The “Watering Down” of the Division Safety of Dams

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History of Division of Safety of Dams

“The Division of Safety of Dams came into existence as a result of one of California's worst catastrophes - the failure of the 2-year-old St. Francis Dam in Southern California which occurred in March 1928.

A wall of water, mud, trees, and boulders crashed down the San Francisquito Canyon into the Santa Clara River Valley on its 5 ½-hour rampage to the Pacific Ocean near Oxnard. The 70-foot wall of debris laid bare a 2-mile-wide swath 70 miles long, killed more than 450 people, left hundreds of others homeless, destroyed 900 houses, many bridges and roads, and 24,000 acres of farmland was swept away. In California's history, this disastrous event ranked second only to the San Francisco 1906 earthquake.

A California commission reported that the dam failed because it was ill-built, on a geologically unstable site.

The failure of the St. Francis Dam prompted the State Legislature, on August 14, 1929, to create what is today the Division of Safety of Dams (DSOD), under the California Department of Water Resources and is institutionalized in the California Water Code and Code of Regulations.

Division engineers and engineering geologists review and approve plans and specifications for the design of dams and oversee their construction to ensure compliance with the approved plans and specifications. Reviews include site geology, seismic setting, site investigations, construction material evaluation, dam stability, hydrology, hydraulics, and structural review of appurtenant structures. In addition, Division engineers inspect over 1200 dams on a yearly schedule to ensure they are performing and being maintained in a safe manner. “

* - Information on this brief history was taken from the DSOD website.

The California Legislature’s intent for the oversight of dams constructed in the State as set forth in California Water Code – Division 3, Sections 6000 to 6470 was to ensure an appropriate level of engineering review of the design and construction of all dams in California including those owned by the DWR. Additionally, to avoid any possible

conflicts of interest in the review of DWR owned dams, the Code Section 6056 specifies that in the administration of its statutory responsibilities an independent review of its own dams shall occur, as follows:

> *"The department shall retain a board of three consultants who shall make an independent report to the director upon the issuance, modification, or renewal of any certificate of approval for any dam owned by the department."*

In the California Code of Regulations, Title 23, specific responsibilities of the board are provided as follows:

> *"(a) The department shall retain a consulting board:*
> *(1) To review the adequacy of the design of a dam and reservoir the department proposes to construct, or*
> *(2) To review the safety of the completed construction and the terms and conditions to be included in a certificate of approval for any dam owned by the department as issued, renewed or modified, no later than six months following any such action.*
> *(b) Where a board is retained to review the adequacy of the design of a dam and reservoir, it shall report its findings to the Director prior to the approval of an application to construct or enlarge the dam."*

In addition, Title 23 states that there shall be periodic reviews, as follows:

> *"the department shall retain a review board at least once every five years to review the operational performance of department owned dams. The Federal Power Commission's five year independent review may be substituted if it is comparable to the review required by this article. "*

There are numerous dams or impoundments which are owned and operated by DWR. All of these dams and impoundments are part of the State Water Project. The Departmental staff responsible for management and day-to-day engineering and maintenance tasks of the SWP are organized under divisions and offices of DWR which report up a chain of command to the Director. The Division of Safety of Dams includes Department staff who report up through a totally separate chain of command up to the Director. Over the years that these organizations have been in existence, Department staff have been allowed to move between the SWP side of the organization to the Safety of Dams organization based on their qualifying experience of the positions involved.

Shortfalls in the DSOD Reviews

Based on what information that has been made available on the DSOD inspection reports, the inspections appear to not have been conducted independently by the consultant board. There is a strong connection to DWR employees being utilized to perform these reviews. This is not consistent with the intent of the California Water Code and Code of Regulations.

The DSOD should have reviewed the original plans and specifications and inspected the construction for the Oroville Dam spillway during the 1950-1968 period however, these records were not available for public review. Some of the design deficiencies which should have been found and corrected included: 1) areas of thin concrete slabs down to 4" thick in localized areas, 2) insufficient concrete steel reinforcement at or near concrete slab joints, 3) lack of water stops at slab joints, 4) inadequate subgrade preparation with the use of erodible soils, and 5) possible field changes to the design during construction without the proper approval of the designer and/or DSOD.

