

Red Rock Geotechnical Pty Ltd

Capability statement



**RED
ROCK**
GEOTECHNICAL



The company

Red Rock Geotechnical Pty Ltd is a specialist consultancy that provides high quality geotechnical analysis and design services to the mining industry. This is Red Rock's sole function. We are not a general engineering company that includes mining amongst its other services. Because all of our resources and energy go into mining engineering, our clients get the full attention of the best specialists available, with the most up-to-date technical resources and experience.

Red Rock was established in 2011 by Geoff Weekes who has been a professional in the mining industry for over 25 years. Red Rock currently has three full time consultants with Tim Johnson and Pat Walker joining Geoff in 2018.

Since its inception, Red Rock has established itself as an innovative provider of geotechnical design solutions. Red Rock is a dynamic and flexible consultancy. It draws on the expertise of other highly regarded senior industry professionals to ensure that the projects it undertakes are always resourced with the best possible people. Red Rock's collaborative approach results in engineering and design solutions that are tailored specifically to the client's needs.

Red Rock consistently delivers on-time and always provides the client with excellent value for money.

- Red Rock is solely a specialist mining engineering firm.
- Red Rock uses the best available expertise.
- Red Rock's technical resources and experience are up-to-date.
- Red Rock's solutions are accurately tailored to the client's needs.
- Red Rock delivers on-time.
- Red Rock provides excellent value for money.



Our services

Red Rock has extensive experience in a variety of commodities, in diverse geological and operating environments.

Our geotechnical engineering expertise includes the evaluation, design and construction of:

- open pit slopes
- waste dumps and integrated waste landforms
- underground mines
- due diligence

Studies are carried out from concept, through feasibility, to implementation.

What makes Red Rock different?

Red Rock's unique service affords significant benefits for the client when compared to the larger geotechnical consultancies. Because we are a small company that is focussed solely on providing solutions to the mining industry, we provide the following benefits to our clients.

Quality of output

The owners, as Principal Consultants, manage all stages of the project, including client liaison, data collection, analysis and design. This results in a more comprehensive analysis and higher quality engineering designs.



Tailored engineering solutions

Engineering designs and deliverables are tailored to the specific needs of the client.

- Pit slope design guidance is provided in the format required by the mine planning engineers. This includes the provision of 3-D slope design solids to constrain the design process if required.

Practical engineering solutions

Red Rock's Principal Consultants have spent many years in operational as well as technical consulting roles. This ensures that geotechnical designs are robust and fit for implementation at operational level.

- All Red Rock slope design parameters are to $\pm 5^\circ$ BFA and ± 1 m berm widths. Bench geometries observe practical limits for drill and blast design and mining equipment.

Innovation

Red Rock always investigates better ways of doing things and employs industry best practice.

- Piping erosion studies; transient groundwater modelling in stability models; slope design block models.

Nimble and flexible business model

Services offered by Red Rock are significantly extended by engaging additional technical expertise as required. Red Rock has a reliable source of senior industry professionals and subject matter experts that it draws on as associates. This ensures that the projects undertaken by Red Rock are resourced with the best possible people.

- Recent TSF embankment designs were prepared for submission to DER for works approvals by engaging senior tailings and environmental consultants with close knowledge of the regulatory requirements, speeding up the approvals process.



Capacity building

Red Rock uses a collaborative approach to projects and has in the past mentored the client's junior staff.

- Red Rock is highly accessible at all times. Informal technical queries are always comprehensively answered.

Capability building

Red Rock sees itself as a technical partner to its clients and takes pride in building technical capability within its clients' organisations.

Transparent processes

Red Rock's engineering and design processes are highly transparent. Design inputs and outputs can be easily audited. Processes can be understood and followed by client's engineers.

Create value

Red Rock understands the value drivers in mining and seeks to deliver on both safety and economics.

- All pit designs are iteratively reviewed to ensure the optimal geotechnical and economic performance. In a recent iron ore project a 4° improvement in OSA was achieved, and waste stripping ratios substantially reduced following additional discretisation of shear strength models and subsequent revision in pore pressure models.

