## Table of Contents

I. Arizona Geological Society  
II. Augusta Company Summary  
III. Augusta Resources Profile  
IV. Rosemont Ranch Second Quarter/2007  
   a. Rosemont Location – State Map  
   b. Rosemont Location – Details Map  
   c. Claim Map  
V. Rosemont Ranch Executive Summary  
VI. Geology  
   a. Geologic Report  
   b. General Geology Schematic  
   c. 3500 Level Schematic  
   d. 4500 Level Schematic  
   e. Section View Schematic  
VII. Drilling Maps  
   a. In-Fill Drilling  
   b. Drill Results  
   c. Block Model Cross Section  
VIII. Process  
   a. Process Narrative  
   b. Process Flow Diagrams  
IX. News Articles  
   a. Inside Tucson Business 3/26/07  
   b. Arizona Daily Star 02/25/07  
   c. Arizona Daily Star 10/15/06  
   d. Green Valley News 06/28/06  
   e. Arizona Daily Star 06/24/06  
X. Editorials  
   a. Inside Tucson Business 03/07/07  
   b. Green Valley News 01/23/07  
   c. Tucson Weekly 02/01/07  
   d. Green Valley News 09/29/06
Section 1

Introduction
ARIZONA GEOLOGICAL SOCIETY

ARIZONA GEOLOGICAL SOCIETY

Dear Field Trip Participant,

Welcome to the 2007 Spring Field Trip. On behalf of the Arizona Geological Society thanks Augusta Resource Corporation for their generously hosting the trip. This trip will visit the Rosemont property which is located in Pima County. The property has been recently mapped and drilled; it is situated near a number of large porphyry-type, producing, copper mines operated by Phelps Dodge (Freeport) and Asarco. The Property contains three known potentially open-pit-mineable copper/molybdenum ("Cu/Mo") skarn deposits: Rosemont, Peach-Elgin, and Broadtop Butte. Rosemont resource increased to 10.3 billion pounds copper equivalent in March of 2007.

We thank the people closely related with making this trip possible: Bill Daffron, Mark Stevens, Scott Parks, and Thornwell Rogers.

Please remember to stay hydrated and pay attention to your surroundings for your safety and the safety of your fellow participants.

Enjoy the trip

Rich Brown
AGS VP of Field Trips

APRIL 28, 2007

Text and illustrations in this guidebook have been provided by Augusta Resource Corporation and not been edited or reviewed by Arizona Geological Society.

Section 2

Augusta Company Summary
Company Summary

Augusta Resource Corporation (AMEX/TSX:AZC) is a mineral exploration and development company responsibly advancing the Rosemont copper project in Southern Arizona. Augusta's Rosemont property is located in Pima County, approximately 50 kilometers southeast of Tucson, Arizona, and contains a potentially world class open-pit copper-molybdenum-silver (Cu/Mo/Ag) deposit. The Rosemont resource estimate reports 8.4 billion lbs of Cu equivalent (543.1 M tons at 0.75% Cu equivalent at 0.2% cutoff) in measured and indicated resources and 1.9 billion lbs of Cu equivalent (163.0 M tons at 0.55% Cu equivalent at 0.2% Cu cutoff) in inferred resources. The estimate also includes a silver resource of 66.5 million ounces in measured and indicated and 9.3 million ounces of Ag in inferred resources. Augusta's preliminary assessment published in June 2006 shows potentially robust economics for the project, and is now working on a bankable feasibility study that is on track for completion in the second quarter of 2007. Augusta has a solid asset base, proven management team, and is committed to becoming a mid-tier copper producer within five years. Website: AugustaResource.com
Arizona Geological Society
Rosemont Mine Tour / Saturday, April 28, 2007

Section 3

Augusta Resources Profile
Augusta Resource Corporation is a mineral exploration and development company responsibly advancing the Rosemont copper/moly project in southern Arizona. Augusta has a solid asset base, proven management team, and is committed to becoming a mid-tier copper producer within the next five years.

Rosemont (100% ownership)

The Rosemont property is located in Pima County, Arizona approximately 50 kilometers southeast of Tucson, Arizona. The Rosemont deposit contains more than 10.3 billion pounds of copper equivalent, including 7.2 billion pounds of copper, 180 million pounds of molybdenum, and 75 million ounces of silver.

After completing a positive Preliminary Assessment and securing water rights for the property in June 2006, Augusta commenced a bankable feasibility study. The Company also filed an initial “Plan of Operations” with the US Forest Service in August 2006, launching the permitting process for what may well become one of best new copper/moly projects in the United States.

<table>
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<th>Cutoff Cu%</th>
<th>Short Tons (M)</th>
<th>%Cu</th>
<th>%Mo</th>
<th>%Ag oz/t</th>
<th>% Cu Eq*</th>
<th>lbs Cu (M)</th>
<th>lbs Mo (M)</th>
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<td>0.014</td>
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* Copper equivalence is based on prices of US$1.25/lb Cu, $18.00/lb Mo and $8.50/oz Ag, with no applied recovery factors.

MEASURED & INDICATED MINERAL RESOURCES

INFERRED MINERAL RESOURCES

INVESTMENT HIGHLIGHTS

World Class Deposit
A preliminary assessment reflected robust economics for the 100% owned Rosemont copper/molybdenum/silver deposit. The project holds a net present value of $442 million (8% discount rate), with an estimated annual copper production of more than 226 million pounds at $0.42 per pound.

Strategically Positioned
Arizona is home to several of the world’s largest copper producers, offering stable mining laws, a clear regulatory regime, and established infrastructure.

Experienced Management Team
The Company has an accomplished and proven management team with extensive experience in operations, exploration and development.

Strong Market Demand
Demand for copper is expected to grow at a rate of more than 3.5% over the next few years, reaching over 18 million tonnes annually. As the world’s population grows, and economic development continues, consumption of copper is expected to increase.

FINANCIAL HIGHLIGHTS

- Issued Shares: 72.7 M
- Options & Warrants: 23.7 M
- Management Ownership (~ 22%): 15.9 M
- Market Capitalization: C$185 M
- Cash (3/31/07): C$3.8 M
- Current Price (04/26/07): C$2.56 / US$2.26
- 52 Week Trading Range: C$1.60 - $3.10
Shell Deposit  
(option agreement for 100% ownership)

The Shell deposit is located 60 kilometers west of Ely, Nevada, approximately two kilometers from Mount Hamilton. (3) Historical drilling by Union Carbide Corporation in the 1980s identified an indicated and inferred resource of gold and molybdenite as follows:

- Gold Zone: 469,157 tonnes of 7.4 g/t gold
- Moly Zone: 1,032,236 tonnes of 1.20% MoS₂

The Company commenced a 3,000 meter phase I drill program in August 2006 to confirm and extend known mineralized zones.

Mount Hamilton  
(purchase agreement for 100% ownership)

Located in the White Pine Mining District in Nevada, the Company commenced a pre-feasibility study to explore the development of the Centennial Gold Zone in May 2006.

- Centennial Gold Zone(4): 309,000 gold ounces in an indicated resource of 6.7 M tonnes of 1.31 g/t gold, using a cut-off grade of 0.078 g/t gold. Historical work to date has also identified significant mineralization of gold (Au), tungsten (WO₃), molybdenite (MoS₂) and copper (Cu).

*Please note the Company has entered into a Letter of Intent with Ivana Ventures Inc. respecting Augusta’s proposed sale of the Company’s interest in the Mt. Hamilton and Shell properties. Please see press release dated May 1, 2007 for more details.*

**2007 OBJECTIVES**

- Complete Final Feasibility Study  
Expected for completion in the second quarter to evaluate the project economics associated with processing sulfide ores as well as oxide copper processing.

- Advance Permitting Process  
Preparing an comprehensive Plan of Operations document for submission to the US Forest Service in the second quarter of 2007. Augusta will then move through the 12 to 18 month National Environmental Policy Act permitting process.

- Secure Financing  
The Company has commenced discussions with various financial intermediaries to initially secure sufficient funding to cover expenditures through to the expected completion of the permitting process.

- Marketing & Corporate Development  
The Company will work hard to expand relationships with both new and existing investors, and continue to look for opportunities to acquire projects that will position the Company as a mid-

For further information please visit www.augustaresource.com
Arizona Geological Society
Rosemont Mine Tour / Saturday, April 28, 2007

Section 4

Rosemont Ranch Second Quarter, 2007 Summary
Augusta Resource Corporation is a mineral exploration and development company responsibly advancing the Rosemont copper project in southern Arizona. Augusta has a solid asset base, proven management team, and is committed to becoming a mid-tier copper producer within the next five years.

**RESOURCE HIGHLIGHTS**

- **Sulfide Resource**: 706 million tons
- **Oxide Resource**: 104 million tons
- **Contained Copper**: 6.9 billion pounds
- **Contained Molybdenum**: 180 million pounds
- **Contained Silver**: 76 million ounces

**AUGUSTA HIGHLIGHTS**

- **World Class Deposit**
  For 20 years, Rosemont will provide 10% of US copper production and 5% of US copper consumption in addition to significant production of molybdenum and silver.

- **Strategically Positioned**
  Arizona is home to several of the world’s largest copper producers, offering stable mining laws, a clear regulatory regime, and established infrastructure.

- **Experienced Management Team**
  The Company has an accomplished and proven management team with extensive experience in operations, exploration and development.

- **Strong Market Demand**
  Demand for copper is expected to grow at a rate of more than 3.5% over the next few years, reaching over 18 million tonnes annually. As the world’s population grows, and economic development continues, consumption of copper is expected to increase.

*Please see press release dated March 16, 2007 – NI 43-101 compliant technical report to be filed on SEDAR within 45 days. Resource estimate includes all measured, indicated & inferred mineral resources.*

**RIGHT PEOPLE. RIGHT PLACE. RIGHT PLAN.**
RIGHT PEOPLE.

Senior Management

Gil Clausen, President & CEO
Donald Clark, VP Administration
Mike Clarke, VP Exploration
Lance Newman, VP Metallurgical Operations
Bruce Nicol, Senior VP & CFO
James Sturgess, VP Projects & Environment
Richard W. Warke, VP Corporate Development

Recent Accomplishments:

2007 Published updated resource statement
2007 Completed 20,000 meter in-fill drill program
2006 Secured water supply source with CAWCD
2006 Filed initial "Plan of Operations"
2006 Commenced feasibility study
2006 Published positive preliminary assessment

RIGHT PLACE.

30 miles southeast of Tucson, Arizona
Recognized mining district
Accessible via highway from east to west, with a network of unpaved roads leading to the property
Less than 10 miles from major transmission line, near the main east-west rail line to Los Angeles and the Port of Tucson
Stable mining laws & clear regulatory regime

PRODUCTION DATA FOR PRIMARY US COPPER PRODUCERS

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<th>Operation</th>
<th>County</th>
<th>State</th>
<th>2005 Annual Production</th>
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<td></td>
<td></td>
<td>Ore Grade</td>
<td>Ore Grade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(mill) % Cu</td>
<td>(heap) % Cu</td>
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<tr>
<td>Morenci</td>
<td>Greenlee</td>
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<tr>
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<td>Chino</td>
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<td>Mission</td>
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<td>Silver Bell</td>
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<tr>
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<td>0.33</td>
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</table>

By-Product Copper    |         |         |           |           |           | 5,709 |
Total U.S. Production (excluding Rosemont) |         |         | 1,282,258 |
Total U.S. Production (including Rosemont) |         |         | 1,405,908 |

Rosemont Production Data Based on Estimated Mill Recoveries of 89% Cu.
Blue = Estimated Production - Private Company
RIGHT PLAN.

Augusta is following an environmentally-driven process to advance permitting on the economically-robust Rosemont project.

Stakeholder response to the initial Plan of Operations has been used to modify the project feasibility study, and the final comprehensive Plan of Operations will incorporate this public input.

Using this plan as a basis for permitting, Augusta is moving through the National Environmental Policy Act ("NEPA") permitting process, whereby the US Forest Service conducts an Environmental Impact Statement ("EIS") and public review process. The US Forest Service will then issue a "Record of Decision" either approving the plan or providing recommendations for modifications to the plan.

Subsequent to the "Record of Decision", the Company will file a final Plan of Operations (incorporating any necessary modifications). It is then that permits would be issued allowing the Company to commence construction. Upon completion of this process, Augusta expects to receive approval to construct the mine in 2009 and to produce copper at Rosemont in 2010.

PROJECT ECONOMICS

Annual Production:
- Copper (lbs) 226 million pounds
- Molybdenum (lbs) 5 million pounds
- Silver (oz) 3 million ounces

Jobs:
- 400 direct jobs
- 800 indirect jobs
- $59,000 average annual salary
- $400 million payroll over life of mine

Taxes (over life of mine @ $2.00 Cu):
- Federal: $1.8 billion
- State: $490 million
- Local: $50-100 million

Endowment:
- $50 million community endowment

VIEW FROM THE TURNOUT ON HIGHWAY 83

Highway 83, Mile Post 44, 2006:

Highway 83, Mile Post 44, Year 10:
Augusta has made the following commitments in the Rosemont Plan of Operations:

1. Sustainable water supply
2. Concurrent reclamation during mine life
3. Visual screening berm
4. Goals of Sonora Desert Conservation Plan
5. Endowment Trust Fund for regional use
6. Modern processing technology

2007 OBJECTIVES

➢ Final Feasibility
   Expected for completion in the second quarter.

