WM-34

PDR

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 2 1 1979

MEMORANDUM FOR: G. Wayne Kerr, Assistant Director for State Agreements Program, Office of State Programs

FROM: James P. Knight, Assistant Director for Engineering, DSS

SUBJECT: TECHNICAL ASSISTANCE REQUEST (TAC 5331)

PROJECT NAME: Uravan Tailings Retention Project - Union Carbide
RESPONSIBLE BRANCH: Office of State Programs, J. Kendig, Coordinator
REQUESTED COMPLETION DATE FOR INITIAL REVIEW STAGE: November 9, 1979

We have completed our inspection of the retention dams at the Uravan site in fulfillment of your technical assistance request. The review items covered in my October 25, 1979 memorandum to you have been addressed in the attached inspection report prepared by Mr. J. D. Kane of my staff.

Our inspection has revealed alarming signs of retention dam instability. The timely completion of the work contained in the recommendations of the attached inspection report is of major significance because these dams have been constructed immediately upstream from the mining town of Uravan and the safety of the residents of Uravan should be considered as a major concern.

The limited manpower available in the Geosciences Branch makes it very difficult to immediately undertake the unscheduled safety review indicated in the attached report. A possible alternative would be to enlist the services of a Contractor such as Geotechnical Engineers, Inc. Geotechnical Engineers, Inc. has an existing contract with NMSS to review Union Carbide's long term reclamation plans and this firm did have a representative participate in the October 30, 1979 inspection. Since it was indicated at the October 30, 1979 meeting that definite reclamation plans have not yet been finalized by Union Carbide, it would appear that Geotechnical Engineers, Inc. would be in a favorable position to undertake the immediate safety review. Staff members from the Geosciences Branch will be made available to provide the immediate assistance needed to guide a Contractor in the interpretation of R.G. 3.11 and 3.11.1 and on NRC dam safety criteria. We recommend that you take immediate steps to employ

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Geotechnical Engineers, Inc. or a similar firm to implement the proposed program, and that you inform the state of Colorado of the results and recommendations of our review. We request your direction for further action concerning the Uravan project.

James P. Knight, Assistant Director
for Engineering
Division of Systems Safety

Enclosure:
As stated

cc: w/enclosure
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URAVAN URANIUM PROJECT
UNION CARBIDE CORPORATION
SITE INSPECTION REPORT AND RECOMMENDATIONS ON DAM SAFETY
PREPARED BY: Joseph D. Kane, P.E., Geotechnical Engineering Section
GB, DSS, NRR

Introduction

The Office of State Programs in an October 9, 1979 memorandum (G. Kerr to J. Knight) requested technical assistance from NRR in assessing the stability problem observed on the uranium mill tailings retention embankment at the Uravan project in Montrose County, Colorado. A meeting at the Uravan project site was held on October 30, 1979 between Union Carbide Corporation and their consultants, Acres American, Inc. and the staff from the State of Colorado and the NRC with their consultants. Attending representatives are noted on the enclosed list.

Inspection Observations

The uranium mill tailings are currently retained in two disposal areas at the Uravan site. The areas which have been identified as ponds 2 and 3 have been developed by incrementally raising the retaining dam embankment by the upstream method of construction. The approximate top elevation of pond 2 retention dam is Elevation 5488 and Elevation 5531 for pond 3. The maximum heights that have been reached in these retention dams are significant and are approximately 140 feet high at pond 2 and 105 feet high at pond 3. Both ponds 2 and 3 have been constructed on high ground approximately 900 feet west of the mining town of Uravan. The town is founded about 500 ft below the dams at approximately Elevation 5000 along the San Miguel River.

At the time of our inspection, no liquid or tailings were being discharged into pond 2 and the existing liquid surface was several hundred feet back into the basin from the dam crest. Inactive dozers were parked along the northern top perimeter of pond 2 with visible signs of past construction activity. Previously deposited sand beach material had been pushed towards the crest to begin the next dam raise that was to be approximately 8 feet in height. Tailings slurry was being discharged at the western corner of pond 3, but the depth of liquids appeared small and at large distances from the existing dam crest.

