LEADING PRACTICE RECLAMATION AT RESOLUTION COPPER

Claiming the Future by Reclaiming the Past
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After more than a decade of work and more than $40 million invested, Resolution Copper has nearly finished reclaiming 130 acres of the old Magma Copper West Plant Site, situated adjacent to the town of Superior, Arizona. When the company assumed control of the Magma Mine in 2004, it was tasked with cleaning up and reclaiming the site.

The company’s primary objectives have been to protect human health and the environment from legacy mining materials, restore the historic mine area to a more natural and visually pleasing state and restore areas for brownfield reuse and redevelopment. Resolution wanted to avoid repeating the practices of the past and ensure sustainable development in the long term.

The challenge was cleaning up the past and at the same time building for the future by developing one of the richest copper deposits in the world.

The old Magma Copper Mine was once one of the largest copper deposits in the United States. It is a significant part of Arizona’s history and a remnant of a rich mining culture. The site included an underground mine and associated surface mining infrastructure, processing facilities (concentrator and smelter), cooling plant, maintenance shops, process and storm water ponds, tailings, waste rock and smelter slag.
The Resolution Copper Project

The Resolution Copper Project is one of the largest copper deposits ever found in the world at 1.7 billion tons of 1.52% copper. Situated in the Pioneer Mining District three miles east of Superior, Arizona and part of the historic Copper Triangle, the copper rich deposit rests more than a mile below the surface.

Resolution Copper is developing a modern copper operation at the site of the Magma Mine operation, which closed in 1996. The new mine will be completely underground, with one engineered tailings facility and no open pits or associated waste rock dumps. The operation will consist of an underground mine, an ore processing operation and support facilities west of the town of Superior, Pinal County, Arizona.

Total estimated economic impact of the 60+ year project on the state of Arizona, including construction, operations and reclamation is approximately $60 billion.

To the extent possible, Resolution has reused historic property and disturbances already created by the Magma Copper Mine. This includes brownfield expansion of the East Plant site for future surface mine facilities, re-use of the Magma mine processing areas for a new concentrator and reuse of the existing disturbance and railway corridor for pipelines and associated surface infrastructure.

Resolution will be a block caving operation. Block caving is a well-established method used at more than 20 mining operations around the world. The ore is blasted, transported and crushed underground, then conveyed to the surface for further processing. Block caving is safe, environmentally sound and cost effective for mining a large, deep orebody.
Reclaiming a Mining Legacy: Doing Good Work Up Front

Permitting and building any mine is a long and complex process. Building a mine on the site of a century old operation is even more challenging. The old Magma Mine started producing in 1912 and soon became one of the largest copper producers in the United States. The operation shut down in 1996, but the potential to develop a rich new copper deposit near the town of Superior and reusing the already disturbed historic mining site kept the site active and alive.

Reshaping the Landscape, Reusing the Land

Resolution Copper assumed ownership of the Magma site in 2004. Along with this world class orebody came a lot of historic baggage. A legacy of old mining practices left the company with acres of land in need of rehabilitation and an eyesore for local communities, including:

- 14 million tons of acid-generating tailings ponds located in seven separate areas and two million tons of waste rock
- Limited storm water management controls that could affect storm water quality
- Contaminated soils near the Magma smelter
- Waste rock dumps, process ponds, and tailings that needed to be reshaped, consolidated and covered to protect air and groundwater, and to restore a more natural environment
- Aging storm water channels that needed to be cleaned up and rebuilt

State regulations require Resolution to commit to cleaning up and reclaiming the old Magma site once current mining activities are underway and once future operations are complete. Resolution wanted to go further. Accelerating the cleanup demonstrates a strong commitment to the Superior community.
By doing substantial reclamation years before the closing of the mine, the company could assess the success of their reclamation efforts. It would be in a position to learn from the reclamation work and apply best practices to future reclamation, better plan for future tailings storage and at the same time restore the site to minimize and prevent impacts to groundwater and surface water.