➢ Advance Permitting

➢ Secure Financing
   Secure sufficient funding to cover expenditures through to the expected completion of the permitting process.

➢ Corporate Development
   Continue to look for opportunities to acquire projects that will position the Company as a mid-tier copper producer within five years.
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Rosemont Mine Tour / Saturday, April 28, 2007

Section 5

Rosemont Ranch Executive Summary
Executive Summary

The subject of this Plan of Operations is known as the Rosemont Project ("Project"), which is owned and will be developed and operated by Augusta Resource (Arizona) Corporation (Augusta), a wholly owned subsidiary of Augusta Resource Corporation. The Rosemont Project area consists of a group of patented mining claims, unpatented mining claims and fee land that cover most of both the Rosemont Mining District and the adjacent Helvetia Mining District (the Property), wholly within the political boundary of Pima County in southeastern Arizona. Specifically, the Project is located approximately 30 miles southeast of Tucson, west of State Highway 83. Access to the Property is from Interstate 10 to State Highway 83 south, then west on the future Project Access Road.

The Project area and near vicinity have a history of mining exploration and activities. The core of the Rosemont Property consists of 132 patented lode claims that in total encompass an area of nearly 2,000 acres (800 hectares). A contiguous package of 850 unpatented lode mining claims with an aggregate area of approximately 12,000 acres (almost 5,000 hectares) surrounds the core of patented claims. Associated with the property are 14 parcels of fee land grouped into six individual areas that enclose a total of 911 acres (369 hectares). Most of the unpatented claims were staked on Federal land administered by the United States Forest Service (Coronado National Forest), but a limited number of claims in the northwest portion of the property are on Federal land administered by the Bureau of Land Management (BLM). The area covered by the patented claims, unpatented claims and fee lands totals approximately 14,880 acres (6,026 hectares).

The Rosemont Project is a copper mining project. In addition to a copper resource, it has been determined through drilling and metallurgical testing that recoverable quantities of molybdenum and silver are also resident in the deposit. Augusta has confirmed or identified the availability of approximately 440 million tons of ore which is planned to be mined at a rate of approximately 27 million tons per year. This rate translates into a project life of approximately 16 years. Additional reserves resulting in at least four more years of mine life (i.e. up to 20 years of total mine life) are expected to be developed as exploration drilling continues. Approximately 348 people will be employed full time, drawn from a largely locally available pool of workers. This schedule estimates a mill through-put of approximately 75,000 tons per day.

Mining of the ore will be through conventional open pit mining techniques. Overburden and waste rock will be blasted and transported by haul truck to the waste rock deposition areas. Ore will be blasted and either hauled by haul truck to the leach pad, or crushed and loaded onto a conveyor for transport to the mill, depending on the type of ore. Ore will be processed either by conventional sulfide milling, or by leaching. The copper concentrates from the milling operations will be further processed by either on-site concentrate leaching, or they will be transported off site for smelting. Leach ore will be placed on a lined leach pad. Solutions from the pad will be collected in a solution pond and then processed through a Solvent Extraction – Electrowinnning (SX-EW) plant. Copper cathodes generated from the SX-EW plant will be transported off site to copper warehouses or directly to customers.
The total disturbance footprint of the operation is estimated to be 4,000 acres, with approximately 840 acres on private land, 3,135 on federal lands managed by the Coronado National Forest, and 20 acres on state trust lands.

In general, the Rosemont Project has been designed as a sustainable development, defined as a development that meets the needs of the present without compromising the ability for future generations to meet their own needs. Specifically, Rosemont is being developed using the underlying principles and analysis that acknowledge the significant economic benefit this Project can bring to the local area, while fully considering the environmental impacts a mining operation can have.

Because this is a new project, the opportunity exists to ensure that all activities associated with the mine are environmentally sound and as protective of the environment as possible. Augusta has emphasized sustainability in its approach to facility siting, water supply, water conservation, concurrent reclamation, and the community benefits of the Santa Rita Mountains Regional Trust. Specific sustainable concepts are outlined below and discussed further throughout this document.

- **Facility siting.** In siting waste rock and tailings facilities, it was determined that multiple facility footprints located at a lower elevation and covering multiple drainage basins would not be as environmentally sound as a single consolidated facility covering a smaller area or located within a single drainage basin. The Project mining activities, therefore, have been designed to be confined to the Barrel Canyon drainage to the greatest extent possible, at an elevation that results in little or no anticipated visual impact to Green Valley or Tucson. The industrial nature of the milling facility has been located in a recessed canyon, screened from view of local areas by surrounding ridgelines.

- **Water supply.** Of significant importance to the project is the supply of water, estimated at approximately 5,000 to 8,000 ac-ft per year. By contracting for and purchasing Central Arizona Project (CAP) water in an amount equivalent to that used at the mine, Augusta proposes to recharge CAP water to the regional aquifer at the Pima Mine Road location in the upper Santa Cruz groundwater basin. Recharge of CAP water at this groundwater recharge facility will offset the potential impact of groundwater withdrawal on a regional scale. That is, by recharging CAP water in sufficient amounts, the overall water balance and safe-yield goal of the Tucson Active Management Area (AMA) will be satisfied.

- **Water conservation.** Augusta understands that water is a critical resource in eastern Pima County, and has incorporated a number of water conservation efforts at the Rosemont Project. These include the use of dry tailings placed with waste rock instead of conventional tailings pond construction and operation; drips and emitters for the leach process instead of sprinklers and atomizers; reduced surface area for freshwater ponds; lined and elevated tankage to minimize seepage losses; and covered storage tanks.

- **Concurrent reclamation.** The deposition of waste rock will be initiated with a series of perimeter berms that are designed to: 1) reduce visual impacts from State Hwy 83 and surrounding areas,
and 2) allow reclamation to begin within the first year of operations. Soil will be salvaged prior to pit operation and used as a vegetation growth medium as soon as the perimeter berms are established, during the early phases of mine operations. Waste rock will continue to be deposited behind, i.e. to the west of, the perimeter berms during the life of the mine.

• Santa Rita Mountains Regional Trust. The Project plan will have provisions for contributing a portion of proceeds from production to the development of conservation projects of regional importance, to be developed with participation from local stakeholders.

In the coming months, Augusta will continue to pursue the extensive engineering, permitting, and public involvement efforts associated with acquiring all of the necessary approvals for operations. Development and implementation of an environmental management system will tie all of the environmental program requirements into a cohesive, easy to manage package. Though the exact format of the system has not yet been determined, the Rosemont environmental management system will be produced at the conclusion of the NEPA review process, and will incorporate all requirements and conditions as stipulated in federal, state, and local agency permits and approvals.

WestLand Resources, Inc.
Engineering and Environmental Consultants
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Arizona Geological Society
Rosemont Mine Tour / Saturday, April 28, 2007

Section 6

Geology and Relogging Program
Geologic Report, Relogging Program
at the
Rosemont Porphyry Skarn Copper Deposit,
Augusta Resource Corporation

March 2007

By
Willam J. Daffron, Robert A. Metz, Scott W. Parks,
and
Karl L. Sandwell-Weiss
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Author(s)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>William J. Daffron</td>
<td>1</td>
</tr>
<tr>
<td>Mining History at Rosemont</td>
<td>Karl L. Sandwell-Weiss</td>
<td>1</td>
</tr>
<tr>
<td>General Geologic Setting</td>
<td>Scott W. Parks</td>
<td>3</td>
</tr>
<tr>
<td>Stratigraphy, with Observations</td>
<td>William J. Daffron</td>
<td>5</td>
</tr>
<tr>
<td>on Alteration and Mineralization</td>
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<tr>
<td>Intrusive Rocks</td>
<td>Robert A. Metz</td>
<td>12</td>
</tr>
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<td>Mineralization</td>
<td>Robert A. Metz</td>
<td>18</td>
</tr>
<tr>
<td>Structure</td>
<td>Scott W. Parks</td>
<td>21</td>
</tr>
<tr>
<td>Brief Comments on the</td>
<td>William J. Daffron</td>
<td>22</td>
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<tr>
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<tr>
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<td>Karl L. Sandwell-Weiss</td>
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Introduction

Beginning in 2005, Augusta Resource (Arizona) Corporation began a program in the Rosemont Mining District, Pima County, Arizona to confirm and extend the results of previous drilling by other companies. This drilling partially delineated a buried skarn-type porphyry copper deposit. Augusta's program continued into the early months of 2007, and consisted of core drilling to collect new information and a separate program of logging, photographing, sampling and assaying of stored core that had been retained from the previous drilling campaigns.

Augusta completed a total of 95,557 feet of new core drilling, and 194,332 feet of previously drilled core was relogged, photographed and sampled, where appropriate, at the facilities at the Hidden Valley Ranch. This brief report is an attempt to summarize the observations of those concerned with the relogging program.

Mining History at Rosemont

The Rosemont District has been mined since before the American Civil War, but no records remain of that activity, only some pits and shafts. Over 36 mines have been listed as working in the district.

The documentation for the early claims are incomplete and the claims themselves are difficult to locate, especially the ones registered before the Rosemont Smelting and Mining Company was started in 1894. Not many of the early claims were actually worked. The major mining was done by the owners and lessees of the Rosemont and Narragansett claims.

In June of 1894, there were 50 men preparing an 80 ton smelter and developing a mine, most likely the Chicago Mine. By the end of October, the smelter was operational, but financial difficulties forced the company to close and auction off its assets, except for the
land. The Lewisohn brothers of New York paid between $30,000 and $40,000 for the assets.

By early January, the Lewisohns started operations as the Rosemont Copper Mines and then changed the name to the Rosemont Copper Company. The company shipped its ore via the Sonoita Station of the New Mexico and Arizona Railroad.

The mines closed briefly in 1899 due to a lack of coke for the smelter and then the smelter worked intermittently until 1903, when it closed for good.

There was some production by lessees at Rosemont in 1922 and in 1924, but it is not know which claims were mined. Various claims were worked from about 1943 to 1950 but there are no good records to show which claims they were or how much ore was extracted. However, some records claim that there was continuous mining from 1915 to 1951. In most cases they were small exploration holes or "high grading" of the ore.

One of the earliest, possibly the first claims in Rosemont was the Narragansett, located in 1879. By February of 1882 a tunnel about 30 feet deep had been dug into "good ore." It was worked off and on until about 1909, when it is reported that the Lewisohns had taken an option on it but the option was never closed. Reports show that the mine was active from 1911 — 1913. In 1915 the property was sold and by 1917 about 250 men were working the mine. However, the owners met with serious financial difficulties and the mine, despite being a "good producer" was sold in 1918. Of note, the company mercantile store was worth more than the mine. All operations finally ceased in 1921. In 1924 an inventory of the mine showed that it consisted of "12 shafts, seven cuts, two tunnels and one drift."

The total estimated and recorded base and precious metal production from the Helvetia/Rosemont districts through 1972 (the last year there is any record of production) is about 426,000 tons of ore containing:
17,422 tons of copper
680 tons of zinc 261 tons of lead
347,000 ounces of silver
1,580 ounces of gold

Additionally, it is reported that some 13 tons of high grade molybdenum concentrates and a few tons of high grade tungsten concentrates came from the Helvetia district. Of note, quite often the Rosemont and Helvetia districts are combined as the boundaries are not clear.

From the 1950's to 1998 there were numerous exploration holes drilled by the various property owners. Some were quite extensive, involving hundreds of holes and others were sporadic efforts. Based on current USGS maps and various databases, over 40 miles of road were cut and over 500 holes drilled on the property. Many of the drill pads have casing that marks the old holes and the wire rope used to support the drill rigs is buried in the ground. Old metal pieces used in various mining activities are strewn over the landscape and the smelter location is marked by the large slag pile.

The Banner Mining Company purchased the Rosemont claims from the trustees of the Lewisohn estate in 1961. Anaconda bought the Banner holdings in 1973 and continued to refine the ore body limits. Around 1973, Anamax obtained the property and in 1988 ASARCO got the land. It was sold to Triangle Ventures for $4.8 million in 1998 and was offered to Pima County for $11.5 million, which refused it. Triangle Ventures then sold the holdings to Augusta Resource for $20.5 million in 2006.

**General Geologic Setting**

The Rosemont project is located on the eastern edge of the Sonoran Desert sub-province of the southern Basin and Range physiographic province. The Basin and Range Province in Arizona is characterized by alluvial basins bounded by mountain ranges formed by extensional normal faulting in the mid-Tertiary to present.
The deposit forms part of the extensive belt of porphyry copper deposits found in the cordillera of North and South America running from Chile to the Yukon. Regionally, Rosemont is part of a cluster of porphyry deposits that runs from Cananea in Sonora, to Bagdad and Mineral Park in northern Arizona.

