Optimization of Removal of Overburden Material for an Open Pit Gold Mine

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ABSTRACT

An open pit gold mine located north-west of Yuma, AZ has historically experienced excessive slope failures along the north pit walls in the conglomerate overburden (waste rock) material that overlies the ore bearing gneiss. However, the stability of the south, west, and east walls has been acceptable. This paper presents an overview of slope stability modeling using anisotropic material properties and slope monitoring that has been conducted to optimize mining operations and reduce the number and size of failures of the north pit wall slopes.

The Mine has taken a proactive approach to slope stability monitoring and has developed a system of measurements and visual observation along the crests of the high walls in an effort to provide assurances for safety and to minimize loss of production. Additional slope stability analyses were performed to model the proposed slopes of the East Rainbow Pit. Past slope stability analyses were completed by modeling the pit material as a homogenous mass. Review of the geologic mapping completed by the Mine indicated that the slope failures were potentially controlled by the faulting and bedding planes, which could not be adequately modeled as a homogenous material. In order to analyze the effects of the faulting and bedding planes, slope stability analyses were completed using anisotropic properties to model the mapped faulting and bedding. The results of the modeling were consistent with the observed failures in the pit and allow for further optimization of the pit wall slopes by allowing the south, west, and east pit walls to be excavated at a steeper angle than the north pit wall thus reducing the amount of waste rock that will have to be removed to reach the ore body.

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