So in 2004, Resolution Copper began cleaning up and reclaiming the Magma site. Resolution significantly reduced the size of the new mine’s footprint in several ways, including: building new lined ponds on top of an old facility to store solids from the water treatment plant and reusing and restoring the old concentrator thickener tanks and foundations for its new water treatment plant.

Resolution also reclaimed several old tailings and waste rock impoundments. Waste rock was reshaped and seeded with a native seed mix. Waste rock was also removed from the drainage channels, which were subsequently restored to as close as possible to their original location. Tailings were reshaped to a more natural form, covered with non-acid generating rock from underground shaft sinking activities and seeded with a native seed mix. This all helps to prevent and minimize infiltration of precipitation and re-directs storm water away from the tailings, further protecting groundwater and surface water.

To date, Resolution Copper has cleaned up and reclaimed approximately 130 acres of the West Plant site. The work is nearly complete and approximately $40 million has been invested so far. In keeping with its commitment to the community and the local economy, this work is being done largely by local contractors.
Resolution Copper has contoured the land to improve drainage, water quality and aesthetics; covered and restored tailings and waste rock piles with native vegetation; and hydro-seeded the land to encourage the growth of low maintenance native plants. In addition, contact storm water is maintained on site for evaporation and treatment. Reclamation work has also included removing historic tailings near the Lower Smelter pond. The area has been covered with clean fill and replacement soil and vegetated with a native seed mix.

Reusing a Precious Resource, Preserving a Mining History

To gather additional data for the future mine design, Resolution Copper constructed a new mine shaft. To safely access the orebody from the new shaft, dewatering the old mine was critical. Working with local regulators and farmers, Resolution Copper agreed with the New Magma Irrigation and Drainage District (NMIDD) that the water pumped from the mine would be beneficially reused for agriculture. The company constructed a new water treatment plant and a 27-mile pipeline that delivers the treated water to NMIDD. Farmers at the district use the water for part of their crop irrigation. This helps reduce the amount of groundwater they need from other sources. When the new mine starts operating, the water will be reused in the mining process.

Many icons of the once bustling West Plant site have survived, but fell into disuse or were demolished for safety reasons. In 2011, Resolution documented the surviving buildings and facilities to decide whether to restore, demolish or reuse them. Multiple technical studies have been conducted on the Smelter structures in particular in recent years. Based on the results of these studies, the company has validated and confirmed that a proactive approach is required to clean contaminants out of the soil and eliminate a safety threat to our employees posed by the unstable Smelter structures. Due to the threat of collapse and falling debris, restoration work is not an option for the Smelter complex.
Resolution Copper is moving into the next phase of this major environmental reclamation project for the West Plant site. Removing soil contaminants and rehabilitating the site can only be completed after the Smelter structures are demolished and removed.

Much of the reclamation of these old and obsolete facilities is finished or in progress. Of particular note is the rehabilitation of the old mine hospital, renamed the Verde Building. After a complete renovation, the building now houses the Resolution Copper headquarters while still maintaining its historic character. In fact, several Resolution Copper employees were born there in the same building where they now work.

Also still on site is Magma Copper’s air conditioning system, the first large-scale mechanical refrigeration system for underground mining. In 1976, it was designated a National Historic Mechanical Engineering Landmark by the American Society of Mechanical Engineers and the Smithsonian Institution.

**A Community Built on Copper**

The Town of Superior and its residents, who live adjacent to the mine, are essential to the successful development of the Resolution Project. The new copper deposit is about three miles away from the town; processing facilities are a half mile northwest of the town, while the tailings will be located several miles away. Resolution Copper is and has been committed to employing as many local residents and contractors as possible. It has actively engaged the community about its plans since it arrived in 2004 and more formally since 2013. Resolution created a Community Working Group (CWG) that now meets regularly with the company to ensure constant flow of information and feedback. This has helped Resolution Copper improve its plans in important ways. Superior residents understandably have a sentimental attachment to mining’s past and are eager to see economic development in the future.

