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40-3453/PJG/82/06/28/0

JUN 30 1982

WMUR:PJG
Docket No. 40-3453

MEMORANDUM FOR: Docket File No. 40-3453

FROM: Peter J. Garcia, Jr., Project Manager
Operating Facility Section II, WMUR

SUBJECT: ATLAS TAILINGS DAM RAISE, SUA-917, AMENDMENT NO. 7

1.0 Background

By letter dated March 21, 1978 and accompanying submittals, Atlas Minerals requested authorization for a 36 foot raise to the tailings embankment system at the Moab Mill. Based on staff concerns regarding safety and reclamation aspects of the proposed total raise, the staff authorized a six foot raise by amendment dated July 25, 1978. Atlas then provided a revised proposal for a single 12 foot lift. The staff authorized an additional 12 foot raise to the embankment system by amendment dated October 29, 1979.

By letter dated July 10, 1981, Atlas requested authorization to construct the final 18 foot lift to the embankment system. This request was accompanied by reports addressing NRC concerns.

2.0 Scope of Review

The staff has reviewed the environmental, safety, and reclamation aspects of the proposed raise. The list of reports reviewed by the staff and technical consultant Geotechnical Engineers, Inc. (GEI) concerning the proposed lift is presented in the appendix to this document.

3.0 Environmental Review

The review of environmental impacts associated with the proposed raise is described in the "Final Environmental Statement Related to Operation of Moab Uranium Mill" (FES, NUREG-0453) dated January, 1979. License conditions resulting from conclusions in the FES were incorporated into Atlas' license as renewed on April 24, 1979.

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4.0 Safety Review

4.1 Stability Review

The stability review performed by technical consultant GEI is documented in a report entitled "Safety Evaluation Report, Proposed 18-Foot Raise, Atlas Minerals Tailings Pond, Moab, Utah" dated June 28, 1982 (attached). This review was performed to assure that the proposed design is in accordance with Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills." Conclusions from the GEI report are as follows:

(1) The static stability of the proposed raise meets all the criteria of Regulatory Guide 3.11.

(2) The licensee has performed acceptable analyses regarding liquefaction and seismic stability aspects of the proposed raise and concluded that the raise meets the criteria of Regulatory Guide 3.11.

(3) Additional field and laboratory testing should be performed to verify the validity of certain assumptions and soil strength values used in the analyses. Specific recommendations are provided in Section 13 of the GEI report.

(4) Drainage berms should be installed over existing seepage areas on the embankment. This will provide protection against possible piping or surface erosion.

(5) The proposed requirements for maintainence of six feet of freeboard and 150 feet of tailings beach are in accordance with hydrological criteria in Regulatory Guide 3.11.

The reasons for verification of certain assumptions and soil strength values are discussed below. The licensee's liquefaction analysis was based on standard penetration test blowcounts and soil samples from borings taken downstream of the proposed final crest. Thus, because it is an upstream lift, soils underneath the proposed final crest were not evaluated. The licensee's liquefaction analysis assumed that all soils underlying the final embankment had strength values equivalent to those of soils under the crest of the existing dam. GEI recommended and the staff concurs that the licensee should be required to do some additional

field and laboratory testing to confirm and verify the overall assumption that the soils are equivalent.

The licensee's seismic stability analysis used peak shear strengths. GEI in their report pointed out that post-peak strengths may be less than peak strength. Consequently, GEI recommended that it would be prudent to do some additional tests to verify the strength values used in the licensee's analysis. The staff concurs with GEI's recommendation.

Some clarification is warranted regarding the overall quality of the analyses performed by the licensee and the specific recommendations made by GEI. Liquefaction and potential seismic instability are only concerns in the event of a large magnitude, low probability earthquake. The licensee's analyses used a conservatively large earthquake with a recurrence interval of 500 years. The additional field testing recommended by GEI would provide nothing more than verification regarding the liquefaction potential and seismic stability of the existing embankment and also the proposed raise. The staff concludes that the factor of safety of 1.18 calculated by the licensee for the originally proposed 36 foot raise is not significantly lower than that for the embankment following the initial six foot raise (1.30). This compares with the factor of safety of 1.0 specified in Regulatory Guide 3.11 for seismic stability.

If the values obtained in the prescribed additional field and laboratory testing program are lower than those used in the licensee's analyses, the staff will require that the licensee repeat these analyses to more accurately determine the effect of the lower values on the overall factors of safety for the embankment.

4.2 Review of Embankment Inspection Program

Atlas has proposed an embankment inspection program which is generally equivalent to that specified in Regulatory Guide 3.11.1 "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings." The only exception is that Atlas' proposed program did not include a yearly technical evaluation of embankment performance. The staff will therefore require that a technical evaluation be performed and submitted for NRC review annually. In addition, the staff will require that Atlas maintain embankment piezometer and pond level readings in graphical form to facilitate data review.

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4.3 Construction Quality Control

The licensee did not provide adequate information regarding frequencies for quality control testing. GEI has therefore provided recommendations for testing frequencies in Section 13 of their report. The staff feels the recommendations are reasonable and will require that they be implemented.

5.0 Reclamation Review

The staff has reviewed Atlas' proposed reclamation plan. The review is documented by memorandum from P. Garcia to Docket No. 40-3453 dated June 29, 1982. The review concluded that the reclamation plan proposed by Atlas is acceptable.

The staff will therefore require that reclamation of the tailings pile be as proposed by Atlas, and that NRC-approved surety be established by January 1, 1983 to cover all reclamation and decommissioning costs.

