

# TAILINGS AND MINE WASTE 2022



November 6-9, 2022 | Denver, Colorado



CIVIL AND ENVIRONMENTAL  
ENGINEERING  
COLORADO STATE UNIVERSITY

## WIRELESS PASSWORD CSU2022

### Sunday, November 6, 2022

#### Pre-registration and Reception

12:00 PM - 7:30 PM Registration & Exhibit Hall Open  
6:00 PM - 8:00 PM Reception — Exhibit Hall

### Monday, November 7, 2022

7:00 AM - 5:00 PM Registration  
7:30 AM - 8:30 AM Presenters' Breakfast — Wind Star  
7:30 AM - 8:30 AM Delegate Breakfast — Exhibit Hall

Exhibit Halls are located in the Grand Mesa Ballroom & 2nd Floor Atrium

#### Welcome and Introductions

8:30 AM - 8:45 AM — Grand Mesa Ballroom

#### Keynote Speaker Dr. Andy Fourie

8:45 AM - 10:00 AM — Grand Mesa Ballroom

Topic: **Evaluation of Static Liquefaction Susceptibility — Key Outcomes of the TAILLIQ Research Project**

10:00 AM - 10:30 AM — Break — Exhibit Hall

#### Session 1A: Design & Operation

10:30 AM - 12:00 PM — Chasm Creek

- Progressive Release of Closure Security - A Case Study of Lupin Mine Closure  
*A. Tong, J. McKinley, M. Surette, K. Lewis*
- Good Practices for Safe Design, Operation, and Closure of Upstream TSFs  
*K. Aguilard, L. Yenne, J. Redmond, R. Davidson, K. Katapa, K. Kruger, T. Johndrow, G. Lysay*
- Optimizing Depositional Strategies and Dam Construction Methodology at the Highland Tailings Storage Facility  
*T. Beingessner, J. Grover, E. Hill, D. Hegadoren*
- Design Approach for a Co-Managed Tailings and Waste Rock Facility in British Columbia, Canada  
*S. Bainbridge, S. Bainbridge, J. Bainbridge, J. Samtez, W. Samtez, D. Samtez*

- Permeation Grouting of an Upstream Tailings Dam: A Feasibility Study  
*K. Boschi, M. Arroyo, D. Burbano, G. Spagnoli*

#### Session 1B: Reclamation & Remediation

10:30 AM - 12:00 PM — Mesa Verde

- Hydrology of Final Covers for Overburden Piles and Pit Backfill At High Elevation Mine Sites in Southeastern Idaho  
*C.H. Benson, W.H. Albright, P. Apiwantragoon, B. Lyles*
- Influence of Climate Data Substitutions for Evapotranspiration Cover Design  
*K. Greaser, A. Norris, J. Scalia IV*
- Mine Waste Covers Performance Modelling – From Uncertainty to Probability  
*I. Miskolczi, J. Mayer*
- Physico-Chemical Characteristics of Soil Covers for Rehabilitation of Mine Tailings: A Lysimeter Trial  
*M. Proto, R. Courtney*
- Implications of Cover Depth on Reclaimed Plant Communities: A Conceptual Review of Rooting Profiles  
*J. Dillon*

#### Session 1C: Tailings Processing

10:30 AM - 12:00 PM — Highlands

- Tailings Surface Stacking; Longevity Review  
*J. Johnson, M. Magoffin*
- Refinement of Central Thickened Discharge Tailings Facilities  
*D. Accadia, F. Gassner*
- Impact of Solids Content on Sub-Aerially Deposited Potash Fine Tailings  
*C. Sonntag, K. Freistadt, M. Haug*
- Toward Understanding the Rheology of Poned Coal Combustion Residuals (CCRs)  
*R.C. Bachus, Y. Zhao, S. Dai*
- The Cost Impact of Partial Stream Tailings Filtration  
*C. Braun, K. Rahal*

