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DATE: September 11, 2010

TO: Mr. Michael Waggoner, Executive Chief of Field Branch, Division of Safety of Dams, Department of Water Resources, State of California, P.O. Box 942836, 2200 X Street, Suite 200, Sacramento, CA 94236-0001

RE: Dunsmore Debris Dam and Basin, Los Angeles County, California

Mr. Waggoner,

I am inquiring as to whether the Division of Safety of Dams should have jurisdiction and oversight over the Dunsmore Debris Dam and Basin and to express my concerns about storing of sediment at that location. The dam and basin are located at the mouth of Dunsmore Canyon, on Los Angeles County property, and just north of the City of Glendale (Figure 1). The basin and dam are not listed on your web site as under the Division's jurisdiction, but the dam's retainment volume (102,700 cu-yds, or 63.66 acre-ft) and height, that is greater than six feet, seems to meet the Division's jurisdictional size chart. The Division does have oversight over the nearby and smaller volume Blanchard Debris Basin (dam #32-025, national ID #CA01151). The mouth of Dunsmore Canyon is also a Sediment Placement Site (SPS) (Figures 2 & 3) for Los Angeles County's Department of Public Works (LA-DPW), and the amount of stored debris at that site has grown significantly since the 2009 Station fire burned in Dunsmore Canyon as well as adjacent watersheds (the Dunsmore site also receives debris from other LA-DPW maintained debris basins).

The SPS occupies most of the canyon mouth both linearly and aerally, and the debris dam and basin occupy only a fraction of the eastern portion of the canyon (Figures 2 & 3). The combined SPS, debris dam, and basin span the entire mouth of Dunsmore canyon and any flow from the canyon, whether water or debris flows, will encounter one or more of these structures downstream. Combined, these effectively create one man-made structure across the entire mouth of Dunsmore Canyon that is much larger than the existing debris dam.

Extensive residential areas of the City of Glendale and La Crescenta (unincorporated Los Angeles County) are directly down-slope of the Dunsmore Debris Dam and Basin, and the SPS. Concerns have been raised by the residents, and me, to LA-DPW about the safety and wisdom of storing large amounts of debris at this type of location- especially following the recent fire.

Dunsmore Canyon lies along the rugged and steep southern flank of the San Gabriel Mountains and there the canyon mouths and the adjacent Crescenta Valley have a well-documented record of extensive and frequent debris-flow activity (both historic and pre-historic), especially after large fires (Figure 3). During the first hour of New Year's Day 1934, and following a large fire the previous fall, a series of large debris-flows caused at least 40 deaths and extensive property damage to the Crecenta Valley communities of north Glendale, La Crescenta and Montrose. While most of the local debris basins were built in response to the 1934 disaster, it is disconcerting to realize that even the larger debris basins would retain only about one-third to one-half of the sediment produced during the 1934 event (Plate I). The largest debris basins in the Crescenta Valley portion of the system have a maximum storage capacity slightly in excess of 100,000 cu-yds, yet in 1934 two canyons, Pickens and Hall-Beckley, were the source of at least 500,000-700,000 cu-yds of debris, much of which was deposited in the community of Montrose and was the cause of most of the previously mentioned death and destruction. Dunsmore Canyon shares with Pickens and Hall-Beckley Canyons nearly the same geologic conditions and characteristics that control the occurrence and scale of debris-flows, i.e., similar drainage basin area, topographic steepness, thickness of unconsolidated material cover on mountain slopes (soil and colluvium) and canyon fills (alluvium), and bedrock lithology and intensity of fracturing. Since 1934 there have been several smaller debris-flow episodes that caused local property damage, but the debris basin system in the Crescenta Valley remains largely untested by debris-flow events similar to those that occurred in 1934.

