SGME | Engineering new environments

CAPABILITY STATEMENT

SUBJECT

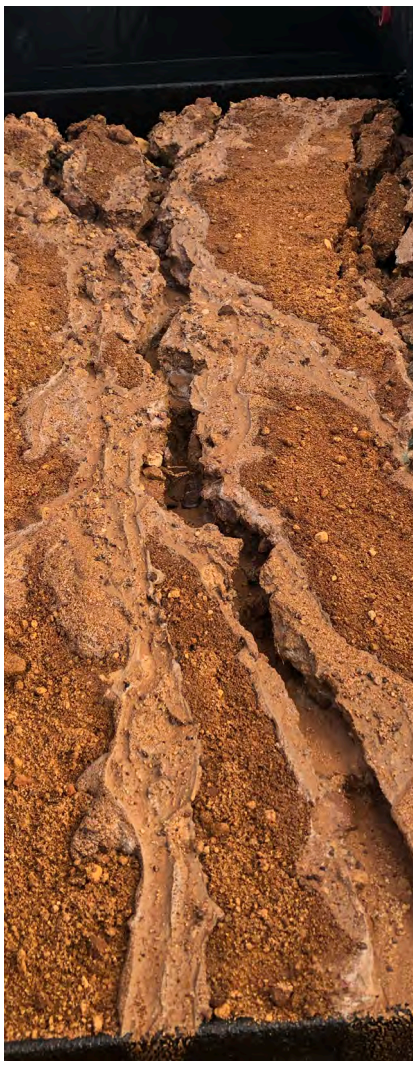
Rainfall Simulation

MARKETS

Feasibility and Mine Planning I Mine Operations I Mine and Quarry Closure
Rehabilitation, Monitoring and Research

ISO

9001:2015 I 14001:2015 I 45001:2018



Rainfall Simulation

Landform stability is paramount in successful mine rehabilitation as it mitigates environmental risks by preventing waste exposure. To evaluate long-term stability efficiently, laboratory trials are preferred over erosion field trials due to their cost-effectiveness.

Rainfall and overland flow simulations are pivotal in providing erosion data for these trials. Rainfall simulation measures interrill erosion potential, while overland flow simulation measures rill / gully erosion potential. These simulations are crucial for observing erosion processes and quantifying sediment transport on rehabilitated land.

Benefits of simulation studies includes that it aids in assessing erosion susceptibility, enables identification of erosion hotspots and facilitates prioritisation of intervention areas based on slope gradient, soil type and vegetation cover. This data informs tailored erosion control strategies, soil fertility maintenance and water quality protection in the receiving environment.

Simulation studies evaluate the efficacy of erosion control structures and can inform optimised designs and cost-effective mitigation measures. They also provide data for modelling sediment transport pathways, predicting sediment deposition areas and assessing ecosystem impacts.

Simulation data, namely interrill and rill / gully erosion potential, serve as inputs for modelling in Water Erosion Prediction Project (WEPP) which is a continuous simulation program developed by the United States Department of Agriculture's Agricultural Research Service. By integrating rainfall simulation data into WEPP, we can predict erosion rates and evaluate effectiveness of erosion control measures under varied rainfall scenarios.

The connection between WEPP modelling and landform evolution models lies in their complementary roles in understanding landscape dynamics. WEPP focuses on predicting short-term erosion processes and providing valuable data on erosion rates, sediment transport and hydrological parameters. This information serves as input for landform evolution models which take a broader perspective by simulating long-term geomorphic processes. These models provide insights into how landscapes evolve over time including the formation of landforms, erosion patterns, sediment deposition and impacts of landform changes.

