HANSEN ALLEN & LUCE INC

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Utah Division of Oil, Gas and Mining
451 East 400 North
Price, Utah 84501

October 31, 1996

Attention: Mr. Peter Hess

Re: Response to Deficiency Comments Pertaining to Willow Creek Mine Proposed Permit ACT/007/038 Modifications Due to the Railroad Realignment in the Preparation Plant Area

Gentlemen:

Cyprus Plateau Mining Company has received several letter communications from the Utah Division of Oil, Gas and Mining (UDOGM) that address deficiency comments pertaining to the Willow Creek Mine proposed permit modifications recently submitted. The modifications were submitted to reflect proposed changes to the permit due to the proposed railroad realignment in the Preparation Plant Area. The letter communications containing the deficiency comments include the following:

1. A memorandum to "File #2" from Mr. Steven M. Johnson, Reclamation Specialist with UDOGM, dated October 21, 1996.

2. A letter addressed to Mr. Ben Grimes from Mr. Peter Hess, Reclamation Specialist III with UDOGM, dated October 11, 1996.

3. A memorandum to Mr. Peter Hess of UDOGM from Mr. Randy Harden of UDOGM, dated October 11, 1996.

Cyprus Plateau has requested that Hansen, Allen & Luce, Inc. assist them in responding to the deficiency comments. Responses to the specific comments raised in these letter communications are presented below.

MR. STEVEN JOHNSON MEMORANDUM

Comment: "The following deficiencies must be addressed before the operational hydrologic section can be declared complete and accurate:

1. C-25 appears on Map 23E-1 and in Appendix D but the design is not summarized in Table 13-11."

Response:

The data presented for culvert C-24 in Table 13-11 is the data applicable to culvert C-25. "C-24" in Table 13-11 was a typographical error. It should have been "C-25". Culvert C-24 is a undisturbed area culvert which is addressed in Table 13-12. Therefore, attached is replacement Table 13-11 with the typographical error corrected.

Mr. Johnson also indicated in the analysis portion of the comment that reference is made to culverts C-26, C-27, and C-28 in the calculations that were to be added to Exhibit 13, Appendix D, and that these culverts are referred to as culverts CGC-10, CGC-9, and CGC-11, respectively in the text and on the maps. These culverts were originally numbered C-26 through C-28 and just prior to submittal the numbers were changed to CGC-10, CGC-9, and CGC-11. The number designations were changed in the written calculations but apparently not in the spreadsheets accompanying the written calculations. Therefore, please find attached replacement Sheets 11, 13, and 15 which have been corrected for the proper designation.

Comment: "The following deficiencies exist in the rail road relocation pond amendment. These deficiencies must be addressed prior to approval and final review of the amendment.

1. Map 15 still shows Pond 003 though it looks as if they attempted to remove it.

2. Map 16 is unreadable. It needs to either be in the original colors or completely reformatted to show all features clearly.

3. Map 18B has also been changed from a color-format and is now unreadable."

Response:

Map 15 has been modified to delete reference to Pond 003. Revised copies of the map are attached.

As discussed with Mr. Johnson, our draftsman will modify each of the original Map 16 drawings at the UDOGM office such that the modifications will be on the original colored copies.

Map 18B has been reproduced in its original colored format. Attached are the revised copies of the map.

MR. PETER HESS LETTER

Comment: "In a letter from Mr. Brad Price, P.E., of RB&G Engineering, Mr. Price recommends that the eastern cut slope of pond 12B be redesigned from the 1.5/1 slope to a 2/1 slope in order to provide for an increased factor of safety. If the 1.5/1 slope is to be retained, the design must indicate that the slope will be over excavated, and a 6 foot thick horizontal thickness of sandy gravel be placed and compacted to attain a safety factor of 1.3. Although Mr. Barton, P.E., has certified map 26B, cross section A still shows the eastern cut slope of Pond B to be at the 1.5/1 slope. I have difficulty understanding why the expense of a geotechnical investigation was absorbed if the recommendations are not heeded by Mr. Barton."

Response:

According to Mr. Barton, the recommendations of RB&G Engineering have always been included in the design and are to be followed in construction. Separate construction documents have already been prepared for use (upon permit approval) in the field that ensure compliance with these requirements. In our attempt to expedite submission of the permit modifications, the detail containing RB&G's recommendation was inadvertently omitted from Map 26B.