Considering the debris flow volumes estimated from Pickens and Hall-Beckley Canyons in 1934 it reasonable to assume that the Dunsmore Debris Basin, with its 102,700 cu-yd capacity, could fill rapidly in a 1934-type event, or should either the inlet or outlet to this basin be restricted or blocked by sediment or woody debris (a situation that occurred this past winter at the Mullally basin), LA-DPW's maintenance crews will be challenged to prevent a catastrophic impact on the neighborhoods below the basin. Most, if not all, of the death and damage in 1934 event occurred in about one hour's time, and the flows came as numerous large pulses separated by only a few minutes. With a filled basin, or restricted or blocked inlets or outlets, or both, subsequent debris flow pulses will have a high likelihood of reaching the residential areas. The Dunsmore basin outlet is a narrow concrete-lined channel (Figure 4) and it is unlikely that this channel could constrain large and rapid pulses of debris flow. A new and unconstrained natural channel could quickly develop across the easily erodible material of the SPS during a large debris-flow event, given that the SPS spans much of the canyon mouth. Large debris flows have tremendous erosive power, and are characterized by very rapidly changing flow patterns. A large debris flow moving across the SPS could actually expand in size from the more than adequate supply of stored sediment at the SPS and put the downslope community at additional risk.

LA-DPW's storing of sediment at the mouth of canyons that have a history of debris-flow activity may be unique world-wide as I have found no similar situations to date.

The Dunsmore site has some additional oddities in that some of the stored sediment at the Dunsmore site was removed from the downstream Verdugo Wash basin, transported upslope by LA-DPW, and stored at the mouth of same canyon from which the sediment was derived. The editor of a recent book on debris flows politely described this type of maintenance as "counter-intuitive." There is another unusual aspect that might impact the mouth of Dunsmore Canyon in the future. The SPS, debris dam and basin are built over a set of fault scarps that are well documented with old photos (Figure 5), a trench log (Figure 6) and discussion in United States Geological Survey (USGS) Professional Paper 1339. These scarps are pre-historic in age but geologically very young as they displace Holocene-age fan deposits. The scarps lie along the Sierra Madre fault system, which is considered to be seismically active by both the USGS and the California Geological Survey. The scarps would be the most likely location of surface rupture and high ground-acceleration associated with any future moderate or large earthquake along this portion of the Sierra Madre fault. It is unclear to me if such an earthquake would have an impact on the integrity of the dam and the SPS but it is an issue worthy of consideration.

Crescenta Valley is now densely populated relative to 1934 and as I mentioned some portions of the residential communities are located directly downslope from the numerous debris dams, basins, and sediment placement sites. If it is determined that the Division of Safety of Dams has jurisdiction over the Dunsmore Dam and Basin, or any other part of the debris basin system in the Crescenta Valley, I believe an independent review by the Division would benefit the public understanding of the potential debris-flow hazard following the Station Fire or a recurrence of a 1934-type event, or both. To my knowledge no environmental impact report or public review was ever done for the Dunsmore SPS despite its potential impact on the surrounding residences.

The increased debris flow risk to Dunsmore Canyon, and the entire Crescenta Valley, from the impact of the Station Fire will remain until the vegetation cover returns to the mountains -at least several years (Figure 7). The upcoming rainy season will be the second since the Station Fire, and the climatic forecast is for dryer conditions in southern California (La Nina year). Short term climatic forecasts can have local variations. Overall 1934 was not a wet year (El Nino) despite the extreme local rainfall amounts that initiated the 1934 New Year's Day debris flows. During the next few years the probability of a 1934-type debris-flow event is low but if it were to recur the impact to public safety will be extreme. It is my belief that the Dunsmore SPS may add additional risk to a flood control system that was not designed to handle a repeat of a 1934-type event.

I appreciate the Division's consideration of this issue.

Sincerely,

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PS: I spoke with Division Geologist Mr. Marvin Wood about this issue in May 2010.

7 Figures in document
1 Plate attached

Figure 1. Location of Dunsmore Canyon sediment placement site (DCSPS) and Crescenta Valley (CV), 2003 image.

Figure 2. Dunsmore Canyon sediment placement site (DCSPS) and debris basin (DB) located at the mouth of Dunsmore Canyon, 2003 image. An extensive residential area of north Glendale is located downslope of the sediment placement site and debris basin.

Figure 3. Mouth of Dunsmore Canyon showing sediment placement site (DCSPS) as of April 2010. New debris is being added to the placement site from Dunsmore and other debris basins. The combination of the August 2009 Station Fire and heavy rains in early 2010 resulted in many of the foothill basins being filled to near capacity. Terrace-like surfaces along canyon (Qdf) are tops of older debris-flow deposits, image as of April 2010.

