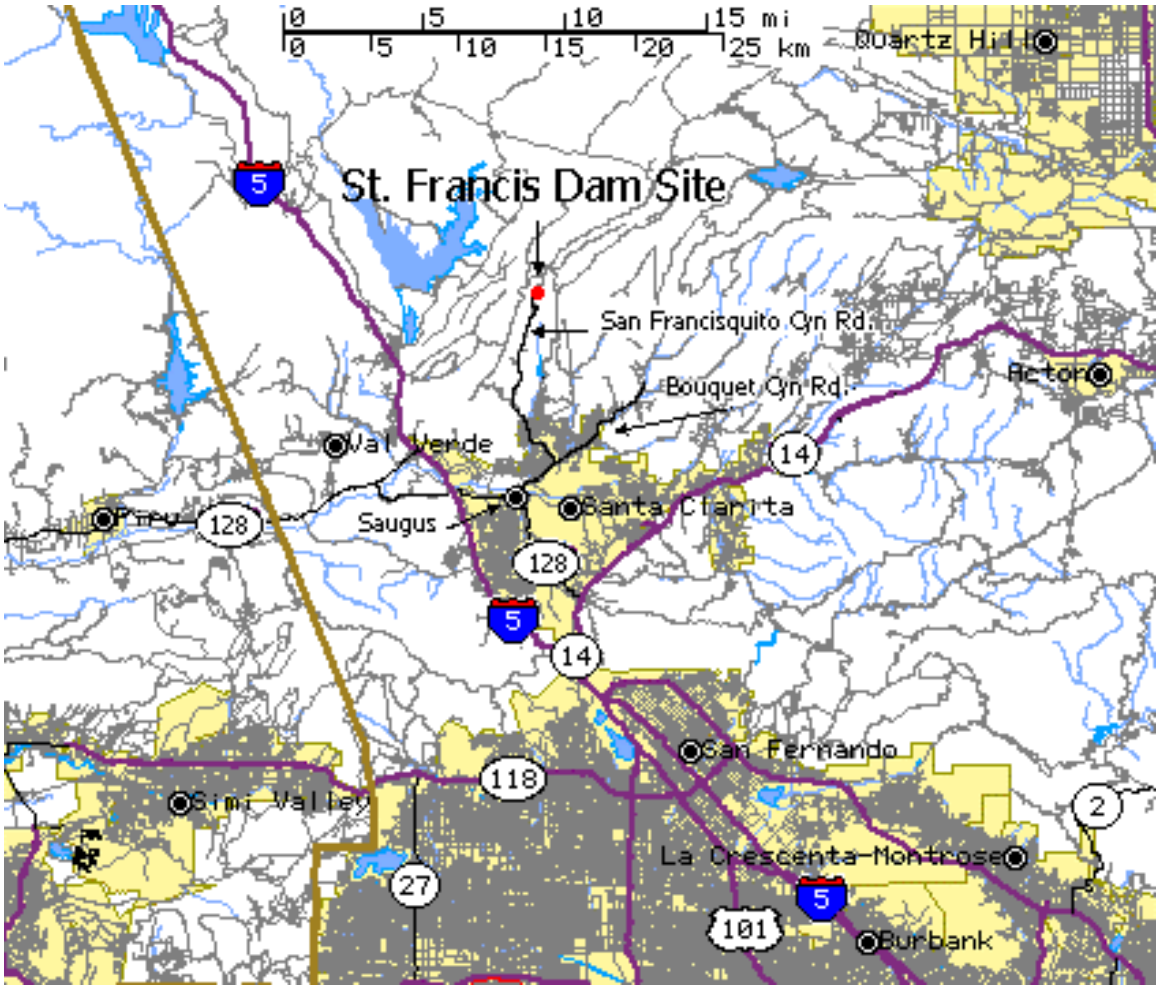
St. Francis Dam

The City of Los Angeles Bureau of Water Works and Supply built St. Francis Dam in 1925-26 as a curved concrete gravity dam, approximately 200 feet high in San Francis Quito Canyon, about 5 miles northeast of what is now Magic Mountain, California. The stated purpose of the dam was to provide an additional 38,000 acre-feet of storage for Los Angeles - Owens River Aqueduct water in close proximity to Los Angeles. The dam failed catastrophically upon its first full filling, near midnight on March 12/13, 1928, killing at least 450 people in the San Francis Quito and Santa Clara River valleys. It was the greatest American civil engineering failure in the twentieth century.