The facilities of the Oroville Dam complex were designed and constructed under the direction of the DWR, and began operation in 1968. A consulting board advised DWR through the development and construction phases of the Oroville project. An important document which was prepared by the Oroville Dam project designers in October 1967 is the "Design Engineer's Criteria for Operations and Maintenance" which is generally known as the "Designer's Memorandum to O&M" from the Division of Design and Construction to the Division of Operations and Maintenance. This memorandum is a critical document providing important information on how to operate and maintain the project facilities as intended by the designers. This document is also a key component for DSOD and its board of consultants to be aware of during periodic reviews to insure the facilities are properly being operated and maintained. It appears very likely that this document has not or is not being used by either the Division of Operations and Maintenance or DSOD for proper guidance. This document provides the personnel in charge of maintaining the spillway instructions on annually cleaning out the spillway drainage system, to avoid using grout under the spillway chute slab which might block the drainage system, and the avoidance of vegetation growth near the spillway structure which might clog the proper operation of the drainage system.

On most critical structures which require specific maintenance on a regular basis, standard maintenance procedures are generally developed to ensure the proper maintenance and procedures are followed on a regular basis. The Oroville Dam Spillway is a significant facility structure which warrants such standard maintenance procedures. It is not known if such standard maintenance procedures were developed for the Oroville Dam spillway during the almost 50 years it has been in operation. These procedures should have incorporated the information provided in the designer's

memorandum on the spillway. If this document has not been prepared, DWR should immediately begin preparing such a document.

The required DSOD periodic review of the Oroville Dam spillway would have brought to light the lack of maintenance and improper repairs to the spillway chute underslab drainage system and maintenance of the vegetation near the spillway. The repairs which have been performed under the direction of the Division of Operations and Maintenance may also have been performed by unqualified engineers and without the consultation of the Division of Engineering or DSOD, all which should have been done.

Internal and External Organizational Influences

Traditionally, DWR's top-level management organization, or formally known as the Executive Division, consists of the director, chief deputy director, at least 2 deputy directors, and a few minor executive-level managers, all functioning within the director's delegation of authority policy manual. The director was responsible for addressing high level policy issues and legislation, interacting with the Governor's Office and the Legislature, and reporting to the Resources Agency secretary as required. The chief deputy director was responsible for overseeing the deputy directors and holding each accountable, serving as an advisor to the director and acting on behalf of the director when he/she was not available. Each deputy director was responsible for the business operations of his or her divisions and offices under their purview, draft new policies, implement or administer policies, ensure accountability of their subordinate division and office chiefs, and insure coordination between their counterparts. In past practice, prior to 2001, the appointment of division chiefs, deputy directors and the chief deputy director were individuals with broad knowledge and experience of DWR business, its jurisdictional authorities and responsibilities, well established internal and external relationships, and demonstrated leadership, communication skills and decision making capabilities. A brief look into the backgrounds of the current individuals occupying these key management positions will indicate this is no longer the requisite practice.

Up until mid-1999, the management and duties of *DSOD has kept and maintained an independent oversight of DWR owned dams to minimize and avoid conflicts of interest. However, around 2001, the DWR Division of Operations and Maintenance, State Water Contractors, the Executive Division and outside consultants had taken a more active role in influencing the review and actions of DSOD on SWP dams. These types of interactions have affected the independence of DSOD's statutory authorities over DWR dams resulting in conflicting interests; however, it is very difficult to determine the magnitude or significance of these outside influences on the DSOD decision making process. Probably, of more importance is the shift of the retired DWR deputy directors

(including acting deputy directors, appointed since 2003), retired DSOD chiefs and/or retired SWP chiefs who are taking paid positions with local engineering consultant firms. Of significance is the fact that a large percentage of high-level DWR managers have left to work for a specific engineering consulting firm that has been regularly hired to advise on DWR projects or SWP dams. This high-level involvement on DWR projects may intimidate current DWR staff and is probably affecting the independent decision making process, all which conflicts with the intent of the California Water Code and Code of Regulations.

