BLOCK CAVING AND SUBSIDENCE

The positive aspects of a block cave mine include no overburden waste piles on surface, and no large open pits. One consequence of block cave mines, however, is the potential for surface subsidence or settling. Surface subsidence is caused as the material above the orebody gradually moves downward to replace the ore that has been mined.

Using industry standard engineering practices, we are able to predict both the cave and subsidence zones based on orebody knowledge gained during our pre-feasibility drilling work. However, the best understanding of caving and subsidence will come once mining begins.

Protecting Apache Leap

Our commitment to protecting Apache Leap is absolute, and we are taking a variety of steps to ensure that the area is not harmed as a result of our mining activities.

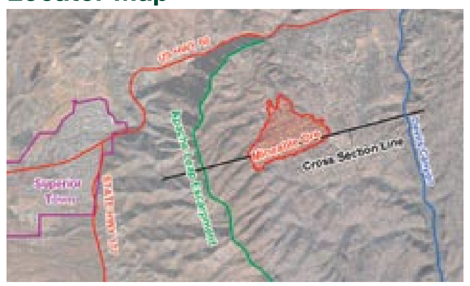
Keeping a close watch on subsidence

Mining will start at a point away from Apache Leap. This will allow us to gather technical information over a period of years to reassess the cave and subsidence angles. This data will be used to ensure the Apache Leap easement is not impacted as mining progresses to the west.

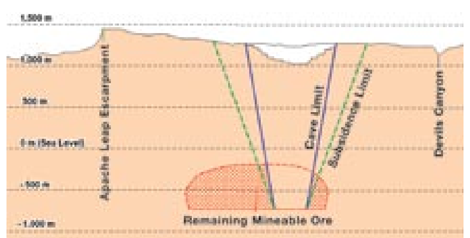
This information will allow us to identify any possible threat to Apache Leap as a result of our mining activities. If a threat is identified, we will change our mining practices to ensure the Leap is protected.

MOST PROBABLE SUBSIDENCE PREDICTION FOR RESOLUTION COPPER MINE

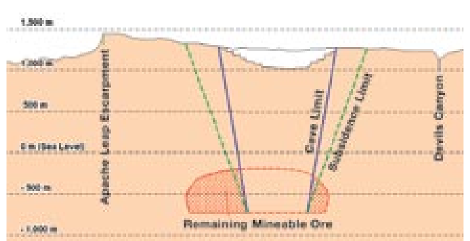
Locator Map



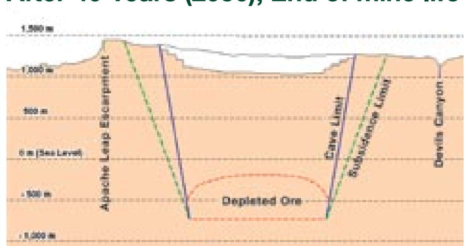
After 10 Years (2026)



After 20 Years (2036)



After 40 Years (2056), End of mine life



This figure illustrates Resolution Copper's current best estimate of the final effects of surface subsidence. The assumptions and methodology behind this estimate have been reviewed by a panel of independent industry experts. This panel visits Resolution every six months to review the technical component of our pre-feasibility study work.

Why the mine would be affected before Apache Leap

It is important to note that the way the mine will be constructed adds to the protection of Apache Leap. Here's why:

A series of three shafts is required to provide fresh air to the underground workers and equipment. This will include the existing #9 Shaft and two new shafts in the same area. These shafts will be the main lifeline to the mine and will cost in excess of $500 million to build. The mine could not operate without these shafts.

The way we plan to mine means that the subsidence zone would approach the boundary of the shaft complex after 15 years of mining. At that point in time, the subsidence zone would still be more than 3,000 feet from the boundary of the Apache Leap easement and would take another 25 years to reach the boundary of the conservation easement that will protect the Leap. In simple terms, subsidence would jeopardize the mining operation long before it affected Apache Leap or Queen Creek Canyon.

Summary

Subsidence evaluations and predictions will be regularly updated as more geological information is gathered and more powerful predictive tools are developed. Once caving commences, a comprehensive continuous monitoring system will be used to track the progression of the cave, validate subsidence predictions and check the suitability of the mine plan.

For more information on our block caving approach, please visit our website at www.resolutioncopper.com, email info@resolutioncopper.com, or call our Resolution project hotline at 520-689-3409.

