

### Concrete Coalition

A Program of EERI, PEER and ATC Progress with the California Inventory Project

# CA Inventory Project



Website has more information:

#### www.concretecoalition.org

- Building on LA work
- Funded with a FEMA Hazard Mitigation Grant through CAL EMA (formerly OES)
- Goal to ESTIMATE size of the problem as a first step





Focus on highest seismic risk

counties

350+ cities in 22 counties, representing

~ 32 million people

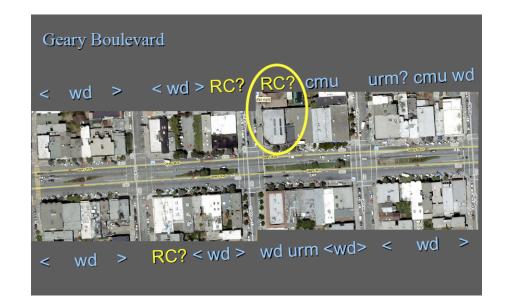




#### Pilot Cities

- Los Angeles
- San Francisco
- Long Beach
- Berkeley







# Kick-off Meetings

■ To recruit volunteers

In Los Angeles and San Francisco

Volunteer coordinators in Northern &

Southern CA



#### Guidance on what to count

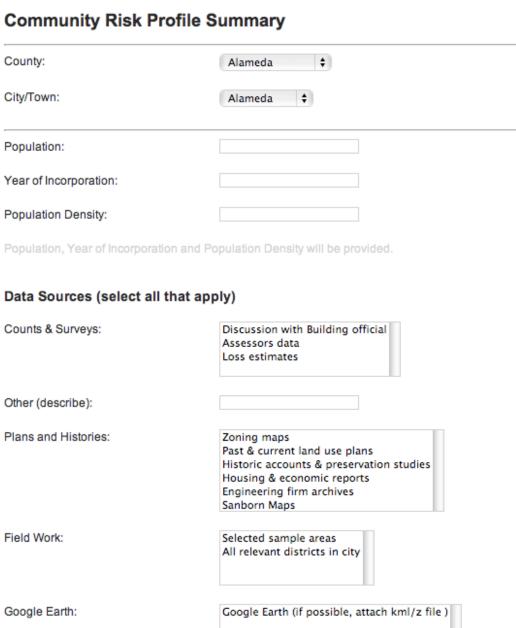


Concrete Building Types	Count Data	Optional – Other Databases Available <sup>1</sup>	Do Not Count Data
City Buildings	Х		
County Buildings	Χ		
State Buildings		X	
Post Offices	Χ		
County and State Courthouses		X	
Federal Office Buildings and Courthouses		X	
Hospitals Regulated by OSHPD		X	
Utility-owned Buildings	Χ		
Grade K-12 Public Schools		X	
UC and CSU		X	
Community Colleges	X		
Private Schools and Colleges	X		
Military, Prisons, Regional Parks	X		



#### Ultimate GOAL—4 Estimates

Your	·City
Category	Estimate
Total Number of Buildings	
Total Number of Concrete Buildings	
Pre-1980 Buildings	
Pre-1980 Concrete Buildings	





#### **Form** provided online

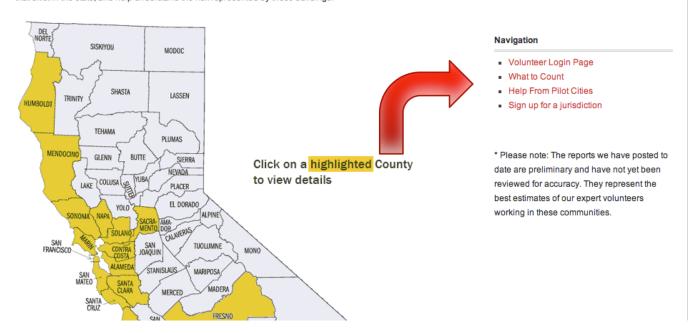


## Website provides guidance



#### California Inventory Project

The Concrete Coalition is building a network of volunteer engineers in California who will help gather information on the number and types of pre-1980 concrete buildings that exist in the state, and help understand the risk represented by these buildings.