No less than a dozen separate investigations of the failure followed, the most cited being the state commission appointed by Governor C.C. Young, which convened on March 19th, made one site visit, and issued their report (known at the time as the "blue book" report) five days later. That board concluded that the dam's failure was most likely ascribable to hydraulic piping of the dam's right abutment, which had been built upon a fault contact between the Sespe conglomerate and the Pelona Schist. This somewhat simplistic explanation was

offered after observing that blocks from the dam's west abutment were supposedly found further downstream than those of the opposing, east side.

The failure of St. Francis Dam represents but one of a number of important dam failures that occurred in the 1920s and 30s, when American civil engineers began to push the limits of a technology then in its infancy. The dam's high-profile failure led to the immediate and irrevocable demise of William Mulholland, architect of the Los Angeles water supply system. Like most notorious engineering failures, looking back we can take some measure of satisfaction in knowing that considerable long-term societal benefit resulted from public outcry following the disaster. Some of the most important consequences included: a) the formulation of the world's first dam safety agency/ b) normalization of uniform engineering criteria for testing of compacted earthen materials still in use world-wide; c) a reassessment of all Los Angeles Department of Water and Power dams and reservoirs which led to an extensive retrofit of Mulholland Dam; and d) the formulation of a state-mandated process for arbitration of wrongful death suits that forms the basis of similar legislation following the 1989 Loma Prieta earthquake.

In recent years detailed geologic assessments have shown that the eastern, or left abutment of St. Francis Dam was unknowingly founded upon massive paleo mega-slides, developed within the Pelona Schist. The balance of this article explores what is currently understood about the St. Francis disaster by reassessing its failure with modern forensics analytical techniques, most of which were unavailable to civil engineers and geologists in 1928.

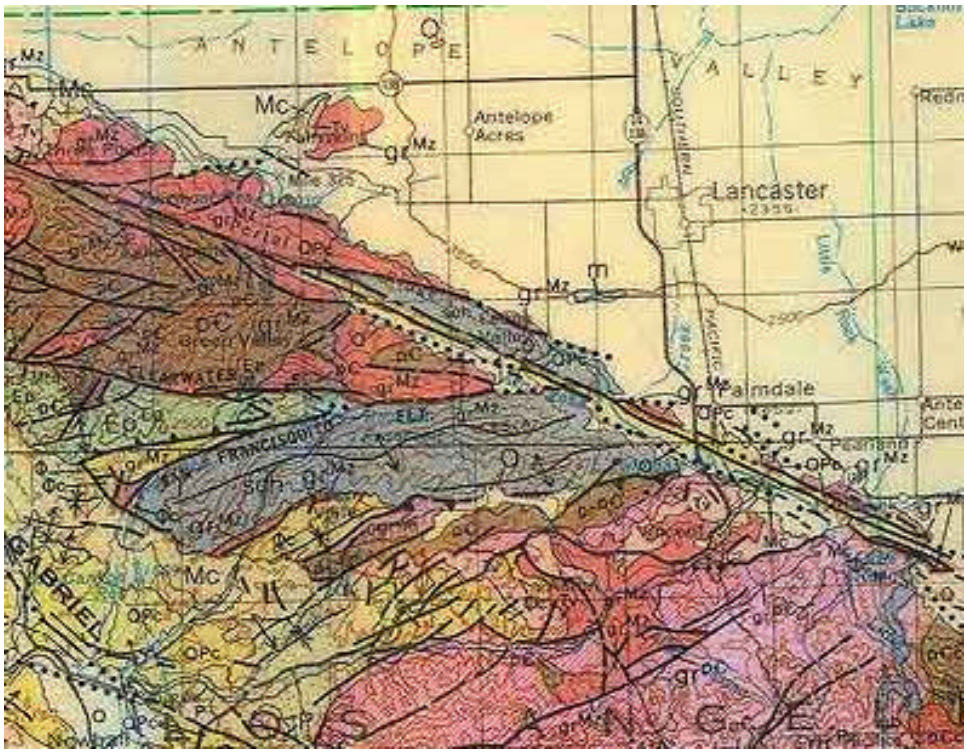
Research-to-date suggests that St. Francis was in al likelihood not designed with a proper appreciation of uplift theory; the dam's base width was not as thick as previously assumed; and the designers were not aware that the left abutment was a paleo mega-landside or that the Sespe red beds would slake upon submersion; and that it was actually pieces of the left (eastern) abutment, against the Pelona Schist, that were actually found furthest downstream following the dam's collapse. A review of the available evidence suggests the dam failure sequence was likely brought about by a combination of factors, including excessive titling when fully loaded, an absence of seepage relief in the dam's sloping abutments, and the partial reactivating of underlying paleo mega-slides within the Pelona Schist. Upon forces acting to destabilize the sloping abutments would appear to have been similar to those which fostered the disastrous failure of Malpasset arch dam in France in 1959, which took more than five years to sort out and understand (Londe, 1968, 1979, 1970).