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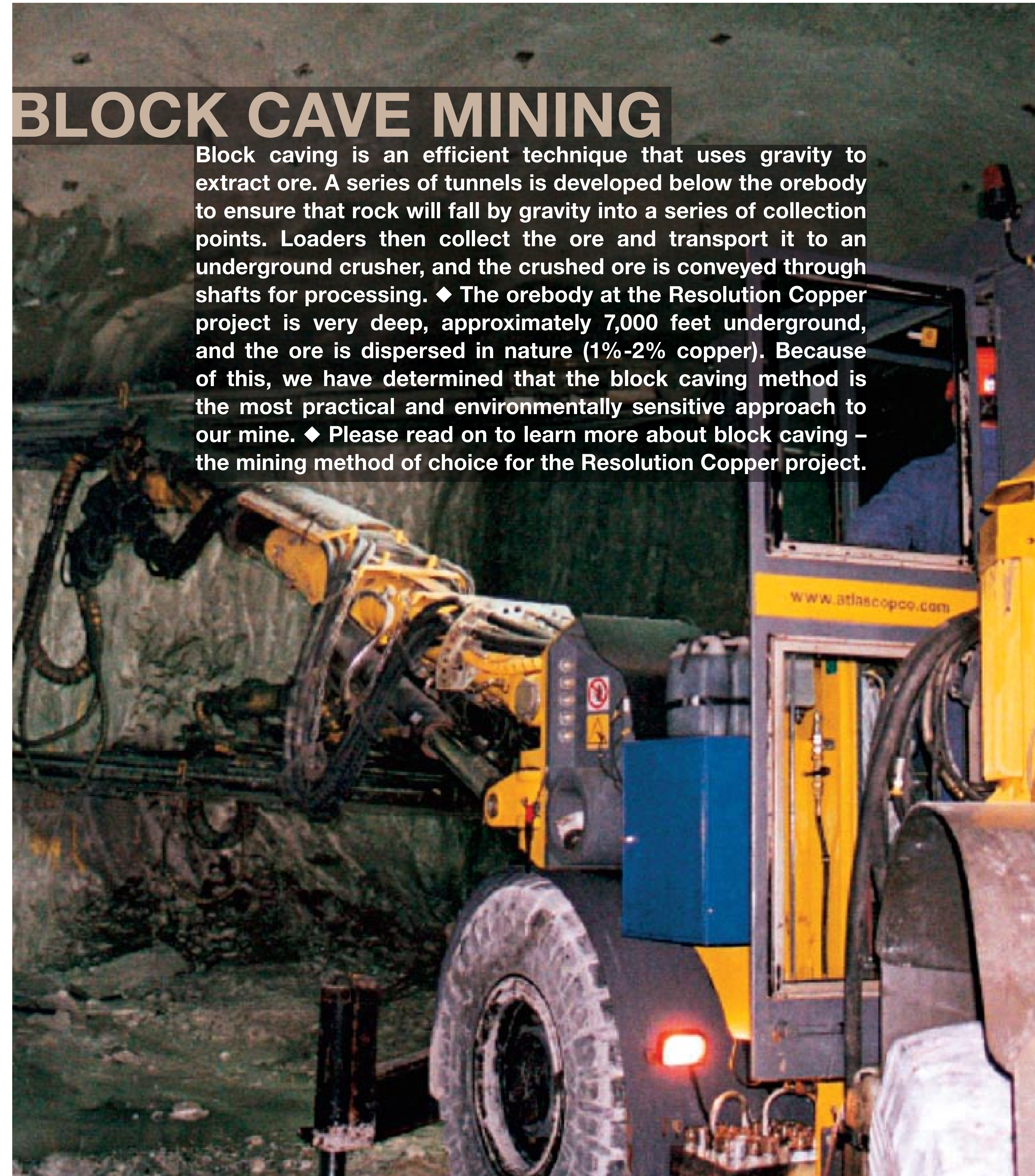
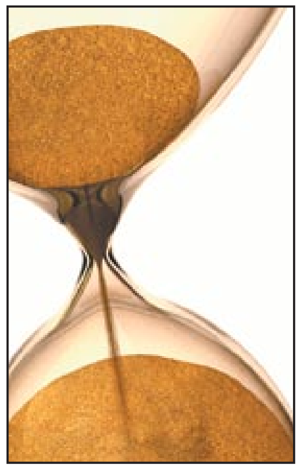


BLOCK CAVE MINING

Block caving is an efficient technique that uses gravity to extract ore. A series of tunnels is developed below the orebody to ensure that rock will fall by gravity into a series of collection points. Loaders then collect the ore and transport it to an underground crusher, and the crushed ore is conveyed through shafts for processing. ◆ The orebody at the Resolution Copper project is very deep, approximately 7,000 feet underground, and the ore is dispersed in nature (1%-2% copper). Because of this, we have determined that the block caving method is the most practical and environmentally sensitive approach to our mine. ◆ Please read on to learn more about block caving – the mining method of choice for the Resolution Copper project.