A recent survey showed that fully 84 percent of residents in Superior and the surrounding communities favor opening the mine. By a 2-to-1 margin, people indicated that their opinion of Resolution Copper had improved during the past year. The need for jobs in the area was the top reason cited for supporting Resolution Copper. The company remains dedicated to earning support from area residents.
Despite the project’s positive potential and Arizona’s decades-long reliance on copper mining, the legacy of previous mining operations and their effects on the environment and communities understandably concern some residents.

To make sure Superior isn’t solely reliant on the mining industry, Resolution Copper is working with town and community leaders to diversify Superior’s economy with industries such as tourism.

As early as 2005, local residents met to talk about the company’s reclamation plan. Today, Resolution Copper continues to update the community on the status of the mine development and the reclamation. The community is particularly interested in the future of the old Smelter stack. Multiple technical studies show the brick structure is deteriorating and could collapse in high winds. Due to the threat of collapse and falling debris, restoration work can’t be done safely and is not an option. Resolution will continue consulting with residents on cultural heritage initiatives dedicated to Superior’s rich mining history. The company is currently completing archaeological and historical documentation of the Smelter stack and buildings. The Resolution Copper team is proud of its work to clean up the Magma Mine site to make it safer.

**Claiming the Present, Planning for the Long-term**

With the reclamation of the West Plant site nearing completion, Resolution continues to develop one of the richest and largest undeveloped copper deposits in the world. Monitoring and sampling of groundwater wells, storm water, and vegetation is ongoing and will continue long after the mine closes.

Final reclamation of the entire site will start at the end of the 40-year operating mine life and is expected to take several years. This includes long-term monitoring of water quality and vegetation after closure is completed. A final reclamation plan for the future mine is required under both state and federal law. Resolution—not taxpayers—will be required to cover all closure costs and post-closure monitoring.

Closure plans will, of course, evolve with new reclamation technology and progress on the new mine, but the current plans call for an industrial area at the West Plant site. After
the mine stops operating, several facilities will remain that can be used again. Where practical, the
land around the mine will be regraded and reclaimed to its original condition. Following completion of
final reclamation, Resolution is committed to caring for and maintaining the site for many years to
come.

Lessons Learned

Reclamation has been a legal requirement and standard practice in the mining industry for the last few decades, but this wasn’t always the case. When Resolution Copper assumed control of the Magma Mine in 2004, it was tasked with cleaning up and reclaiming decade’s worth of environmental problems on the site. The challenge was cleaning up the past and at the same time developing one of the richest copper deposits in the world. The company is committed to avoiding a repeat of the practices of the past and ensuring sustainable development in long term by:

- **Starting the best efforts up front.** By accelerating the cleanup of the West Plant Site and siting new mining facilities within the footprint of the historic Magma Mine area, Resolution will reduce the footprint of new mine disturbance, prevent and minimize future impacts to groundwater and surface water, while demonstrating a commitment to the local community. By doing substantial reclamation years before the mine closes, the company can see how their reclamation efforts might work in the future. They can better plan for future tailings storage and prevent and minimize impacts to ground water and surface water.

- **Investing time and resources in maintaining good community relationships.** Resolution’s early and regular engagement with communities helped site managers understand community priorities and concerns around reclamation of the historic mine site. This helped the company identify community expectations and make necessary improvements or adjustments to their reclamation plans. Resolution continues to talk with the community regularly about all aspects of the new mine development. The parties may not always agree, but by engaging local communities early and often, Resolution can improve our current and future plans and at the same time continue to understand the priorities of the local communities.

- **Planning for the long term.** Resolution follows the closure standards and core principles of its parent company, Rio Tinto, along with established state and federal rules, regulations and guidance. Planning for closure from the earliest stages of project development minimizes financial, social and environmental impact. Together with the local communities and regulators, Resolution Copper will determine the most sustainable long-term plan for using the land once the mine closes.