12:00 PM - 1:30 PM Lunch — Exhibit Hall  
Grand Mesa Ballroom

## Session 2A: Design & Operation

1:30 PM - 3:00 PM—Chasm Creek

- Validation of TSF Capacity Predictions for Optimized Mine Planning  
*G. Peltack, G. Gjerapic, M. Moesliman*
- Accelerated Settlement by Preloading & Prewetting Uncompacted Waste Rock for Crusher Foundation  
*M. Sova, M. Kaya, D. Geier, K. Regan*
- Design of Remedial Measures for Tailings Dams Founded on Soft Ground  
*B. Panda, C. Sandhu, A. Jacobs*
- Closure of Abandoned Copper Sulfide Mine - Methods for Improved Construction Safety  
*R. Greenwood, S. Garland, R. Claydon, J. Edwards*
- Tailings Improvement by Stress-Densification from Waste Rock Capping  
*T. Sully, K. Brouwer, P. Robertson, G. Greenaway*

## Session 2B: Site Characterization & Monitoring

1:30 PM - 3:00 PM—Mesa Verde

- Seepage and Geotechnical Monitoring of Tailings Dams using Integrated Distributed Fibre Optics Sensing Platform  
*S. Alkhaffaf, J. Furlong, Z. Anderson*
- Review of Modern Recommendations for the Monitoring Plans of Tailings Storage Facilities  
*V. Le Borgne, A. Siamaki, A. Dulmage*
- Assessment of Embankment Piezometer Trigger Values Using Multiple Automated Trials to Create Phreatic Surfaces  
*S. Paterson, I. Vernengo*
- Conducting a Successful Geophysical Campaign: Benefits, Pitfalls, and Guidelines  
*D. Compos Halas, B. McClement, A. Marchand, B. Walker*
- Is Collection of Monitoring Data Enough to Prevent TSF Collapses?  
*D. Colombo, P. Farina, A. Ciampalini, V. Taurino*

## Session 2C: Water Management

1:30 PM—3:00 PM—Highlands

- Reuse of Gold Mine Pit in South America as a Water Source for Local Communities  
*S.T. O'Donnell, R.D. Espinoza*
- Innovative, Low-Energy Solutions to Remove Environmental Contaminants from Process Wastewater and ML/ARD  
*K. Bossy, T.C. Anderson, A. Lister*

- Coal Mine Water Treatment and Control Options for Selenium: **Overview, Evaluation, and Case Studies**  
*N. Finke, B. Malyk, A. Lee, D. Aduke, G. Gilron, M. Bianchin*
- Integrated Watershed Assessment for Mine Closure: Horizon Oil Sands Mine  
*R. Simms, C. Dourado, R. Maji, L. May, G. Biftu, F. Meng, W. Adeba*
- Using a Retrofitted Tailings Drop Box to Evaluate the Validity of Darcy's Law for Drain Rock  
*S. Bigsby, G. Klemet, A. Chou, C. Mendoza*

3:00 PM—3:30 PM Break—Exhibit Hall  
Grand Mesa Ballroom

## Session 3A: Filtered Tailings

3:30 PM - 5:00 PM—Chasm Creek

- Innovations in Tailings Management-Hydraulic Dry Stacking  
*P. Newman, M. Bruton, J. Burgos, J. Purrington*
- Learnings from Dry Stacking Fine Grained Nickel Residue in the Tropics  
*A.J. Bodley, C. Vaguener*
- The Impact of Coarse Particle Addition to Fines on Thickening and Filtrations  
*K. Rahal, C. Braun*
- Characterizing a Filtered Stabilized Metallurgical Residue with PMT  
*K. Boschi, M. Arroyo, D.A. Burbano, G. Spagnoli*
- Use of Climatic Type Settings to Understand the Potential for ARD from Filtered Tailings Stacks  
*N. Aghazamani, J. Scalia IV, C.A. Bareither*

## Session 3B: Geotechnical Considerations

3:30 PM - 5:00 PM—Mesa Verde

- Laboratory Vane Shear Testing Apparatus for Evaluating Critical State Parameters and Undrained Shear Strength of Mine Tailings  
*J. W. Harvey, I.A. Contreras*
- Modified Field Vane Technology for Improved Reliability of Undrained Shear Strength Measurements in Mine Tailings  
*A.A. Hogan, S.A. Kelly, O. Storteboom, P.K. Robertson*
- Effects of Soil Fabric on the Triggering of Static Liquefaction - Implications on Mine Tailings  
*S. Bokkisa, J. Macedo, A.L. Petalas*
- Liquefaction Assessment of Tailings Using CPTu Soundings Through Different Methodologies  
*G. González, E. Santos, J. Campana*
- Residual Strength Based on CPT Sleeve Friction and a Constant Volume Ring Shear Device  
*E. Mmbando, A. Fourie, D. Reid, C. O'Loughlin, J. Gao Y. Wang*

