SGMenvironmental

Creating enduring value

SGME VALUES

Honest

Trust

Innovation

Safety

Geochemistry

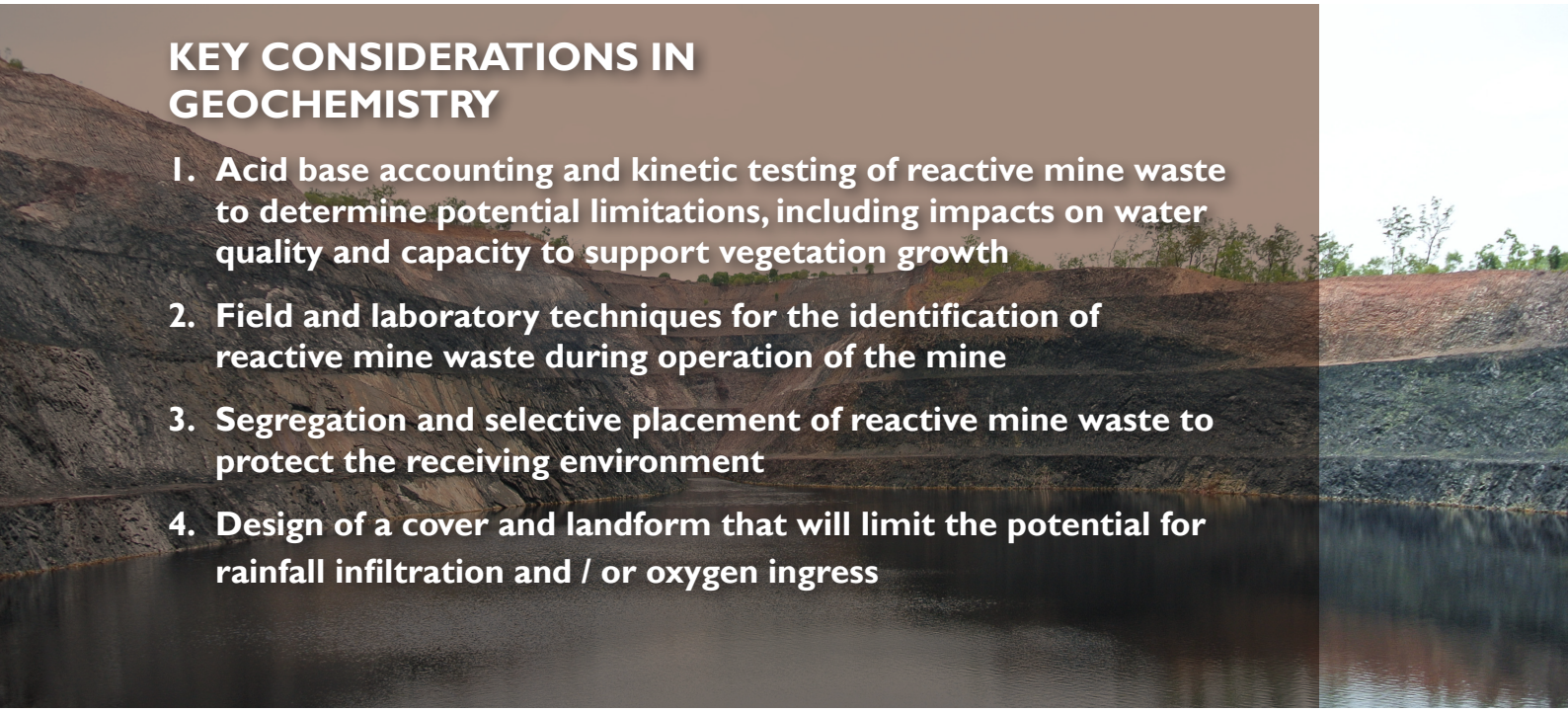
Sulfide bearing ore bodies, usually from pyrite (the reactive mine waste), are problematic because they have the greatest potential to produce acid mine drainage and / or neutral mine drainage if not managed correctly.

Although sulfide oxidation is a natural process, mining can speed the process up by exposing large surface areas of reactive mine waste to water and oxygen. Exposure of reactive mine waste to oxidation commences with the onset of mining and continues in the waste storage and potentially in the final landform after rehabilitation. Pyrite can be exposed on the walls of pit voids - but the most significant exposed reactive mine waste surfaces are in the fragmented pieces of reactive waste rock and tailings that are removed from the open-pit and placed in waste storages.