## Different Approaches

- Most everyone used:
- Sanborn Maps
- Google Earth
- Field Work
  - Bicycling through the city
  - Walking or driving sample areas







# Currently have estimates from volunteers in 30+ cities

- 22 from Northern CA
- 9 from Southern CA
- Largest cities:
  - Los Angeles--1500
  - San Francisco--3000
  - San Jose--350
  - Oakland--1300
- Representing 25% of population in highest risk counties



# Reports by City on website





# Regression Model (developed by Peter May, UW)

- Use estimates from volunteer cities to extrapolate to remaining cities
- Tried MANY different combinations of census data
- Model now using total number of housing units; % 20 units or more; % built before 1939

POPULATION	
70,576	
16,444	
100,744	
39,328	
6,882	
200,468	
140,293	
78,409	
41,956	
395,274	
10,952	
65,950	
78,178	
69,176	
100,631	
23,302 10,762	
10,762	
123,252	
41,852	
23,171	
19,488	
23,908	
35,916	
16,290	
27,177	
17,599	
19,039	
62,547	
33,153	
102,186	
31,004	
49,999	
64,196 17,294	
17,294	
1,135	

10.8 6,534.8 16.2 37.1 15( 1.7 9,672.9 x 16.4 41.9 36 10.5 9,594.7 13.4 55.8 27: 10.5 9,594.7 13.4 55.8 27: 12.2 3,121.3 x 169.0 11.0 44 12.3 3,121.3 x 169.0 11.0 44 12.4 3,166.9 20.5 3.5 12.3 3,166.9 20.5 3.5 14.0 2,995.9 16.9 42.5 15.0 14.7 4.4 4.1 1.1 14.7 1.7 3,039.2 16.9 42.5 130 15.1 1.7 5.967.8 14.6 9.9 40.5 13.1 5,967.8 14.6 9.9 40.5 13.1 5,967.8 14.6 9.9 40.5 13.1 1.1 5,967.8 14.6 9.9 40.5 13.1 1.1 5,967.8 14.6 9.9 40.5 13.1 1.1 5,967.8 14.6 9.9 40.5 13.1 1.1 5,967.8 14.6 9.9 40.5 13.1 1.1 5,967.8 14.6 9.9 40.5 13.1 1.1 5,967.8 14.6 9.9 40.5 13.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1	41.9 55.8 0.1 14.0 1.7 3.5 4.1 2.7 42.5	16.4 13.4 10.9 69.0 14.7 20.5 4.4		9,672.9 9,594.7 3,121.3 5,735.0 2,613.7	1.7 10.5 12.6
10.5 9,594,7 13.4 55.8 27: 12.6 3,121.3 10.9 0.1 1.2 5,735.0 × 69.0 14.0 44 76.7 2,615.7 14.2 12.3 12.3 12.3 12.3 12.4 14.2 12.3 13.3 12.3 12.4 14.2 12.5 12.5 12.5 12.5 12.5 12.5 12.5 12	55.8 0.1 14.0 1.7 3.5 4.1 2.7 42.5	13.4 10.9 69.0 14.7 20.5 4.4		9,594.7 3,121.3 5,735.0 2,613.7	10.5 12.6
12.6 3,121.3 10.9 0.1 1.2 5,735.0 x 69.0 14.0 44 76.7 2,613.7 14.7 1.7 23.9 3,280.7 4.4 4.1 1.7 1.7 3.5 14.0 2,99.5 11.9 42.5 13.1 5,967.8 14.6 9.9 40. 13.1 5,967.8 14.6 9.9 40. 13.1 6,209.5 12.7 13.1 5,967.8 14.6 9.9 40. 13.1 5,967.8 14.6 9.9 40. 13.1 1.5 2,905.8 14.6 1.3 13.1 5,967.8 14.6 1.3 13.1 5,967.8 14.6 1.3 13.1 5,967.8 14.6 1.3 13.1 5,967.8 14.6 1.3 13.1 1.3 1.3 1.2 1.3 1.2 1.3 1.2 1.3 1.2 1.3 1.3 1.2 1.3 1.3 1.3 1.2 1.3 1.3 1.3 1.3 1.3 1.2 1.3 1.3 1.3 1.3 1.2 1.3 1.3 1.3 1.3 1.2 1.3 1.3 1.3 1.2 1.3 1.3 1.3 1.3 1.2 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3	0.1 14.0 1.7 3.5 4.1 2.7 42.5	10.9 69.0 14.7 20.5 4.4	×	3,121.3 5,735.0 2,613.7	12.6
.1.2 5,735.0 x 69.0 14.0 44 76.7 2,613.7 14.7 1.7 44.3 3,166.9 20.5 3.5 23.20 3,280.9 4.2 2.7 25.1 1.7 6,442.4 x 0.0 70.5 13 21.7 3,039.2 7.6 1.3 1.9 21.7 3,039.2 7.6 1.3 1.9 21.7 3,039.2 7.6 1.3 1.9 21.7 3,039.2 7.6 1.3 1.9 21.7 3,039.2 7.6 1.3 1.3 1.9 21.7 3,039.2 7.6 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3 1.3	14.0 1.7 3.5 4.1 2.7 42.5	69.0 14.7 20.5 4.4	×	5,735.0 2,613.7	
76,7 2,613,7 14,7 1.7 44,3 3,166,9 20,5 3,5 3,5 14,0 2,996,9 8,2 2,5 13,0 14,0 2,996,9 8,2 2,7 16,1 7,045,9 1	1.7 3.5 4.1 2.7 42.5	14.7 20.5 4.4	×	2,613.7	1.2