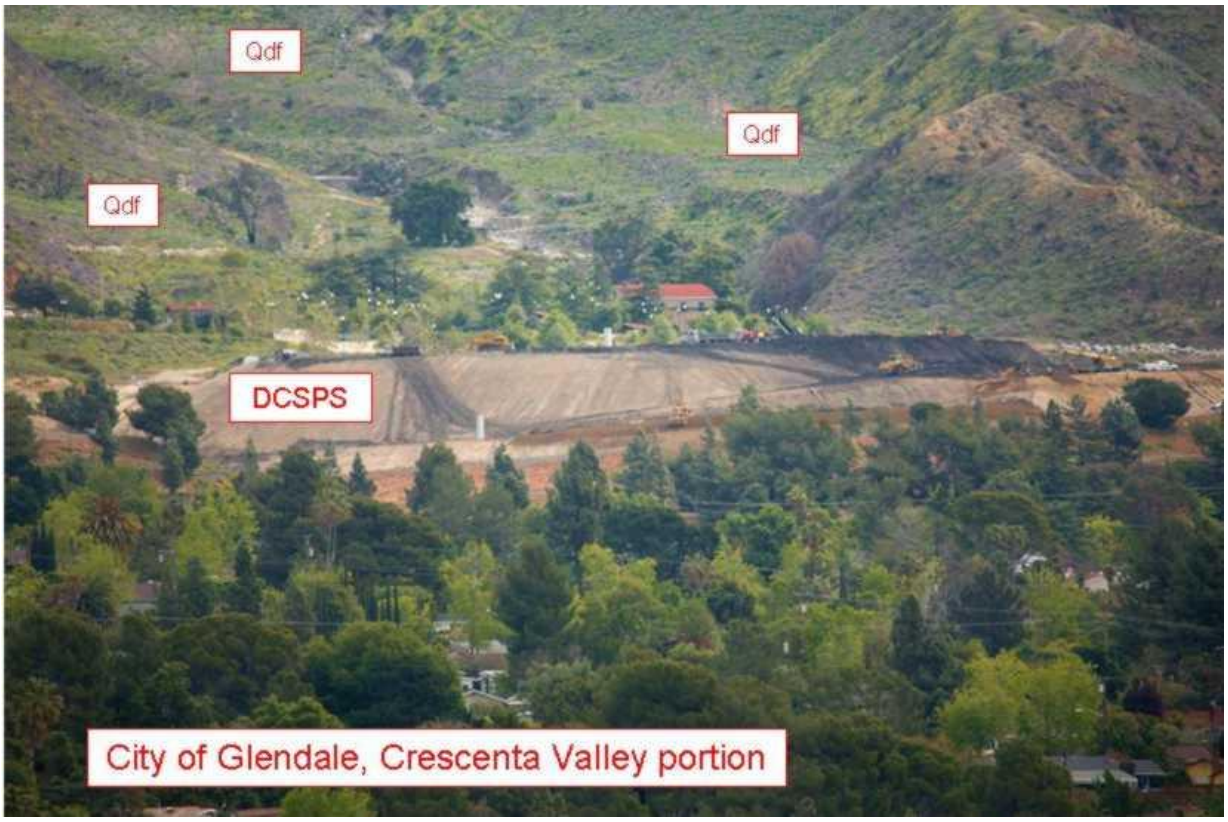

Figure 4. Outlet channel for Dunsmore debris basin (debris dam and basin are located behind vegetation). Looking north from point where channel passes under Markridge Road: a potential debris-flow spreading point if basin fills and excess flow continues into channel.

Figure 5. Old aerial photo of lower Dunsmore Canyon showing active fault scarps that now underlie SPS. Photo shows two fault scarps displacing Holocene age fan deposits (from USGS Professional Paper 1339, Figure 2.6, and discussion pgs 37-43). Starting in the late 1970's the SPS was built over fault scarps.

