# FACSIMILE TRANSMISSION COVER SHEET


HOMESTAKE MINING COMPANY OF CALIFORNIA

GRANTS RECLAMATION PROJECT

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DATE: 8-19-94 TIME: 3:20 PM

TO: Tim Hicks 7E 36 / T7C6

COMPANY: Nuclear Regulatory Commission

FACSIMILE NUMBER: (301) 415-5397

FROM: Fred Craft

COMPANY: Homestake

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MESSAGE: Tim / Ron.

Attached are responses to your questions regarding the evaporation pond #2 license amendment. Please review and let me know if more discussion is required.

Fred

NUMBER OF PAGES: 5 (INCLUDING THIS SHEET)

PLEASE CALL (505) 287-9289 IF ALL THE PAGES ARE NOT RECEIVED.

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Mr. Fred Craft
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**SUBJECT: RESPONSES TO NRC QUESTIONS ON EVAPORATION POND #2 (EP2)**

Dear Fred:

The following information is provided in response to the questions raised by the US NRC in recent telcons with you concerning the design, ground conditions, and behavior of evaporation pond #2 (EP2).

1. Stability analysis - The NRC commented that some soil designations appeared to have been reversed in the stability analysis model. Although the soil designations are correct with respect to parameters assigned to the soil units, a correction has been made to the fourth data line of the input file to change the soil under the ground surface downstream of the dike toe from type 1 (compacted fill) to type 2 (natural alluvial soil). The stability analyses have been revised using this correction and the outputs (attachment 1) show that the minimum factors of safety are 1.50 and 1.11 for static and pseudostatic loading, respectively. These values are a few one-hundredths lower than originally reported but are at or above the minimum values required. It should be noted that the analytical model assumed full saturation of all soil and fill below the maximum pond elevation, a condition that would never occur, so the analysis is very conservative.

2. Seismic parameters - The stability analyses discussed above used a peak ground acceleration value of 0.1 g for both horizontal and vertical ground response to the design earhquake or seismic event. This value was first reported and justified for use at the Grants location in the "Stability Assessment" by D'Appolonia, 1980 and is based on the studies by Algermissen and Perkins (U.S.G.S. Open-File Report 76-416). This value has been used in all stability analyses of the large tailing impoundment and in the design of #1 evaporation pond.

3. Soil characterization in the pond area - The NRC expressed concern about how well the soils in the pond area could be characterized based on previous test pit

investigations. The test pits as well as test borings and water-well drilling near the pond area have shown the following:

a) The water table lies at least 40 feet deep below EP2.

b) All soils above bedrock are alluvial sediments with some interbedded eolian sands. The soils are characteristically thinly bedded to lenticular and are composed of sand, clay, and mixtures of these and are usually medium dense or stiff.

We believe that the pond-area soils are characterized to allow soil properties to be assigned with an adequate level of conservatism, which has already been applied. This view is apparently shared by both the New Mexico State Engineer and the state Environment Department. However, to reassure the NRC a test boring program has been developed to take samples for soil classification and to perform Standard Penetration tests in six borings.

4. Settlement - The NRC has stated that the potential for settlements needs to be addressed. Our evaluation indicates that large total settlements or significant differential settlements are extremely unlikely for the following reasons:

a) The water table lies 40 feet or more below ground surface, and no perched water has been found anywhere on the site. Therefore, it is very unlikely that any saturated soils occur at shallow depths below the pond area. Unsaturated soils are not dependent for consolidation on drainage of pore water and will densify upon load application. Therefore, any "settlement" should occur during construction, eliminating any measureable settlement after construction.

b) Although the soils are not uniformly stratified, the lateral boundaries between soils are generally gradational or wedge-shaped, minimizing the possibility of abrupt lateral differences in subgrade properties that could cause differential settlements.

c) The incremental loads imposed by the pond will be relatively light. The net change in loading on the pond-basin subgrade will be about 373 psf (2.6 psi), about the same pressure applied by a man standing on the pond bottom. The increase of load

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on the dike subgrade will be about 1600 psf, a higher but still relatively small load. At water table depth, this incremental load will be spread out so that the pressure increment at that depth will be considerably less, about 1100 psf, or about 20-25 % of the preconstruction pressure at that depth. For medium to stiff clay or moderately dense sand, this increase is unlikely to induce measureable settlements.

d) For almost two years after construction of evaporation pond #1, settlements were measured on its south dike. Although this dike was constructed of tailing sand on compressible subgrade (tailing sands mixed with saturated slimes). Settlements occurred for less than two years, totalled less than 0.5 feet and differed gradually along the dike. No structural distress was found. Considering this performance at a nearby location on much more compressible shallow soil, the settlement that can be expected along the EP2 dikes should be much less and probably below the expectable range of survey error.

5. Stability of the west dike of evaporation pond #1 (EP1) - The NRC raised some question about the stability of the west dike of EP1, apparently because its outslope passes directly into the east-side crest and inslope of EP2. Although we have not performed a numerical stability analysis of this slope, there is no doubt that both the static and pseudostatic factors of safety against mass movement of this slope are well above the minimums. This certainty is based on the following:

a) Both the EP1 outslope and the EP2 inslope are 5H:1V. This is a much flatter gradient than the other EP2 slopes. A 20-foot wide bench separates the EP1 outslope from the EP2 inslope. This configuration would force any failure surface that intersects both slopes to be either very flat with large radius, or very deep. In either case the geometry clearly is in favor of the resisting forces being larger than the driving forces on the failure surface.

b) For more than 12 years the outslopes of the large tailing impoundment were analyzed quarterly for stability. Those slopes were as steep as 2.5H:1V, up to 100 foot high, composed of hydraulically-placed loose-to-medium dense sand with little

cohesion, and were saturated from about five feet above the toe to tens of feet beyond the toe. Each of these parameters were worse than their equivalents on the EP1-EP2 common slope. Nevertheless, the factors of safety for these tailing impoundment slopes were consistently above minimums. Therefore, the stability of the west outslope of EP1 should be much greater and, therefore, not a reason for concern.

The EP1 west dike was designed and constructed to be an engineered fill, with known soil properties verified through a construction QC program. The specification and as-built records (Completion Report) are available in Homestake files for NRC's examination.

I trust that this information will provile satisfactory responses to the NRC. However, if any points need clarification or additional discussion, we will be happy to provide it.

Yours truly,

Alan K. Kuhn

Alan K. Kuhn, Ph.D.,P.E.

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attachments

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