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MEMORANDUM

TO: **Ms. Jeanine A. Derby / U.S. Forest Service**
Mr. Jamie Sturgess / Rosemont Copper Company

FROM: **Mr. Robert Pratt / Call & Nicholas, Inc.**
Mr. Dave Nicholas / Call & Nicholas, Inc.
Mr. Jim Davis / E. L. Montgomery and Associates

DATE: **16 November 2007**

SUBJECT: **Dewatering for the Planned Rosemont Mine**
(FS MPO Comments – Item Nos. 1 and 4 [GW-1 and GW-3])

1.0 INTRODUCTION

This memo is in response to the U.S. Forest Service's request for information regarding dewatering for the planned Rosemont Mine. In a letter dated 19 October 2007, the Coronado National Forest requested that Augusta Resource Corporation provide a "…description of the potential for mine dewatering,..." and "General information on the location of any dewatering wells.".

On 31 October, 2007, a meeting was held at the offices of Call & Nicholas, Inc. (CNI) with Mr. Dave Nicholas and Mr. Robert Pratt of CNI and Mr. Jim Davis of E. L. Montgomery & Associates to discuss Rosemont dewatering issues in response to the Forest Service letter. The conclusions regarding dewatering presented in this memo were outlined during this meeting.

2.0 ROSEMONT MINE DEWATERING

Dewatering requirements for the Rosemont Mine are based on slope stability requirements. Groundwater in mine slopes causes pore pressures which result in a loss of shear strength. This loss of shear strength can result in either flatter mine slopes or slope failures.

Based on the results of slope stability analyses done by CNI, depressurization by dewatering will primarily be required in (1) the east wall Willow Canyon Formation, (2) the south wall alluvial conglomerate, and (3) the northwest wall Bolsa Quartzite. These areas are shown on Figure 1.

2.1 Possible Dewatering Techniques

Mine dewatering can be accomplished with the use of horizontal drains drilled into bench faces, pumping from vertical wells, a combination of horizontal drains and pumping wells, and/or an underground drift from which fans of dewatering holes are drilled behind the pit slope, or no active depressurizaton except that resulting from the mining of the pit. The effectiveness and need for these means of dewatering depends on the amount of dewatering required, the hydraulic conductivity of the rock, and the timeframe needed to achieve the required dewatering.

2.2 Willow Canyon and Alluvium (Glance Conglomerate)

To date, work done by E. L. Montgomery & Associates (M&A) indicates that the phreatic surface is relatively high at approximately 100 to 200 feet below the ground surface. Due to the assumption of a non-perched aquifer for the Willow Canyon Formation, pore pressures based on this phreatic surface are relatively high for the east wall. CNI recommends pore pressure monitoring using 3 to 4 nested vibrating-wire piezometers in fully grouted piezometer drill holes to determine if the Willow Canyon aquifer is perched or not. If it is determined that the Willow Canyon aquifer is perched, then pore pressures will likely be much lower than those assumed for the perched aquifer condition and less dewatering will be required for the east wall.

Two pump tests done by M&A in the Willow Canyon Formation (test sites PC-3 and PC-4) resulted in low well yields and permeabilities. Based on this information, adequate depressurization of the east wall can be done with fans of drainage holes drilled from an underground drift located behind and below the pit slope at approximately an elevation of 4000 feet, or with a combination of closely spaced vertical surface wells and horizontal drains.

The potential for using surface dewatering methods (vertical wells and horizontal drains) is dependent upon the permeability and well yields determined from pump tests. The low well yields and permeabilities determined from the two pump tests done to date, indicates that vertical

wells and horizontal drains will have to be closely spaced to achieve the required depressurization. It is possible that surface methods will be ineffective in achieving the required dewatering. However, there is not enough data to confirm or refute this conclusion. CNI recommends additional pump tests in the Willow Canyon Formation to properly evaluate the dewatering method appropriate for the east wall.

Based on the current data, the requirements for dewatering the east wall with vertical surface wells and horizontal drains are presented below:

1) Surface wells at the pit perimeter are required at a spacing of 75 to 200 feet along the perimeter down to an elevation of 4500 to 4000 ft. Because of the low well yields expected from these wells, small 4 to 6 inch pumps will be required.

2) Temporary surface wells will be required within the final pit limits in the first 5 to 10 years of mining to achieve depressurization required for the final pit.

3) Horizontal drains on a 50 foot vertical and horizontal spacing drilled to a depth of 400 ft will be required for each pushback. Water collected from the horizontal drains should be diverted to a sump and pumped out of the pit area.

Three alternatives are available in the event that additional pump test data and groundwater modeling indicate that the required dewatering cannot be achieved with surface dewatering methods. These alternatives include (1) flattening the slope, (2) a combination of surface dewatering and flattening, or (3) dewatering from fans of drainage holes drilled from an underground drift located behind and below the pit slope. The suitability of these alternatives is dependent upon the effectiveness of the dewatering method and the tradeoff between savings on stripping as a result of mining at steeper slope angles and the cost of dewatering which is needed to stabilize the slope at these steeper slope angles. A cost-benefit analysis should be done to further study the tradeoff between dewatering costs and reduced stripping costs.

