia</td>
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<td>10:00</td>
<td>MORNING BREAK</td>
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### SESSION 7: RESEARCH AND INNOVATION

**SESSION CHAIR** E Eberhardt, The University of British Columbia, Canada

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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>10:30</td>
<td>Benchmarking and its application for caving projects. <em>IT Ross,</em> CaveConsult Pty Ltd, Australia</td>
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<tr>
<td>11:00</td>
<td>Strategy for research and development in the cave mining industry. <em>GA Ferguson,</em> Settrust Associates Limited, UK; <em>D Cuello,</em> Newcrest Mining Limited, Australia; <em>P Gandara,</em> Codelco, Chile; <em>Y Potvin,</em> Australian Centre for Geomechanics, The University of Western Australia, Australia; <em>E Rojas,</em> Codelco, Chile</td>
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<tr>
<td>11:30</td>
<td>The role of research in cave mining. <em>SD McKinnon,</em> Queen's University, Canada; <em>GA Ferguson,</em> Settrust Associates Limited, UK</td>
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<td>11:45</td>
<td>A systems approach to mining innovation. <em>DM Morrison,</em> V Orye, Centre for Excellence in Mining Innovation, Canada; <em>PO Labrecque,</em> Labrecque Technologies Inc., Canada</td>
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<tr>
<td>12:00</td>
<td>LUNCH</td>
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### SESSION 8: MINE PLANNING (2)

**SESSION CHAIR** S Webster, CMOC, Australia

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>13:00</td>
<td>Grasberg Block Cave mine: cave planning and undercut sequencing. <em>D Beard,</em> C Brannon, Freeport-McMoRan Inc., USA</td>
</tr>
<tr>
<td>13:30</td>
<td>Chuquicamata underground mine design: the simplification of the ore handling system of Lift 1. <em>P Paredes,</em> T Leaño, L Jauriat, Codelco, Chile. Presented by <em>Y Martinez,</em> Codelco, Chile</td>
</tr>
<tr>
<td>14:00</td>
<td>Maximising resource utilisation in scheduling of underground mining works with multiple faces. <em>D Cortes,</em> Y Martinez, Codelco, Chile; <em>M Silva,</em> Züblin, Chile</td>
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<td>14:15</td>
<td>Overview of mine scheduling for Oyu Tolgoi Underground project. <em>S Fawke,</em> B Groeneveld, Rio Tinto, Australia</td>
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<td>14:30</td>
<td>Development planning for the Oyu Tolgoi panel cave mine. <em>D Beard,</em> C Brannon, Freeport-McMoRan Inc., USA</td>
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<td>14:45</td>
<td>Developing projects using CaveLogic™. <em>M Arancibia,</em> F Soto, Maptek, Chile</td>
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<td>15:00</td>
<td>AFTERNOON BREAK</td>
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### SESSION 9: SEISMICITY (1) – TOOLS TO MANAGE SEISMIC RISK

**SESSION CHAIR** S Savage, Oyu Tolgoi LLC, Mongolia

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>15:30</td>
<td>Development and implementation of the Short Term Activity Tracker and Mine Control Trigger Response System. <em>C Chester,</em> D Cuello, Newcrest Mining Limited, Australia; <em>G Basson,</em> Institute of Mine Seismology, Australia</td>
</tr>
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<td>15:45</td>
<td>Rapid assessment of the spatial extent of strong ground motion in mines – ShakeMap approach. <em>S Meyer,</em> Institute of Mine Seismology, Australia; <em>J Doolan,</em> C Chester, Newcrest Mining Limited, Australia; <em>G Basson,</em> Institute of Mine Seismology, Australia</td>
</tr>
<tr>
<td>16:00</td>
<td>Towards physics-based hazard assessment tools for developing blanket re-entry rules. <em>W de Beer,</em> ESG Solutions, Australia; <em>L Smith-Boughner,</em> G Vegas, K Bosman, D Angus, ESG Solutions, Canada</td>
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### SESSION 10: SEISMICITY (2) – CAVE FRONT TRACKING