Key considerations

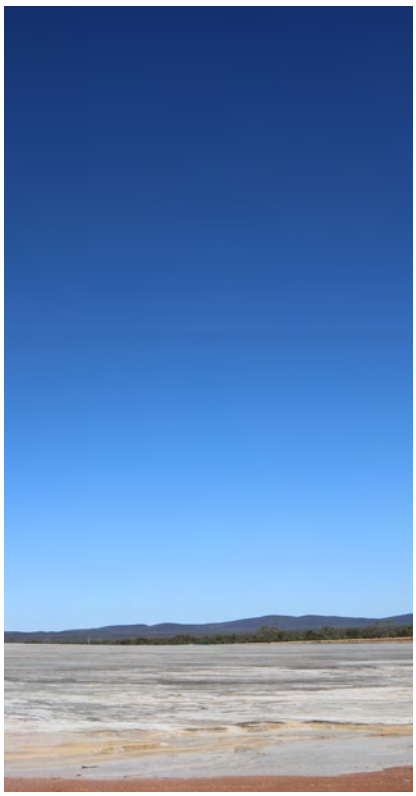
1. **Slope gradient:** Landform steepness influences runoff and erosion rates as steeper landforms are more prone to erosion, especially during intense rainfall events.
2. **Soil type and texture:** Different soil types have varying infiltration rates, erodibility properties and water retention capacities. Understanding soil characteristics helps to predict water movement, erosion potential and sediment transport.
3. **Vegetation cover:** Vegetation plays a key role in stabilising landforms by reducing surface runoff, enhancing soil structure and minimising erosion. Assessing vegetation cover and its impact on water interception, infiltration and runoff is crucial for accurate simulation and landform evolution modelling.
4. **Land use practices:** Mining significantly alters post-mining landforms and hydrological processes. Evaluating the effects of post-mining land uses on soil erosion, sediment yield and water quality is important for sustainable land management.
5. **Hydrological connectivity:** Understanding connectivity between different landforms, waterbodies and drainage networks is vital for predicting water flow paths, erosion hotspots and sediment deposition areas. Hydrological connectivity analysis helps to assess landscape resilience and identify vulnerable areas.

Approach

Our effective assessment of erosion on previously mined landforms involves application of advanced techniques such as rainfall simulation and flume experiments in a controlled laboratory setting. By simulating realistic rainfall events and overland flow in the flume we can accurately measure erosion rates and patterns, and sediment transport, without relying solely on field measurements. These controlled experiments provide valuable data on erosion potential and sediment yield.

In conjunction with laboratory simulations, we use WEPP, complimentary modelling tools and landform evolution models to predict erosion processes and long-term landform evolution. Integrating simulation data from rainfall and flume experiments into these models enhances their accuracy and allows us to assess erosion risks.

Combining these experimental data points with predictive modelling enables development of a robust erosion control strategies tailored to specific mine conditions. This approach ensures efficient land rehabilitation, compliance with regulatory requirements and minimisation of environmental risks, and promotes community protection and achieving a sustainable post-mining land use.



Outcomes

Engaging SGME for a study involving rainfall simulation, flume experiments and / or erosion assessments for mined landforms will lead to valuable outcomes. SGME's expertise ensures accurate measurement of erosion rates, sediment transport and erosion patterns by assessing erosion susceptibility, identifying hotspots and prioritising areas for control measures. By integrating data into WEPP modelling, SGME is able to accurately predict erosion rates. Our tailored strategies consider factors such as slope gradient, soil type and vegetation cover, and promote sustainable land rehabilitation that minimises environmental risks. Outcomes from our assessments empower informed decision-making, effective erosion management and implementation of environmentally responsible practices in relation to mined land rehabilitation.

Working with SGME

Engaging SGME as a collaborative partner delivers numerous benefits:

- **Improved return on investment (ROI):** Our expertise maximises ROI to satisfy investor expectations.
- **Reduced mine closure risks and disruptions:** Our strategies minimise complex closure risks to ensure a smooth future land use transition.
- **Addressing environmental, social, and governance (ESG) risks:** We focus on ESG criteria to mitigate environmental impacts and meet regulatory standards.
- **Enhanced strategic insight:** Collaboration boosts your performance through strategic planning.
- **Industry collaboration:** We foster partnerships with mining experts, staying abreast of technology and regulatory advancements.
- **Future risk vigilance:** Our proactive approach anticipates future risks to aid informed decision-making.
- **Innovative solutions for safe execution:** Our expertise delivers innovative solutions to ensure safe execution.

Our proactive and ethical approach ensures adaptability, sustainability and responsible development to safeguard the mining industry and create enduring value.

CONTACT

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