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## Congress of the United States House of Representatives

November 2, 1995

Mr. Bruce Cosgrove  
Auburn Dam Council  
601 Lincoln Way  
Auburn, CA 95603-

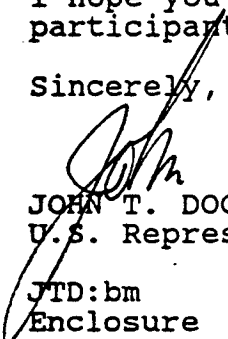
Dear Bruce:

As we begin to reach a better understanding and agreement on the goal of a multipurpose Auburn Dam for flood protection and water supply in the region, I thought it important to share with you expert testimony provided recently regarding dam safety issues at Auburn.

The testimony, provided by Mr. Vern Persson, the Chief of California's Division of Safety of Dams, focuses on the risk and frequency of seismic activity at the Auburn damsite. I think you'll find Mr. Persson's testimony -- backed by 18 years of experience as a structural and geotechnical engineer -- quite informative.

On Thursday, November 9, at 6:00 p.m., at Sacramento City Hall, the Sacramento Area Flood Control Agency is set to consider the stageable Auburn Dam as its preferred alternative to help remedy Sacramento's flooding problems. I hope you will make every effort to be an active participant in that debate.

Sincerely,

  
JOHN T. DOOLITTLE  
U.S. Representative

JTD:bm  
Enclosure

**THE RECLAMATION BOARD  
Regular Meeting  
October 12, 1995**

**Summary of Comments Made by  
Vern Persson,\* Chief, Division of Safety of Dams  
California Department of Water Resources**

Good morning, President Stearns and Board Members and staff.

I currently manage the Division of Safety of Dams for the Department of Water Resources and I have been doing that type of work for the last eighteen years. Prior to that, I helped build The State Water Project and prior to that a few bridges in California.

I am a Civil Engineer, a graduate of the University of Nebraska. I have title authority as a Structural Engineer and as a Geotechnical Engineer, and had the privilege in the late 1970s of managing the State seismic review of the original Auburn Dam. I was asked to come here this morning to speak on the two subjects that were identified earlier, and I would speak first on the seismic safety of the site.

During the studies in the late 70s and 1980, we engaged professional consultants of great reputation, including George Housner and Bruce Bolt, whom you have probably heard of, and that panel studied all of the work that was accomplished at the site by the U.S. Bureau of Reclamation and their consultants. The panel also took and heard testimony from various other significant agencies in that process; and after hearing all that testimony and spending several years looking at the problem, our consultants determined that a safe dam could be built at the Auburn site. Our consultants offered site criteria to the Department of Interior in 1978 and 1979, and that criteria was accepted by Interior in 1980.

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\* Please see page 5 for additional comments made by Mr. Persson later in the meeting in response to comments made by other speakers.

That criteria, briefly stated, is that any dam that is developed at the site should be capable of withstanding a peak bed rock acceleration of six tenths g (60% gravity) and that there should be provisions in the design for offset on a number of features in the foundation of the dam. That offset could occur on any one of the features or be distributed over several features. Those features are faults and TALC zones, the total offset required was five inches.

As in the case in many things we do, there wasn't total agreement as to the amount of displacement and our California Division of Mines and Geology recommended that value be three quarters of a foot. CDMG's recommendation was made known to Interior and the criteria accepted by Interior in 1980 included the three quarters of a foot offset.

And so that work, in geologic time, is still relatively quite good. I might speak to the limiting parameters of that study. The USBR was looking, at that time, for any movement in those fault systems that might have occurred within the past 100,000 years as a seismic source. That is very conservative criteria.

The foothill fault system includes the features that I spoke of earlier, this system is not considered a highly seismic area, not nearly as active as the zones along the San Andreas and San Jacinto faults and other major faults along the coast and in Southern California.

The creep rate on the foothills system is very low compared to the San Andreas segments which is moving centimeters per year. Creep on the foothills system is not even detectable as far as that is concerned.

There is a mountain a building, I'm not a geologist, but there is a mountain building activity going on in the Sierras and has been for a long time. There is a slight upthrusting of the Sierras and that will continue.