**SESSION CHAIR** D Stead, Simon Fraser University, Canada

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>16:15</td>
<td>Tracking cave shape development with microseismic data. <em>R Lynch,</em> S Meyer, E Lötter, Institute of Mine Seismology, Australia; <em>J Lett,</em> Newcrest Mining Limited, Australia</td>
</tr>
<tr>
<td>16:30</td>
<td>Identifying a migrating stress front using apparent stress for an unplanned rock mass cave. <em>L Brown,</em> M R Hudyma, Laurentian University, Canada</td>
</tr>
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<td>16:45</td>
<td>Mapping cave front growth utilizing the collective behaviour of seismicity and velocity fields. <em>G Vegas,</em> K Bosman, D Angus, ESG Solutions, Canada; <em>W de Beer,</em> ESG Solutions, Canada; <em>L Smith-Boughner,</em> ESG Solutions, Canada</td>
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<tr>
<td>17:00</td>
<td>Major sponsor presentation: ESG Solutions</td>
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**18:30 | Symposium Dinner – Top of Vancouver Restaurant, 555 W Hastings St, Vancouver**

*This programme is subject to change. For updates, please visit www.caving2018.com*
KEYNOTE ADDRESS AND SESSION 1: DRAW CONTROL/FRAGMENTATION (2)

08:00 KEYNOTE: Past learnings focus innovative solutions to future cave mining
C Stearns, A van As, E Peebles, Rio Tinto, Australia

08:30 Footprint Finder tool for sublevel caving T Diering, Dassault Systemes, Canada
J Bailey, De Beers Group of Companies, South Africa

09:00 REBOP–FLAC3D hybrid approach to cave modelling MA Fuensalida, Itasca Consulting Group, USA
ME Pierce, Pierce Engineering, USA
T Katsaga, Itasca Consulting Canada, Canada

09:30 Experiments and simulation of gravity flow in block caving through FlowSim R Castro, Advanced Mining Technology Center, University of Chile, Chile
L Arancibia, University of Chile, Chile
D Guzman, JP Henriquez, BCTEC Engineering and Technology, Chile

09:45 Non-vertical cave and dilution modelling at New Gold’s New Afton Mine J Parsons, D Hamilton, New Gold Inc., Canada
C Ludwicki, Dassault Systemes, Canada

10:00 MORNING BREAK

SESSION 12: SEISMICITY (3) – SEISMIC HAZARD CASE STUDIES

10:30 Leinster cave seismic risk management: a block cave solution M Hopkins, R Rimmelin, A London, BHP, Australia

11:00 Controlling the effects of stress and seismicity in a sublevel caving operation HEJ Esterhuizen, Ernest Henry Mining, Australia

11:30 Progression and management of seismic hazard through the life of Telfer sublevel cave MJ Woods, ME Poultier, RG King, Newcrest Mining Limited, Australia

12:00 Analysis of a damaging seismic event on 24 December 2011 in the Pilar Norte sector of El Teniente mine D Malovichko, Instituto of Mine Seismology, Australia
D Cuello, Newcrest Mining Limited, Australia
E Rojas, Codelco, Chile

12:15 Evaluating the effect on seismicity of a hydraulic fracturing trial using Bayesian data analysis K Jonsson, Luossavaara-Kirunaavaara Aktiebolag (LKAB), Sweden
J Martinsson, Luleå University of Technology and Luossavaara-Kirunaavaara Aktiebolag (LKAB), Sweden

12:30 LUNCH – POSTER SESSIONS AT 12:45, EAST MEETING ROOM 1-3

SESSION 13: SUBSIDENCE AND MONITORING

13:30 InSAR as a practical tool to monitor and understand large-scale mining-induced ground deformations in a caving environment K Mäkitalo, B-M Stockel, T Saviakhti, Luossavaara-Kirunaavaara Aktiebolag (LKAB), Sweden
J Sjöberg, Itasca Consultants AB, Sweden
J Dudley, MA McParland, R Morin, MDA Geospatial Services, Canada

14:00 Understanding and managing surface subsidence at New Gold’s New Afton block caving operation AG Davies, DB Hamilton, New Gold Inc., Canada
M Hopkins

14:30 Development of a monitoring network for surface subsidence at New Gold’s New Afton block caving operation MA Clayton, BGC Engineering Inc., Canada

14:45 InSAR monitoring of subsidence induced by underground mining operations G Feldon, S Del Conte, TRE ALTAMIRA Inc., Canada
F Bellotti, D Colombo, TRE ALTAMIRA s.r.l., Italy

15:00 Testing the suitability of radio frequency identification cattle tags for tracking block caving progression ML Wilson, GJ Van Hout, FF Dean, Rio Tinto, Australia

