HOMESTAKE

ALBUQUERQUE OFFICE

40-8903

Alan D. Cox
Manager - Grants & Southwest U.S.

31 May 2002

Ms. Maura Hanning, Program Manager
State of New Mexico
Ground Water Pollution Prevention Section
Environmental Department
P.O. Box 26110
Santa Fe, New Mexico 87502

USPS Priority Mail

Re: **Grants Reclamation Project - Discharge Plan (DP-725)**
Liner Repair for Evaporation Pond #1

Dear Ms. Hanning:

This letter is in followup to a telephone conversation made to Mr. F. Kalish of your staff on May 31, 2002 regarding some pond liner tears along the eastern margin of the # 1 evaporation pond at the Grants site. As you are probably aware, this pond is approximately 12 years old, is situated on the small tailings pile for the site, and consists of an asphaltic membrane liner system to contain water generated from our project ground-water restoration program.

In order to remedy the situation related to the liner tears along the pond pool waterline on the inside margin of the eastern dike, the pond elevation has been lowered by transferring water from Pond #1 to evaporation Pond #2 such that the water line is below the tom sections of liner. We are presently maintaining the water level down in the pond and anticipate initiation of liner repair in the next 1-3 weeks depending on logistics of getting a liner repair contractor and related equipment mobilized to the site. The pond design engineer of record was retained to inspect the liner damage and recommendations for repair obtained. Those recommendations (letter report attached) will be followed during repair work. A liner contractor has visited the site to inspect the work required.

As part of the liner tear inspection and development of a repair plan, we have initiated an options review to determine the best way to minimize and prevent liner tears from win-

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wave actions in the future. A wind-wave dissipator system is under consideration, however, other options may be considered for implementation.

As required under our DP-725 permit, we will keep your office informed regarding repair work and will provide a written report after repair activities are completed. Thank you for your time and attention on this matter; if you or members of your staff have questions or comments, please contact me in our Albuquerque office.

Sincerely yours,

HOMESTAKE MINING COMPANY
Alan D. Cox

\ Enclosure

Cc: B. Landin- NMED, Santa Fe
A. Phillips- NMED, Santa Fe

E. Brummett - NRC, Rockville
B. Ingersoll, SLC
G. Gleadle, Grants
G. Hoffman, Hydro-Engineering, Casper

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KLEINFELDER
An employee owned company

May 29, 2002
Project No. 16977

Mr. Al Cox
Homestake Mining Company of California
P.O. Box 98
Grants, NM 87020

**SUBJECT: ENGINEERING EVALUATION, LINER DISTRESS
EAST DIKE OF EVAPORATION POND #1
HOMESTAKE GRANTS PROJECT
GRANTS, NEW MEXICO**

Dear Mr. Cox:

On May 24, 2002 Dr. Alan Kuhn of Kleinfelder, Inc. accompanied you on a site visit to the Grants Project to examine and discuss problems with the liner and east dike of Evaporation Pond #1 (EP1). At that time Dr. Kuhn described to you his observations of the problems and some measures that could be taken to address them. The following documents those observations and recommendations.

OBSERVATIONS

Along the east dike of EP1, the existing pond liner has split about 2/3 of the way up the exposed portion of the liner above water line, or about 4-6 vertical feet below the crest. There are a number of other similar splits that occur at about this same level, forming a discontinuous line running approximately horizontally along most of the dike. A large-diameter HDPE pipe runs parallel to the crest and sits about 2-3 feet above the split line; for some time the pipe was apparently at a lower position just above the liner split line. At other locations the liner appears to be intact; no other splits were observed along this dike.

Parallel to the liner split is a bench or step in the underlying dike earthfill. This bench is about 1-1.5 feet high, essentially continuous along the east dike and coincident with the liner split. Dike material appears to have moved from the bench downslope, forming irregular bulges under the liner.

There is no visible evidence of structural distress in the east dike. The damage to the dike described above is shallow and appears to have not compromised the stability of the dike.

CAUSE(S) OF THE PROBLEM

The EP1 liner, constructed in late 1990, is a two-part composite. The base consists of felt panels laid on a prepared earth surface. The top layer is an asphaltic layer applied as a hot emulsion

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(Derry Oil #6) in two or more passes of a truck-mounted or hand-held spray bar, creating a final layer up to 160 mm thick. Generally, this liner system appears to be in good condition where external factors have not caused damage to it.