The Rosemont project is located in the Helvetia-Rosemont mining district in southwestern Pima County in the northern Santa Rita Mountains. Adjacent mining districts include the Empire, Greaterville, Old Baldy, and Pima districts. Further south in the Patagonia Mountains are the Harshaw and Patagonia districts, which contain undeveloped porphyry copper deposits including Red Mountain and Sunnyside.

The Empire District, located to the northeast in the northern Empire Mountains was a multi-element limestone replacement district. Silver bearing, lead, zinc, and copper oxides were mined from fault intersections in Permian limestone.

The Greaterville District, which lies just to the south of the Rosemont district, is a gold district. Although some lode deposits were mined early on, the majority of the production came from placer deposits.

To the west of Greaterville is the Old Baldy district, which covers the highest peaks in the Santa Rita Mountains. Numerous small prospects exploited base and precious metal bearing quartz veins in Triassic volcanic and sedimentary rocks.

The Helvetia-Rosemont District spans the ridge making up the Northern Santa Rita Mountains with the Helvetia portion on the west side and Rosemont on the east side of the range. Over fifty mines were worked in the districts beginning in the late 19th century. Both districts are intrusive centered, sediment hosted, copper dominant districts.

Igneous rocks in the Santa Rita Mountains include pre-Cambrian, Jurassic, and Laramide age rocks.

Precambrian granitic rocks outcrop on the crest of the ridge and down the western slope in the Rosemont-Helvetia area. These rocks have been mapped as granite, quartz diorite,
quartz monzonite, and associated aplite. The Precambrian intrusive rocks cut in the Rosemont drilling were logged as coarse grained porphyritic quartz monzonite. The Santa Rita Mountains occur within a broad belt of exposures of the early Mesozoic magmatic arc that runs from Mexico through Arizona, California, and throughout the Sierra Nevada. The Mount Wrightson Formation, exposed to the south of the Rosemont project, is an early Jurassic, silicic to intermediate volcanic formation with associated eolian sediments intruded by a coeval monzonite pluton. Riggs et al 1994.

Small Laramide Stocks occur in the Rosemont area and they consist of quartz monzonite or quartz latite. Somewhat larger stocks of similar character occur to the north at Broadtop Butte and west in the Helvetia area. They are associated spatially and temporally with the sediment hosted mineralization and are themselves mineralized. In section, these intrusive bodies appear rootless due to strong post-emplacement deformation.

Just to the north of the Rosemont project, in the Mount Fagan area, an upper Cretaceous caldera complex has been mapped. Extensive rhyolite and lesser andesite flows and ash flow sheets, and three distinct stocks have been mapped in the area (Ferguson et al, 2001).

**Stratigraphy, with observations on alteration and mineralization**

In general, the stratigraphy consists of a group of Paleozoic sedimentary rocks of the Cambrian, Devonian, Mississippian, Pennsylvanian and Permian Periods, that strike roughly north-south, and dip 55° to 65° easterly. Cretaceous sedimentary rocks and mafic volcanics unconformably overlie the Paleozoic rocks, with a strong fault forming the contact between them. The attitudes of the Cretaceous rocks do not mirror the attitude of the underlying Paleozoic rocks.

There are several Laramide monzonite or quartz latite intrusives that are discussed in another section of this report.
Lower Cretaceous

Willow Canyon Formation

The Willow Canyon is comprised of feldspathic sandstones and arkosic conglomerates. The sandstones are frequently cross-bedded locally. The arkosic conglomerates are for the most part heavily stained with secondary hematite, and there are significant intervals with abundant hematite after coarse cubic pyrite.

Core logged within the area of the Rosemont copper deposit shows weak to moderate propylitic alteration in the Willow Canyon arkoses. Epidote is common, frequently as lenses along bedding. Potassium feldspar is common.

Copper mineralization encountered within the arkose is almost entirely "black" oxides, cupriferous iron oxides, chrysocolla, chalcocite, and a few specks of native copper. These minerals occur as fracture coatings or cavity fillings, excepting the native copper. Pyrite occurs rarely. Primary copper mineralization is confined to rare localized areas of weak quartz veining that contain sparse very-fine grained bornite and chalcopyrite.

Andesite occurs within the Willow Canyon. The andesite frequently exhibits individual flows with strongly amygdaloidal andesite comprising the upper five to twenty-five feet of each flow. Coarse pyrite, calcite, or quartz usually occurs within the amygdular andesite, and pyrite is commonly disseminated in the groundmass. Chalcopyrite occurs with the pyrite, often as intergrowths, and often shows rims of chalcocite. Pyrite/chalcopyrite is on the order of 10/1. Molybdenite occurs rarely. The andesite flow tops are commonly moderately to strongly propylitically altered, with strong epidote and potassium feldspar mineralization.

Locally, moderate quartz veining occurs, with vein widths in the range of 1/16" to 1/4". These veins can be mineralized with very fine-grained chalcopyrite, bornite, and pyrite.
There is usually an overprint of oxide copper, most often chrysocolla, black oxide or wad and some cuprite, that occurs most typically as fracture coatings. Copper carbonates are rare. Native copper occurs rarely, as small specks. Coarse brown sphalerite occurs commonly, with intervals of a few inches to several feet, as blebs or specks. Galena occurs very rarely, as a few isolated blebs. The mineralization within the Willow Canyon in general overlies the mineralization in the underlying Paleozoic rocks.

The overall thickness of the Willow Canyon formation that was encountered by the drilling at Rosemont varies from none on the west to approximately eleven-hundred feet down the dip to the east. The thickness of the andesite varies from a few tens of feet in the southern part of the drilled area to approximately five-hundred feet in the north.

The contact with the underlying Glance Conglomerate is commonly a series of slips and breccias that can be several feet thick.

**Upper Jurassic-Lower Cretaceous**

**Glance Conglomerate**

Within our drilling area, the Glance is a white, fine to medium-grained marble conglomerate, clast supported. The unit is rarely mineralized. There are, locally, sections of conglomerate containing pebbles and cobbles that reflect the lithologies of underlying units.

The Glance is not always present, particularly down dip to the east. Thickness varies from zero to several hundred feet.

The lower contact of the Glance may be a strong fault separating the Glance from the underlying Paleozoic rocks, or a relatively weak chloritic slip separating the Glance from a dense, bluish-gray, fine-grained cherty marble. This marble is frequently absent, and where present usually contains one or more tine-grained, white quartzite beds, a few feet to over ten feet in thickness. These quartzites are in the lower one third of the unit. Horn
coral fossils have been seen in core of this marble, very rarely. Geologists have referred
to this unit as the “Mystery Limestone” and it has been speculated that it is the Permian
Concha Limestone. The “Mystery Limestone” is not mineralized.

The “Mystery Limestone” does not appear in the southern part of the drilled area. Over
the remainder of the drilled area, where it occurs, it is always in contact with the
overlying Glance Conglomerate. The lower contact of the “Mystery Limestone” is always a
strong fault, which is usually a few feet thick, but can be as much as one-hundred feet of
breccia, rubble, and clay gouge.

**Permian**

*Scherrer Formation*

The Scherrer formation was identified in four core holes, always at the far eastern edge of
the section being drilled, and always immediately beneath the fault separating the
Cretaceous rocks from rocks of the underlying Paleozoic. The Scherrer, where drilled, is
a brown to gray, very-fine grained silty quartz sandstone, locally cross-bedded,
containing minor clay and calcite. Alteration, if present, consists of very weak chlorite
and pyrite mineralization. There are scattered traces of chalcopyrite, less of bornite.

The Scherrer is approximately 200 feet thick. The lower contact is conformable with the
Epitaph Formation.

*Epitaph Formation*

The Epitaph is a fine-to-medium grained, light-to-medium gray, limestone or marble,
dolomite, or dolomitic marble with local gypsum or anhydrite. Intense serpentinization is
common, always accompanied by magnetite. Also common are large sections of
dedolomitized limestone with an intense stockwork of random hairline chlorite-
serpentine-magnetite veins containing very-fine-grained bornite. Chlorite is abundant
and ubiquitous. There are large sections of garnet skarn, green or brown, accompanied
by intervals of diopside skarn or diopside-garnet-chlorite skarn. Chalcopryte and bornite occur throughout the skarns, with bornite usually predominating. There is some pyrite mineralization, mainly weak.

There are several thin sandstone or quartzite layers in the lower portion of the formation. The Epitaph is reported to be up to 1,000 feet thick and drilling has suggested as much as 800 feet without cutting completely through the formation. The underlying contact is a chemical, intertongueing relationship.

**Colina Limestone**

The Colina is dark gray to black limestone or marble, fine grained, locally graphitic, with local sections containing abundant small fragments of invertebrate marine fossils. The Colina is commonly dolomitic. There is a quartzite bed near the base. Alteration consists of some green or brown garnet skarn beds, and some serpentine and magnetite alteration. Very-fine-grained bornite and chalcopyrite occur disseminated or in hairline veinlets, with bornite predominant. Pyrite is rare.

Segregating the Colina from the Epitaph has been problematic and questionable. The main criteria used have been the black, fossiliferous limestone and the graphite, which can be massive over more than 6 inches in length, in the Colina. The presence of bedded anhydrite or gypsum seems to be confined to the Epitaph.

Overall thickness of the Colina is unknown, but may be on the order of 300 feet. The contact with the underlying Earp formation is conformable.

**Pennsylvanian-Permian**

**Earp Formation**

The Earp contains a series of green, red, and tan siltstones and sandy siltstones, sandstones and very-fine-grained marbles or dolomites. The siltstones usually have been
The Earp formation can be approximately 800 feet thick, but the maximum thickness drilled at Rosemont was about 500 feet. The contact with the underlying Horquilla Limestone is gradational and difficult to identify.

**Pennsylvanian**

*Horquilla Limestone*

Within the project area, the predominant lithologies are a fine-to-medium grained, white marble, usually with considerable wollastonite, or a medium-grained, reddish-brown massive garnet skarn. To a lesser extent, there are green garnet-chlorite skarns, quartzites, and areas with nearly massive serpentine and interbedded siltstones or hornfels. Quartz-vein stockworks, magnetite vein stockworks, chlorite-serpentine vein stockworks, and calcite vein stockworks are common in the Horquilla where altered. Bornite, chalcopyrite, and chalcocite occur usually as very-fine-grained disseminations in the stockworks of magnetite or chlorite-serpentine hairline veinlets, which are cut by the later, weakly mineralized quartz veins. The copper sulfides are often finely disseminated within the skarns and are rarely massive. Very-fine-grained pyrite accompanies the copper mineralization in small quantities. Oxide copper mineralization in the Horquilla can be significant within 100-150 feet of a major fault. Chrysocolla and dioptase (libethenite?) occur extensively in areas affected by faulting, along with the copper sulfides. This is illustrated in DDH A802.

The true thickness of the Horquilla Formation at Rosemont appears to be approximately 600 feet. The lower contact, with the Escabrosa Limestone, is an unconformity.
Mississippian

*Escabrosa Limestone*

Most of the Escabrosa Limestone is barren, medium-to-coarse-grained, white marble, with abundant serpentine in and around fractures or slips. However, the upper 100-250 feet can be intensively altered and mineralized if it is in contact with quartz-latite porphyry. This is illustrated on cross section 303725 (the old Anaconda grid) in DDH's A814 and 1580. At and near the contact with the intrusive, the Escabrosa is altered to massive garnet skarn and garnet (green and brown) diopside skarn, with magnetite, disseminated to massive pyrite, strong bornite and heavy chalcopyrite mineralization with chalcocite and sections with blebs of sphalerite. This cross section indicates that intense alteration and copper mineralization in the Escabrosa extends from the contact with the intrusive down the dip from 250-300 feet, where the unit becomes barren marble. The intensity of alteration and mineralization is inversely proportional to the distance from the contact with the intrusive, as expected.

The true thickness of the Escabrosa is approximately 600 feet. In part of the area drilled, it appears that the Escabrosa section has been thickened by faulted slivers. The lower contact with the underlying Martin Formation is an unconformity.

Devonian

*Martin Formation*

At Rosemont, the Martin Formation is a massive dolomitic marble, locally chloritic and serpentinitic. Copper sulfide mineralization is usually absent, but does occur sporadically. The thickness of the Martin, where it was cut by drilling, varies from approximately 300 feet to less than 100 feet where it was thinned by faulting. The sporadic nature of the mineralization in the Martin is not economically significant.

The contact with the underlying Abrigo Limestone is an unconformity.
Cambrian

Abrigo Limestone

The Abrigo has been sporadically marbleized, and is primarily an unaltered, unmineralized limestone with regular, parallel laminations of silty or sandy shale and minor quartzite. As much as 650 feet of true thickness has been drilled at Rosemont. The contact with the underlying Bolsa Quartzite is conformable and abrupt.