Timely delivery

Red Rock works under the premise of 'under-promise but over-deliver'. This means that Red Rock will reject projects rather than risk under-delivering on them.



Value for money

As a small consultancy with low overheads, Red Rock is able to offer Principal Consultant level service for the entire project at a low overall project cost.

Supplier risk

Red Rock can be considered to be a low risk supplier for the following reasons:

Contractual risk

Red Rock typically adopts its client's Standard Terms and Conditions. We have never been involved in a contractual dispute.

Contract price

In lump sum contracts the ceiling price for projects is never exceeded.

Business stability

As a small consultancy with low overheads, Red Rock provides cost-effective advice at competitive prices, ensuring the long-term viability of its own business. Red Rock has weathered the mining construction downturn with little change in its business model.

Safety

Red Rock has an impeccable safety history. Behavioural based safety is underpinned by our OHSE policy. Red Rock personnel hold Western Australian Quarry Manager's Certificate of Competency and has held statutory management positions in the industry.



Our clients

Current clients of Red Rock include:

- Rio Tinto Iron Ore
- FMG
- Newcrest Mining
- FMR Investments
- Bullseye Mining
- CITIC Pacific Mining
- Newmont Mining Corporation
- Snowden Mining Industry Consultants
- Xstract Mining Consultants
- Harmony Gold
- Grange Resources
- AngloGold Ashanti



Our capabilities

Red Rock can undertake studies for all aspects of the mining cycle. Our engineering and design capabilities span:

Geotechnical investigations

- design and management of geotechnical investigations, including geotechnical drilling programs
- supervision and training of geotechnical data collection, specifically core logging
- assistance with developing geotechnical databases, data collection and management systems
- management of sampling and laboratory testing
- data analysis and interpretation, developing statistical data sets for geotechnical input data, rock mass and defect shear strengths.





Open pit

- rock mass characterisation and geotechnical domain identification
- structural and kinematic analyses
- failure mode identification and backanalyses
- stability analysis using numerical modelling (limit equilibrium and finite element analyses for groundwater, stress and displacement models).
Deterministic and probabilistic modelling.
- slope design, including optimisation of slopes to minimise waste stripping ratios
- design of artificial support and ground reinforcement including bolts, mesh and shotcrete
- mining and excavation performance monitoring, including displacement monitoring design
- trafficability and diggability assessments
- slope failure management and remediation
- pit slope management plans
- risk assessments.



Waste dumps and integrated waste landforms

- waste rock characterisation – both geomechanical and geochemical



- waste materials, mass balances, foundation assessments
- slope stability assessments, including overall slope and tiphead stability for safe dump truck operation
- waste materials storage design and optimisation to minimise capital and operating costs
- waste dump and tiphead operating guidelines and management plans
- integrated waste landforms (integrated waste rock and tailings storage)
- hydrological and runoff assessment.

Underground

- rock mass characterisation
- stability analysis to determine excavation dimensions, support and ground control requirements

Due diligence

- Investment review and insurance claims



Major projects

Rio Tinto Iron Ore

Red Rock is currently engaged in several studies for RTIO and has completed over fifteen projects for Rio Tinto in the past six years. Geotechnical slope design studies for open pits have been conducted for both CID and BIF hosted deposits ensuring economically optimum open pit design solutions that meet the geotechnical design acceptance criteria. One of the geotechnical challenges increasingly confronting Rio Tinto's iron ore operations is outward dipping bedding for high rock slopes now being mined below the watertable. Red Rock has developed significant expertise in this regard.

Major projects include:

- Greater Paraburdoo Operations - Western Range PFS, 11W, 14W LOM Studies
- West Angelas Deposit C and D FS
- Yandi Billiard South FS
- BS2 LOM Pit Design Review – Pits 6x, 8, 9, 10, 11, 12 and 13
- Hope Downs 4 Areas 1, 2, 3 and 4N FS
- BS2 Pit 8 and 9 Implementation study
- BS2 Pit 6x LOM design
- Nammuldi Lens EF LOM design study
- Nammuldi Lens CD LOM design review and waste dump design review
- BS4 Pit 3 FS
- BS4 Pit 2 and 5 LOM
- Mesa A Breach Ramp stability assessment for low loader access
- Mesa J Slope stability assessment for mining up to a TSF.