We inspected the reported problem areas of sloughing on the downstream slope of pond 2. Two separate areas of embankment instability were observed. In one area, a portion of the downstream slope, which measured approximately 80 foot wide at the intermediate berm level located at approximately Elevation 5415, had slid towards the downstream toe. The slide widened to approximately 200 foot wide at the toe near Elevation 5360. Visible signs of seepage on the downstream face were evident at elevations just below the berm which had been destroyed in the slide. Embankment and uncovered foundation materials in and adjacent to the slide area at the downstream toe were observed to be very wet and soft. There were indications of flow under pressure in the toe area as reflected by bubbling air in the seepage water. Based on visual inspection, the stability of pond 2 retention dam appeared precarious. Construction work to stabilize the sloughed area

had been started with the placement of the gravelly drainage fill over a filter fabric designated MIRAFI 500X. This remedial work was being performed just downstream of the toe and had not yet progressed up the dam face.

A second area of slope instability had occurred approximately 400 feet southwest of the first slide. The lower slope portion of the sludge pond, which is located at the base of pond 2 embankment, had also experienced a slide. The width of the slide was visually estimated to be 30 feet at the top and 150 feet wide at the base. Indications of seepage in the higher portions of the approximately 45 foot high slide was visible. Remedial work to stabilize this second slide area had not started.

Our visual inspection of pond 3 retention dam did not reveal obvious areas of instability. Seepage was being emitted on the downstream slope and resulting in a gradual wetting and softening of the slope face and toe area. Measures to stabilize the base of pond 3 embankment slope are currently scheduled to begin in the spring of 1980.

Meeting Discussion

1. Planned Stabilization Program. Union Carbide plans to stabilize ponds 2 and 3 retention dams in two phases. Phase I is essentially limited to the slope areas where the slides have already occurred. It is hoped by Union Carbide that weather conditions and material availability will permit this work to be completed by the end of 1979. Phase II work is to be completed in 1980 along the embankments of ponds 2 and 3 which were not stabilized under Phase I work. The intent of Union Carbide in completing the stabilization work is to produce a retention dam section with an adequate margin of safety to meet the provisions of R. C. 3.11 during the next 3 to 5 years of operation.

The construction to be performed in the stabilization program is essentially the same slope treatment for both Phase I and II. The treatment consists of laying a filter fabric over the lower downstream slope portion of the tailings embankment, placing a 5 foot minimum thickness gravelly drainage fill on top of the fabric and then constructing an outer zone of mine waste rock. The toe berm thus formed is intended to control seepage in the downstream slope and add weight at the toe for resisting potential embankment slides.

2. Filter Fabric and Gravelly Drainage Fill. The coarser portion of the specified gradation range for the drainage fill permits a material which is too coarse and prevents this granular material from meeting normal filter criteria. To compensate for this deficiency, the filter fabric is being used. There are concerns with the long term permeability and chemical stability of the proposed filter fabric, particularly in face of the highly acidic environment in which it is expected to function. Documentation that addresses tnese concerns is to be provided by Union Carbide to the State. Union Carbide agreed to consider modifications to the processing and washing of the drainage fill, including the blending of a sand material to produce a material that would meet filter criteria.

Union Carbide asked if our concern for the filter fabric requires the stopping of current stabilization work. In recognition of the existing instability of pond 2 embankment and the threat of approaching severe winter conditions which could stop stabilization work, it was indicated that construction should continue on a priority basis. Early resolution of our concern for the filter fabric and for possible modification in processing the drainage fill material was urged. In the meantime, the filter fabric could be placed in the downstream toe area but should not be extended up the slope face.

