

October 30, 2007 Alum Rock Earthquake

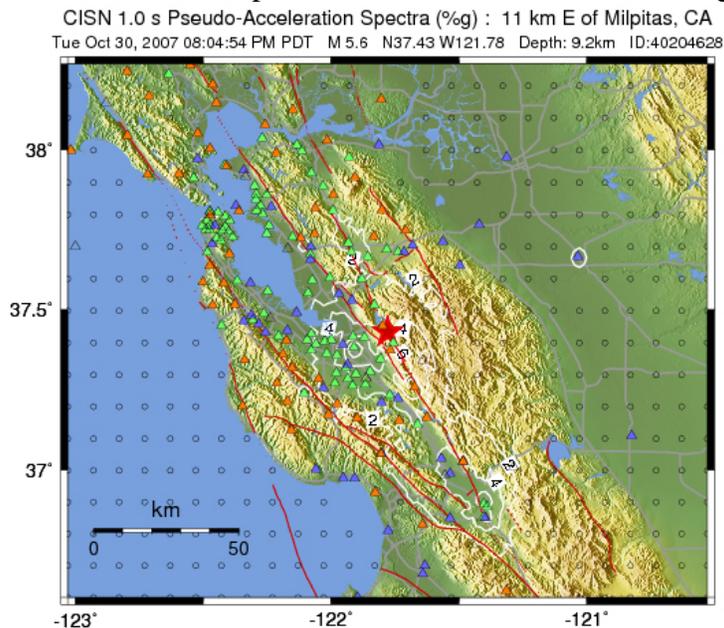
At 8:05 PM on October 30, 2007 an earthquake struck at lat. 37.432°N and long.121.776°E, about seven miles east of the city of Milpitas. The earthquake had a moment magnitude of 5.6 and it ruptured at a depth of five miles.

Despite the relatively small magnitude, the large ground motion (particularly at 1.0 sec. spectral acceleration) led engineers to assess if bridge damage could have occurred.

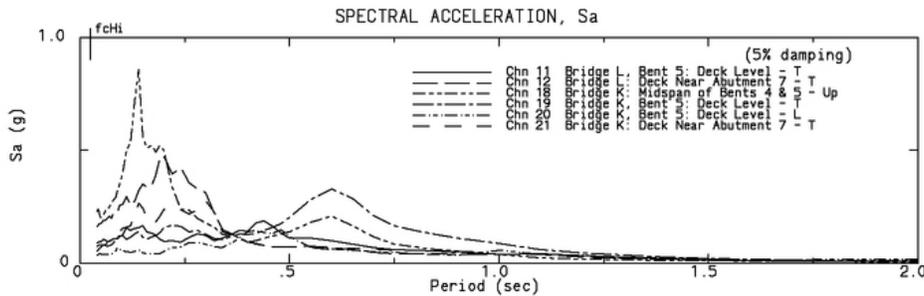
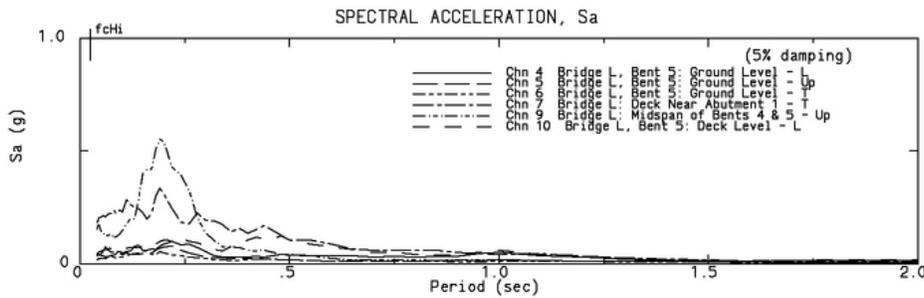
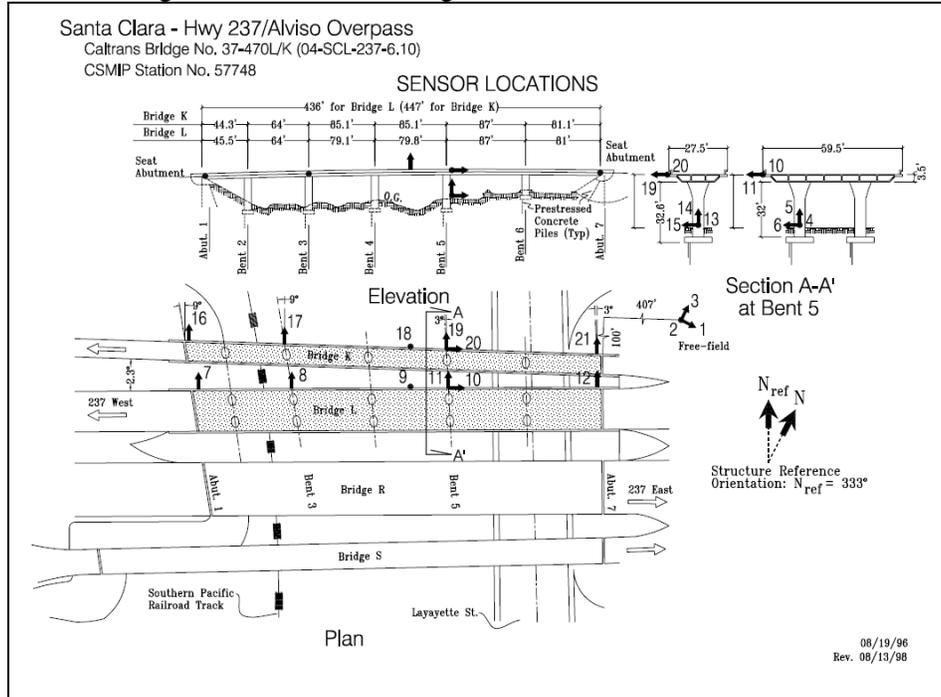
Table 1: Recorded Ground Motion from Alum Rock Earthquake