## Session 3C: Governance & Regulations

3:30 PM - 5:00 PM— Highlands

- Tailings Management Multi Criteria Analysis Option Review for Capricorn Copper Mines' Tailings Storage Facility  
*F. Daliri, C. Ghebosu, D. Brett, R. Longey*
- A Simplified Approach to Advance Tailings Management by Expanding its Geotechnical Characterizations  
*M. Al-Mamun*
- A Framework for Life Cycle Assessment of Tailings Storage Facilities  
*A. Raymond, L. Melo, G. J. Rix, R.C. Bachus*
- Dam Safety Reviews in Chilean Tailings Dams - Lessons and Opportunities  
*C Román, R. Zapata, I. Atucha*
- Common Themes Identified During Recent Dam Safety Reviews  
*L. Philip, L. Hurlbut*

5:30 PM - 7:30 PM Reception—Exhibit Hall

## Tuesday, November 8, 2022

7:30 AM - 5:00 PM Registration

7:30 AM - 8:30 AM Presenters' Breakfast — Wind Star

7:30 AM - 8:30 AM Delegate Breakfast — Exhibit Hall

## Welcome and Introductions

8:30 AM - 8:45 AM — Grand Mesa Ballroom

## Keynote Speakers

**Kimberly Finke Morrison**  
**Rebecca Darling**  
**Kristin Pouw**

8:45 AM - 10:00 AM— Grand Mesa Ballroom

Topic: **Tailings Management Under the GISTM: Building on Our Values – Strengthening Our Governance – Improving Our Performance**

10:00 AM - 10:30 AM—Break—Exhibit Hall

## Session 4A: Governance & Regulations

10:30 AM - 12:00 PM—Chasm Creek

- Key Considerations for Successful EOR Transition and GISTM Compliance  
*R. Chambers, J.M. Cumbers, M.G. Davis, M.M. Davis*
- Transforming Tailings Management Systems toward Alignment with the GISTM: A Case History  
*E. Ruiz, H. Halderman, P. Ridlen*
- Gold Fields: Our Journey Toward Full Compliance with the GISTM by August 2023 and August 2025  
*L. McNab, J. Boshoff*
- Implementation of the Global Industry Standard on Tailings Management (GISTM) in Chile  
*P. Chacón, E. Santos, J. Urquidi*
- Deviance Accountability Reports: Considerations for a Practical Approach  
*T. Brown, C. Priscu, A. Küpper*

## Session 4B: Geotechnical Considerations

10:30 AM - 12:00 PM—Mesa Verde

- Laboratory-Based Shear Strength Characterization of Tailings  
*M.V. Sanin, D. Wijewickreme, D. Willems*
- Arguments for Increasing the Use of Hollow Cylinder Testing in the Characterization of Tailings  
*D. Reid, G. Chiaro, R. Fanni, A. Fourie*
- State Parameter and Undrained Shear Strength of Mine Tailings from In-situ and Laboratory Testing  
*I.A. Contreras, J.W. Harvey, D.N. Obeidat*
- Influence of the Particle Size Distribution on the Critical State Properties of Mine Tailings  
*L. Vergaray, J. Macedo, C. Arnold, M. Arroyo*
- Shear Strength Assessment of Consolidated treated Fluid Fine Tailings using Applied Suction Method  
*B. Fisseha, G.W. Wilson, D.G. Fredlund*

## Session 4C: Risk Management

10:30 AM - 12:00 PM—Highlands

- Considerations for Defining Fatality Rates Associated with Non-Newtonian Flows from Tailings Dam Failures  
*M. Walden, M. Rust, N. Rocco*
- Key Elements of Tailings Dam Safety Case  
*J. Herza, J. Coffey, R. Singh*
- Waste-Dump Failure into a TSF Reservoir Dynamic Analysis: A Risk Based Evolution  
*L. Amaral, H.A. Duarte, V.F. Riberio, P.M. Martins*
- A Probabilistic Approach to Determination of Breach Characteristics Used in DBA  
*F. Giurich, I. Ezama*
- Optimizing Mitigation of Tailings Dams Portfolios  
*F. Oboni, C. Oboni*