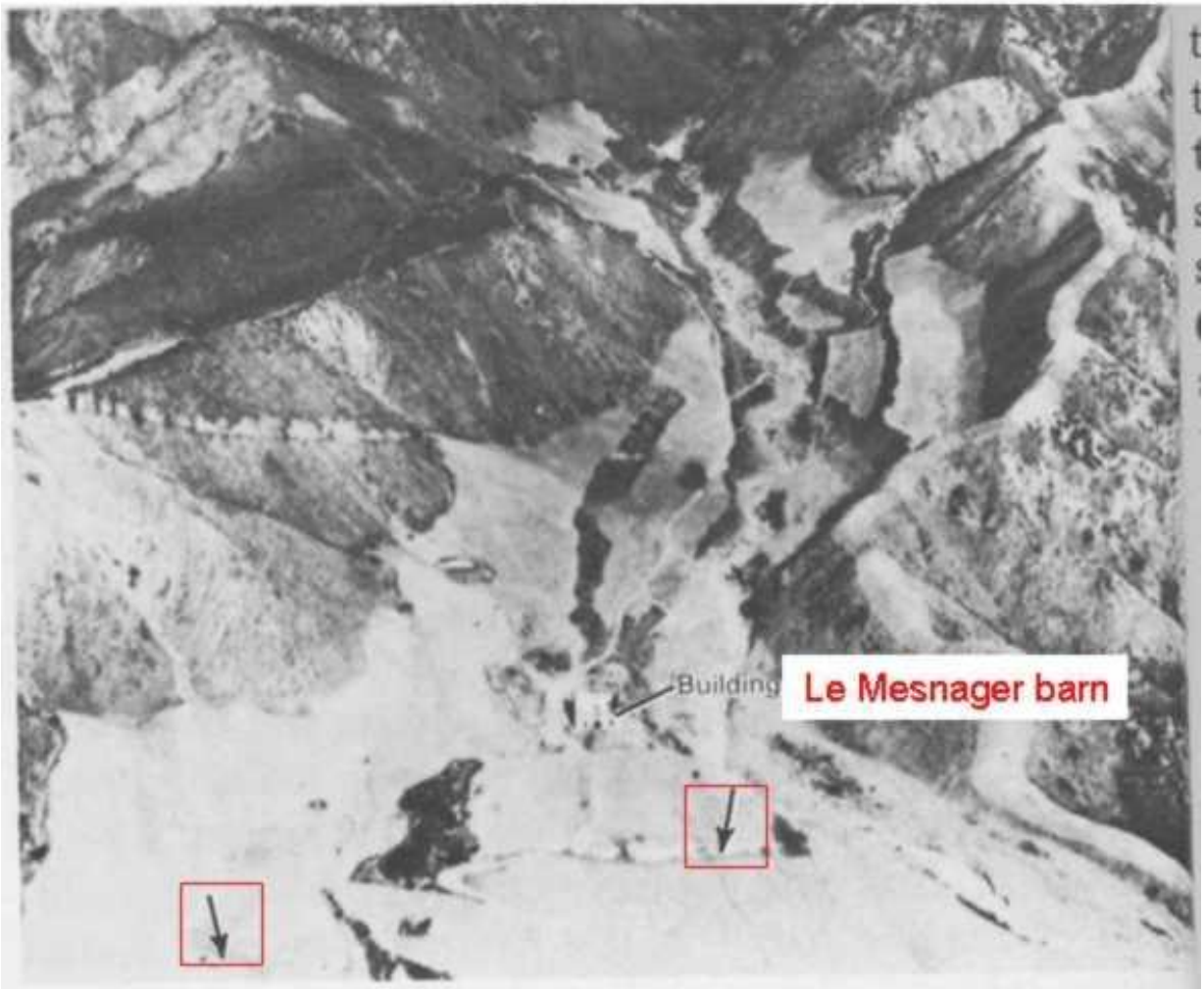

FIGURE 2.6.—Dunsmore Canyon and head of unit 2 Dunsmore fan, showing two distinct fault scarps (arrows). Several unit 2 terrace surfaces visible on right (east) side of canyon above building probably correspond to segments of the fan surface separated by the fault scarps. Oblique aerial photograph courtesy of UCLA Spence collection.

Figure 6. Trench log across fault scarp at Dunsmore Canyon showing displacement of Holocene-age unit 2 (from USGS Professional Paper 1339, figure 2.5 and pg 42 for discussion). Note inset map showing locations of scarps, trenches, and debris basin and dam.