Neutralisation of acid mine drainage and / or neutral mine drainage can also occur naturally and this reaction will govern the composition of the drainage from the waste storage. The common acid neutralising minerals present in reactive mine waste are carbonates such as limestone and dolomite.

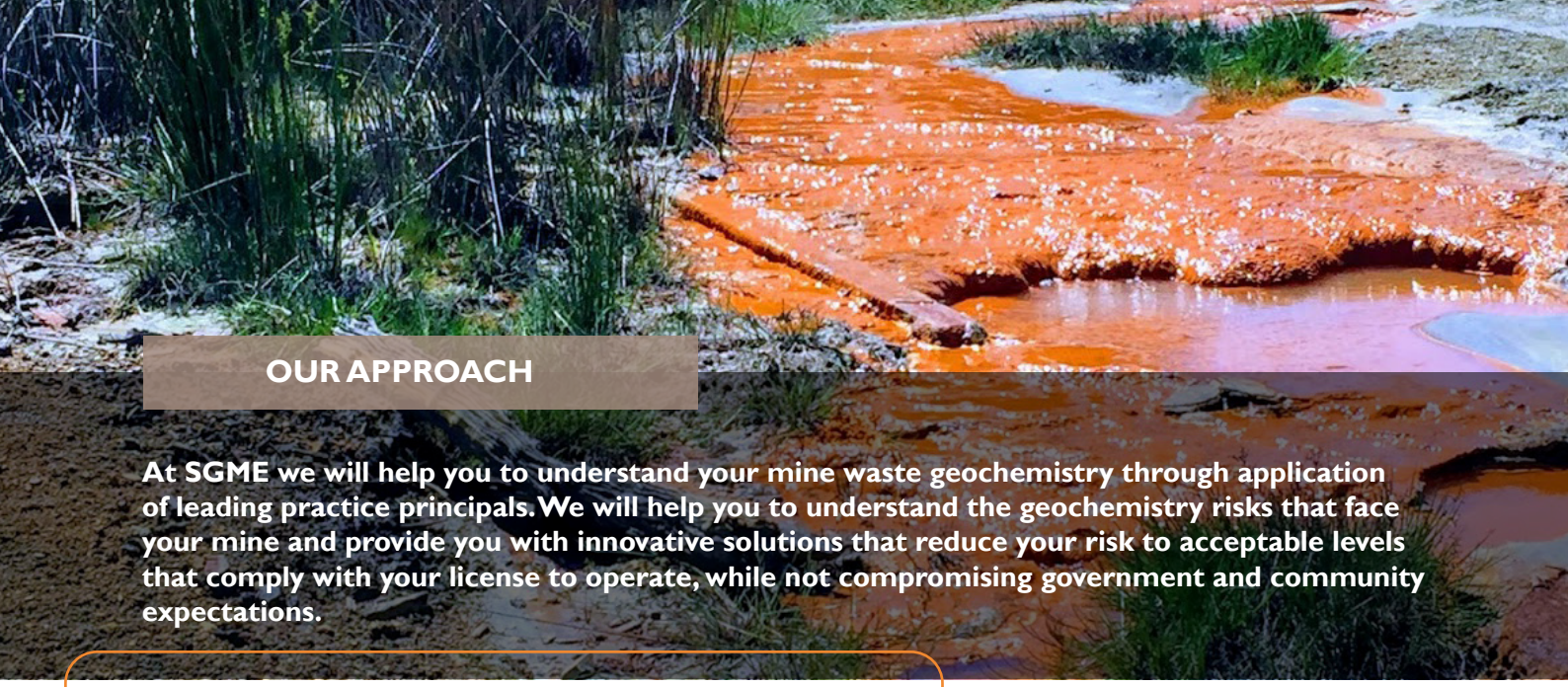
For both acid mine drainage and / or neutral mine drainage, water from rainfall infiltration and runoff from the waste storage is the transport mechanism. Transport of the reaction products of acid mine drainage and / or neutral mine drainage to the receiving environment should be managed by total water submersion or by selectively placing reactive mine waste during the construction of the waste storage then building a cover on the flat top surface. These management tools should reduce the potential for rainfall and runoff to interact with the reactive mine waste by limiting infiltration and by limiting the potential for reactive mine waste to come into direct contact with rainfall by encapsulating it in non-reactive waste rock.