12:00 PM - 1:30 PM Lunch—Exhibit Hall

## Session 5A: Design & Operation

1:30 PM - 3:00 PM—Chasm Creek

- Performance Based Design - How Does Performance Based Design Work?  
*M. Kafash, T. Barham, P. Sheykhloo, R. Davidson, L. Yenne*
- Pre-Failure Stability of the Mount Polly TSF Embankment: Conventional vs. Performance-Based Evaluations  
*E. Zabolonii, N.R. Morgenstern, G.W. Wilson, P.H. Simms*
- Stabilization and Ground Improvement of Tailings and Impoundment Dams  
*C. Krug, D. Ruffing*
- Integrated Waste Rock Co-Disposal at the Filtered Tailings Storage Facility  
*F. Lessard, P. Gomes, H. Abdel-Aziz, A.H. Zamani, J.F. Painchaud, W. Fresser*

- Codisposal of Tailings and Mine Waste: Combined Geochemical and Geotechnical Risk Implications from Field Trials  
*H. Purnamasari, S. Pearce, D. Brookshaw*

## Session 5B: Site Characterization & Monitoring

1:30 PM - 3:00 PM—Mesa Verde

- In-Situ Testing Sampling? Yes. But Where? Application of Real Random Testing/Sampling on a Tailings Dam Embankment in Construction  
*H. Kundulo Wa Kitambo*
- In-Situ and Laboratory Site Specific Geotechnical Characterization of Hard Rock Gold Mine Tailings  
*M.D. Bonin, M. Limoges Shaiget, A.E. Takch, D.E. Becker, E. Masengo.*
- Obtaining Block Samples from the Philippine Jungle for Geotechnical Testing and Analysis in Australia (International Field Investigations)  
*L. McNab, J. Boshoff, R. Fanni, C. Vulpe*
- Characterizing Tailings Behavior at the San Manuel Copper TSFs Part 1: In-situ and Laboratory Geotechnical Techniques  
*J. Casey, R. Friedel, R. Chambers,*
- Advanced Techniques for Characterizing Tailings Behavior at the San Manuel Legacy Copper TSFs Part 2: Imaging Techniques at Tailings- Matrix Scale  
*T. Kotzer, K. Sexsmith, R. Chambers, J. Casey, R. Friedel*

## Session 5C: Geochemistry

1:30 PM - 3:00 PM—Mesa Verde

- Validating AMD block models  
*W. Panjaitan, J. Hertrijana, D. Brookshaw, T. Wright, S. Pearce*
- An Integrated Machine Learning Approach for Prediction of Mine Waste Rock Drainage  
*C. Zhang, W. Liu, L. Ma*
- Geochemistry of the Future Lac Guéret Graphite Mine Waste Rocks  
*B. Plante, V. Tsafack Mouafo, I. Demers, J. Gravel, M. Lévesque Michaud, A. Lamontagne*
- Bioremediation of Naphthenic Acid Fraction Compounds after Ultraviolet Photocatalytic Oxidation with TiO<sub>2</sub>  
*S.M. Miles, T.C. Leshuk, F. Gu, A.C. Ulrich*
- Geochemical Interactions and Long-Term TSF Stability: An Update  
*J. Durocher, D. Sprague, B. Usher*

3:00 PM—3:30 PM    Break—Exhibit Hall  
Grand Mesa Ballroom

## Session 6A: Risk Management

3:30 PM - 5:00 PM— Chasm Creek

- Applying the Concept of ALARP During the Design Process  
*P. Chapman*
- Risk Quantification of Geotechnical Instability Failure Mode of Embankment Dams  
*Y. Zhu, W. Roberds*
- Use of Probabilistic Stability Models to Evaluate At-Risk Tailings Facilities  
*S. Garland, R. Greenwood, P. Kioussis*
- Reduce Risk in Tailings Management by Layering Hazard Controls  
*K. Chovan, A. Kent*
- Incorporating TSF Management in Mine Valuations: The Integration of Physical and Market Risks using DNPV  
*D. Espinoza, G. Castro*