Collapse of St. Francis Dam

The failure of the St. Francis Dam, and the resulting loss of over

500 lives in the path of a roaring wall of water, was a scandal that resulted in the almost complete destruction of the reputation of its builder, William Mulholland.

Mulholland was an immigrant from Ireland who rose up through the ranks of the city's water department to the position of chief engineer. It was he who proposed, designed, and supervised the construction of the Los Angeles Aqueduct, which brought water from the Owens Valley to the city. The St. Francis Dam, built in 1926, was 180 feet high and 600 feet long; it was located near Saugus in the San Francisquito Canyon.



The dam gave way on March 12, 1928, three minutes before midnight. Its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. 65 miles of valley was devastated before the water finally made its way into the ocean between Oxnard and Ventura. At its peak the wall of water was said to be 78 feet high; by the time it hit Santa Paula, 42 miles south of the dam, the water was estimated to be 25 feet deep. Almost everything in its path was destroyed: livestock, structures, railways, bridges, livestock, and orchards. By the time it was over, parts of Ventura County lay under 70 feet of mud and debris. Over 500 people were killed and damage estimates topped $20 million.

At the inquest following the tragedy, evidence was brought forth that the dam was leaking as late as the day before the break, and that the Department of Water and Power, but more importantly, Mulholland himself, knew it. On the stand, Mulholland admitted being at the dam the day before the break but had noticed nothing out of the ordinary. He testified that leaks were not unusual in dams, especially in dams the size of the St. Francis.

In the end, the jury found that the disaster was caused by the failure of the rock formations on which the dam was built. But responsibility was placed on the governmental organizations behind the construction of the dam, and on its chief designer, William Mulholland. No criminal charges were brought against him, but he soon retired from his position with the DWP, and slowly retreated into a life of self-imposed isolation. He died in 1935, at the age of 79.

At the time, rumors were rife that the dam had been sabotaged--dynamited, it was theorized, by individuals who bore grudges against Mulholland and the city over the Owens River Valley controversy. Threats against the dam and Mulholland himself had been received in the past, and the Los Angeles Aqueduct had actually been dynamited in 1924. Though there was no hard evidence to reinforce the rumors, neither was there hard evidence to disprove them.

Recent research has raised questions about Mulholland's responsibility, and also offered some possible answers as to what really caused the St. Francis Dam to break. A 1992 examination of the disaster concluded that, given the geological knowledge of the time, Mulholland was in fact innocent of criminal negligence--that the break was caused by the anchoring of the dam's eastern edge to an ancient landslide impossible to detect in the 1920s.

The only memorial to the man who helped build the Colorado Aqueduct, Hoover Dam, and the Panama Canal is a fountain in the Los Feliz area.