44.3         3,166.9         20.5         3.5           23.9         3,280.7         4,4         4.1           14.0         2,996.9         8.2         2.7           56.1         7,045.9         16.9         42.5         130           1.7         6,42.4         x         0.0         70.5         8           21.7         3,039.2         7.6         1.3         1.3         1.3         5,967.8         14.6         9.9         40           19.3         3,584.2         8.3         1.2         3.2         1.1         1.2         3.2         1.1         1.2         3.2         1.1         3.2         1.2         3.2         1.3         1.2         3.2         1.3         1.2         3.2         1.3         1.2         3.2         1.3         1.2         3.2         1.3         1.2         3.2         1.3         1.2         3.2         1.3         3.2         3.2         1.3         1.5         3.0         1.3         3.2         3.2         1.3         1.2         3.2         3.2         1.3         1.3         3.2         3.2         3.2         3.2         3.2         3.2         3.2         3.2         3.2	3.5 4.1 2.7 42.5	20.5 4.4			
23.9 3,280.7 4.4 4.1 1 14.0 2,996.9 8.2 2.7 1 56.1 7,045.9 16.9 42.5 130 1.7 6,442.2 × 0.16.9 16.9 42.5 130 1.3 1 3,584.2 × 1.4 6 1.9 42.1 1 1.3 1 3,584.2 8.3 1.2 40 1.7 0 3,727.1 7.2 3.2 1 1.6 2,008.8 2.9 1 3.9 2,759.5 × 0.4 1.5 1 3.0 1 4,094.3 15.5 15.1 15.1 15.1 15.1 15.1 15.1 15	4.1 2.7 42.5	4.4			76.7
14.0         2,996.9         8.2         2.7           56.1         7,045.9         16.9         42.5         130           1.7         6,442.4         x         0.0         70.5         8           21.7         3,039.2         7.6         1.3         1.3         1.3         1.5,967.8         14.6         9.9         40           19.3         3,584.2         8.3         1.2         27.0         3,727.1         7.2         3.2         1.3         1.2         3.0         1.2         3.0         1.2         3.0         1.2         3.2         1.3         1.9         3.2         1.3         1.9         3.2         1.3         1.9         3.2         1.3         1.9         3.3         1.9         3.3         1.9         3.3         1.9         3.3         1.9         3.3         3.6         6.436.4         6.3         10.8         22         3.6         6.5         2,998.2         0.01         0.3         0.01         0.3         0.01         0.3         0.01         0.3         0.01         0.3         0.01         0.0         0.01         0.0         0.01         0.0         0.01         0.0         0.0         0.0         0.0 <td>2.7 42.5</td> <td></td> <td></td> <td>3,166.9</td> <td>44.3</td>	2.7 42.5			3,166.9	44.3
14.0         2,996.9         8.2         2.7           56.1         7,045.9         16.9         42.5         130           1.7         6,442.4         x         0.0         70.5         8           21.7         3,039.2         7.6         1.3         1.3           13.1         5,967.8         14.6         9.9         40           19.3         3,584.2         8.3         1.2         3.2           27.6         3,727.1         7.2         3.2         1.3           3.9         2,095.5         x         4.4         1.5           30.1         4,094.8         15.4         1.7           18.1         2,312.3         1.9         0.3           3.6         6,436.4         6.3         10.8         22           6.5         2,998.2         0.01         0.3	42.5	8.2			23.9
56.1         7,045,9         16.9         42.5         130           1.7         6,442.4         x         0.0         70.5         8           21.7         3,039.2         7.6         1.3         9           19.3         3,989.2         16.3         1.2         40           27.0         3,727.1         7.2         3.2         11.6         2.008.8         2.9         1           3.9         2,759.5         x         0.4         1.5         3.3         1.5         4.09.4         1.5         1.3         1.5         4.09.4         1.5         1.5         4.09.4         1.5         1.5         4.09.4         1.5         0.3         1.5					14.0