AN OVERVIEW OF
BLOCK CAVING

While block caving is not a new concept, it is gaining popularity as a safe and cost-effective method of mining deep orebodies.* Resolution Copper's goal is to not only create a profitable and thriving mining operation in Superior, but also to meet or exceed today's environmental and social standards. Block caving helps us achieve this by keeping the mining footprint small and reducing the amount of waste rock.



HOW IT WORKS

Block cave mining in its simplest form operates in the same way sand falls through an hourglass.

Block caving involves a three phase process of blasting and tunneling to form the shape of an hourglass out of rock.

- Phase A involves blasting an upper cavern of broken rock.
- Phase B involves drilling a tunnel underneath the broken rock cavern.
- Phase C involves blasting a narrow neck (drawbell) that allows broken cavern rock to fall through the drawbell down into the underlying tunnel.

In block caving where the base of the hourglass shape is a confined tunnel, the speed of rock falling through the hourglass neck (drawbell) is controlled by the speed at which rock is removed from the tunnel.

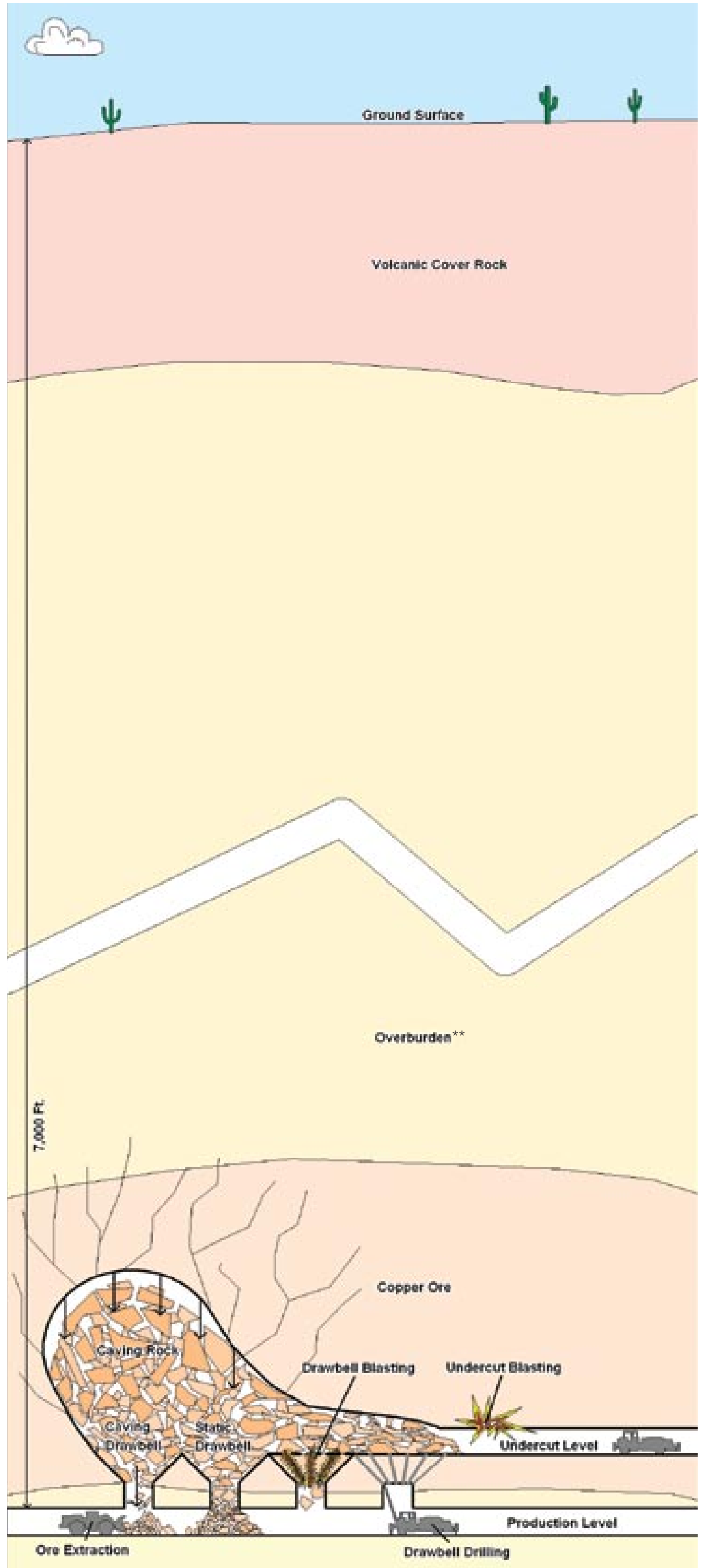
As broken rock in the upper cavern falls through the neck or drawbell, the roof of the cavern gradually collapses further to create more broken rock within the cavern. This process is continued until all the rock ore is removed via the tunnel.