Since February 7, 2017 acting director Bill Croyle began using a GEI consultant, Dave Gutiérrez, who recently retired as the previous Division of Safety of Dams Chief, to advise DWR on the Oroville Dam spillway. Gutierrez is being used by DWR as one of its primary media spokespersons on the current repairs of Oroville Dam spillway and the related engineering evaluations of the cause(s) of the spillway damage. He was also used as an Oroville Dam spillway spokesman during a May 11, 2017 legislative hearing on the subject. It's become quite apparent his representation of DWR is part of the strategy to influence the public, local government, FERC, as well as its own DSOD that Oroville Dam has and continues to be in compliance with dam safety requirements. The use of Mr. Gutierrez, including the cost and potential conflict of interests under CalPERS and state law, is questionable, especially when subject matter expertise already exists within DWR.

Of interest and importance is the fact that the DSOD inspection reports for Oroville dam headworks and concrete spillway, written between 1999 and 2004, were under the purview of then DSOD chief Steve Verigin, and subsequent inspection reports were under Mr. Gutierrez, who was DSOD chief until he retired at the end of 2016. Steve Verigin, David Gutierriez, Bill Bennett, and Richard Sanchez, all former DSOD and some former SWP managers are now GEI senior level consultants. These previous DWR employees are used by the current DWR management due to their presumed knowledge of State Water Project, Division of Engineering, Bay Delta Planning and DSOD programs including current and planned projects (although current civil service staff have the same expertise and capabilities but at a much lower cost). However, the use of these specific consultants creates a major conflict of interest with the intent of DSOD's responsibilities, due to the previous knowledge and responsibility's these employees had in DWR.

The most significant examples of organizational influence are the recently exposed existence of DSOD inspection reports dating back to 1989. For reasons yet to be fully determined, identified deficiencies were either ignored, treated as low priority, not acted upon or a combination thereof. However, complacency, lack of industry standard level maintenance, and possibly pressure from internal DWR management and external State Water Contractors' representatives to hold down maintenance costs were key

contributors. **The lack of concern and focus in the timely addressing of the Dam Headworks concrete spalling and cracking, missing welds, gate trunion cable cracks, and dam abutment “wet spots”, all noted deficiencies listed in reports generated by DSOD, private engineering consultant(s), the Board of Consultants (which reports to the Director), US Army Corps of Engineers, and FRCIT, serve as prime examples of the DWR culture and failures.

Restructuring - a Solution?

DSOD and other divisions within DWR have dedicated and public service oriented staff. However, without sound quality leadership who can avoid being involved in conflicts of interest, and can focus its efforts on the missions and associated designated authorities and responsibilities, the long-term level of public safety required for the facilities of Oroville will not be met. The February 7, 2017 spillway failure and subsequent evacuation of Oroville and regions within Butte County drive home the need for timely drastic measures to stop and mitigate the management culture and on-going conflicts occurring at DWR.

The recent Assembly Joint Hearing Committee on Oroville Dam Spillway briefly discussed the possibility of restructuring DWR. Building upon their considerations the following proposals were developed for consideration:

1) Amend the current Water Code to remove DSOD from DWR and place it under the CA Natural Resources Agency or CA Environmental Protection Agency as a board or commission. This would minimize or eliminate similar internal and external influences DSOD is experiencing while under DWR, mitigate conflicts of interest, and greatly increase accountability.

2) Appoint a new acting or permanent director and deputy directors including their division chiefs over O&M/SWP, Engineering and Flood Management; and re-instill compliance with established policy and Government Code.

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* It’s unclear if the DSOD and Operations and Maintenance Division were aware of the Designers Memorandum issued in 1967.

** Thus far, 'Physical Root Causes' have been identified and corroborated that are founded in:

1) The Design Phase (e.g. lack of water stops in spillway chute base slabs, lack of 2-way steel reinforcement in spillway chute base slabs),

2) The Construction Phase (e.g. underbase grading with erodible soils, omission of concrete filling in identified foundation voids filled with erodible soils), and

3) The Operations and Maintenance Phase (e.g. pumping grout into under-base voids, repeated patching of chute base slab joints and cracking, failure to maintain sub drainage system free of obstacles, allowing long-term growth of vegetation adjacent to spillway lateral drains, use of primitive methods to determine developing failure modes - chain 'drumming' to determine presence of voids, painting large cracks enabling watching the 'cracks grow', ignoring broken and fractured gate trunnion cables), and dam abutment 'wet spots'.