## Session 6B: Geotechnical Considerations

3:30 PM - 5:00 PM— Mesa Verde

- Evaluation of Tailings Behavior for Dam Breach Analyses  
*A. Adams, K. Brouwer, P.K. Robertson, V. Martin*
- Application of the 3D Limit Equilibrium Method in Tailings Dam Breach Analysis  
*J. Castellanos, S. Yong, V. Martin*
- Geometrical Considerations on the Runout Analysis of the Fundão Dam Failure Dams  
*R. Cornejo, J. Macedo, S.M. Olson, A. Yerro*
- Multi-model Assessment of Dam Failure and Runout  
*A. Saeedi, X. Xia, Z. Esfandiari, E. Zabolotnij, P. Simms*
- Hydraulic Erosion in Tailings Dam Breach Analysis  
*H. Joanna Chen*

## Session 6C: Reclamation & Remediation

3:30 PM - 5:00 PM— Highlands

- The Influence of Organic Carbon Covers on Tailings Porewater Quality - A Laboratory Study  
*M. McAlary, R. James, S. Mancini*
- An Optimized Approach to Progressive Reclamation that Includes Assessment of Mine Rock Storage Facility Construction Methods – Development of a Simulation Model  
*G. Meiers, M.A. Pernito, M. Bianchin*
- Biogeochemical and Geotechnical Behavior of Treated Tailings in Oil Sands End Pit Lakes  
*H.L. Cossey, A.C. Ulrich*

- Incorporating Progressive Reclamation Strategies in Mine Design: Three Pillars of Mine Water Management  
*M. Bianchin, J. Gentles, N. Finke, G. Meiers*
- Improving Snow Management Practices on Tailings Storage Facilities to Reduce the Risks Associated with Snowmelt  
*V. Boulanger-Martel, H. Pignet, B. Swarbrick, J. Côté*

5:30 PM - 7:30 PM Reception—Exhibit Hall

## Wednesday, November 9, 2022

7:00 AM - 5:00 PM Registration

7:30 AM - 8:30 AM Presenters' Breakfast — Wind Star

7:30 AM - 8:30 AM Delegate Breakfast — Exhibit Hall

Exhibit Halls are located in the Grand Mesa Ballroom & 2nd Floor Atrium

### Welcome and Introductions

8:30 AM - 8:45 AM — Grand Mesa Ballroom

### Keynote Speaker Len Murray, P.Eng., P.E.

8:45 AM - 10:00 AM— Grand Mesa Ballroom

Topic: **Technical and Business Lessons Learned from a Career in Mine Tailings**

10:00 AM - 10:30 AM—Break—Exhibit Hall

### Session 7A: Aspiring Engineer of Record (Panel Session)

10:30 AM - 12:00 PM—Chasm Creek

### Session 7B: Geotechnical Considerations

10:30 AM - 12:00 PM—Mesa Verde

- Large-Scale Triaxial and Oedometer Test of Two Rockfill Products with Different Gradations  
*E. Krumm, S. Zarnani*
- The “Air Dried” Specimen Reconstitution Technique — Review, Refinements, and Applications  
*D. Reid, P. Simms, S. Sivathayalan, R. Fanni, A. Fourie*
- Assessing Dilative Conditions of Cyclone Underflow Tailings  
*P. Mello Martins, H. Oliveria Alves, R. Maghaddam, A. Gagnon*
- On the Assessment of Dynamic Properties of Spatially Variable Deposits  
*J. Macedo, L. Maria Pua, J.P. Villacreses, B. Caicedo*
- Calibration of Tailings Consolidation Parameters: Practical Applications  
*M. Pauly, N. Brink, S. Abbaszadeh*

### Session 7C: Geosynthetics

10:30 AM - 12:00 PM—Highlands

- A Miner's Guide to Electric Leak Location for Geomembrane-Lined Containment Systems  
*S. Calendine, N. Crook, B. Minkin*
- Containment of K<sub>2</sub>O Contaminated Site Through a Multifunctional Active Cover System  
*T. Walker, S. Niewerth*
- Geo-Composite Physicochemical Treatment Using Synthetic Fibers for Enhanced Dewatering, Shear Strength, Consolidation, and Fines Agglomeration of Fluid Fine Tailings Deposits – Concepts & Lessons Learned  
*F. Da Silva*
- Comparative Analysis of Engineered Mine Waste Rock Cover Systems and the Role of Geomembranes in Acid Mine Drainage Control  
*D. Hersey, C. Power*