	Network	Statn			Dista	PGA _{v1}	PGA _{v2}	PGV	PGD	Sa (α)	Sa	Sa	Struct
Id	Name	Nmbr	N.Lat	W.Lona	Epic F	(α)	(α)	(cm/s)	(cm)	.3sec	1sec	3sec	Abk(α)
NC	NCSN	CHR	37.373	121.769	6.6	0.209	0.208	17.02	2	0.421	0.163	0.013	- -
NP	USGS	1825	37.414	121.871	8.6	0.112	0.111	5.28	0.8	0.246	0.073	0.006	- -
NP	USGS	1793	37.347	121.808	9.9	0.098	0.098	6.85	1.1	0.202	0.098	0.008	- -
NP	USGS	1684	37.515	121.83	10.4	0.046	0.046	2.7	0.4	0.076	0.034	0.004	- -
NP	USGS	1788	37.417	121.915	12.4	0.082	0.082	4.43	0.5	0.279	0.052	0.005	- -
NP	USGS	1838	37.383	121.911	13.1	0.163	0.161	12.73	2.5	0.448	0.212	0.032	- -
CE	CGS	57318	37.338	121.885	14.2	0.072	0.073	6.13	1.2	0.16	0.089	0.015	0.152
CE	CGS	57356	37.338	121.888	14.4	0.113	0.114	7.98	1.1	0.547	0.086	0.014	0.332
CE	CGS	57355	37.338	121.893	14.7	0.074	0.071	5.84	1.1	0.329	0.063	0.013	0.209
NP	USGS	1783	37.307	121.849	15.3	0.139	0.139	5.26	0.9	0.168	0.058	0.01	- -
BK	BDSN	MHC	37.342	121.643	15.4	0.067	0.068	5.9	0.8	0.201	0.065	0.006	- -
CE	CGS	57031	37.392	121.955	16.5	0.07	0.07	3.02	0.5	0.167	0.036	0.006	- -
CE	CGS	57064	37.53	121.919	16.7	0.075	0.075	3.79	0.6	0.178	0.048	0.005	- -
CE	CGS	57748	37.418	121.973	17.5	- -	- -	- -	- -	- -	- -	- -	0.188
CE	CGS	57594	37.328	121.937	18.3	0.073	0.074	5.74	0.7	0.239	0.062	0.008	0.074
CE	CGS	57600	37.329	121.937	18.3	0.158	0.159	6.86	0.6	0.352	0.054	0.007	- -
NP	USGS	1781	37.301	121.904	18.4	0.075	0.074	3.96	0.8	0.258	0.048	0.005	- -
NP	USGS	1782	37.318	121.944	19.5	0.079	0.078	3.05	0.5	0.209	0.03	0.007	- -
NP	USGS	1841	37.358	121.978	19.7	0.126	0.127	6.89	0.5	0.28	0.05	0.007	- -
NP	USGS	1779	37.267	121.867	20	0.094	0.094	8.33	0.9	0.192	0.078	0.006	- -
NP	USGS	1794	37.407	122.001	20.1	0.051	0.051	2.42	0.3	0.043	0.023	0.004	- -
NP	USGS	1688	37.597	121.88	20.5	0.05	0.05	3.52	0.4	0.125	0.034	0.003	- -
NP	USGS	1839	37.285	121.936	21.6	0.151	0.151	4.26	0.6	0.192	0.037	0.005	- -

The Shake Map from California's Integrated Seismic Network (CISN) shows the epicenter in the foothills east of Milpitas on the Calaveras fault according to the USGS.