FMG

Geotechnical design studies and geotechnical support for both operating and brownfield assets.

Projects include:

- design of geotechnical investigation program for Western Hub and Nyidinghu deposits
- Firetail South LOM geotechnical design study
- Firetail North LOM geotechnical design study
- Solomon CID LOM geotechnical design study
- Firetail North bench design review for 8m batter heights
- tailings storage facility options study for FMG Solomon Project.

Newcrest Mining Limited

Geotechnical design studies, peer review and risk assessments for Telfer Gold Mine in Western Australia and Wafi Gold Mine project in Papua New Guinea.

Projects include:

- peer review of Geotechnical FS for West Dome Expansion at Telfer Gold Mine
- geotechnical slope design study to PFS level for Hidden Valley Gold Project in Papua New Guinea for Morobe Mining Joint Venture.
- geotechnical risk assurance study on TSF7 at Newcrest Telfer Goldmine.

Bullseye Mining Limited

- geotechnical FS for open pit mining at North Laverton Gold Project, including waste dump design





- options analysis and concept design for TSF/ Integrated waste landform at North Laverton Gold Project.

FMR Investments Limited

- Greenfields Mill TSF3 Cell A, B and C Stage 2 Embankment raise design. Included field investigation, design and preparation of mining applications, works approval documents, construction drawings and specifications.

Newmont Mining Corporation

- Review of Boddington structural model for input to geotechnical assessments and slope stability

CITIC Pacific Mining

- Geotechnical assessment for slope designs at Sino Iron West Pit
- Operational geotechnical review

Snowden Mining Industry Consultants

- Geotechnical sub-consultants on a number of projects

Harmony Gold

- Geotechnical design and operational review of Hidden Valley Gold mine, PNG.



Key personnel

- **Geoff Weekes** – Principal Geotechnical Consultant and Director. Geoff has 28 years' experience in geology, geotechnical engineering and project management roles across multiple commodities (gold, base metals, industrial minerals and iron ore) in a wide range of environments and cultures, from the tropical highlands in Papua New Guinea to the Great Sandy Desert of Western Australia. Geoff holds a Western Australian Quarry Managers Certificate of Competency, is a Certified Professional with the Australian Institute of Mining and Metallurgy and is a member of the Institution of Engineers Australia.
- **Tim Johnson** - Principal Geotechnical Consultant and Director. Tim has over 23 years' experience in the mining industry, including more than 19 years in geotechnical design and operational risk management roles. His areas of expertise include rock slope & waste dump engineering, design and implementation of slope monitoring and risk management systems, structural geology modelling, and technical assurance and compliance auditing. Tim has led geotechnical operational and design teams supporting major iron ore and gold mining operations. Accountability in his previous roles included design signoff for 9 major multi-pit operations. Tim's operational geotechnical experience includes development of geotechnical risk management systems supporting management of geotechnical risk at large iron ore operations and at a unique & challenging PNG gold operation.
- **Pat Walker** – Principal Geotechnical Consultant and Director. Patrick has over 35 years' experience in the mining industry as a mining engineer, rock mechanics engineer, researcher and consultant. His areas of expertise include rock slope engineering, underground excavation and support design and blast engineering and fragmentation. Patrick has worked on projects in several



countries including Southern Africa, Australia, Indonesia, Armenia, Mongolia, Peru and Canada over a range of commodities including gold, coal, iron ore and magnetite, copper, nickel and uranium. Patrick's experience includes operational geotechnical roles in deep South African gold mines, open cut and underground coal mines and large iron ore open pits. Since 1999, Patrick has been heavily involved in the application of geotechnical engineering in the Pilbara iron ore mines including operational roles, conceptual, Pre-feasibility, Feasibility and implementation studies.

In order to provide the highest level of expertise to meet the needs of particular projects, Red Rock engages highly-regarded mining professionals:

- engineering geologists
- environmental scientists
- mining engineers
- geotechnical engineers (underground and open pit specialists)
- hydrogeologists
- numerical modellers (3-D).



The company

Red Rock Geotechnical is located in Perth, Western Australia.

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