We recently met on a number of occasions with the Corps of Engineers who at this time are identified as the designer and builder of the alternative which includes Auburn Dam. DSOD has been assured that USCOE are following the criteria that has been established for that site. They are in a feasibility phase so they haven't developed

all the details for final design, but we feel confident those details will meet our requirements and that our role in reviewing those plans and specifications under a new regulation we have developed with the U.S. Army Corps of Engineers will assure this. The regulation pertains to when the Corps designs, builds, and then transfers a dam or a project to local control. We have developed a regulation with the Corps' South Pacific Division that allows us access to the design and to the construction of such facilities. And we currently are doing this at the Seven Oaks Dam on the Santa Ana River where we have been involved in reviewing the designs and the construction processes for this type of a dam.

So even though in our California statutes we do not have primary authority over the Federal Government, those provisions contained in the regulation developed with the South Pacific Division will allow us to assure the State and its citizens that the dam is safe at time of transfer.

So that's basically it; I might point out that our activity in reviewing these projects is very detailed. We look at the geology, we look at the site, we look at the foundation, we look at all of the parameters, and all the forces that might affect the safety of the dam. DSOD does a detailed review of all the studies that are presented and relied upon in those designs. After approval, we then monitor construction to see that the plans and specifications we approved are executed in the field. We inspect jurisdictional facilities on a frequency that we hope to be annual, or greater for a dam like Auburn, and we supervise the owner's control of the dam including how well they do with their operation and maintenance of the facility. So, we basically are with a jurisdictional dam from the time it is thought of until the time it is removed. We feel, in conclusion, that the safety of Auburn Dam is assured at this site.

The next topic is reservoir induced seismicity. I will have to expand a little bit on that as I proceed, but reservoir induced seismicity does exist in the world. There are some eleven thousand large dams in the world, and only a few, just slightly over 100, have suspected occurrences of reservoir induced seismicity.

Now, there isn't a real large amount of data or information on this subject and there are a lot of writings and conclusions made based on what we would consider

scant data. But let me explain just briefly what we perceive to be reservoir induced seismicity. The weight and pressure of the water must affect the tectonic environment of the foundations at depth. These earthquakes that have been attributed to reservoir induced seismicity are considered to be shallow. They occur at four miles or deeper beneath the earth's surface. There are two postulated causes of this type of event. One of them is that water under pressure would actually lubricate the system at depth to allow stresses that are locked into the system to be released. That would in effect cause an earthquake of lesser magnitude and at an earlier time than might have naturally occurred on the system. A key to this theory is that there is stress that does exist. Reservoir induced seismicity would not occur on an inactive system (no existing stress).

The other theory is that the weight of the water is enough of an exciter to cause motion at depth. In observing the presentation this morning, I note that one of the plans is to fluctuate Folsom Lake some 700,000 acre feet seasonally. Proponents who support that should consider RIS as well. This fluctuation should be a very good lab experiment to determine whether we have the potential for reservoir induced seismicity in the area, since Folsom is on the same foothill fault system as the proposed Auburn Dam. Folsom Lake has already been fluctuated a number of times and we haven't had any RIS event to date.

*Reservoir Induced Seismicity*

We have four dams in California that have been tagged by investigators as having reservoir induced seismicity. Lake Mendocino, Lake Crowley, Lake Oroville, and Lake Shasta.

The Oroville event in 1975 is determined to be one of those. There is an absence of discussion in the literature that there was a 1940 earthquake in the Chico area of about the same magnitude as the Oroville event and occurred on the same system. At that time none of these reservoirs was in place, so that data has been left out of the argument.

I think that everyone agrees that the phenomenon does exist, (RIS), that the magnitude of the earthquake that might occur is less than the earthquake which would occur naturally, and the foothills fault system has been tagged from Sonora up to Chico

as capable of producing a 6.5 event with or without any reservoir construction. The local planners should be ready to build their communities based on that data no matter what we do here.

So the other aspect, I feel, is that the reservoir induced seismicity has been heightened to a level of concern that really isn't warranted here on this project, but I think the real decision process is whether the environmental aspects of the canyon are competing with the protection of downstream residents.

I would be happy to answer any questions regarding this element. I would underscore that myself and my staff feel that a safe dam can be built at Auburn whether it is a dry dam or a multipurpose dam. There have been a number of different types of dams studied for the site, and we feel that there are two or three types that could be safely constructed there.

If you have questions I would be glad to respond to them.

Michael Stearns, President, The Reclamation Board: Are there any questions at this time? Thank you very much.

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**Additional comments made by Mr. Persson later in meeting in response to comments made by other speakers.**

I would just like to say that I was misquoted by the gentleman earlier in those statements that are attributed to the panel. They are attributed to Dr. Lloyd Cluff who has since admitted that recently he does not consider Oroville a reservoir-induced case and has taken it off his list, and he is noted as an international expert on the subject.