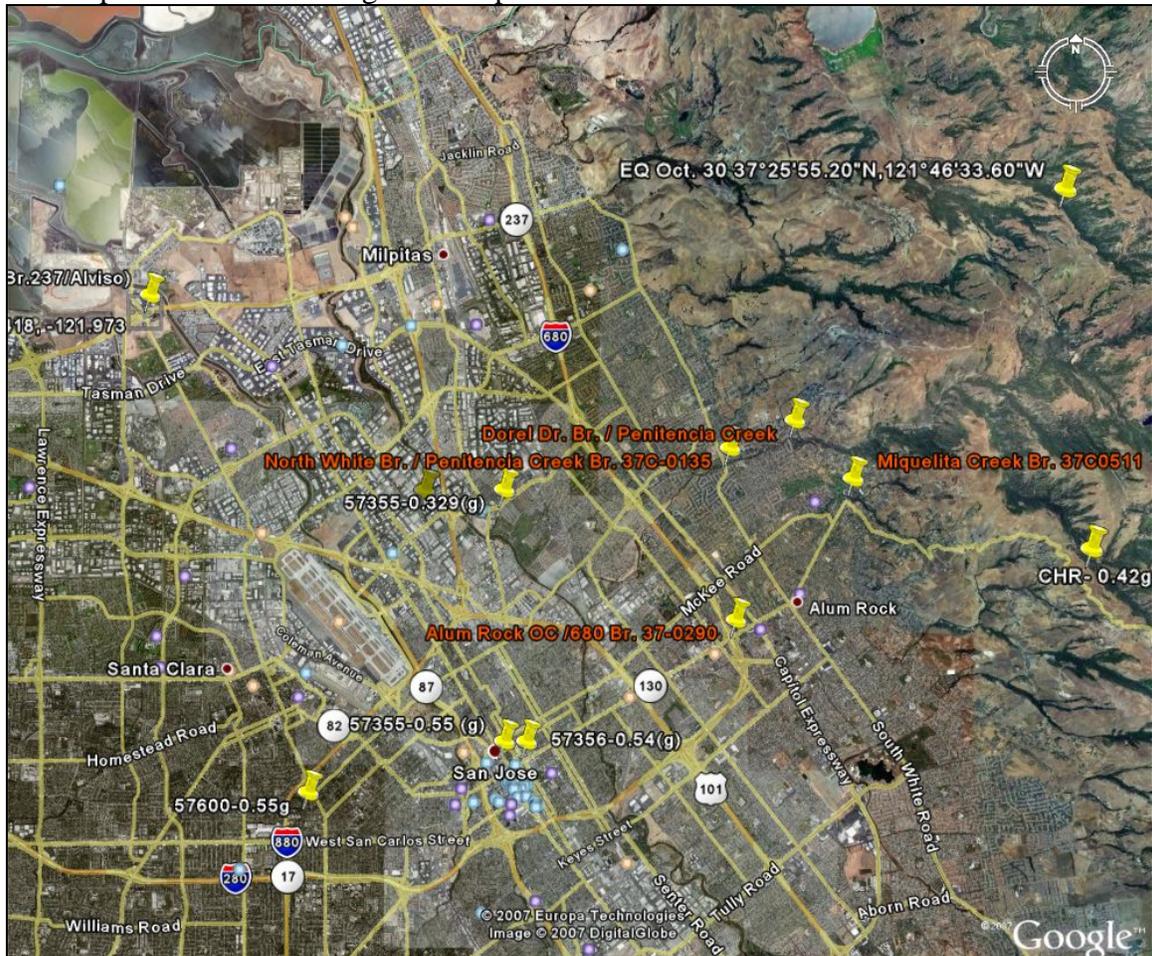


Caltrans had several instrumented bridges that recorded motion from this earthquake. The Highway 237/Alviso Overpass (37 0479L/K) at N37.418° W121.973° includes two six-span reinforced concrete box girder bridges crossing over the Southern Pacific Railroad tracks and a city street. It is 17.5 km from the epicenter (just west of Milpitas). The free field instrument was damaged, but the structure had a peak horizontal acceleration of 0.19g recorded on the bridge deck.



Other bridges recorded the earthquake motion, including the Dumbarton toll bridge near Palo Alto with a recorded free field motion of 0.01g. More information about strong motion recordings can be obtained at: http://www.strongmotioncenter.org/cgi-bin/ncesmd/iqr_dist.pl?iqrID=AlumRock_30Oct2007&SFlag=0&Flag=1

On Sunday, November 4, 2007 Mark Yashinsky and Majid Sarraf (from Stantec Consultants) drove down to assess selected bridges for possible earthquake damage. The figure below shows the location of stations that recorded large ground motions in relation to the epicenter and the bridges we inspected.



Google Map showing location of earthquake epicenter, stations that recorded high 0.3 sec. spectral accelerations, bridges that were inspected, and Alviso Overhead.

However, the bridges we investigated showed no sign of movement or damage. We are thinking that our investigation should have included bridges in downtown San Jose where the largest spectral accelerations were recorded. This downtown area is on deeper alluvium, which may have amplified the ground motion. Also, the bridges we inspected were two or three spans and less likely to show much damage or movement.

On the next page are photos of three of the bridges that were inspected. Alum Rock OC (37 0290) is a two span concrete box girder bridge on a two-column bent that carries city traffic over I-680. Miquelita Creek Bridge (37C 0511) is a 3-span T-girder bridge on concrete piers. Upper Penitencia Creek Bridge (37C 0135L/R) was a modern 3-span slab bridge on concrete piers. We saw no signs of damage or movement on these bridges.



Alum Rock OC.



Miquelita Creek Bridge



Upper Penitencia Creek Bridge