15:15 AFTERNOON BREAK

SESSION 14: GROUND SUPPORT

15:45 Characterising the behaviour of rockbolts based on in situ pull tests J Hadjigeorgiou, University of Toronto, Canada
P Tomasone, Mining Plus, Canada

16:00 Discrete element modelling of a laboratory static test on welded wire mesh F Karemapura, B Baek, J Hadjigeorgiou, University of Toronto, Canada

16:15 An empirical comparison between new and existing laboratory-based dynamic sample configurations G Kang, A Berghorst, P de Bruin, New Concept Mining, South Africa

16:30 Rapid mine development using efficient in-cycle shotcrete F Erismann, B Lindlar, Sika Services AG, Switzerland
C Munoz, Sika Chile, Chile
M Hansson, Sika Services AG, Sweden
R Erlangga, Sika Indonesia, Indonesia

16:45 Numerical modelling of dynamic testing for rock reinforcement used in underground excavations E Marambio, JH Vallejos, L Burgos, University of Chile, Chile
C Gonzalez, MIRARCO Mining Innovation, Canada
G Hadjigeorgiou, J Lima, Campinas Siderurgica Equinoccio, Chile
J Urruzua, Teiko Ingenieria Ltda., Chile

SESSION 15: CAVING DATA

17:00 Using a structured data management system to improve mine development efficiencies E Savage, To Moorcroft, Oyu Tolgoi LLC, Mongolia
S Talu, Rio Tinto, Australia

17:15 Geotechnical data collection and approach to modelling for the Cukaru Peki deposit K Lewellyn, SRK Consulting (UK) Ltd, UK
J Jakubec, SRK Consulting (Canada) Inc., Canada
R Goddard, SRK Consulting (UK) Ltd, UK
P Stenhouse, Polyphase Consulting Ltd, New Zealand

17:30 Major sponsor presentation: Sika

17:35 Closing address and farewell Y Potvin, Australian Centre for Geomechanics, The University of Western Australia, Australia

17:45 SYMPOSIUM CLOSE
LABORATORY TOUR, EARTH SCIENCE BUILDING, DEPT OF EARTH, OCEAN AND ATMOSPHERIC SCIENCES, UNIVERSITY OF BRITISH COLUMBIA

The ACG is facilitating a university laboratory tour for attendees only of the Fourth International Symposium on Block and Sublevel Caving. The University of British Columbia is generously offering a tour of their Geological Engineering laboratories.

Date: Friday 19 October 2018
Time: 9am (own transport)
Venue: Atrium of UBC Earth Science Building, 2020-2207 Main Mall, Vancouver

To register, and to learn more, see caving2018.com/site-visit

SYMPOSIUM DINNER

The Caving 2018 Symposium dinner will be an opportunity for delegates to socialise, network and enjoy a delicious meal with a spectacular 360 degree view of Vancouver.

Venue: Top of Vancouver Restaurant, 555 W Hastings St, Vancouver
Date: Tuesday 16 October 2018
Time: Pre-dinner drinks at 6:30pm, dinner at 7:00pm

CAVE MINING FORUM WORKSHOP

Sunday 14 October 2018 | Simon Fraser University | Vancouver, Canada

PRELIMINARY WORKSHOP PROGRAMME

8:30 – Registration
9:00 – Presentations
12:00 – Catered lunch
1:00 – Workshop and panel discussion
3:00 – Social function (Steamworks Pub)

CONTACT INFORMATION

To register, please contact Alice Huynh at ahuynh@srk.com

Presentations:
Rehabilitation of a Converged Drawpoint at the New Afton Mine
Corey Kamp, New Afton
Part 1: An Innovative Transition to Mass Mining
Steve Olson, North American Palladium
Part 2: Integrated Particle Flow Modeling: From Concept to Operations
Steve Olson, North American Palladium & Scott O’Connor, Deswik Mining Consultants
Effective Cave Draw Strategies to Manage Point Loading/Crushing of the Extraction Level
Andre Van As, Van As Consulting
Effective Ground Support Strategies for Rehabilitating the Extraction Level
Sami Talu, Rio Tinto
Rehabilitation in Weak Ground – Cassiar and Other Case Studies
Jarek Jakubec, SRK Consulting
Cave Recovery After Major Failures
Alan Guest, Alan Guest Technical Consulting

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