Subsequent to the submittal, RB&G evaluated a third alternative associated with the 1.5:1 slope. This alternative will be followed during construction. This third alternative allows for over-excavation of the slope and then tapering the recommended layer of sandy gravel from 6 feet at the base to 2 feet at a height of 8.5 feet above the base. Attached please find the RB&G letter and accompanying calculations that address this third alternative. These are to be included in Appendix A-6 of Exhibit 13. Also please find attached revised pages EX 13-63 and EX 13-63A for the text of Exhibit 13 that reflect the discussion of this alternative.

Section D has been added to Map 26B that reflects RB&G's recommendations. Copies of this revised map are attached.

Comment: "The computer model using the Spencer Method to show the stability analysis is considered to be a satisfactory method for solving limiting equilibrium problems. Three computer runs have been made, all considering the pond to be full. The runs considered a 1.5/1 slope with loose coal refuse, a 2/1 slope, and a 1.5/1 slope with compacted gravel. The first page of each run indicates that **the results of computations performed using this computer program should not be used for design purposes unless they have been verified by <u>independent analysis</u>, experimental data, or field experience."**

If an independent analysis, (or any combination of the three) has been performed, where is the documentation to back up this design?"

Response:

Attached is a letter from RB&G Engineering dated October 28, 1996 which addresses this concern. According to RB&G:

> "Spencer's procedure was developed in 1967. Dr. Stephen G. Wright developed UTEXAS in 1984 and UTEXAS2 in 1985. UTEXAS2 permits the user to select Spencer's procedure, Simplified Bishop's procedure, the Corps of Engineers Modified Swedish procedure, or the force equilibrium procedure with Lowe and Karaifath's side-force equilibrium for computing

the factor of safety. The computer programs are tools which must be used in conjunction with engineering judgement to be effective.

RB&G Engineering has used UTEXAS2 for slope stability analysis on a routine basis since 1985. We have concluded that Spencer's method is the preferred procedure for modeling field conditions. The accuracy of the computer program is only as good as the input data. Based upon our experience, we have recognized the importance of defining the subsurface and embankment characteristics prior to performing analysis.

As a consequence, no analyses are performed without generating cross sections based upon field and laboratory testing and engineering judgement. This procedure was followed in performing the analysis for Pond 12B, as outlined in the September correspondence. The final computer runs are the results of several trial runs and represent our judgement of the most realistic conditions, based upon the results of field and laboratory data and our experience."

Comment: "Regarding the Hilfiker retaining wall design from Geotechnical Design Services, has Mr. Barton chosen not to heed the recommendation that the foundations for the Hilfiker wall be excavated and backfilled with compacted granular material? No mention is made of this on drawing 26B, Sedimentation Pond 12B."

Response:

According to Mr. Barton, CEntry intends to construct the retaining walls in strict accordance with the requirements of the geotechnical recommendations. Over excavation of loose and unsuitable foundation materials, and the removal of deleterious materials from the wall foundations is essential. Field personnel, including the earthwork sub-contractor will have copies of the geotechnical report. In addition, CEntry has now modified the permit drawing (Map 26B) to incorporate the geotechnical requirements for clarity. In our attempt to expedite submission of the permit modifications, the information containing RB&G's recommendation was inadvertently omitted from Map 26B. Note 3 has been added to the top of Map 26B that reflects RB&G's recommendation. Copies of this revised map are attached.

MR. RANDY HARDEN MEMORANDUM

Comment: "As stated in the plan in section 4.2.3.1, Pond Embankment Stability Evaluation, the requirements based on the RB&G Engineering report are that the pond be over excavated and that the slope materials be replaced at least 6 feet horizontally with suitable material. This alternative was selected over reduction of the slope from 1.5:1 to 2:1 due to the areal constraints of the facilities surrounding the pond. Map 26B does not indicate that this will be accomplished during construction. Map 26B should be revised to clearly indicate the extent of over-excavation and replacement of materials to occur in those areas necessary to maintain a minimum factor of safety for the inslopes of the pond embankment and over-excavation necessary for foundation preparation for the embankments."

Response:

See the response to the first comment in the Mr. Peter Hess letter.