12:00 PM - 1:30 PM Lunch—Exhibit Hall

Grand Mesa Ballroom

### Session 8A: Engineering of Record (Panel Session)

1:30 PM - 3:00 PM—Chasm Creek

### Session 8B: Geotechnical Considerations

1:30 PM - 3:00 PM—Mesa Verde

- Applications of Classic and Advanced Constitutive Models in Tailings Practice  
*A. Halliday, C. Vulpe, A. Fourie, A. Arenas*
- Role of Tailings State and Compressibility on Cyclic Induced Shear Deformations  
*A. Cerna-Diaz*
- Machine Learning Based Models for Assessing the Seismic Performance of Downstream Tailings Dams  
*J. Macedo, C. Liu*
- Calibration of Numerical Models to Improve Tailings Management Through Bayesian Methods  
*M.A. Llano-Serna, S.H. Lines, L.F. Contreras*

### Session 8C: Imaging & Spatial Analysis

1:30 PM - 3:00 PM—Highlands

- Monitoring the Effect of Weather on Settlement Response of Tailings by Means of InSAR  
*C. Vulpe, A. Fourie, R. Gavin, N. Mangall, H. Larkin, A. Thomas, L. McNab, J. Boshoff*
- Hyperspectral Imaging (HSI) Technology for Oil Sands Tailings Characterization: Practical Aspects  
*I. Entezari, D. McGowan, J. Glavina*



- Using Unmanned Aircraft Systems as a Quick and Cost-Effective Means for Developing High Resolution Topographic Mapping of Remote Mine Sites  
*S. Dent, H. Young, B. Thoms*
- Impacts of Topography Errors on Tailings Dam Breach Analyses  
*J. Turner, A. Ellithorpe, A. Ng, A. Krupa*

3:00 PM—3:30 PM Break—Exhibit Hall  
Grand Mesa Ballroom

## Session 9A: Tailings Education (Panel Session)

3:30 PM - 5:00 PM— Chasm Creek

- Your Opinion Matters - The Collective Perceptions of Tailings Professionals  
*D.L. Spencer, C.A. Bareither, J. Scalia IV, C.N. Hatton, K.J. Ward*

## Session 9B: Design & Operation

3:30—5:00 P.M. Mesa Verde

- Addressing Saturation and Seepage Issues to Improve the Safety Assessment of Mining Facilities  
*G. Gjerapic, D. Gillette, D. Znidarci*
- Seepage Investigation at a Tailings Storage Facility in San Luis Potosí, Mexico – Case Study No 1 of Rationalizing the Unusual and Unexpected  
*J. Ejezie*
- Typical CPTu Response and Identification of Probe Desaturation Tailings  
*M. Rust, E. Rust, M. Theron*
- Mitigation of Dust at Newmont Porcupine Tailings Storage Facility  
*D.R. Barsi, S.M. Castro, G.W. Wilson, S.L. Banks*
- Case Study: Impact of a Frozen Tailing Layer in the design of a Tailings Storage Facility  
*M. Shaiget, M. Brenner, D. Becker, T. Krezewinski, E. Masengo*

## Session 9C: Tailings Processing

3:30 PM—5:00 PM Highlands

- Enhancing Performance of Plate and Frame Filter Presses with Polymer Addition – A Case Study  
*D. Trong, J. Criss, M. Tizzotti, T. Kane, A. LeCroy, S. Wagner, C. Favero, F. Poncet, R. Valero, B. Tavernier*
- Direct Hydrometallurgical Reprocessing of the Cantung Tungsten Mine Tailings  
*T.C. Cheng, H.E. Jamieson, C. Soriano, D. Smith, H.F. Falck*
- Optimization of Flotation Circuit with FibreWrap  
*M. Amir, Z. Anderson*

- Influence of Iron Mining Tailing Addition on Geopolymeric Binders  
*C. Freire, F. Lameiras, G. Bella*
- The Influence of Thermal and Thermochemical Pre-treatment of Mine Tailings of Mine Tailings on their Solubility and Phase Composition for Geopolymerization Applications  
*C. Clements, E. Odell, L. Lunstall Tunstall, A. Hedayat*

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