

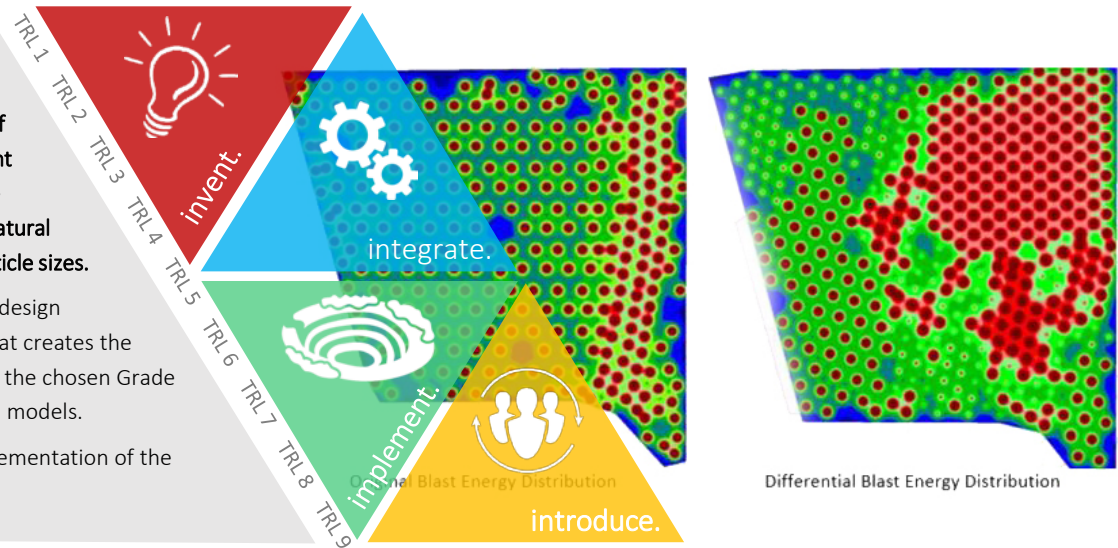
# Blast design optimisation for Grade Engineering®

PROJECT P2-002

Developing integrable optimisation modules for design and management of blast techniques that enable subsequent Grade Engineering® by exploiting grade heterogeneity at blast-hole scale and natural department of grade into different particle sizes.

The outcome will be a prototype blast design optimiser that finds the blast design that creates the maximum value for a given block using the chosen Grade Engineering® levers and fragmentation models.

This project will be an enabler for implementation of the Grade Engineering® levers on site.



## Research collaboration

Mining3 is a partnership between former organisations CRC Mining and the CSIRO Mineral Resources. Formed in July 2016, Mining3 brings the activities and capabilities of the two organisations into a new research organisation for the mining industry.

As Australia's national innovation agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has been pushing the edge of what's possible for almost a century. CSIRO Mineral Resources works closely with industry partners and delivers innovation to grow Australia's resource base, increase productivity and drive environmental performance.

Data61 is Australia's leading digital research network within CSIRO and is focussed on helping to create a data-driven future.

The Mining3 partnership brings together significant mining and research capabilities to effectively deliver research and innovative technologies for Participants and the global mining industry. Mining3's mission is to develop industry solutions, which provide both incremental and step-change productivity increases for major mining challenges.

<b>Project Manager:</b>	Fernando Vieira, CRC ORE
<b>Project Leader:</b>	Ewan Sellers, Mining3
<b>Timing:</b>	April 2017 – December 2017
<b>Participants:</b>	Mining3, CSIRO Data61

Image: An energy distribution image of differential blasting. Supplied by CRC ORE.

## Background & aims

With existing software and blast models it is difficult for production drill and blast engineers to apply Grade Engineering® levers to exploit grade heterogeneity and create the best value for downstream operations.

The objective of this project is to develop a blast design optimiser to enable quick turnaround of production and determine the 3D explosive energy distribution that achieves maximum value in heterogeneous orebodies, whilst considering the inherent operational constraints. The solution for a grade engineered blast design is resolved as constrained optimisation to maximise value. The resulting particle sizes from the various blast components are derived from the distribution of the explosive energy, such fragmentation patterns, which can then be submitted to value calculators, such as the Integrated Extraction Simulator (IES).

The project will identify and test the most suitable optimisation methodology. The module will interface with existing fragmentation models as well as value calculators such as the Mining3 MARA mining model and CRC ORE's Integrated Extraction Simulator (IES). Geological, separation and mining inputs will be balanced with practical constraints such as fixed equipment and explosive products.

## Focus on outcomes

- Define the system architecture, inputs and data structures.
- Construct methods and protocols for practical combination of fragmentation models.
- Develop a prototype module and test the most suitable optimisation methodology.
- Test the ability of the module to identify the additional value on single data sets for each of the Grade Engineering® levers
- Suggest requirements for development and other opportunities to provide additional value.
- Provide field testing protocols to enable testing on mine sites for creating outcomes at TRL 6 and higher.