Comment: "Design assumptions used in determination of embankment stability were based on steady state (pond full) conditions. These analyses should also consider embankment conditions during rapid drawdown (pond empty w/saturated embankments) and show that under these conditions, a minimum factor of safety of 1.1 can be achieved."

Response:

It should be noted that the lowest level to which the pond can drain via the outlet works to the pond is elevation 6095.3 feet. This is the elevation of the proposed decant pipes, which consist of three 2-inch diameter pipes connected into the primary spillway standpipe (see Map 26B). The invert elevation of the primary spillway is 6099.5 feet. The 10-year 24-hour event was routed through the pond, the results of which are already contained in Appendix A-3 "Modeling for Sediment Ponds 12A and 12B" of Exhibit 13. Based on these calculations it requires 3 plus days to dewater the pond (via the three decant pipes) down to the elevation of the decant pipes. Dewatering of the ponds below elevation 6095.3 feet is via evaporation and seepage losses.

Therefore, under these circumstances, it is not possible to have a "rapid draw-down" condition, and it is highly unlikely that the pond walls will be saturated when the pond is empty.

Attached is a letter from RB&G Engineering dated October 28, 1996 which also addresses this concern. According to RB&G:

> "It is our understanding that a rapid drawdown condition is unlikely for the sediment pond since drainage of the pond will either be from seepage loses or from two 2-inch drain pipes. Since the embankment materials consist of granular coal refuse and granular soils, we do not believe that pore pressures will develop in the embankment from the pond full to pond empty state. It will be observed from Figure 1 of the October 8 correspondence (figure attached) that a saturated unit weight has been used below the high water level and that the strength parameters have been reduced for the loose coal refuse below high water. The reduction in friction angle from 33° to 30° is considered to be conservative. An additional analysis has been performed using the saturated assumptions and varying the phreatic surface from pond empty with the water level at the base of the pond to pond drained. We believe that placing the phreatic surface at the base of the pond represents a worse case rapid drawdown condition. A factor of safety of 1.16 was obtained for the saturated embankment with the water level at the base of pond, increasing to 1.52 with the pond drained. Copies of the analysis are enclosed."

The letter from RB&G is to be added to Appendix A-6 of Exhibit 13.

Comment: "Additional concerns regarding the embankment stability of the northern inslopes of the pond are also apparent regarding ground vibration from trucks and trains on either side of the pond itself. Seismic evaluation of the embankment should be conducted based on ground velocities generated from truck and train traffic adjacent to the pond."

Response:

Attached is a letter from RB&G Engineering dated October 28, 1996 which also addresses this concern. According to RB&G:

"Reference is made to a report published by the Earthquake Engineering Research Center at the University of California at Berkeley. The report is entitled "Liquefaction Potential of Sand Deposits Under Low Levels of Excitation" by David P. Carter and H. Bolton Seed, Report No. UCB/EERC88/11, August 1988. Chapters 4 and 5, "Measurement of Ground Vibration Amplitudes Produced by Trains", and "Liquefaction Potential of Train Induced Ground Vibrations", address this concern. The authors were concerned that "the belief that ground vibrations produced by trains have caused large-scale liquefaction failures appears to be inconsistent with the relatively small amplitudes (of the train-induced ground vibration records) that are reported in the literature." Measurements of train-induced ground vibrations were taken as part of the study. 24 sets of records were recorded at a number of sites and at different distances from the tracks. The records were obtained for 4 passenger trains and 20 freight trains. The engines produced significantly higher amplitudes than the cars. Figures 4.4 and 4.6 (enclosed herewith) show the peak particle acceleration and peak particle velocity as a function of the distance from the nearest rail. These values are higher than previously reported values.