The split in the liner probably resulted from a couple processes related to the position of the HDPE pipe and the wave action on the east inslope of the pond. The east side of the pond is leeward with respect to the prevailing westerly wind direction; consequently, wave fetch is higher and wave run-up is longer on the east side and east inslope of the pond. It is our conclusion that the pipe, in its earlier position lower on the slope, kept the waves from running up and gradually dissipating on the east inslope. Instead, the waves broke against the pipe, causing local turbulence that resulted in:

- Localized wearing and erosion of the liner membrane, initiating small leaks through the liner,

- Agitation of the pipe enough to cause or aggravate liner leaks through abrasion,

- Concentration of tensile stress on the liner between the upper portion anchored by the pipe and the lower portion stretched by the turbulence and drag of the breaking and retreating waves.

The observed damage to the dike appears to have resulted from water passing through splits in the liner. The liner appears to have split or pulled apart through the felt panels rather than along the overlaps between panels (on all inslopes the liner panels were applied along, not across, the fall line). Once the splits developed, the fine sand tailings underneath became saturated during periods of high wave action. Once saturated, the fine sand was liquefied by the agitation of the waves, lost strength, and moved downslope. This process probably occurred during intervals of high winds, gradually forming the bench in the dike.

RECOMMENDATIONS

To restore the form and function of the east inslope liner, the dike must be repaired first. The bench should be filled in with material that is not liquefiable but also graded fine enough to not puncture the overlying liner. The crusher fines, a mixture of non-plastic basalt fragments ranging from silt to large gravel, that are stockpiled at the basalt quarry west of the site appear to be appropriate for this use. Alternative materials could include sandy clay to clayey sand alluvial soils present at shallow depths west and north of the large impoundment.

We recommend that the following repair methodology be followed:

- Open the liner for the length of the east dike along the split line, and fold the liner back to fully expose the eroded bench.

- Place non-liquefiable fill material in the bench to restore the dike inslope to its original elevations and grade. Fill should consist of crusher fines as described above, if possible. The fill should be placed in lifts of not more than 6.0 inches, with any 2-inch or larger rock fragments

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removed and discarded prior to compaction. Each lift should be compacted by hand-operated tamper or by tracking with a light dozer. Moisture conditioning to a specific standard is not necessary if non-plastic crushed fines are used; otherwise, the fill material should be carefully moistened during placement.

- Replace the split liner over the repaired slope, and patch the liner with a compatible overlay that is melt-sealed to the cleaned, dry liner along all seams.

These recommended repairs, if performed properly, will not adversely impact the stability of the dike and should eliminate this particular cause of leakage and damage to the dike inslope. However, subsequent leaks at this or other locations in the pond could produce liquefaction of susceptible soils, leading to problems similar to those addressed here.

To reduce the chances of a similar split developing again in this liner, the HDPE pipe should be kept above the run-up elevation of waves on the dike. In addition, a wave dissipater would help in reducing height and energy of waves impacting the east inslope.

A dissipater can be fabricated from sections of thin-wall HDPE pipe already in boneyards on site. Sections of this pipe, capped or otherwise sealed, can be attached together in sausage-link fashion and placed in front of and parallel to the east dike. One or more of these can be used, and their locations can be adjusted to achieve the wave-stilling effect desired. Each dissipater string should be anchored to the north and south dikes by deadman or other means that does not cause abrasion or other damage to the dikes and liners at the anchor locations.

LIMITATIONS

The recommendations contained in this report are based on our field examination and our understanding of the previous and proposed construction. All depths and topographic observations referred to in this report are relative to the existing grade at the time we performed our field investigation. For various reasons beyond our control, grades could change between the time of our field investigation and the time of construction, rendering our reference to existing grade inaccurate. This should be considered in the implementation of our recommendations in the design and construction of the project.

If any conditions are encountered at this site which are significantly different from those described in this report, Kleinfelder should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, our firm should also be notified. This report was prepared in accordance with generally accepted standards of practice at the time the report was written. No warranty, express or implied, is made. It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report should be used at the Owner's and Contractor's option and risk.

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ADDITIONAL SERVICES

The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be performed during the construction to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation and earthwork operations;
- Consultation as may be required during construction;

It is also recommend that the project plans and specifications be reviewed by Kleinfelder to verify compatibility with the conclusions and recommendations presented in this report. Additional information concerning the scope and cost of these services can be provided by this office upon request.

We appreciate the opportunity to work with you on this project. If you have any questions or need additional information, please contact this office.

Respectfully submitted,

KLEINFELDER, INC.

Alan K. Kuhn, Ph.D., P.E., R.P.G.
Senior Program Manager

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