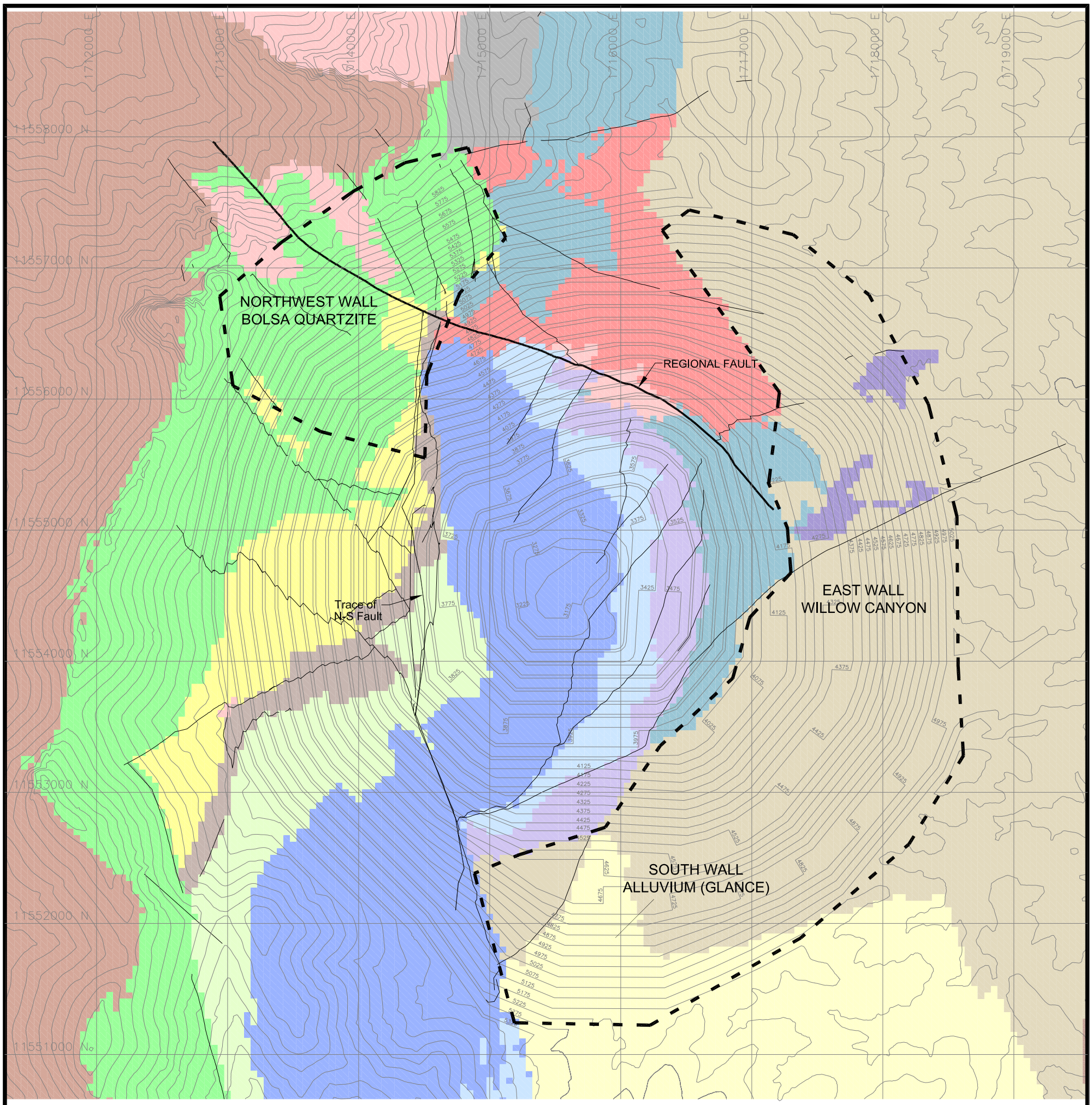
2.3 Northwest Area

In the northwest portion of the pit, dewatering will likely be required to avoid potential failure along the pre-Cambrian Granite/ Bolsa Quartzite contact. In order to depressurize this area, vertical pumping wells will be needed around the pit perimeter and horizontal drains will be required on all benches below the phreatic surface. CNI believes this type of dewatering will work because the flow of groundwater is fracture/fault controlled in the northwest area. Because no hydrogeologic data have been collected in this area, CNI recommends piezometer installation

and pump tests in the area of the northwest wall.

2.4 Rock Slopes Controlled by Catch Bench Design

In the remaining area of the pit, the slope angles are controlled by catch-bench design. In these areas, horizontal drains will be used where needed to mitigate localized areas of excessive pore pressure. Horizontal drains are usually drilled on a spacing of 50 to 150 feet and to a depth of 300 to 600 feet. Water draining from the horizontal drains is collected and diverted to sumps and pumped out of the pit.



LEGEND

- OVERBURDEN
- EPITAPH DOLOMITE
- COLINA LIMESTONE
- EARP FORMATION
- HORQUILLA LIMESTONE
- ESCABROSA LIMESTONE
- MARTIN FORMATION
- QTZ MONZONITE PORPHYRY
- ANDESTIE
- ARKOSE WILLOW CANYON FORMATION
- CONCHA LIMESTONE
- ABRIGO FORMATION
- BOLSA QUARTZITE
- PRECAMBRAIN GRANITE
- GLANCE CONGLOMERATE
- FAULTS

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FILE ROSEMONT\ACAD\2007\FINAL PIT WITH DEWATERING.DWG

PRIMARY DEWATERING AREAS

AUGUSTA RESOURCES / ROSEMONT

SCALE 1"=800' | FIGURE 1