The end result? Block caving could allow a valuable natural resource to be developed using a proven mining method that is safe, financially viable and minimizes impact to the environment. At the same time, the mine and the businesses that support it would bring social and economic benefits to the region for generations.

*Orebodies - A well-defined mass of mineral or rock, in this case, copper.

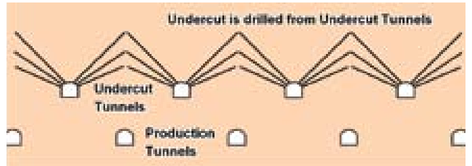
**Overburden - Rock material of little or no commercial value that overlies an ore deposit and must be removed before ore mining can begin. (Refer to graphic overview diagram)

GRAPHIC OVERVIEW OF BLOCK CAVING

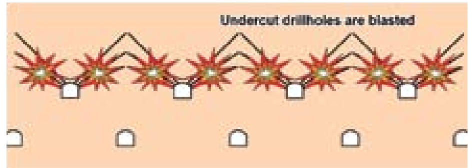


BLOCK CAVING PHASES AND STEPS

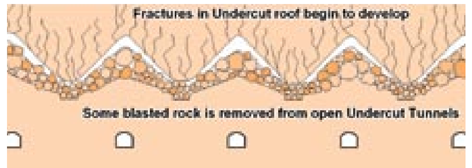
Phase A: Undercut Development



1. UNDERCUT DRILLING
Within a set of parallel tunnels on the top level (the undercut level), a set of holes is drilled into the roof.

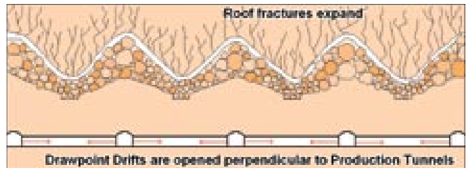


2. UNDERCUT BLASTING
Holes within the tunnel roof (undercut tunnels) are filled with explosives and detonated.

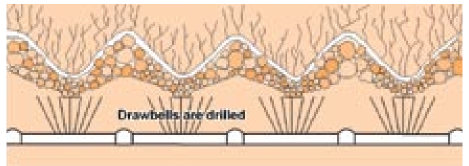


3. UNDERCUT ROCK REMOVAL
With explosions and tunnel collapse in selected sections, broken rock is removed via sections of the tunnel not yet affected by blasting. This process initiates the development of the upper cavern of broken rock.

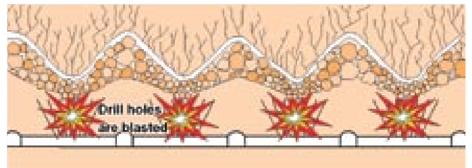
Phase B: Drawbell Development



4. DRAWPOINT TUNNELING
A set of tunnels is developed below the broken rock caverns.

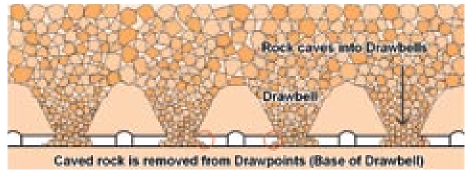


5. DRAWBELL DRILLING
A group of vertical holes is drilled from the tunnel roof into the broken rock caverns.



6. DRAWBELL BLASTING
The groups of drill holes that connect the tunnel with the overlying broken rock cavern are blasted.

Phase C: Production



7. ROCK-CAVING
With blasting of the connecting drill holes, rock from the overlying rock cavern falls down into the underlying (Production) tunnel.