Bolsa Quartzite

The Bolsa is a fine-to-medium-grained quartzite that may be silty near the contact with the overlying Abrigo Limestone. Mineralization within the Bolsa, where it occurs, is an occasional speck of pyrite or chalcopyrite, and nowhere is it of economic significance.

The Bolsa rests unconformably on the Precambrian Continental Granite, a granodiorite of Proterozoic age.

Intrusive Rocks

Several types and occurrences of intrusive rocks have been identified in the vicinity of the Rosemont deposit. The following comments are mainly based upon observations of drill core as well as some previous publications. Among those rocks are Cretaceous (?) andesite and granodiorite, and Laramide (?) quartz monzonite porphyry, quartz latite porphyry, rhyolite porphyry and a few pebble dikes.

1. Cretaceous ( ) Intrusive Rocks

   a. Andesite
Though not generally regarded as intrusive, the Cretaceous (?) andesite in the area is usually observed as one or more flow units within the Willow Canyon arkosic sandstone and conglomerate. It is commonly aphanitic in texture and often amygdaloidal, usually with varying degrees of propylitic alteration. Feeder dikes, though not noted in the logs or literature, undoubtedly occur. Feeder dikes, though not noted in the logs or literature, undoubtedly occur.

In DDH AR2013, andesite was intersected between 45 and 476 feet. The rock is mainly amygdaloidal with some strictly aphanitic zones. However, from 101 to 476 feet there are numerous zones with abundant xenoliths of the arkosic sandstone and conglomerate, some several feet in diameter, which suggests possible proximity to a feeder of some type.

b. Granodiorite

Although not seen in drill core, one or possibly more plutons of granodiorite (referred to as quartz monzonite by Anzalone, 1995) reportedly occur outside the main deposit, and are described by McNew (1981) as follows:

"A medium — to — coarse — grained granodiorite exposed in the northwest corner of the study area was mapped by Drewes (1972) as part of the Precambrian continental granodiorite but was observed during this study to have intruded the adjacent Bolsa Quartzite and to contain xenoliths of this quartzite. This rock was not studied in any detail, but is believed to be part of the Helvetia stocks of Drewes (1972) (the closest of which he mapped 0.5 km to the north). Drewes interpreted these stocks as being slightly older than the quartz latite porphyry intrusions. The Helvetia stocks do not appear to be related to the extensive alteration and mineralization observed in the Helvetia and Rosemont mining districts."

2. Laramide (?) Intrusive Rocks

At least three, and possibly more, stages of younger intrusive rocks were observed in drill core. Admittedly without the benefit of petrographic determination and solely on
megascopically observed, these are referred to as quartz monzonite and quartz latite porphyries, and rhyolite porphyry.

a. Quartz monzonite porphyry
Quartz monzonite porphyry and porphyritic quartz monzonite observed in the drill core occurs as what appear to be small plutons and probably dikes and sills cutting the Horquilla, Colina, Epitaph formations and overlain by Willow Canyon formation (drill holes A855, A846, A1535, A852, A875, and A853). Details of these intercepts are shown in Table IV. i. It is interesting that, although the quartz monzonite porphyry and Willow Canyon formation occur together in the first three of those holes and both rocks are altered and mineralized, in no place was the porphyry seen to intrude the Willow Canyon. Outside the main Rosemont deposit, at Broad Top Butte, is a small stock of the same intrusive rock, portions of which were observed in drill holes A1480 and A1531.

The porphyry is variously cream to white, light- to dark-gray, and reddish- pink-or orange-stained, depending on alteration or weathering effects. It is usually medium- to coarse-grained, but can be fine-grained in chilled border phases near contacts. Phenocrysts consist of subhedral quartz (usually corroded dipyramidal, but sometimes "droplet") <10 mm in diameter, euhedral and subhedral orthoclase <13 mm, subhedral plagioclase <5 mm, and anhedral biotite flakes <2 mm across; the groundmass appears to be mostly quartz and plagioclase.

Quartz monzonite porphyry was also logged in two drill holes at Broad Top Butte (A1480 and A1531). The rock is identical to that in the main Rosemont area and exhibits classic phyllic and potassic alteration, in 1531 an intrusive breccia contact, and is accompanied by strong mineralization in the wall rocks. Also, from 120-123 in that hole,

there is a zone of miarolitic cavities, suggesting that this is near the top of, or a relatively shallow part of the pluton.

b. Quartz latite porphyry

A rock judged to be petrologically similar to, but distinctively finer-grained than, the quartz monzonite porphyry was noted in drill holes A846 and A855.
In A846, from 1145-1147 ft, a 2-ft sill of endoskarn composed of very fine-grained quartz latite porphyry with anhedral quartz and feldspar phenocrysts mm, and containing intensely epidotized groundmass and xenoliths, occurs at the contact between overlying marble and a chioritized chert conglomerate below (probably the base of the Horquilla formation).

In A855, from 907-925, there is an interval of light gray to pink- and red-stained, fine-grained to very fine-grained, silicified and sericitized quartz latite cut by a quartz monzonite porphyry stringer from 910-911; multi-stage quartz stockwork veining occurs in both rocks. As noted above and in Table IV. i., the rock below is quartz monzonite porphyry. Although the contacts are indistinct due to the condition of the core, it appears that quartz latite porphyry both cuts and is cut by the quartz monzonite porphyry, suggesting multiple magmatic surges within the system.

c. Rhyolite Porphyry

In drill hole A853, from 811-916 there is a tan to light gray very fine-grained but slightly porphyritic (5-10% phenocrysts) rhyolitic (?) intrusive, possibly a sill (the contact with overlying Horquilla formation is at 45° to the core axis). It has subhedral plagioclase (or sanidine?) phenocrysts <3 mm and quartz "eyes" <1.5 mm in a cryptocrystalline (quartz?) groundmass. It is cut by very thin quartz veinlets with minor bornite-chalcopyrite±sphalerite in the veinlets and as disseminated clots in the groundmass plus some manganese oxide and sparse traces of chrysocolla on fractures. A substantial amount of the rock has been brecciated and subsequently silicified. The rock below is brecciated at the contact.

d. Pebble Dikes

Pebble dikes are a common feature in porphyry copper systems, usually representing a late pneumatolitic phase of the intrusive activity. Two occurrences were noted in drill
hole AR2008 near the center of the deposit: one from 781-783 cutting the Earp formation, and another, one-foot wide, at 886 ft in a section of Horquilla formation. Both consist of the characteristic rounded pebbles of mineralized rock in a sand-sized matrix. Although no porphyry was seen in the hole, its presence at depth is reasonably expected.

### Quartz Monzonite Intercepts in Relogged Drill Holes

<table>
<thead>
<tr>
<th>DRILL HOLE</th>
<th>FOOTAGE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>A846</td>
<td>168-228</td>
<td>Varicolored coarse-grained quartz monzonite porphyry with subhedral quartz phenocrysts &lt;6 mm, plagioclase phenocrysts &lt;5 mm and remnant biotite flakes ~2 mm, cut by minor quartz veinlets; the rock has been severely altered by supergene fluids down to 219 where some remnant sulfides are found. The upper contact is faulted, but the lower contact (with Horquilla fm hornfels and skarn) has a 1-ft chilled border.</td>
</tr>
<tr>
<td>A852</td>
<td>General</td>
<td>Three, or possibly more, intercepts of medium- to coarse-grained quartz monzonite porphyry were found in this hole. The rock is phyllically altered and moderately to well mineralized with strong quartz stockwork veining and limonite after sulfides and traces of malachite in the upper portions. Varying amounts of sulfide mineralization (traces to 10% pyrite, bornite, lesser chalcopyrite and molybdenite) occur below 1175, with sporadic deep oxidation shown by limonite on fractures. In the deepest interval (1309-1360) the rock is coarse-grained with euhedral orthoclase phenocrysts &lt;13 mm and subhedral quartz phenocrysts &lt;10 mm, with occasional traces of epidote and secondary replacing the groundmass; there are also multiple stages of quartz-sulfide stockwork veining with disseminated sulfides as well. Strong replacement in the skarn and hornfels wall rocks indicates this porphyry intrusive was a strong mineralizer.</td>
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<tr>
<td>A852</td>
<td>1014(?)-1087</td>
<td>(Core missing 651-1014, 1043-1052) At 1023 apparently a sample was taken for age-dating by Anaconda, the results of which are not known at this time. This is red-stained, light gray medium- to coarse-grained, silicified and sericitized, heavily limonite-stained quartz monzonite porphyry with traces of malachite in leached plagioclase and on fractures; most of the limonite (5-10%) is indigenous after sulfides.</td>
</tr>
<tr>
<td>A852</td>
<td>1175-1183(?)</td>
<td>(Core missing 1183-1201) Light gray, cream, and some red coarse-grained quartz monzonite porphyry with phenocrysts &lt;6 mm, intensely silicified and cut by quartz-sulfide (chalcopyrite, pyrite, bornite and possibly tetrahedrite, and molybdenite)</td>
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<td>Page</td>
<td>Description</td>
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<tr>
<td>A852</td>
<td>1201-1288</td>
<td>Quartz monzonite porphyry as above with weaker sulfide mineralization and two clear stages of quartz veining: an early hairline stockwork cut by thicker (&lt;13 mm) almost clear quartz veining. Both have associated molybdenite, pyrite, chalcopyrite and minor bornite.</td>
</tr>
<tr>
<td>A852</td>
<td>1309-1360</td>
<td>Light gray and red-stained coarse-grained quartz monzonite porphyry as above with euhedral orthoclase phenocrysts &lt;13 mm, and subhedral quartz phenocrysts &lt;10 mm cut by multiple stages of quartz-sulfide stockwork with minor disseminated sulfides and occasional traces of epidote and secondary orthoclase replacing the groundmass. Upper contact is at 85° to the core axis and there is a 3-in. chilled border in the porphyry.</td>
</tr>
<tr>
<td>A853</td>
<td>17-21</td>
<td>(No core above) cream to white, variably fine- to medium-grained (possibly a chilled border phase) argillized, sericitized and silicified quartz monzonite porphyry (quartz veins notably lacking), with chrysocolla and copper wad after sulfides in hairline veinlets.</td>
</tr>
<tr>
<td>A855</td>
<td>882-907</td>
<td>(Core missing above) red-stained pinkish to light gray medium-grained quartz monzonite porphyry with subhedral quartz and feldspar phenocrysts &lt;3 mm cut by light gray quartz stockwork veining with some orthoclase flooding.</td>
</tr>
<tr>
<td>A855</td>
<td>907-925</td>
<td>Light gray to pink- and red-stained fine-grained to very fine-grained silicified and sericitized quartz latite with a quartz monzonite porphyry stringer from 910-911, multi-stage quartz stockwork veining in both rocks.</td>
</tr>
<tr>
<td>A855</td>
<td>925-1023</td>
<td>Light- to medium-gray fine- to medium-grained quartz monzonite porphyry with subhedral quartz phenocrysts &lt;5 mm.</td>
</tr>
<tr>
<td>A855</td>
<td>1080-1110</td>
<td>(Fault contact at 1080) light gray, fine-grained siliceous porphyry, with numerous quartz veins, quartz phenocrysts &lt;3 mm and biotite plates 1 mm altered to chlorite; becomes medium-grained after 1103 with multi-stage quartz stockwork suggesting the above is a chilled border phase. Core was missing below 1110.</td>
</tr>
<tr>
<td>A875</td>
<td>21-263</td>
<td>Medium- to dark-gray, orange-stained coarse-grained quartz monzonite porphyry with subhedral feldspar (plagioclase slightly argillized, orthoclase mostly unaltered) phenocrysts &lt;6 mm, anhedral and some &quot;droplet&quot; quartz phenocrysts &lt;6 mm, small biotite flakes (altered to chlorite), minor disseminated fine-grained magnetite in groundmass of mostly quartz, a few small quartz veins; oxidized to 120 with abundant limonite after sulfides, occasional traces of chrysocolla, malachite, and manganese oxides. 74-80 is a zone of fine-grained white marble xenoliths. Below 120 the rock contains traces of sulfides (pyrite, chalcopyrite, bornite and molybdenite).</td>
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<tr>
<td>A1535</td>
<td>1139-1185</td>
<td>Reddish, pink, cream and light gray medium- to coarse-grained</td>
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<td>quartz monzonite porphyry sill(?) with euhedral to anhedral quartz phenocrysts &lt;6 mm, subhedral feldspar phenocrysts &lt;1 cm and biotite flakes &lt;2 mm. Mineralization consists of limonite on fractures and numerous sulfide boxworks with some remnant pyrite and chalcopyrite, quartz veins &lt;6 mm thick with occasional molybenite and minor bornite. Wall rocks above and below (Epitaph fm?) are moderately strongly mineralized with chalcopyrite and pyrite replacement and veining.</td>
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<tr>
<td>A1535</td>
<td>1200-1206</td>
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<td>a sill with similar mineralization to that above in the porphyry as well as the contact zones</td>
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<tr>
<td>A1535</td>
<td>1294-1307</td>
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<tr>
<td></td>
<td>Quartz monzonite sill as above with quartz stockwork and chiorite veining; sulfide minerals are completely oxidized to limonite boxworks with patches of chrysocolla and copper wad (lampadite?) on fractures. Stronger replacement mineralization (pyrite, bornite chalcopyrite + molybdenite) occurs in the wall Rock</td>
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</table>

**Mineralization**

Mineralization in the Rosemont deposit occurs as a wide variety of types and mineralogy, dependent upon host rock composition, position in the system and structural features such as folding, faulting and fracturing. The comments herein are based mainly on observations from logging drill core in part of the deposit. Thus the overall effects of structure can only be inferred from relatively small bits of information such as local flexures and crenulations in bedding and fault zones seen in mostly remnants of original core. As the deposit is felt to be structurally very complex and only generally understood, zoning within it is often inconsistent and variable. There are significant differences between the styles of mineralization in the overlying Willow Canyon formation and andesite and that of the older units beneath, suggesting different stages or genesis of mineralization.