The liquefaction potentials were evaluated by both the shear stress approach and the shear strain approach. In section 5.6, Summary, the authors conclude:

> The liquefaction potentials of level loose sand sites subjected to train induced ground vibrations, for example, were evaluated by following both the shear strain and the shear stress approaches and since the levels of cyclic shear strain, predicted to be generated within the level sites that were analyzed, were only slightly greater in magnitude than the threshold strains for most sands, it seemed reasonable to conclude that the ground vibrations generated by trains are probably incapable of liquefying sands at distances greater than about 10 ft from the nearest rail; analyses were not performed at distances closer than 10 ft from the rail.
>
> The same general conclusion was also reached for those level sites analyzed using the shear stress approach. However while none of the shear strain analyses predicted that these sites would liquefy at distances beyond 10 ft from the tracks (see Figure 5.29), analyses using the shear stress approach indicated that liquefaction might occur up to distances of about 20 ft from the track under certain site conditions (Figure 5.30). Because the water tables at most sand sites probably lie more than 3 ft below the ground surface and the sands at all sites have almost certainly been subjected to

thousands of cycles of prior shaking, most level sand sites are not predicted to liquefy at distances greater than about 10 ft from the tracks as shown in Figure 5.31.

Figure 5.30 referred to above assumes the groundwater at the ground surface. Figure 5.31 (enclosed herewith), assumes the groundwater level to be greater than 3 feet below the surface. It will be observed that liquefaction is not predicted to occur beyond a distance of 10 feet from the nearest rail. It will be observed from the attached figure that the edge of the Retaining Wall is 10 feet in from the edge of the nearest railroad track, with the slope containing the loose coal refuse east of the wall. It is essential that the loose fill and refuse to be removed from the foundation area supporting the wall as recommended in the September 20 correspondence. .Seed and Carter also investigated road traffic as a non--seismic source to induce liquefaction. It was concluded that the ground vibrations generated by fully loaded trucks were probably incapable of inducing large-scale liquefaction failures. They cited the maximum particle velocity reported by Ames et al to be about 0.056 inches/sec at a distance of 17 feet from a fully-loaded fill haul truck traveling over San Francisco Bay Fill.

Based upon our review of information outlined above, and a comparison of the conditions considered in the report to those conditions at Pond 12B, we do not believe there to be a liquefaction problem from the truck or train traffic."

Comment: "The plan further indicates that the material used to backfill the Hilfiker retaining wall is normally free-draining material. Where the pond embankment abuts the retaining wall, the material adjacent to the wall has been sized to prevent excessive seepage from occurring. The Hilfiker retaining wall will become the southern embankment for the sediment pond. Based on the characterization of the materials described as fill materials for the Hilfiker embankment, it appears that excessive pond seepage may occur through the retaining wall itself. This presents concern regarding stability of the Hilfiker embankment should saturation of the embankment occur from the pond, as well as excessive seepage and water loss from the pond through the Hilfiker embankment. Their concerns need to be evaluated and discussed further in the proposal prior to approval."

Response:

Attached is a letter from Geotechnical Design Services, Inc. addressing this comment. This letter is to be included in Appendix A-6 of Exhibit 13. In response to this comment, Mr. Jerold A. Bishop of Geotechnical Design Services, Inc., indicates the following:

"In response to this concern I would indicate that the reinforcing for this wall is adequately designed for the additional saturated unit weight which may occur from time to time as such saturation occurs. With the seepage occurring from the front, there will be no buildup of hydrostatic forces against the back of the wall, and the external stability of the wall is not a concern. Therefore, with proper construction, the wall's structural stability is not expected to be degraded at any time by seepage.

With respect to seepage loss, a simplified streamtube analysis indicates that total flow through the length of the embankment will be on the order of 0.1±gpm; such seepage loss is not considered to be of concern. This is based upon a continuous 3 feet of head throughout the year (unlikely) and an assumed permeability of 100 feet per year (probably high considering the material gradation).

Based on these considerations, the concerns of UDOGM appear to be adequately addressed by the design. Modifications to the wall design are not recommended by Geotechnical Design Services."

Comment: "Foundation preparation and excavation requirements for the removal of unsuitable materials and sewage and water lines should also be provided in the construction details for the pond excavation. More detail needs to be provided in the text of the plan and on the drawings regarding foundation preparation and construction of the Hilfiker embankment. Appendix A-6 provides recommended details and design information, but the plan is inadequate in describing specifically which methods will be utilized during actual construction."

Response:

See the response to the third comment in the Mr. Peter Hess letter.

If there are any additional questions regarding our responses to the UDOGM comments as presented herein, please call.

Sincerely,

HANSEN, ALLEN & LUCE, INC.

Marvin E. Allen, P.E.
Principal

Attachments

cc: Mr. Steve Johnson, UDOGM - SLC
Mr. Randy Harden, UDOGM - SLC