

PROJECT OPPORTUNITY

Grade Engineering potential for metalliferous black shales

The challenge



Many Western Australian gold deposits contain localised black shale bands. Although often metalliferous, these black shales can be problematic to treat and may hinder the efficient processing of other gold-bearing ore types. As a result, these black shales are often discarded or stockpiled as lower-value material for potential future processing.

This project aims to collect samples from various deposits to conduct laboratory scale testwork on the potential amenability of Grade Engineering techniques to upgrade these problematic ore types.

Why invest in this project? This is not minor continuous improvement but rather there is potential for a step-change in economic outcome – possibly in the order of several percent of project NPV – if the ability to treat black shale stockpiles or to exploit ‘untreatable ore zones’ is realised.

Targeted outcomes



Build knowledge of metal deportment for black shale ore types and stockpiles.



Investigate the ability to treat black shale using Grade Engineering and build black shale ore into strategic Life of Mine plans.

- Build a database of black shale bearing deposits in Western Australia – location, Preferential Grade by Size (PGS) characteristics.
- Determine deportment of gold grades and other relevant ore components by size to compile a clearer picture of variation in deposits across the region.
- A preliminary ‘size of the prize’ assessment whereby if an opportunity of sufficient improved value exists then the contained results and data can be utilised in the second phase of a more detailed assessment and economic modelling.

Kalgoorlie-Boulder Mining Innovation Hub
Located in the Western Australian Chamber of
Minerals and Energy (CME) office
115 Egan St, Kalgoorlie WA 6430

Email: info@kalhub.com
Website: www.kalhub.com



Australian Government
Department of Industry,
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Business
Cooperative Research
Centres Program

CRC **ORE**

Project scope



- This project aims to develop initial business cases regarding opportunities for implementation of Grade Engineering screening strategies and techniques on various gold-bearing black shales. Ore types containing black shale bands have long been known as a cause of gold losses in processing due to their refractory nature in CIL/CIP plants. The presence of carbon as well as localised elevated levels of copper and/or reactive sulphides (marcasite, pyrrhotite, +/- chalcopyrite) may cause significant declines in gold recoveries. Excessive copper and reactive sulphides consume large proportions of oxygen and cyanide, limiting the capacity for gold dissolution.
- The project aims to build a database of black shale-bearing deposits in Western Australia and determine laboratory scale response rankings using preferential grade by size. In the future, this data may prove beneficial to further studies surrounding the extractive metallurgy of problematic black shales.
- Samples will be crushed and screened into size fractions. Weights and assays will be determined for each size fraction. This will give a preliminary indication of gold, carbon and sulphide department.
- It is possible that deleterious compounds such as carbon or reactive sulphides may report to specific size fraction(s). If these fractions can be segregated from the auriferous segments, there may be potential to upgrade the gold grade or reduce the deleterious components to a level suitable for economic processing.
- We envisage a three month project for each site. Project planning and initial sample identification together with collection and screening would be completed in 2-3 weeks, followed by 4-6 weeks for elemental assay and quantitative mineralogy (QXRD). Results would be documented during a 4 week reporting phase.

What we are seeking

The Kalgoorlie-Boulder Mining Innovation Hub is seeking industry participants to contribute to a study to determine the amenability of various auriferous black shales to Grade Engineering.

MINERS



Shale samples

Representative samples of gold-bearing black shales are being sought from ore deposits in WA.

These could consist of drillcore samples, small ROM samples from stockpiles or underground/open pit workings. Ideally, we are seeking 5 to 10 drillcore or coarse reject samples, and 5 to 10 samples of 50-150kg representative ROM/stockpile samples.

METS



Sample treatment & assays

Support is sought from METS companies in the region who may be able to assist with crushing, screening and laboratory testing.

METS companies are also invited to contribute insights on other potential treatment options.

RESEARCHERS



Department quantification

If preliminary data indicates significant department (positive or negative), further work will be undertaken with Curtin University's Western Australian School of Mines or other research organisations to quantify carbon/sulphide department in a semi-quantitative manner.

Researchers are also invited to contribute insights on other potential approaches.

Like to get involved?

Contact: Laurence Dyer
info@kalhub.com

Project Manager: Sabina Shugg, Hub Director
s.shugg@kalhub.com 0417 998 586

Project Leader: Laurence Dyer, Hub Technical Specialist
l.dyer@kalhub.com 0409 294 896