Generally, however, mineralization types can be subdivided into hypogene and supergene occurrences.
A. Hypogene

Hypogene mineralization occurs as replacement in garnet and/or magnetite skarn, hornfels, and other silicated or silicified and recrystallized rocks as well as the arkosic conglomerate and andesite. Hypogene sulfide mineralization is found as finely disseminated grains and in veins and vein systems. Paragenesis of the sulfide mineralogy would be a worthwhile study and may have been investigated by others in the past. The main hypogene minerals noted are:

Bornite: apparently the most abundant sulfide, most often finely disseminated but sometimes as larger blebs in skarn, marble and wollastonite; also in veins with quartz, chiorite and other sulfides.

Chalcopyrite: as with bornite, but more commonly in veins with gangue minerals and other sulfides.

Sphalerite: fairly abundant in the sulfide assemblage, as discrete blebs and veins but also seen rimming chalcopyrite; also, solid solution textures of sphalerite with chalcopyrite are common in the Twin Buttes District and other porphyry copper systems.

Molybdenite: usually in quartz veins as selvages by itself or associated with copper sulfides, and as "paint" on fractures.

Pyrite: relatively minor overall as this is generally a low-sulfide system, but common in the Willow Canyon formation and andesite units.

Uncommon and rare sulfide minerals: these include pyrrhotite, tetrahedrite, galena, and cubanite (?). Tetrahedrite was positively identified in a few places and probably is more abundant due to the difficulty in identifying very small grains megascopically. It, along with chalcopyrite, bornite and galena, are likely the sources of silver in the deposit.
Pyrrhotite was identified only once in the core, but also is suspected of being more abundant. Galena was noted relatively few times, occurring with sphalerite and in discrete veins. One relatively large sulfide vein initially thought to be chalcopyrite was found to be magnetic; as there was no obvious magnetite or pyrrhotite associated with it, the mineral is suspected to be cubanite.

B. Supergene Sulfide and Oxide Mineralization

The host rocks in the Rosemont deposit have undergone varying degrees of leaching and oxidation, both due to weathering and structural complexities which have produced deep oxidation in many parts of the system. In particular, the Willow Canyon formation contains a wide variety of both common and relatively rare minerals. Supergene sulfide minerals occur in a variety of settings in all mineralized rocks.

1. Supergene sulfides: these include chalcocite and covellite, although it is recognized that some of these may be hypogene in origin.

2. Supergene oxides: these include limonite (much of which is undoubtedly cupriferous), cuprite and chalcotrichite, native copper, chrysocolla, cupriferous wad (lampadite?), brochantite (including chrysocolla pseudomorphs after brochantite and brochantite crystals in copper wad), malachite, relatively uncommon azurite, diopside, libethinite and copper montmorillonite. Akaganeite was noted as an oxidation product of molybdenite. A mineral tentatively identified as linarite was observed in a deep oxidized zone in marble of the Horquilla formation.

3. Uncommon and rare oxides in the Willow Canyon formation: along with others mentioned above, these include wulfenite, ferrimolybdate, stilbite plus singular occurrences noted of metatorbernite, tyuyamunite (?), and crocoite (?). Zeolites, such as stilbite, are known to commonly occur in porphyry copper deposits and are considered a late-stage product of the waning hydrothermal
process; somewhat curiously, each deposit seems to contain only one of the zeolite group in the assemblage.

**Structure**

**Faults, Mesozoic-Paleozoic boundary, dip and strikes etc.**

The Santa Rita Mountains in the Rosemont area are characterized by a NNE trending ridge with the Bolsa Quartzite and Precambrian granitic rocks holding up the crest line. A series of steeply dipping normal and reverse faults, and some proposed thrust faults, roughly parallel this ridge. Cutting these faults are a number of younger northwest-southeast to east-west trending faults that cut the section into blocks highlighted by outcrop patterns on the geologic maps of the area.

Detailed structural analysis, completed as part of the geologic-block modeling of the deposit, shows coincident NE trends in stratigraphic offsets and mineralization control. (Clarke pers. comm. 2007)

The following discussion is limited to the observations made from examining core from the Rosemont Project and working with the sections constructed through the proposed pit area.

The western boundary of the pit is roughly coincident with the Santa Rita or Backbone Fault, a system of steeply to moderately dipping faults with a normal-oblique offset. The footwall rocks range from the Bolsa Quartzite through the Escabrosa Limestone. The hanging wall rocks are east dipping, Paleozoic strata ranging from the Martin Formation up through Earp Formation. Numerous smaller faults within and between the units reduce or thicken their apparent thicknesses on section. The porphyries also occur in this structural block.

Approximately 350 feet to the east occurs another north trending, east dipping normal fault, possibly what earlier workers called the Deering Springs Fault. This fault
juxtaposes the upper Paleozoic Epitaph, Colina, and Scherrer Formations against Earp and Horquilla to the west.

There has been much talk about thrust faults in the Rosemont-Helvetia District. Hardy (1997) described a series of east-verging thrusts that put Paleozoic units on Cretaceous units. This relationship has not been seen in the drilling to date. Drewes (1971) mapped stacked, west verging thrusts that put younger on older rocks. The Peach-Elgin deposit in the Helvetia District is described as the decapitated top of the Copper World deposit two kilometers to the east.

Based on the drilling information from the proposed Rosemont pit area, there are no older on younger relationships that require thrust faults. What is apparent from the sections is a low angle contact, dipping to the east, which separates the Paleozoic units from younger units above. This contact is a prominent and obvious feature on all the sections covering the Rosemont pit area. In all cases this contact has been described as a fault. In the south, this "upper plate" is soled by the Cretaceous Willow Canyon Formation, in the central part of the study area, it's soled by the Upper Jurassic-Lower Cretaceous Glance Conglomerate, and in the north there is a thick wedge of what has been logged as Mystery Limestone above this contact. It is postulated that the Mystery Limestone is the Permian Concha Limestone.

**Brief comments on the mineralization/alteration**

There is a quartz-latite porphyry depicted on cross sections 303525N through 304725N, centered on grid line 858,500E and partially exposed on the surface, that appears to be the source of the thermal metamorphism and mineralization. This relationship seems best illustrated on sections 303725N through 304525N where the up-dip portions of the Escabrosa, Horquilla, and Earp terminate against the intrusive. Massive skarn-type and strong copper sulfides, and other skarn-related mineralization are strongest at and near this contact, and decrease down dip and away from it.
Sections 303725N through 304125N illustrate that the quartz-latite porphyry shown on these sections may be a faulted segment, of a larger intrusive, that is lying on its side, and that what is now the lower contact with the Paleozoic sedimentary rocks is in fact the eastern edge of the intrusive. This contact is not a fault contact, but a fairly typical contact of an intrusive with its host. There is a fault contact where Cretaceous rocks overlie the intrusive.

If this intrusive segment did at one time exist northward, it has been removed by erosion. The strong skarn alteration and mineralization in the Colina and Epitaph formations nowhere are in contact with the quartz-latite porphyry segment, but exhibit the same geometry of the other sediments in that alteration and mineralization are strongest up-dip, and weaken down-dip.

To the south, alteration and mineralization weaken greatly and more or less feather out by section 303325N.

To the north, mineralization and alteration remain strong, until Section 306925N, on the west, up-dip portion of the Paleozoic rocks, but weaken drastically down-dip. From about 305925N northward the base of the Cretaceous rocks above mineralized Horquilla is seven hundred feet and more deep, rendering the underlying mineralization economically unmineable.

Reference List


Ref Type: Personal Communication


Ref Type: Journal (Full)


Ref Type: Generic


Ref Type: Journal (Full)


Rogers, T. (1-7-2006). Summary of the Cambrian to Pennsylvanian/Permian Stratigraphy in Southeastern Arizona.
Ref Type: Personal Communication


Ref Type: Serial (Book,Monograph)


Ref Type: Personal Communication
Generalized from Hardy, J.J., Jr., 1997.\textsuperscript{5}
Arizona Geological Society
Rosemont Mine Tour / Saturday, April 28, 2007

Section 7

Drilling Maps
Rosemont: In-fill Drilling (showing inferred blocks)

Cross Section 304,325N (looking North)
Rosemont Deposit:
Block Model Cross Section

>0.50% TCu
0.30 - 0.50% TCu
0.17 - 0.30% TCu
0.05 - 0.17% TCu
0.01 - 0.05% TCu

*based on $1.50 Cu price
Arizona Geological Society
Rosemont Mine Tour / Saturday, April 28, 2007

Section 8

Process and Economic Assessment Information
27. APPENDIX A

OXIDE HEAP LEACH/ ACID LEACH/ SXEW EVALUATION ALTERNATIVE CASE

Preliminary leach tests on the flotation concentrate indicated that this material is amenable to acid leaching. It is envisioned that the concentrates would be leached, resulting in a copper rich leach liquor and leach tailings containing copper as chalcopyrite, as well as the precious metals. The copper rich liquor would be further treated by SXEW resulting in the production of cathode copper on site. The presence of an SXEW circuit on-site would also facilitate the treatment of any oxide copper ore by heap leaching methods. These options are considered as a project opportunity and are discussed as follows.

27.1 Economics - Alternative Case

In the Cathode and Concentrate Production Case hereafter called the Alternative Case, the copper oxide ore is leached using run of mine ore on a lined leach pad. The ore is not crushed or agglomerated before placement; however, dozer ripping to loosen material does occur. The pregnant leach solution is then processed through an SX/EW plant. Copper production from the oxide ore adds an average 7 million lbs per year of copper production to the Base Case bringing the average total copper production up to 232 million lbs per year.

In the Alternative Case, 100% of the concentrate is sent to an atmospheric copper leaching circuit. 75% of the copper (bornite and chalcocite) reports to the SX/EW processing plant, leading to an LME electro-won cathode which receives a US$.06/lb premium. The remaining 25% of the copper (chalcopyrite) reports to the concentrate stream and is sent to third parties for smelting and refining. There is no change in sulfide copper production from the Base Case.

Incremental Alternative Case capital to the Base Case is comprised of US$14.0 million for the leach pad, US$134.1 million for the SX/EW and concentrate leach plant, and US$22.2 million for a 15% contingency. Total incremental Alternative Case capital is US$170.3 million.

Initial (2008-2011) direct capital for mine, processing, water, power, leach pad, SX/EW plant and 15% contingency is estimated at US$806 million. Initial indirect capital for reclamation bonding and working capital is estimated at US$66 million. Sustaining capital is estimated at $28 million. Project net cash costs after by-product credits are estimated to average US$0.37/lb Cu over project life.

Other Key Assumptions and Inputs (only differences from the Base Case are listed):

<table>
<thead>
<tr>
<th>Oxide Ore</th>
<th>Acid consumption: 3 lbs sulfuric acid/1 lb recovered Cu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>US$100/ton delivered acid cost, US$0.15/lb Cu recovered acid cost</td>
</tr>
<tr>
<td></td>
<td>Total Leaching cost = US$0.17/lb Cu recovered</td>
</tr>
<tr>
<td></td>
<td>SX/EW cost = US$0.14/lb Cu recovered</td>
</tr>
</tbody>
</table>
Modeling at Base Case metal prices shows that the project could generate a cumulative net after tax profit of US$1,669 million, a 17% IRR, and a net present value discounted at 8% of US$494 million, over the projected phase one 16 year mine life.

The Alternative Case has a .5% lower IRR than the Base Case; however the NPV @ 8% incrementally increases by US$52 million.

In addition, sensitivity analysis was conducted at standard Trailing and Forward Pricing Cases.