At SGME we will work with you to selectively sample and characterise your mine waste using acid base accounting techniques and kinetic testing if required. We can develop a reactive mine waste management plan that describes how and were reactive mine waste will be encountered and where and how it should be selectively managed to protect the receiving environment and long-term land use. Through SGMEs expertise, site specific waste storage covers can be designed that minimise potential environmental risks after mining by applying sound soil chemistry, physics and unsaturated soil mechanics principals to our design process.



KEY CONSIDERATIONS IN GEOCHEMISTRY

1. **Acid base accounting and kinetic testing of reactive mine waste to determine potential limitations, including impacts on water quality and capacity to support vegetation growth**
2. **Field and laboratory techniques for the identification of reactive mine waste during operation of the mine**
3. **Segregation and selective placement of reactive mine waste to protect the receiving environment**
4. **Design of a cover and landform that will limit the potential for rainfall infiltration and / or oxygen ingress**



OUR APPROACH

At SGME we will help you to understand your mine waste geochemistry through application of leading practice principals. We will help you to understand the geochemistry risks that face your mine and provide you with innovative solutions that reduce your risk to acceptable levels that comply with your license to operate, while not compromising government and community expectations.

Past projects

1. Rosebery Mine, construction audit of the three-level waste rock dump (2017-2021), Tas (MMG)
2. Trap Gully Landfill, spoil and soil suitability assessment for inclusion in a cover to create a final landform, Qld (Banana Shire Council)
3. Frances Creek Mine, acid base accounting, encapsulation strategy for three potentially contaminating waste rock dumps and a waste rock management plan, NT (TRL Frances Creek Pty Ltd)
4. Snowy 2.0, spoil disposal options study, NSW (Snowy Hydro Pty Limited)
5. Tennant Creek Operations, waste rock management and geochemistry analysis review, NT (TRL Tennant Creek Pty Ltd)
6. Newlands Coal Mine, review of rehabilitated land and recommendations based on geochemical analysis to improve vegetation establishment, Qld (Glencore)
7. NSW legacy mine program, former works assessment program for the Apsley, Mullon, North Wisemans Creek, Peelwood, Ponsonby, Phoenix Mabel and Shambala Mines, NSW (Department of Planning & Environment)
8. Bluff Coal Mine, geochemistry assessment and waste rock management plan for a planned pit extension, Qld (Bluff PCI)
9. CSA Mine, site investigation, source pathway and receptor analysis and remediation action plan for a tailings spill, NSW (Glencore)
10. White Dam Gold Mine, phase 2 extension waste rock and ore management plan and heap leach pad management plan, review of cyanide source, pathway and receptor study for the heap leach pad and review of acid mine drainage potential from rehabilitated waste rock dumps, SA (Round Oak Minerals)
11. Lady Annie Mine, large scale kinetic column trials to assess the rinsing period for decommissioning of the heap leach pad, Qld (Austral Resources)
12. Century Mine, cover performance, tailings and waste rock geochemistry and source pathway receptor investigation on the evaporation dam and tailings storage facility, Qld (MMG)
13. Queen Bee Mine, mine closure study (geochemistry, water management and cover design and sediment management), NSW (Peak Gold)
14. Carborough Downs and Broadlea Coal Mine, material characterisation program and reporting to satisfy the progressive rehabilitation and closure planning guidelines, QLD (Fitzroy Australia Resources)
15. Peak Gold Mine, rapid assessment of the New Cobar waste rock dump using handheld XRF, geochemistry testing / verification during the TSF lift works and geochemistry kinetic columns, NSW (Aurelia Metals)

Working with SGME

We are highly experienced and leaders in the fields of soil science, geochemistry and mine closure. At SGME we support you to achieve your objectives in ways that contribute to a sustainable outcome:

- Our director and technical leaders are 'on the tools'. We will not waiver from this commitment as it is critical to your successes
- We have a practical, solution focussed work ethic
- We are cost-effective, without the overheads of larger competitors
- A high level of responsiveness, enabling us to mobilise at short notice

Dr Timothy Rohde

Timothy is a certified professional soil scientist (CPSS), a practicing engineer in Queensland (RPEQ) and a mine closure specialist (MAusIMM(CP)). He has a been a consultant for 18 years and has worked extensively throughout Australia in coal and metalliferous mining and has published over 25 papers on soil science, geochemistry and mine closure.

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