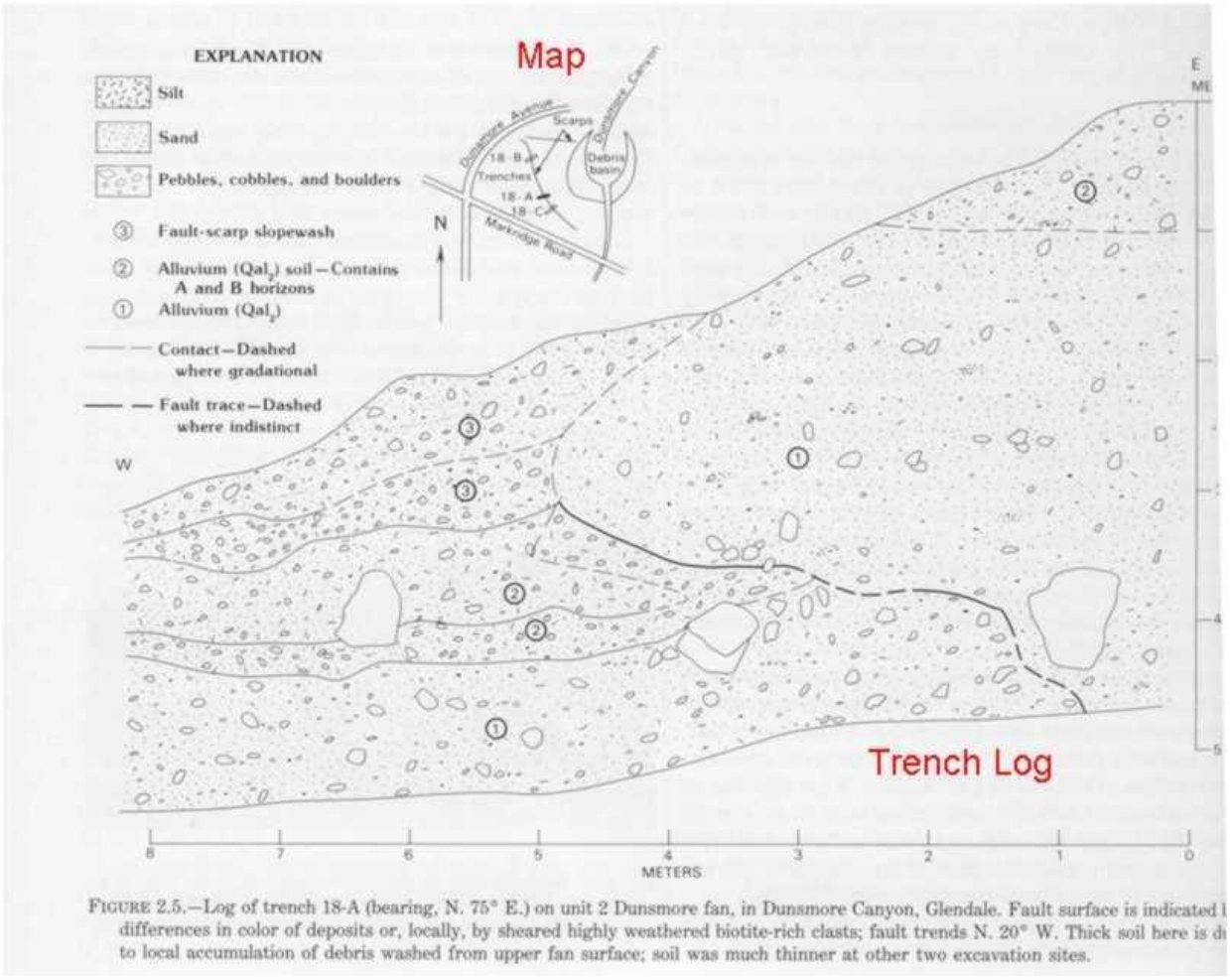

FIGURE 2.5.—Log of trench 18-A (bearing, N. 75° E.) on unit 2 Dunsmore fan, in Dunsmore Canyon, Glendale. Fault surface is indicated l differences in color of deposits or, locally, by sheared highly weathered biotite-rich clasts; fault trends N. 20° W. Thick soil here is d to local accumulation of debris washed from upper fan surface; soil was much thinner at other two excavation sites.

Figure 7. Dunsmore Canyon, San Gabriel Mtns. Photo taken shortly after the August, 2009 Station Fire; view north. The debris basin located on far right has a maximum capacity of 102,700 cu-yds. Los Angeles County Department of Public Work's sediment placement site is in lower part of photo.

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