



# Golden Queen's Soledad Mountain Mine increases recovered value through blast movement monitoring

**CASE STUDY**

Commodity	Ore Grades	Geology	Powder Factor	Location
Gold	0.02* oz/Ton (0.63 g/t)	Narrow Vein	0.41 lb/yd <sup>3</sup> (0.24 kg/m <sup>3</sup> )	North America

Soledad Mountain Mine is a gold-silver mine located near the town of Mojave in southern California.

- The mine uses conventional open pit mining methods, and cyanide heap leach and Merrill-Crowe processes to recover gold and silver from crushed, agglomerated ore.
- The primary ore types are porphyritic rhyolite, flow-banded rhyolite, pyroclastics and porphyritic quartz latite.
- The East Pit mines 20-foot (6 m) benches in one pass.

## Challenges

**Narrow host-vein geometries presented challenges to mine operations due to a high risk of ore loss and dilution**

- The extent of blast movement and its influence on ore zones was estimated
- Designed ore-waste boundaries could not accurately account for blast movement
- A buffer zone of material surrounding ore zones, incorporated to account for movement, was sent to the crusher

## Results

**Improved mining efficiency and stakeholder value  
Average per-blast savings estimated at US\$55,000**

Within the first year of mining, Golden Queen Mining Company implemented blast movement monitoring. Soledad Mountain Mine's results indicate a significant improvement in recovered Tons, estimated at US\$55,000<sup>1</sup> average value per blast, through:

- Avoiding waste processing, and
- Mitigating the effects of ore movement in a narrow, vein-hosted gold/silver deposit

An example blast (shown right) demonstrates measured ore movement and potential savings at the East Pit.

Significant movement occurs within all blasts. Variation of ±50% from the mean horizontal movement is common and occurred in this blast:

- Measured horizontal movement<sup>2</sup> ranged from 4.5 –10.5 ft (1.4 – 3.2 m) and vertical movement of up to 5.3 ft (1.6 m)

As a result of accurately accounting for blast movement within one blast in East Pit, Soledad Mountain Mine:

- **Improved recovered value by an estimated US\$69,195<sup>2,3</sup>**
- Increased ore yield by 4,047 Tons (3,671 tonnes) and avoided 3% ore loss

\* Average grade of ore polygons; 1. Golden Queen supplied data; 2. BMM System-measured blast movement; 3. Calculated at a gold price of US\$1,350/oz.

## Solution

**BMM System accurately measured 3D blast movement and translated post-blast dig lines**

- Blast movement monitors (BMMs) are installed in monitoring holes throughout the shot
- Installation and detection as per site standard operating procedures
- BMM Explorer software calculates new dig lines, and areas of ore loss and dilution that would have occurred without monitoring

*"The BMT system provides an additional level of security for the project's ore control operations. Through tracking the movement of ore zones, we ultimately bring more value to the project."*

Sara Holden, Sr. Technical Geologist  
Golden Queen Mining Company, LLC