### Table 27.1 Primary Alternative Cases

<table>
<thead>
<tr>
<th>Case</th>
<th>Cu Price $/lb</th>
<th>Mo Price $/lb</th>
<th>Ag Price $/oz</th>
<th>IRR %</th>
<th>NPV 5% US $ millions</th>
<th>NPV 8% US$ millions</th>
<th>NPV 10% US $ millions</th>
<th>Net Cash Cost $/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>1.20</td>
<td>10.00</td>
<td>7.50</td>
<td>17</td>
<td>807</td>
<td>494</td>
<td>337</td>
<td>0.37</td>
</tr>
<tr>
<td>Trailing</td>
<td>1.50</td>
<td>20.00</td>
<td>7.50</td>
<td>26</td>
<td>1,589</td>
<td>1,112</td>
<td>873</td>
<td>0.16</td>
</tr>
<tr>
<td>Forward</td>
<td>2.14</td>
<td>20.00</td>
<td>7.50</td>
<td>37</td>
<td>2,554</td>
<td>1,874</td>
<td>1,533</td>
<td>0.17</td>
</tr>
</tbody>
</table>

- **Trailing Case Prices**: Same as Base Case
- **Forward Case Prices**: Same as Base Case

The Trailing Price case increases the IRR to 26%, the NPV at 8% to $1,112 million and decreases the average net cash cost to $0.16/lb.

The Forward Price case increases the IRR to 37%, the NPV at 8% to $1,874 million and decreases the average net cash cost to $0.17/lb.

The potential revenue stream from molybdenum and silver (based upon contained silver metal content); at base-case metal prices, generates by-product revenue of $.44/lb Cu and covers 54% of copper cash operating costs per pound of copper produced.
The following table provides IRR and NPV sensitivities over a range of Cu and Mo metal prices.

**Table 27.2  Additional Price Sensitivities to Alternative Case**

<table>
<thead>
<tr>
<th>IRR%</th>
<th>$1.08/lb Cu</th>
<th>$1.28/lb Cu</th>
<th>$1.50/lb Cu</th>
<th>$1.73/lb Cu</th>
<th>$1.98/lb Cu</th>
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<td>15</td>
<td>16</td>
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<table>
<thead>
<tr>
<th>$ Millions NPV 8% vs. Copper and Molybdenum Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.08/lb Cu</td>
</tr>
<tr>
<td>$1.28/lb Cu</td>
</tr>
<tr>
<td>$1.50/lb Cu</td>
</tr>
<tr>
<td>$1.73/lb Cu</td>
</tr>
<tr>
<td>$1.98/lb Cu</td>
</tr>
</tbody>
</table>

The following table demonstrates the project’s sensitivity to increases and decreases in operating costs and capital costs. Note that a 10% increase in operating costs decreases the Base Case IRR by 2% to 15% and decreases the Base Case NPV at 8% by US$89 million to US$405 million. Similarly, a 10% increase in capital costs decreases the Base Case IRR by 2% to 17% and decreases the Base Case NPV 8% by US$60 million to US$434 million.

**Table 27.3  Operating and Capital Cost Sensitivities to Alternative Case**

<table>
<thead>
<tr>
<th>Net Cash Cost, $/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IRR%</th>
<th>NPV 5%, $ million</th>
<th>NPV 8%, $ million</th>
<th>NPV 10%, $ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case: $1.20 Cu, $10.00 Mo, $7.50 Ag</td>
<td>17</td>
<td>807</td>
<td>494</td>
</tr>
<tr>
<td>Cost Sensitivity Cases:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Cost +10%</td>
<td>15</td>
<td>698</td>
<td>405</td>
</tr>
<tr>
<td>Operating Cost -10%</td>
<td>18</td>
<td>913</td>
<td>580</td>
</tr>
<tr>
<td>Capital Cost +10%</td>
<td>15</td>
<td>749</td>
<td>434</td>
</tr>
<tr>
<td>Capital Cost -10%</td>
<td>19</td>
<td>863</td>
<td>552</td>
</tr>
</tbody>
</table>
The economic evaluation includes the use of inferred resources that are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves. Thus, there is no certainty that the preliminary assessment will be realized.
Section 9

News Articles
Copper Concentrator
Process Flow Diagram

Run Of Mine Feed

CRUSHING → SAG MILLING → BALL MILLING

WATER

ROUGH FLOTATION

AIR

Reagents

TAILS

Concentrate

DRY SOLIDS DISPOSAL

BELT FILTRATION

THICKENING

SECOND STAGE CLEANING

FIRST STAGE CLEANING

40% Cu CONCENTRATE TO SMELTER

Mo RECOVERY THICKENING/FILTERING

30% Cu CONCENTRATE TO LEACHING CIRCUIT

May 31, 2006
Page 65
Rosemont Preliminary Economic Assessment
Augusta Resource Corporation
Rosemont mine has more copper

Monday, Mar 26, 2007

It may not be the proverbial gold mine but pretty close. Augusta Resource Corp. announced updated research and assaying confirms there is at least 3.4 billion more pounds of copper in the ground on its 2,960-acre Rosemont Ranch site in the Santa Rita Mountains southeast of Tucson.

The company reported it has continued to review earlier research in some of which dated back to 1967 and found there is 8.4 billion pounds of ore on the site with indications there could be as much as 10.3 billion pounds. Earlier estimates had placed the amount of ore at about 5 billion pounds.

At current prices that last week were $3.02 a pound it makes the confirmed amount of ore worth more than $25.3 billion. Even at historically low-average prices of around $1 a pound, the ore would be worth over $8 billion.

“I think this points to the value of that property,” said Jamie Sturgess, vice president projects and environment for Augusta. “If we produce 220 million pounds a year out of that mine, that would supply 5 percent of the U.S. demand for the next 20 years. This is a significant mine.”

The next step is for Augusta to use the new results to determine the economic feasibility for developing the mine.

Augusta, headquartered in Vancouver, British Columbia, acquired Rosemont Ranch, off State Route 83, in 2005 for $20.3 million after Pima County supervisors spurned an offer from developer Triangle Ventures to sell it to the county for $11.5 million.

Since then, the supervisors have sought to try to block the mine from being developed, calling on federal authorities to use their authority.

E-mail comments for publication to editor@azbiz.com.

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Hearing shows divide on Rosemont mine

By Tony Davis

ARIZONA DAILY STAR

A contentious congressional field hearing Saturday in Tucson kicked off a two-year effort by Rep. Raúl Grijalva to prevent new mining on public lands in Pima County and to overhaul federal mining law.

But after sitting through three hours of divided testimony Saturday about a proposed copper mine in the Santa Rita Mountains, Grijalva acknowledged his goals will be difficult.

Getting legislation passed to change the 1872 Mining Law or withdraw the Rosemont Ranch site from mining activity is "not going to be a walk in the park," the Tucson Democrat said.

"None of these efforts will be easy. I knew that going in," Grijalva said shortly after holding the oversight hearing, for two House subcommittees, on the mining law's impact on the Santa Ritas, south of Tucson.

Among more than 20 speakers from the general public, mine opponents outnumbered supporters by more than 2-1, after six scheduled speakers from both sides gave their views.

That's just a hint of the tensions that will surface when hearings on the 135-year-old mining law are held later across the West, Grijalva said.

More than 300 environmentalists and mining-industry supporters packed a hearing room Downtown to argue for and against Augusta Resources Corp.'s plans to start mining 225 million pounds of copper annually from the Rosemont Ranch in the Santa Ritas in 2010.

Opponents hammered at what they see as the inability of mining operations to clean up environmental damage after a mine closes; threats of air and water pollution from dust, leaks and spills; and the industry's boom-bust economic cycle.

Allies of Rosemont stressed its 400 proposed jobs, the need for mining in the United States so mining jobs won't go to other countries, and the risk to national security from depending on foreign countries for copper.

Afterward, Grijalva, who chairs the House Resources environment and public lands subcommittee, laid out the following agenda:

- He'll first push legislation this year removing the 17,000 acres of public land planned for Rosemont from mining.

- Then, he'll try to push separate legislation withdrawing all public lands in Pima County and possibly Eastern Santa Cruz County from new mining activity. He has no specific timetable for introducing bills.

Did you know ...

Some of the mining history in the Santa Rita Mountains south of Tucson:

- An inkstand made by Tiffany Co. out of 400 ounces of pure Santa Ritas silver was presented to President Lincoln in March 1865 by Arizona mine owner Charles Poston, in recognition of Lincoln's help in making Arizona a territory in 1863.

- An 1874 discovery of placer gold by A. Smith produced a rush in the Greaterville area. The nearby Kentucky Mine, home to Kentucky Camp, yielded substantial qualities of gold until it played out in 1886.

- The Salero silver mine dates from sometime after the arrival of Spanish Jesuits in the 1690s. In the 1850s, Salero became a steady producer, but by 1865, the Salero Mining Co. was defunct.

- Mount Wrightson in the Santa Ritas was named for William Wrightson, manager of the Salero Mining Co. and Santa Rita Mines. In 1864, Wrightson was surveying in the Sonora Valley with Gilbert Hopkins, a mining engineer for the company, when they were killed by Apaches. Mount Hopkins, also in the Santa Ritas, was named for Hopkins.

- Helvetia was a copper mining site since before the Civil War, but its heyday began in 1881. The mine shut down after the price of copper plunged in 1911. "Helvetia is easy to spot at the northwest end of the Santa Rita Mountains,"
• He'll look into concerns raised by Pima County Administrator Chuck Huckelberry — but rejected by the U.S. Forest Service — that Augusta Resources doesn't have valid claims to use public lands surrounding its 3,000-acre Rosemont property for mining.

• By early next year Grijalva said he hopes to put together a bill to reform the 1872 Mining Law, a law that now makes it difficult if not impossible for federal agencies to deny companies the right to mine on public lands and doesn’t require companies to pay mineral royalties.

Grijalva's fellow Tucson Democrat, Rep. Gabrielle Giffords, said in a statement that she has very deep concerns about putting an open pit mine in one of Southern Arizona’s most scenic areas and finds it “telling” that the 1872 law has no environmental, public health or safety provisions.

Several industry supporters urged Grijalva not to tamper with the law, although others said the law should allow for charging royalties.

A spokeswoman for the American Institute of Professional Geologists said the group supports unfettered access to public lands to "environmentally responsible and smart" mineral-resource development.

"Restricting access to public lands severely inhibits the responsible development of domestic energy and mineral resources," testified Dawn Garcia, a Tucson geologist. "Lack of access to public lands encourages imports of oil, metals and other resources from other countries without the environmental protection laws that we have in the U.S., or from countries where those laws are not enforced."

A mining industry geologist, Tim Marsh of Mesa, testified that, "You can't go (just) anywhere on this planet and find copper . . . the Santa Rita Mountains, a very precious environment, needs to be preserved for the exploitation of mineral resources."

But resident Cynthia Lunine recounted tales of encountering hazardous, open mine shafts and possibly toxic tailings or waste piles while growing up in Lordsburg, N.M., and living the past 12 years at the base of the Santa Ritas.

"In addition to hazards, mines destroy property values," Lunine testified, telling of her family’s recent efforts to buy back her mother’s family home. After inspecting the property, "what we found is that it had been devastated by mining."

"A fluor spar mine across the Gila River had been allowed to dump all the mill crushing/tailings on the land in a huge, multi-acre surface," in the 1970s or '80s, she said.

Huckelberry testified that more than 35,000 acres, or twice the size of Tucson Mountain Park, have been or are being mined in Pima County, and he knows of no plans by any mine to try to restore their site's natural landscape.

James A. Sturgess, Augusta Resource Corp.'s vice president of projects and environment, told Congresswoman Giffords that the Rosemont mine was valued last April at $500 million, contains 5 billion pounds of copper, 100 million pounds of molybdenum and 100 million ounces of silver, and will generate a total of $1.8 billion in federal income taxes during the project’s 20-year life.

But environmentalist Lainie Levick of Save the Scenic Santa Ritas said preservation has an economic upside, too. Pointing to the state-run Watchable Wildlife Program that promotes bird watching and other wildlife viewing, she said studies have shown that retail sales related to that program brought in $173 million plus 3,196 jobs in Pima County in 2001 and another $11.9 million and 236 jobs in Santa Cruz County.

Did you know ...

Some of the mining history in the Santa Rita Mountains south of Tucson:

• An inkstand made by Tiffany Co. out of 400 ounces of pure Santa Ritas silver was presented to President Lincoln in March 1865 by Arizona mine owner Charles Poston, in recognition of Lincoln's help in making Arizona a territory in 1863.

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- Helvetia was a copper mining site since before the Civil War, but its heyday began in 1881. The mine shut down after the price of copper plunged in 1911. "Helvetia is easy to spot at the northwest end of the Santa Rita Mountains," notes the book "Arizona Ghost Towns and Mining Camps," "because of the chalk-like scar in the range due to a later lime quarry."

Sources: Star archives; "Ghost Towns of Arizona" by James E. and Barbara H. Sherman; "Arizona Ghost Towns and Mining Camps," by Philip Varney; "Arizona Place Names."

