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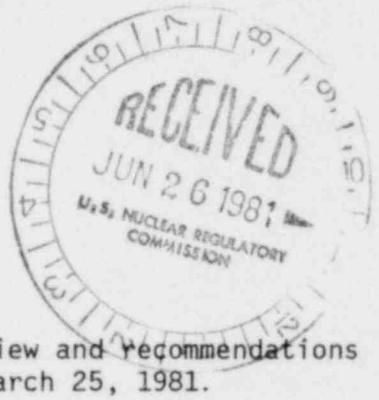

Atlas Minerals
ATTN: Mr. Richard R. Weaver
P.O. Box 1207
Moab, Utah 84532

Gentlemen:

This letter constitutes the results of the NRC staff's review and recommendations pertaining to Atlas' proposal "Groundwater Study", dated March 25, 1981.

Comments and recommendations, relative to the proposed study, are as follows:

1. At this time, we are unable to determine in which direction seepage, if any, is moving away from the tailings pond. Therefore, we recommend that initially wells should be placed on all sides of the pond to define the direction and rate of flow of groundwater and possible seepage. The actual placement of the first wells is somewhat discretionary. However, we do recommend that emphasis be placed on locating wells, at closely spaced intervals, between the pond and the Colorado River.

2. We do not know whether the Colorado River is a recharging stream or a discharging stream, and we do not know whether seepage from the existing tailings pond is moving toward or away from the river or possibly downward to the water table and subsequently in some direction other than toward the river. One possible method that may be helpful in establishing the locat on of initial monitor wells would be to perform a resistivity survey. A resistivity survey could provide valuable information on the direction, orientation and depth of a seepage plume.

3. Since the depth to and characteristics of the bedrock are not known, (i.e., if the bedrock is impermeable, seepage may be confined to the alluvial material above the bedrock and if the bedrock is not impermeable, the seepage may have penetrated to depths below the bedrock surface), wells need to be drilled both to and into bedrock. It is recommended that at least two monitor wells be installed southeast of the tailings pond and perpendicular to the river.

   The first well should be drilled to bedrock approximately halfway between the Colorado River and the toe of the southeast embankment of the pond. During drilling the elevation of the water table should be measured. The depth to bedrock should be measured. The well should be logged with a natural gamma log, a resistance log, an SP log, a caliper log, a gamma gamma log, and a neutron-epithermal-neutron log. The well should be drilled with a mud rotary rig so that the log can be obtained in an open hole. Interpretation of these logs above bedrock will provide an accurate analysis of the hydrostratigraphy at the site. Permeable lenses can be identified for future monitoring. Subsequently, the well should be cased with the casing set in bedrock and allowances made for future slotting of the casing as required by interpretations of the geophysical logs along

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with the well cuttings. It is not sufficient simply to examine well cuttings as they are returned to the surface from drilling. It is not possible to obtain a reliable hydrostratigraphic section using well cuttings alone.

The alternative to the borehole geophysical logging program is to drill the well to bedrock with a hollow-stem auger and extract continuous samples with a shelby tube or a split-spoon sampler. However, this alternative will be difficult to implement if gravels are present as reported in the proposed study document. Gravels tend to plug the openings of split-spoon samplers or shelby tube samplers and prevent the acquisition of reliable undisturbed samples.

On the basis of the information obtained from the geophysical logs, the well cuttings and/or the shelby tube or split-spoon samples, decisions can be made regarding which sections of the casing should be slotted. Subsequently, decisions can be made regarding pump testing of the alluvial aquifer above the bedrock for purposes of defining the migration of the seepage plume. These data can be used also for the design of the remainder of the monitoring wells.

