

Improving sustainability in mining projects using geosynthetics

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ABSTRACT

“Today, it is almost impossible to practice geotechnical engineering without using geosynthetics.” Dr J.P. Giroud – 2023 – IGS 40th Anniversary lecture. This quote sums up the far-reaching impact geosynthetics have had on the sustainability and resilience of the infrastructure required for our modern civilisation. But how do geosynthetic materials impact mining projects?

Mining is the backbone of many economies around the world and is required for the functioning of modern technology and civilisation. Mining operations are typically large-scale projects requiring engineering solutions that increasingly need to yield more practical, safe and cost-effective solutions. Utilisation of geosynthetics in mining is growing and the value add is becoming obvious. Mining projects typically have a fast programme, are in remote and challenging locations, and are characterised by the design often being adjusted during the project to suit site conditions or changes in scope. Geosynthetics can respond well to all of these challenges as they are rapid to install, involve significantly reduced transport volumes, have an inherent margin of safety given their factory MQA processes, and are adaptable to a wide range of conditions. Some specific examples of geosynthetic materials usage in mining are:

- Mining exploration: Stabilising soft soils, road construction, dewatering, reinforcement of tunnels, temporary crusher walls, water conservation and erosion control.
- Construction: Water storage dams, tailings facilities, load capacity improvements for access roads, reinforcement of fill. Mining produces enormous volumes of waste material annually and the environmental protection, containment and sustainability of these facilities is a significant focus for communities.
- Operation: Heap leach pads, geosynthetic "rain coats" to maintain/increase the reaction temperature, crusher walls, dewatering tubes, separation of materials, process water management, containment barriers
- Closure: Impervious capping or cover systems, including drainage for veneer stability, erosion control, stormwater management systems
- Post closure care: Cut off drains, rehabilitation of contaminated land, silt management

The use of geosynthetics in the various stages of mining projects allows for the reduced use of natural resources and thus limits overall earthwork impacts. Incorporation of geosynthetics reduces

the transportation of construction materials, replaces processing energy required for some natural materials such as clay, sand and aggregate and therefore results in an overall reduction of the cost and embodied carbon of the development and thus a more sustainable project.

Examples of the uses of geosynthetics in mining projects will be demonstrated with case studies from the contributing authors, which will also demonstrate the sustainability advantages of using these materials.

BIO

Jonathan is a Technical Director at Tonkin & Taylor Ltd with over 25 years' experience, working exclusively in the field of solid waste engineering. Jonathan's experience encompasses design and construction supervision of general, industrial and hazardous waste landfill developments and barriers, design and construction supervision of waste facility capping barriers and stormwater management facilities, design incorporating geosynthetic materials including specifications and construction quality assurance.

Jonathan's experience up to 2017 has been in South Africa and Africa, where he has been involved with numerous landfill projects until he immigrated to New Zealand in 2018. Since joining T+T Jonathan has designed and reviewed landfill expansion projects in New Zealand and Fiji and undertaken reviews of landfill projects designed by T+T in Australia. He has designed landfill rehabilitation and closure projects in New Zealand and undertaken reviews of landfill projects designed by T+T in Australia.

Jonathan was appointed Chair of the International Geosynthetics Society Technical Committee on Barriers in September 2020 and was elected Vice President of the Australasian Chapter of the International Geosynthetics Society in September 2020 and re-elected September 2022.