1.7         6,442.4         x         0.0         70.5         8           21.7         3,039.2         7.6         1.3         1.3           13.1         5,967.8         14.6         9.9         40           19.3         3,584.2         8.3         1.2           27.0         3,727.1         7.2         3.2           11.6         2,009.5         x         0.4         1.5           30.1         2,799.5         x         0.4         1.5           18.1         2,312.3         1.9         0.3           3.6         6,436.4         6.3         10.8         22           6.5         2,998.2         0.01         0.3		16.9			56.1
21.7         3,039.2         7.6         1.3           13.1         5,967.8         14.6         9.9         40           19.3         3,584.2         8.3         1.2         2           27.0         3,727.1         7.2         3.2         1.5         3.2         1.5         3.2         1.5         3.2         1.5         4.0         1.5         4.0         1.5         3.0         1.5         4.0         1.5         1.7         1.8         1.7         1.2         3.2         1.9         0.3         3.6         6.436.4         6.3         1.0.8         22           6.5         2,998.2         0.01         0.3         0.3         1.9         0.3         0.3         1.0         0.3	70.5	0.0	×		1.7
13.1         5,967.8         14.6         9.9         40           19.3         3,584.2         8.3         1.2           27.0         3,727.1         7.2         3.2           11.6         2,008.8         2.9         1.5           3.9         2,759.5         x         0.4         1.5           18.1         2,312.3         1.9         0.3           6.5         6,436.4         6.3         10.8         22           6.5         2,998.2         0.01         0.3         0.3	1.3	7.6			21.7
19.3         3,584.2         8.3         1.2           27.0         3,727.1         7.2         3.2           11.6         2,008.8         2.9         1           3.9         2,759.5         x         0.4         1.5           30.1         4,094.8         15.4         1.7           18.1         2,312.3         1.9         0.3           3.6         6,436.4         6.3         10.8         22           6.5         2,998.2         0.01         0.3         0.3	9.9	14.6			13.1
27.0 3,727.1 7.2 3.2 11.6 2,008.8 2.9 1 3.9 2,759.5 x 0.4 1.5 30.1 4,094.3 15.6 15.6 15.6 15.6 15.6 15.6 15.6 15.6	1.2	8.3			19.3
11.6 2,008.8 2.9 1 3.9 2,759.5 x 0.4 1.5 30.1 4,094.8 15.4 1.7 18.1 2,312.3 1.9 0.3 3.6 6,436.4 6.3 10.8 22 6.5 2,998.2 0.01 0.3	3.2	7.2		3.727.1	27.0
3.9         2,759.5         x         0.4         1.5           30.1         4,094.8         15.4         1.7           18.1         2,312.3         1.9         0.3           3.6         6,436.4         6.3         10.8         22           6.5         2,998.2         0.01         0.3         0.3		2.9			
30.1 4,094.8 15.4 1.7 18.1 2,312.3 1.9 0.3 3.6 6,436.4 6.3 10.8 22 6.5 2,998.2 0.01 0.3	1.5	0.4	×		
18.1 2,312.3 1.9 0.3 3.6 6,436.4 6.3 10.8 22 6.5 2,998.2 0.01 0.3	1.7	15.4			30.1
3.6 6,436.4 6.3 10.8 22 6.5 2,998.2 0.01 0.3	0.3				
6.5 2,998.2 0.01 0.3	10.8	6.3			3.6
	0.3	0.01			6.5
	2.4	5.9		1,572.9	15.2
12.3 2,920.0 5.9 9.8	9.8	5.9			12.3
9.3 1.751.6 × 3.6 0.5	0.5	3.6	×		9.3
12.4 2.191.7 0.7 4	4	0.7			12.4
12.6 1,396.7 × 3.1 8.1	8.1	3.1	×		12.6
5.2 3,661.3 x 5.5 3.7	3.7	5.5			5.2
15.6 4,009.4 × 6.8 3.8	3.8	6.8	×		15.6
7.1 4,669.4 11.2 0.9	0.9	11.2			7.1
30.0 3,406.2 7.9 14.2	14.2	7.9			30.0
2.6 11,924.6 13.4 8.1			1		
11.6 4,310.3 5.2 0.5			1		
19.9 3,225.9 15.4 1.1			1		
9.2 1,879.8 × 8.6 10.7			×		
0.6 1,891.7 × 0.01 27.8					
9.5 2.692.5 3.8 35.5 10			_ ^		