The second well should be drilled with mud rotary in the vicinity of the well described above. The purpose of this well should be to determine the hydrostratigraphy of the bedrock at the site and along with the first well, to establish the lateral hydraulic gradient and the extent of the seepage plume, if one exists, toward the river. This well should be drilled to bedrock and cased. The casing should be installed so as to seal off the alluvial aquifer above the bedrock. Drilling should continue into bedrock until it is determined that the bedrock is either an aquifer, an aquiclude, or an aquitard. Drilling should continue until an aquitard or an aquiclude has been encountered. This should be determined by an experienced hydrogeologist utilizing the geophysical logging techniques described above and observations during drilling. The aquiclude should be completely penetrated or drilled to a depth sufficient to verify the hypothesis that its thickness constitutes a barrier boundary to downward migration of seepage. A thickness of 30 to 40 feet should verify this hypothesis. If a bedrock aquifer exists either above or below a confining layer, the bedrock portion of the well should be designed so that the bedrock aquifer can be sampled separately from the alluvial aquifer.

These two wells should be developed and pumped and a sample withdrawn from each of them and submitted to a laboratory prior to continuation of drilling. It should be possible to utilize the specific electrical conductance, sulfate and pH to determine whether contamination exists in bedrock and whether additional monitor wells in bedrock are necessary.

The elevations of water levels in both wells, after casings have been slotted, should be measured so that the direction of the vertical component of the hydraulic gradient can be determined.

The location and design of additional monitoring wells along the southeast embankment of the impoundment should be based on the aforementioned resistivity survey, if one is conducted, and at the least, on the results of the two wells discussed above.

4. Due to the probability of seepage we recommend the placement of monitor wells around the other sides of the pond as well. A resistivity survey might be used to locate initial monitoring wells on the other sides of the pond. These initial wells should also be designed and constructed according to Item 3 above so that they could also be used for aquifer pump tests, if appropriate. Such aquifer pump tests would provide the necessary hydraulic parameters prerequisite to predicting the size and rate of migration of the contaminated plume, if such a plume exists.

5. All well casing elevations must be determined so that the elevation of the water table in the alluvial aquifer can be contoured. Such a contour map will provide a description of the impact of the tailings pond on the water table and the direction and rate of groundwater movement in the vicinity of the site.

6. Prior to the collection of water quality samples from wells, all wells should be pumped until specific electrical conductance has stabilized during pumping.

7. Water quality samples shall be field filtered and preserved as indicated on Page 3 of the March 25, 1981 proposal, and uranium, vanadium, and gross beta added to the list, and gross gamma deleted. The first set of water quality samples should be sent to a laboratory that follows EPA recommended analytical procedures as well as to Atlas' laboratory, to ensure from the beginning of this study, that Atlas' water quality analysis techniques and data results are correct.

8. Atlas' response dated December 8, 1980 to NRC questions dated October 24 indicated that you were checking into the status of wells A, B, C, and the embar oil well, which are listed as abandoned in table 2.3-4 of the report entitled "Safety Analysis Report," by Dames and Moore. Please indicate whether these wells are plugged and submit any available lithologic and hydrogeologic data on these wells.

The implementation of the aforementioned analytical hydrogeological procedures has become reasonably standard at other sites licensed by the NRC. Such studies, conducted by qualified hydrogeologists, have been successful in delineating contaminated plumes produced by uranium mill tailings ponds that were constructed prior to the implementation of groundwater protection technologies such as clay or synthetic liners. The probability of significant seepage at the Atlas-Moab site is reasonably high. The significance of the occurrence of seepage lies in the fact that seepage may be discharging into the Colorado River either directly southeast of the tailings pond or some

distance downgradient therefrom. If this is the case, a pump back system to intercept seepage prior to its entry into the river may be required. If this is not the case (i.e., if the Colorado River is a losing stream at this location), then it is important to determine in what direction and at what depths the seepage plume is moving.

If you have any questions on our comments, please contact Mr. Pete Garcia of my staff.

Sincerely,

ORIGINAL SIGNED BY

Harry J. Pettengill, Section Leader
Operating Facilities Section II
Uranium Recovery Licensing Branch
Division of Waste Management

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