3. Environmental Report. Questions with regard to the August 31, 1978 Environmental Report for the Uravan Uranium Project were discussed and included the following:

a. The applicability of the submitted liquefaction analysis that is based on blow counts. The design approach used was developed for conditions of level ground and for clean sands which is significantly different from the conditions at the Uravan site.

b. The apparent omission of soft slimes of low strength when assessing the static stability of the retention dams.

c. The unacceptable practice of recovering and testing supposedly "undisturbed" samples of loose material that were obtained by driving the sampler with a hammer.

d. A seismic analysis that incorrectly used the drained shear strengths for the soil. Discussions centered on the more appropriate consolidated - undrained triaxial shear test and applicable NRC Regulatory Guides (R.G. 1.132 and 1.138).

e. The basis for and the appropriateness of the adopted design earthquake that has a 200-year recurrence interval. This is considered a significant reduction in safety from the provisions of Regulatory Guide 3.11.

f. The correctness of the highest phreatic surface used in stability studies. Field observations would indicate that seepage lines within the embankment have already developed at higher elevations those those surfaces assumed in the stability studies.

Acres American indicated that many of the above items have been addressed in more recent work and reports completed by their firm. Union Carbide responded to our request for these documents by indicating the reports would be made available to the State of Colorado upon receipt of a formal written request.

Recommendations

Items 1 through 3 of the following recommendations were discussed at the October 30, 1979 meeting. The recommendations which have been added (Items 4 through 6) are considered necessary for attaining a reasonable degree of safety during the remaining years of operations at the Uravan site.

1. Discharge of liquid or tailings into pond 2 area should be restricted until Phase I stabilization work is completed. Inspection of the completed work should be performed by the responsible governmental agency before pond 2 is authorized for additional tailings retention.

2. The applicant should be required to submit for approval information which demonstrates the chemical stability and permeability of the proposed filter fabric. A change in the specific gradation limits of the free draining granular fill would be preferable in place of the filter fabric, if the changed gradational limits of the granular fill resulted in meeting filter criteria. To meet construction schedules this information from Union Carbide should be submitted for evaluation not later than November 23, 1979.

3. A sufficient number of copies of the work completed by Acres American (on dam stability, subsurface explorations, laboratory testing, embankment monitoring records, etc.) should be provided to the State of Colorado and the NRC to allow for a timely review and safety evaluation.

4. We recommend that the NRC offer technical assistance to the State of Colorado for assessing the overall stability of the retention dams for ponds 2 and 3. This assessment should check for conformance with the guidelines of Regulatory Guides 3.11 and 3.11.1. A detailed safety evaluation on dam stability should begin now and determine the adequacy of Phase I and II work in providing a reasonable margin of safety for both the remaining years of operation and for long term reclamation requirements. An important feature of this safety evaluation would be to assure that needed stabilization measures are completed before the use of a specific basin area is authorized.

5. Important operational procedures concerning the maintenance of sand beaches and minimum freeboard heights that are discussed on page B-34 of the August 31, 1978 Environmental Report should be made license conditions.

6. A license condition controlling the operation of liquid and tailings discharge from the dam crest should be required. To avoid raising the upper phreatic surface within the embankment to levels above those assumed in dam stability studies, the piezometers closest to the point of tailings discharge should be recorded at least every other day during spigoting operations. If recorded piezometric levels indicate elevations higher than those assumed in stability studies, the tailings discharge operation should be immediately stopped and the discharging operations should be moved to locations where piezometric levels had not been influenced by the previous spigoting operation.

Attendance List

Meeting on Uravan Project - October 30, 1979

Name	Representing
J. F. Frost	Union Carbide Corp.
P. C. Rekemeyer	" " "
G. L. Schierman	" " "
D. T. Narducci	" " "
R. K. Jones	" " "
J. D. Gill	Acres American, Inc.
R. Junge	Colorado Geological Survey
L. S. Person	NRC, NMSS
J. D. Nelson	Col. State Univ., NMSS Consultant
G. Castro	Geotech. Engr. Inc., NMSS Consultant
J. Kane	NRC, NRR, Assisting OSP