- Contact reporter Tony Davis at 806-7746 or tdavis@azstarnet.com.

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Contract geologist Steve Maynard examines core samples from the Rosemont mine site in the Santa Rita Mountains outside Sonoita. Augusta Resource Corp. wants to develop the mine, which could yield 5 percent of the U.S. copper consumed over a 20-year period.

A.E. Araiza / Arizona Daily Star

Business

Copper mine plan aims at santa ritas

High prices make mine attractive; enviros concerned

By Richard Ducote

ARIZONA DAILY STAR

Tucson, Arizona | Published: 10.15.2006

It's no secret there's copper deep under the foothills of the Santa Rita Mountains southeast of Tucson.

Rosemont Ranch, off Arizona 83 going to Sonoita, has been the occasional focus of mining companies large and small for decades. Asarco was the last company to talk of putting the mining claims at Rosemont into production, but sold off the property in 2004. Now, an upstart Canadian firm is again touting Rosemont as a good candidate for large-scale mining. Whether Vancouver, B.C.-based Augusta Resource Corp. will succeed where well-established mining companies have failed depends on several factors:

- Proving the Rosemont deposit's mineral content and mineability.
- Successful permitting from the U.S. Forest Service and environmental regulators.
- Metal prices that justify a new mine.
- Attracting financing from banks and investors.

The Rosemont deposit has been explored before, but Augusta is doing detailed drilling to better define the ore body and design a mine. It could produce more than 4 billion pounds of copper, 100 million pounds of molybdenum and 100 million ounces of silver over 20 years, Augusta says. At today's high metal prices, that's more than $13 billion for just the copper — enough to stimulate some interest in the project.

When might Rosemont transition from ranch to mine? As soon as 2010, says one Augusta official, if the company's plan is well-received by the U.S. Forest Service and other regulators. Rosemont is surrounded by the Coronado National Forest and the use of public land is essential to the mine's development.
Augusta points to a new approach to mining it says will mitigate the project's impact on the area while bringing millions of dollars to workers, suppliers and tax coffers for years to come. The company plans to import Central Arizona Project water to back its effort and proposes establishing trust funds to guarantee rehabilitation of the property when mining ends.

**Opponents favor "never"**
Opponents of the company's plans have a longer time frame in mind for the project. "Never" would be the preferred answer for Matt Skroch, executive director of Sky Island Alliance, a Tucson environmental advocacy group. Once, Augusta was viewed as just "another land speculator in the guise of a mining company," Skroch says, but now, the "conservation community is universally concerned" that the company seems to be moving "full steam ahead with mine development plans."

The legality of the Rosemont project "is not so much the issue as the appropriateness" of mining in the Santa Rita foothills, he says. With Arizona already providing 60 percent of domestic copper production, "there is no place for a new mine in one of the most ecologically diverse places in the country," he declared. "There's just no getting around the fact that open-pit copper mining has significant air, water and land-quality impacts."

Skroch also questions whether the company has the ability to finance an ambitious mitigation plan. The company has no operating record in mining and was formed just three years ago to explore for minerals and has a total market capitalization of $145 million. Phoenix-based Phelps Dodge Corp., the nation's biggest copper producer, has a market cap of $18.5 billion.

**"Do it the right way"**
Augusta describes itself as "a mineral exploration and development company responsibly advancing copper and other base-metal assets in the U.S. southwest." The company has two other mining prospects in eastern Nevada, but Rosemont is its focus now.

Gil Clausen, Augusta CEO, says the feasibility studies now under way will determine whether investors can be drawn to the project. "We are not dressing up the property to sell to someone else. We are putting together a plan to take it through the development cycle and do it the right way," he says.

Rosemont, he says, is a "company-making asset" that will give Augusta "the opportunity to grow." Although headquartered in Vancouver, the company has executive offices in Denver, which would likely relocate to Tucson if Rosemont's development is successful Clausen says.
The man spearheading the project for Augusta knows that mining's past has helped to galvanize opposition to his company's proposal. Jamie Sturgess, Augusta vice president and project manager, says he would not tolerate the Rosemont project's turning the property into a moonscape. Sturgess says Augusta, though small and short on operating history, can turn to banks, joint-venture partners or equity markets for the $636 million or more it needs to bring Rosemont into production with the right plan and permits. The company predicts 350 full-time jobs would be created. The 2010 time frame can be adjusted depending on the demands of the Forest Service and other considerations, he added. "It will take what it takes."

**County missed its chance**

"We are not Asarco" Augusta says in some of its marketing material to persuade people that it is taking a different approach to Rosemont. One big difference is that Augusta is not proposing a land swap such as the one Asarco attempted a decade ago.

But use of Forest Service land is essential for the operation of the proposed 800-acre open pit and associated dumps for waste rock, tailings disposal and processing buildings.

A group formed in 1996 to oppose the Asarco land swap proposal — Save the Scenic Santa Ritas — is awaiting Forest Service action on the Augusta proposal, says Lainie Levick, president. The area around Rosemont is "Increasingly important for a wide variety of recreational pursuits" and is "more important than a copper mine," Levick says. The group has a 10-person board and keeps about 175 people on e-mail alert on the project.

Haunting opponents of the project is the fact that Pima County was offered the entire 2,700-acre Rosemont Ranch by land developers for $11.5 million. The county declined. Augusta paid more than $20 million for the property and will spend that much again to complete environmental and other studies, Sturgess says. But something out of the control of both Augusta and its opponents could kill this or any new copper project.

If the price of copper plummets back to its pre-2004 level, below $1 a pound, there would be little appetite for spending hundreds of millions of dollars on new production. Right now such a price plunge doesn't look likely. Copper is staying above $3 a pound, a level undreamed of just a few years ago.

**Getting permits is costly**

Mining on public land is encouraged under the federal Mining Law of 1872. But while environmental groups may not be able to kill a project outright, they can stall permitting and litigate issues to the point where costs and delays are prohibitive,
says Priscilla Robinson, a retired Tucson consultant in mining and environmental affairs.

Just getting the necessary aquifer-protection permit for such a complex project could cost $8 million, she says. Altogether, permitting could total $20 million and take years, she adds.

About 3,200 acres of Forest Service land would be involved in the Rosemont project, says Beverley Everson, geologist for the Coronado National Forest. A preliminary plan for Rosemont has been returned to Augusta seeking more detail, she says.

Mining is permitted on public land, but the Forest Service has discretion on how it will be done, she says, considering such factors as the visual impact on the land, road safety, impacts on the quality of surface and groundwater, light pollution and other issues.

"It's going to be a very, very complex process" to weigh the issues, she concludes.

- Contact Richard Ducote at 573-4178 or

**Company profile**

- Augusta Resource Corp.
- Founded: 2003
- CEO: Gil Clausen
- Headquarters: Vancouver, B.C.
- Ticker symbol: AZC
- Traded on: Toronto Stock Exchange
- Applied for listing: American Stock Exchange
- Market capitalization: $145 million
- Main investors: Managers hold about 20 percent of company stock; investment funds and other institutions hold about 50 percent; small investors have about 30 percent.

Source: Gil Clausen, Augusta Resource Corp.
Rosemont Mine will be model for water conservation, firm says

By Tim Hull  
Green Valley News

A Canadian firm's plans to operate an open-pit copper mine on the east side of the Santa Ritas took a leap forward this week when the company received permission to buy Central Arizona Project water.

On Monday the CAP governing board approved Augusta Resource Corporation's request to purchase 10,000-acre-feet of water per year for five years, which will be used to offset groundwater the mine's operations will draw from the Tucson aquifer.

The agreement allows Augusta to store the water in a water-bank account at the underground recharge station near Interstate 19 and Pima Mine Road. Once mining begins, the CAP water will then be used to replace water drawn from the Tucson Active Management Area.

"Augusta will use the CAP water to maintain a neutral or positive balance effect on the Tucson AMA aquifer," said Jaime Sturgess, Augusta's Vice President for Projects and Environment.

Several crews are currently working in the sprawling dry hills of the Rosemont Valley, in the north-east section of the Santa Ritas, completing a study of the approximately 4,000 acres of private land on which Augusta plans to mine.

The area has been mined before, and there are abandoned cave-like mines dotting the surrounding rock hillsides.

The proposed mine is expected to produce between 226 to 233 million pounds of copper a year, plus about 5.1 million pounds of molybdenum and 6.7 million ounces of silver, according to company estimates. A feasibility study of the site is expected in early 2007.

Sturgess said that the Rosemont mine is being developed to be a "model for responsible copper mining," and the way the company plans to use water is a big part of that effort.

For example, the mine won't have the kind of tailings ponds used at other open-pit operations in Green Valley and Sahuarita.

Instead, Augusta plans to use "dry tailings" technology, which recycles and recovers water before it is lost.
ROSEMONT: CAP water will come from ‘excess’

FROM PAGE A1

to evaporation from a tailings pond, Sturgess said in an interview Monday.

“This technology will result in a 50-60 percent savings in water use as opposed to conventional tailings disposal,” he said.

He added that the use of what’s called “water-miser” design principals will allow the mine to use 5,000 acre-feet of water per year or less, well below that used by other area mines and half of the 10,000 acre-feet per year the company is now allowed to purchase from CAP.

The Phelps Dodge Sierrita Mine in Green Valley, which operates three pits and is a much larger operation than the Rosemont mine is planned to be, used 24,333 acre-feet of water in 2005, company spokesman Ken Vaughn said.

Rosemont’s CAP water is expected to come from “excess water” unused by other CAP users, which CAP officials project will be available for the next 15-20 years.

“Rosemont plans to pre-store enough water during this time to last for the life of the mine,” Sturgess said.

An acre-foot of water equals 325,851 gallons, enough for two families of four to use for a year.

While other area mines have contaminated the Santa Cruz Aquifer with sulfates and other contaminants, Sturgess explained that by using dry tailings technology his company hopes to avoid the seepage of contaminants into groundwater in the AMA.

Also, Sturgess said, the Rosemont copper deposits are skarn deposits, with rock types derived from limestone, which is high in pH and low in sulfur.

Because it’s a new operation, the Aquifer Protection Permit process the mine must go through with the Arizona Department of Environmental Quality is more stringent than that for existing facilities. Rosemont will be required to use what ADEQ calls Best Available Demonstrated Control Technology, or BADCT (pronounced bad-cat).

Augusta has begun the technical work required for the APP process, Sturgess said, but it generally takes several years for the final permit to be issued.

thull@giscnews.com| 547-9732
CAP flow OK'd for new mine

Firm will store allotment until digging starts

By Richard Ducote

ARIZONA DAILY STAR

A Canadian company promoting a new copper mine in the Santa Rita Mountains has clearance to buy thousands of acre-feet of Central Arizona Project water for the venture.

An attorney working for Augusta Resource Corp. said the CAP governing board this week approved the company's request to buy 10,000 acre-feet of water each year for five years.

Augusta plans to store the water underground through the existing recharge station near Interstate 19 and Pima Mine Road and draw water from the area aquifer in the future if the Rosemont mine project, about 30 miles southeast of Tucson, goes forward.

The CAP action does not guarantee water for the project, but the company is confident that water will be available in future years — a critical step in the development of the project.

The company's goal is to buy and store between 50,000 and 70,000 acre-feet of "excess" CAP water for possible use at the Rosemont project if it is permitted, funded and developed, said Michael Pearce, an attorney with the Fennemore Craig law firm in Phoenix.

An acre-foot of water, about 326,000 gallons, would serve three average-sized Tucson families for a year, according to Tucson Water.

Approved by CAP board

Bob Barrett, spokesman for the CAP in Phoenix, said the project board of directors approved Augusta's application to buy the water and recharge it at the Pima Mine Road site.

CAP officials project that the system will have "excess" water — water that is under contract to users but isn't taken each year — available for the next 15 to 20 years. Most Arizona cities have allocations larger than they can use each year, Barrett said.

Arizona now draws 1.5 million acre-feet of Colorado River water annually for the 336-mile CAP aqueduct that starts at Lake Havasu and terminates at the Pima Mine Road recharge site south of Tucson.

Augusta Resource plans to start buying and storing CAP water in January, said Jamie Sturgess, company vice president for projects and environment, speaking by phone from Denver.

The company's preliminary plan for Rosemont calls for use of about 5,000 acre-feet of water annually in an open-pit mining operation that would produce an estimated 225 million pounds of copper per year, plus byproducts molybdenum and silver, for an estimated life of 16 to 19 years.

The mine would employ an estimated 350 people, Sturgess said.

$20M for 2,960 acres

Augusta paid more than $20 million for 2,960 deeded acres that border the Coronado National Forest. The company also has a grazing lease on 18,000 additional acres, of which 12,000 acres are under mineral claims on national forest land. Augusta is continuing an $8 million drilling campaign to further define the Rosemont property's mineral profile. Development of the mine would cost $500 million or more, Sturgess added.

