Professor David Williams

Professor
School of Civil Engineering

Faculty of Engineering, Architecture and Information Technology

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Professor David John Williams is the Director of the Geotechnical Engineering Centre within the School of Civil Engineering at The University of Queensland, an industry-funded centre that has attracted AUD10 million in funding over the last 15 years. He also manages the industry-sponsored Large Open Pit Project, involving 10 global mining company sponsors, with current funding of USD1 million per year. He has over 40 years of teaching, research and consulting experience, and is internationally recognised for his expertise and experience in mine waste management and mine closure, pertaining to tailings dams in particular. He was a member of Expert Panel investigating technical causes of Brumadinho tailings dam failure and is on a number of Tailings Independent Technical Review Boards, including for Escondida. **He authored in 2009 and 2016 Tailings Management Handbook, as part of the Commonwealth Leading Practice Sustainable Development Program for the Mining Industry.** He is on Working Party for the Australian National Committee for Large Dams Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure, published in 2012, with an Addendum in 2019.

David received his BE (Hons I) in Civil Engineering from Monash University in 1975 and his PhD in Soil Mechanics from the University of Cambridge in 1979. His research interests include:

- Physical characterisation of mine tailings deposition, including beaching, hydraulic sorting, sedimentation, consolidation, desiccation and loading
- Store and release cover systems for potentially acid forming mine wastes
- Co-disposal of mine tailings and coarse-grained mine wastes
- Dewatering and densification of mine tailings
- Dewatering of mineral products
- Moisture movement within mine wastes
- Settlement of coarse-grained mine wastes
- Strength of coarse-grained mine wastes
- Engineered rehabilitation of mine sites
- Risk assessment and cost-effectiveness analysis of mine site rehabilitation and closure
- Long-term seepage and runoff from mine tailings storages
- Characterisation of potentially acid forming waste rock dumps
- Application of high-resolution digital stereo-photography to monitoring erosion from mine waste slopes
- Mined landform evolution and design

Research Impacts

Professor Williams' research on mine tailings continues to be applied to improve the dewatering and densification of tailings deposited as a slurry. He developed the store and release cover system for potentially acid forming mine wastes for application in semi-arid and seasonally dry climates, which has been applied worldwide. He characterised the deposit formed on the pumped co-disposal of coal mine washery wastes; a method that has been widely adopted in the coalfields of eastern Australia and Indonesia. The co-disposal of coarse-grained mine wastes and tailings is

also being applied. His research on the wetting-up of mine waste rock dumps has contributed to understanding of rainfall infiltration into and seepage from waste rock dumps.
The shear strength and settlement of coarse-grained mine wastes have become important as the scale of waste rock dumps and spoil piles increases. Professor Williams has been a pioneer in the application of risk assessment and cost-effectiveness analysis to mine site rehabilitation and closure. In addition, he applied high-resolution digital stereo-photography to monitoring erosion from mine waste slopes. He has pioneered mined landform evolution and design.

Qualifications

- PhD, University of Cambridge
- Bachelor of Engineering (Honours1), Monash University

Publications

He has a very long list of books, book chapters, articles, grants, supervision etc on his website: https://researchers.uq.edu.au/researcher/248

- Journal Article: Catalogue of example instrumentation and monitoring systems for tailings dams in Australia

  Clarkson, Luke and Williams, David (2021). *Catalogue of example instrumentation and monitoring systems for tailings dams in Australia*. Mining Technology, 1-11. doi: 10.1080/25726668.2021.1901026

- Journal Article: An Overview of Conventional Tailings Dam Geotechnical Failure Mechanisms

  Clarkson, Luke and Williams, David (2021). *An Overview of Conventional Tailings Dam Geotechnical Failure Mechanisms*. Mining, Metallurgy & Exploration. doi: 10.1007/s42461-021-00381-3

- Journal Article: The potential use of crushed waste glass as a sustainable alternative to natural and manufactured sand in geotechnical applications

  Kazmi, Danish, Serati, Mehdi, Williams, David J., Qasim, Sadaf and Cheng, Yi Pik (2021). *The potential use of crushed waste glass as a sustainable alternative to natural and manufactured sand in geotechnical applications*. Journal of Cleaner Production, 284 124762, 124762. doi: 10.1016/j.jclepro.2020.124762

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Grants

- Catastrophic Rock and Concrete Brittle Failures

  (2021–2023) ARC Discovery Projects

- Recharge and Drying in an E-Watering Site of The Lower Murray

  (2021) South Australian Department of Environment and Water

- Current tools, techniques and gaps in evaluating mine closure (CRC TiME project led by Curtin University)

  (2020–2021) Curtin University

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Supervision

- Comprehensive Monitoring Strategy for Tailings Dams

  Doctor Philosophy

- Sustainable Tailings Management: Improvement of Tailings Geotechnical Behaviour Using Bio-additives

  Doctor Philosophy

- The tailings dam design process: Design parameters and assessment methodologies

  Doctor Philosophy

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Available Projects for PhD students (more on his website)

- Risk Assessment and Cost-Effectiveness Analysis of Rehabilitating Open Cut Coal Mine Spoil Areas

  Risk assessment and cost-effectiveness analysis techniques are becoming an essential tool in defending the choice of rehabilitation strategy for open cut mines. An existing risk assessment and cost-effectiveness analysis tool developed for the rehabilitation of open cut coal mine spoil areas will be applied to a number of typical spoil areas, and the cost-effectiveness of different rehabilitation strategies assessed.

- Optimising the Earthworks Involved in Reshaping Open Strip Coal Mine Spoil Piles

  Surface coal mining by dragline leaves a legacy of surface disturbance in the form of spoil piles. The rehabilitation of spoil pile areas involves substantial earthworks, which constitute the major cost of rehabilitation. Minimising the amount of earthworks required minimises the cost of rehabilitation. Typically, spoil piles are reshaped from the angle of repose of the spoil (about 37 degrees) to a constant angle of less than 10 degrees. An alternative strategy would be to reproduce, as closely as possible, the pre-mining distribution of slope angles and lengths, which can be determined from pre-mining topographic plans. By comparing the pre-mining and post-mining topographic plans, it is possible to determine the minimum earthworks required to mimic the general pre-mining landform.

- Laboratory Testing of Waste Rock and Tailings Mixtures to Assess Their Suitability as Cover Materials

  The requirements of a cover material for potentially contaminating materials, whether they be sulphidic or saline mine wastes, industrial, or domestic wastes, is that the material can achieve a low hydraulic conductivity, preferably hold saturation, be resistant to desiccation and erosion, and possibly be suitable as a growth medium. There is potential for mixtures of inert, durable waste rock and tailings to satisfy these requirements. A range of waste rock and tailings mixtures will be assessed for their suitability in the laboratory.

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