6.0 Conclusion

Based on the reviews discussed above, the staff recommends that Source Material License SUA-917 be amended to authorize the raise of the tailings embankment system to elevation 4076 feet by revising Condition Nos. 19, 22, and 24 and adding Condition No. 52 to read as follows:

19. (A) Construction of the tailings embankment to elevation 4076 feet shall be in accordance with Appendix B of the submittal "Report of Stability Analyses, 18-Foot Raise of Tailings Embankment to Elevation 4076 Feet, Moab, Utah, for Atlas Minerals" dated June 4, 1981, with the following exceptions:

    (1) Quality control tests shall be performed at the frequencies specified below (ASTM Standard Methods):

        (a) Compaction test, D-698 - At least five full tests prior to construction using a range of representative borrow soils followed by one-point tests at a frequency of at least one per 5000 cubic yards of fill placed. The family of curves developed from the full compaction tests shall be used in evaluating one-point test data.

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(b) Gradation test, D-422 - At least one test per 5,000 cubic yards of fill placed.

(c) Nuclear moisture and density tests D-3017 and D-2922, respectively - At least one test per 2,500 cubic yards of fill placed.

(d) Conventional moisture and density tests D-2216 and D-1556, respectively - Calibration of the nuclear tests specified in (c) above shall be performed using the tests specified in this section prior to beginning construction and at least once per 50,000 cubic yards of fill placed thereafter.

(e) Additional gradation testing shall be performed if the gradation of material appears to differ significantly from materials previously tested. If the gradation has changed significantly, a full compaction test shall be performed.

(2) Embankment piezometers shall be read at a weekly frequency during construction and until readings have stabilized. Thereafter, piezometers shall be read on a monthly frequency.

(3) A report describing construction activities and containing the results of all quality control testing specified in (1) above shall be submitted to the Uranium Recovery Licensing Branch within six months of completion of construction.

(B) The licensee shall maintain a minimum of six feet of freeboard and 150 feet of beach between the embankment crest and the ponded liquid.

(C) At least ninety days prior to beginning construction the licensee shall submit to the Uranium Recovery Licensing Branch for review the results of the field and laboratory testing specified below:

(1) At least six additional borings with standard penetration tests shall be drilled at, and toward the pond from, the final embankment crest. Three borings shall be located at

each of two critical sections. The locations shall extend far enough upstream of the crest to investigate all the soils that could affect the embankment stability. The borings shall penetrate at least to the underlying foundation soils.

(2) In the borings described above and in at least two additional borings on the downstream slope, representative undisturbed fixed piston samples shall be obtained for triaxial compression testing. Samples of both the sand tailings and slime tailings at all depths shall be included. The sampling and handling procedures shall be selected to minimize disturbance and densification. Careful field measurements shall be taken to permit determination of the following data:

-inside diameter of tube and inside diameter of cutting edge
-total distance tube is pushed
-gross length of sample recovered
-net sample length after trimming
-distance to sample and/or packer from both ends of tube, before and after handling and transport

(3) Perform consolidated undrained triaxial compression tests to large enough strains to determine post-peak (steady-state) undrained and drained strength parameters for both sand and slime tailings. Perform sufficient tests to determine any variation in strength with distance into the pond, and to define the strength envelopes over the range of consolidation stresses on the failure envelopes. Carefully monitor sample length and density during handling, trimming, and consolidation in the laboratory.

(4) Evaluate liquefaction potential of soils at and upstream of the crest, based on blowcounts and/or cyclic triaxial test results. Include consideration of the plasticity of the soils, if appropriate. If soils are potentially liquefiable, perform additional analyses to determine effect of liquefaction on overall stability of embankments and pond.

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(5) Determine appropriate post-peak undrained strengths for seismic analyses from results of triaxial tests using the lower of the undrained or drained strengths. Include appropriate corrections for the density changes between the soil in situ and the samples as-tested. If the strengths determined from these additional tests are lower than the values used in the analyses, perform additional pseudostatic seismic stability analyses at critical sections.

(D) Drainage berms shall be installed over seepage areas on the embankment prior to construction of the lift. These berms shall be graded to protect against piping of the embankment material.

22. The licensee shall reclaim the Atlas Mill tailings disposal area in accordance with the May 29, 1981 submittal "Report Conceptual Design and Cost Estimate, Tailings Pile Reclamation, Moab, Utah, for Atlas Minerals." In addition, surety arrangements covering the tailings reclamation costs shall be maintained.

24. The licensee shall establish an effective, NRC-approved financial surety arrangement, by January 1, 1983, to cover all costs for mill decommissioning, decontamination, and site reclamation, and maintain these or other NRC-approved arrangements thereafter until this license is terminated by the NRC.

52. The licensee shall implement the embankment inspection program as specified on pages 8-1, 8-2, and 8-3 of their submittal "Response to NRC Requests For Additional Information, Proposed Tailings Embankment Raise, Moab, Utah, for Atlas Minerals," dated May 17, 1982. In addition to the above program, the licensee shall comply with the following:

(1) Embankment piezometer readings and pond elevation readings shall be maintained in graphical form.

(2) An annual technical evaluation of embankment performance, including reviews of all embankment instrumentation data, shall be performed by an individual familiar with the design, construction and operation of embankments. A copy of this annual report shall be submitted to the Uranium Recovery Licensing Branch within one month of completion.

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The issuance of this amendment was discussed via telecon between R. Weaver, Atlas, and myself on June 28, 1982.

Original signed by

Peter J. Garcia, Jr., Project Manager
Operating Facility Section II
Uranium Recovery Licensing Branch
Division of Waste Management

Original signed by

Approved by: _____
H. J. Pettengill, Section Leader
Operating Facility Section II
Uranium Recovery Licensing Branch
Division of Waste Management

Attachment:
1. Appendix - List of Reports Reviewed
2. "Safety Evaluation Report, Proposed 18-Foot Raise Atlas Minerals Tailings Pond, Moab, Utah"

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