The area is a historic mining area with evidence of activity dating back more than 100 years, including two
abandoned smelter sites, Sturgess said. Augusta's plan calls for transporting copper concentrates to smelters in Arizona or Mexico for processing, he added.

Asarco Inc., which acquired the Rosemont property in 1989, proposed a land swap a decade ago to assemble additional acreage for a mining operation in the area. The company shelved the plan when copper prices slumped in 1998. Asarco later sold the property to Tucson investor Yoram Levy, who offered the land to Pima County. He later sold it to Augusta Resource.

**Plan of operation**

Augusta, based in Vancouver, B.C., plans to submit a plan of operation to the U.S. Forest Service next month, Sturgess said. Augusta Resource (Arizona) Corp. holds title to the property.

The company develops and promotes mining properties in the southwestern United States but has never operated a mine.

Renewed talk of a mine on the Rosemont property is rekindling opposition that surfaced against the Asarco proposal.

"The public spoke pretty strongly in opposition to the Asarco plan, and unless Augusta has come up with something clearly different, that opposition hasn't gone away," said Roger Featherstone, based in Tucson as the "Southwest circuit rider" for Earthworks, a nonprofit Washington, D.C.-based environmental advocacy group.

"It's important to know that the big mining companies never get this stuff right," Featherstone said. "Every mine that goes into operation promises they will never pollute, but none has ever kept that commitment."

Augusta Resource bought the property from Triangle Ventures LLC, which paid Asarco $4.8 million. Triangle, which included Levy, offered the land to Pima County for preservation for $11.5 million, but a citizens advisory committee considered the price too high.

* Contact reporter Richard Ducote at 573-4178 or rducote@azstarnet.com.
Arizona Geological Society
Rosemont Mine Tour / Saturday, April 28, 2007

Section 10

Popular-Press Editorials
Good jobs, education and what’s taking so long?

Column by Steve Emerine, March 7, 2007

Let’s discuss three important local issues today so I can devote next week’s column to what’s wrong with the new values the county assessor has set on your home.

Good-paying jobs

Did you read about the out-of-state firm that wants to hire 400 Southern Arizonans for top-paying jobs and pay billions of dollars in federal, state and local taxes during the next two decades?

That’s the kind of boost we all hoped Tucson Regional Economic Opportunities Inc. (TREO) would produce for us, but few thought it would come so soon.

The deal may not go through, however, because the Pima County Board of Supervisors and U.S. Rep. Raúl Grijalva oppose it. And Rep. Gabrielle Giffords has “very deep concerns” about the proposal.

By now you’ve probably guessed the employer is Augusta Resources Corp., and the project is the Rosemont copper mine in the Santa Rita Mountains southeast of Tucson.

I can’t help but wonder what three of my late friends would tell fellow Democrats Grijalva, Giffords, Richard Elías, Ramón Valadez and Sharon Bronson today about this mining request.

Like today’s public officials, Maclovio Barraza, Rudy Garcia and Eddie Jackson of the United Steel Workers of America loved Arizona and the environment.

But they also loved the standard of living copper mines brought to thousands of local residents. If they were alive today, I think they would be working to help elected officials find a win-win solution to keep those copper jobs in Arizona.

Schools plus jobs

Kudos to Tucson City Councilman Steve Leal for making us aware of the Schools Plus Jobs program for 40 Sunnyside High School students and another 40 from Desert View High.

The goal is to link what’s taught in classes to what the students will be doing when they graduate. Students apply for the program and spend 10 hours a week in classrooms, offices and Sunnyside Unified School District working places.

Their parents join district personnel to provide adult guidance and supervision. Thanks to a $94,000 city grant, the youngsters are paid minimum wages. They must stay eligible by attending class and making their grades.

While Leal was right to praise the program and ask how to expand it, he was wrong to suggest the city raise $6 million to help 6,000 more students. The council cut that to 250 last Tuesday, but they’re wrong, too.
This isn’t what cities are supposed to do.

School districts should educate kids.

Aside from a few pilot projects like this one, cities should stick to providing police and fire protection, water and parks. They should pick up garbage and repair streets.

Leal and his colleagues could, however, join school officials to lobby the Legislature to fund this program statewide. I think they’d get a lot of help from business and the private sector.

Slower than Rio Nuevo?

Why are Tucson officials still inventing hurdles for the University of Arizona’s biosciences park, KB Home’s 110-acre housing development and Eastbourne Investments’ retail center at East 36th Street and South Kino Parkway?

The southside needs the stores, housing and the prestige the biosciences center would bring. The neighbors want all three. The UA, KB and Eastbourne were ready to go last year.

And Tucsonans were told months ago the major points had all been resolved and we just needed to dot a few “i”s and cross a few “t”s.

But the same city leaders and bureaucrats who have produced all those visible results in Rio Nuevo (sarcasm intended) apparently can’t resist raising new issues and stalling permits for this project.

We need to tell them again: The object is to build this. It isn’t to see whether you can drag it out longer than the Barraza Aviation Parkway.

E-mail comments for publication to editor@azbiz.com. Steve Emerine, a Tucson resident since 1960, has run Steve Emerine Strategic Public Relations since 1994. He is a former local newspaper reporter, editor and columnist and served as Pima County Assessor from 1973 to 1980. He is a regular Monday guest on the John C. Scott radio talk show, which airs from 3 p.m. to 5 p.m. weekdays on The Jolt KJLL 1330-AM. This column appears weekly in Inside Tucson Business.

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Tucson creates own environmental problems

Guest Comment
By Bill Kurtz

Tuesday, January 23, 2007

For 50 years of my adult life I have watched, with great dismay, the deterioration of the environment in the Tucson Basin.

The inescapable conclusion for the cause of this deterioration is simply population growth.

The county seems ecstatic and proud that it now contains over a million people and has its eyes set on accelerated growth which will only accelerate all the environmental problems of clean air, water supply, habitat, and plant and animal life, plus traffic, schools, electrical power, etc.

The Rosemont Mine will disturb 4,000 acres over the 20-year life of the mine and reclaim 3,500 acres for multiple use.

This contrasts sharply with the 5,000 acres the developers denude every year.

Rosemont will require 5,000-acre feet per year of water or about the equivalent of ten golf courses or 11,000 homes. Though not required and not done by any other mining company that I am aware of, Rosemont will recharge an equivalent amount of CAP water into the Santa Cruz aquifer. This is exactly what Arizona law allows developers to do with the Central Arizona Replenishment District.

The Rosemont Mine will disturb only 4,000 acres of the about 150,000 acres in the Santa Rita Mountains.

The desert floor is also animal and plant habitat, some of it critical, and Pima County is destroying this at an alarming rate of 5,000 acres per year and in some instances destroying wildlife corridors.
Destroying large areas of habitat as is happening in the Tucson Basin can have far reaching consequences. That this intense human development has a pronounced negative impact on animals is well documented.

The Big Horn sheep no longer exist on Pusch Ridge in the Catalina Mountains. Where Asarco has been open-pit mining since the 1950’s, Big Horn sheep are still present.

Incentives and tax breaks are often used to lure companies and industries here. Some of those that you have attracted like IBM, Weiser Lock, call centers and plastics companies have already moved part or all of their operations out of Tucson.

Rosemont is offering to contribute $50 million to Pima County’s conservation programs and Rosemont will be here for 25 plus years with their well paying jobs.

Rosemont’s tailings disposal system, unlike any presently in Arizona, should eliminate tailings dust as a problem and at the same time reduce water needs.

Rosemont will reclaim as the operation proceeds and will place money and financial insurance to fully fund reclamation. As we enter the era of alternative energy mandated by the Arizona Corporation Commission, I cannot think of a better place for a solar array than on the reclaimed and leveled waste dumps and tailings areas. And what happens if there is no mine? My guess is that with plus 2,500 private acres we will see housing developments to both recoup their investment which by now must be $30 million to $40 million and to make a profit. This would be a huge negative impact on the Santa Ritas.

To my knowledge, this is the first time a mining company has been so open with their information and the first time one has committed to actually helping a county in conservation efforts and the first time one has truly committed to using the latest technology to improve mining not only for mining but for the environment.

I believe Tucson’s and Pima County’s environmental problems are largely of their own making and see the Rosemont mine having a very minor influence on the overall problems.

Bill Kurtz of Amado is a retired geologist and an active member in several environmental groups.
Guest Commentary

Could Augusta's plan to mine Rosemont Valley maybe, possibly, not be such a bad thing?

By JONATHAN HOFFMAN

Sherman, set the Waybak Machine for 1897. We are going to visit the United States Congress as they pass the Forest Management Act, which defined the mission for what will become the United States Forest Service.

Mr. Peabody might begin a history lesson in this way.

The Forest Reserve Act of 1897 created management provisions, provided funding, and defined the purpose of the reserves as forest protection, watershed protection, and a source of timber supply for the nation.

In addition to timber, today's "Land of Many Uses" provides an array of materials and services including ore and recreation.

As a forestry student said to me some 20-odd years ago, "The National Parks are our Crown Jewels, and the National Forests are our industrial diamonds."

The mining industry has profited wildly from these government resources. This, along with its colossal disruption of the countryside and toxic byproducts, make it second only to whaling in industries despised by the environmentally sensitive.

Could there ever be a "nice" mining project, or maybe just an acceptable mining project? If so, what would it look like?

Let's try a little brainstorming. First, a nice mining project would buy the land it wanted to use, instead of paying token, below-market fees for government set-aside land, as do the hikers, mountain bikers, hunters and birders. Second, it would generate an independent fund to restore the site after it is depleted. Third, it would create an endowment that would support the local community. Of course, it would comply with the latest standards of worker and environmental safety.

Enter the Augusta Resource Corporation. Augusta wants to get at the rich copper deposits in the Santa Rita foothills. Its proposed mine seems to fill the bill.

From Pima County Supervisor Ray Carroll to the folks at the Tucson Weekly, anti-miners stand in fierce opposition to the project. Those who are in favor cite the need for copper, job creation, wealth creation, etc., while acknowledging the visual price and environmental risks. The anti-miners generally acknowledge many of these positives, but they see the environmental impact as a deal breaker.
Ironically, this whole controversy could have been avoided if Pima County had purchased the property, now owned by Augusta, from Yoram Levy when it had the chance. Levy purchased the land for $4.8 million, then offered it to Pima County for $11.5 million. The county passed on the deal, and he ended up selling it to Augusta for $20.8 million. Now, some might say that ol' Yoram was a schmuck for trying to more than double his money with the county. Others might call him a fool for making the offer to the county when he could have (and did, in the end) quadrupled his money with another buyer. You might even say that the county blew a chance to buy it at a $9.3 million discount.

I attended the meeting of the Pima County Supervisors in which Ray Carroll's resolution opposing the mine was discussed. The Augusta folks made a presentation, and answered questions from the supes. Carroll did not miss an opportunity to bash the mine idea, or Augusta Resources. Ann Day got in a few licks, but did not seem very inspired. The rest were oddly silent.

The audience was one-third pro-miners, two-thirds anti-miners. Augusta "salted the mine," so to speak, by filling the center section with friendlies.

The speakers were quite predictable, though one put words to a feeling I get that makes me squirm in my seat when these sorts of issues arise. A geologist named Ann Pattison made the following statement: "Some say that we should let all the mining be done in the Third World. That is environmental imperialism of the worst sort." She went on to point out that if a mine were to be built, it would be far better, from a global perspective, for it to be built here. Our environmental laws, labor laws, and advanced technology would result in a much cleaner and safer operation.

From a strictly environmental perspective, that's a tough argument to beat. Maybe we could make amends for our environmental imperialism by offering Augusta a tax break ... just a thought.
Rosemont development

Editor:

Augusta Resource has been developing a feasibility plan to extract copper from the Rosemont orebody in the Santa Rita Mountains. For some residents of Southern Arizona, this is a touchstone for anti-economic development sentiments or for rallying against the mines in their back yards. For others it is the start of an open and honest debate about how we reconcile the need for a wise use of resources against the desire to maintain the status quo.

The mining industry of the 21st century promotes that discussion and has made technological advances that minimize the footprint and impact of new mines. As editorials in this newspaper have pointed out, Arizona has changed and its economy is more diverse than a century ago when we gained statehood.

But, Arizona is as well endowed with mineral resources as it is with sunshine and spectacular scenery. Arizona produces 2/3 of the copper used in the US—copper that is the basis for our electrical power, our transportation, and our communication.

A diversified, high-tech economy is a copper intensive economy. Copper mining contributes more than $400M per year directly to the Pima County economy. Copper mining provides the tax base to support schools and community services when citizens are reluctant to be taxed.

The question for the community to discuss is not whether or not we want mineral resources developed—they have to be. The question for debate is how we co-exist in a community that is surrounded by world-class mineral deposits. Mining is no longer something done to a community, it is something done with a community.

Augusta Resource is willing to be a good partner and a good neighbor and their plan for the development of Rosemont will serve the community well for future generations with its balance of production and protection.

Mary M. Poulton, professor
Mining and Geological Engineering
Tucson