MODEL USING
%20+ UNITS
160.7745218
53.23912588
252.7726129
1.077137742
45.34703708
35.65540511
52.73359925
13.32857352
8.381684697
682.4394825
0.250004824
8.193928578
61.61247438
6.751184449
18.59894688
2.260620176
0.251772468
26.30584017
0.773520811
14.86106213
0.011345895
4.679307907
17.20650955
0.763212391
1.456265778
5.115181594
4.572473116
13.35446211
5.260313422
59.81970823
19.77137354
2.918358134
14.48531622
13.42266657
0.027384965
25.72560805



#### Model to date

- Indicates a focused problem
  - Many cities have a very small number
  - Significant problem for larger, older cities
- Finding anomalies with some of the data coming from volunteers—more investigation
- Looking fairly reasonable at this point

### Next Steps



- Incorporating public school, university, state buildings and hospital data
- Encouraging volunteers in 30+ more cities
- Develop way of incorporating certainty/ uncertainty into total estimates
  - Peer reviewing estimates—a few need further explanation
  - More certain of volunteer estimates than model
- Refine the model
- Build on technical work that PEER doing develop politically, socially & economically acceptable strategies to reduce risk



#### For more information

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- David McCormick, Northern CA volunteer coordinator: <u>dlmccormick@sgh.com</u>
- David Bonowitz, statewide database curator: <a href="mailto:dbonowitz@att.net">dbonowitz@att.net</a>