

An aerial photograph of Los Angeles, California, showing the city's skyline with numerous skyscrapers and a dense residential area in the foreground. The sky is clear and blue.

# QuakeUpLA

*Creating an Interactive Seismicity and Building Response Map Tool*

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*<sup>2</sup>University of Southern California, Spatial Sciences Institute*

Sunday, October 13, 2013

# Subjects ne for wsuits

ing the period when le-  
claims can be filed,  
vn said institutions  
ld feel secure that "past  
are indeed in the past  
not subject to further  
aits."

e also argued that the  
lation, which would  
in part lifted the stat-  
f limitations on sexual  
e claims for one year to  
some childhood vic-  
o file lawsuits, was "un-  
because it singled out  
te organizations, such  
tholic dioceses and the  
scouts. Public schools  
not have been af-  
by the bill, something  
called "a significant  
ty."

ie children assaulted  
ry Sandusky at Penn  
or the teachers at  
onte Elementary  
in Los Angeles are no  
orthy because of the  
of the institution they  
[See Abuse, A26]



MEL MELCON LOS ANGELES TIMES

**THE NEW MART** in L.A.'s fashion district, a concrete building. After a 1985 quake in Mexico, Ethan Eller had a structural engineer assess the safety of his building. Most such structures have not had similar scrutiny.

## A CONCRETE RISK

Short on steel support, hundreds of L.A. buildings are a threat in quakes

BY RONG-GONG LIN II, ROSANNA XIA AND DOUG SMITH

9:12 AM  
touch.latimes.com/#  
Los Angeles Times  
LATEST NEWS 64° Oct. 13, 2013

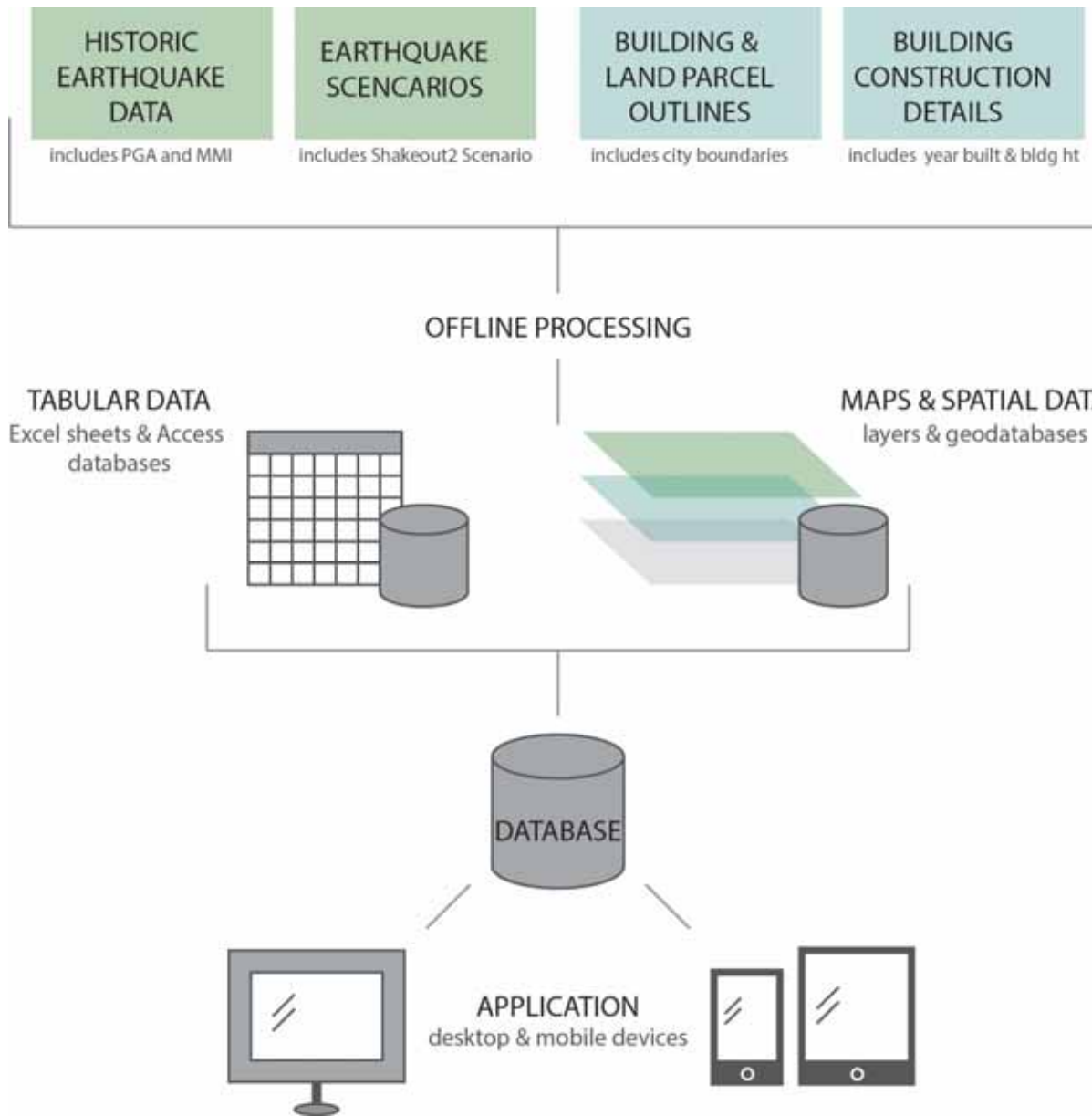
## Many older L.A. buildings could collapse in an earthquake

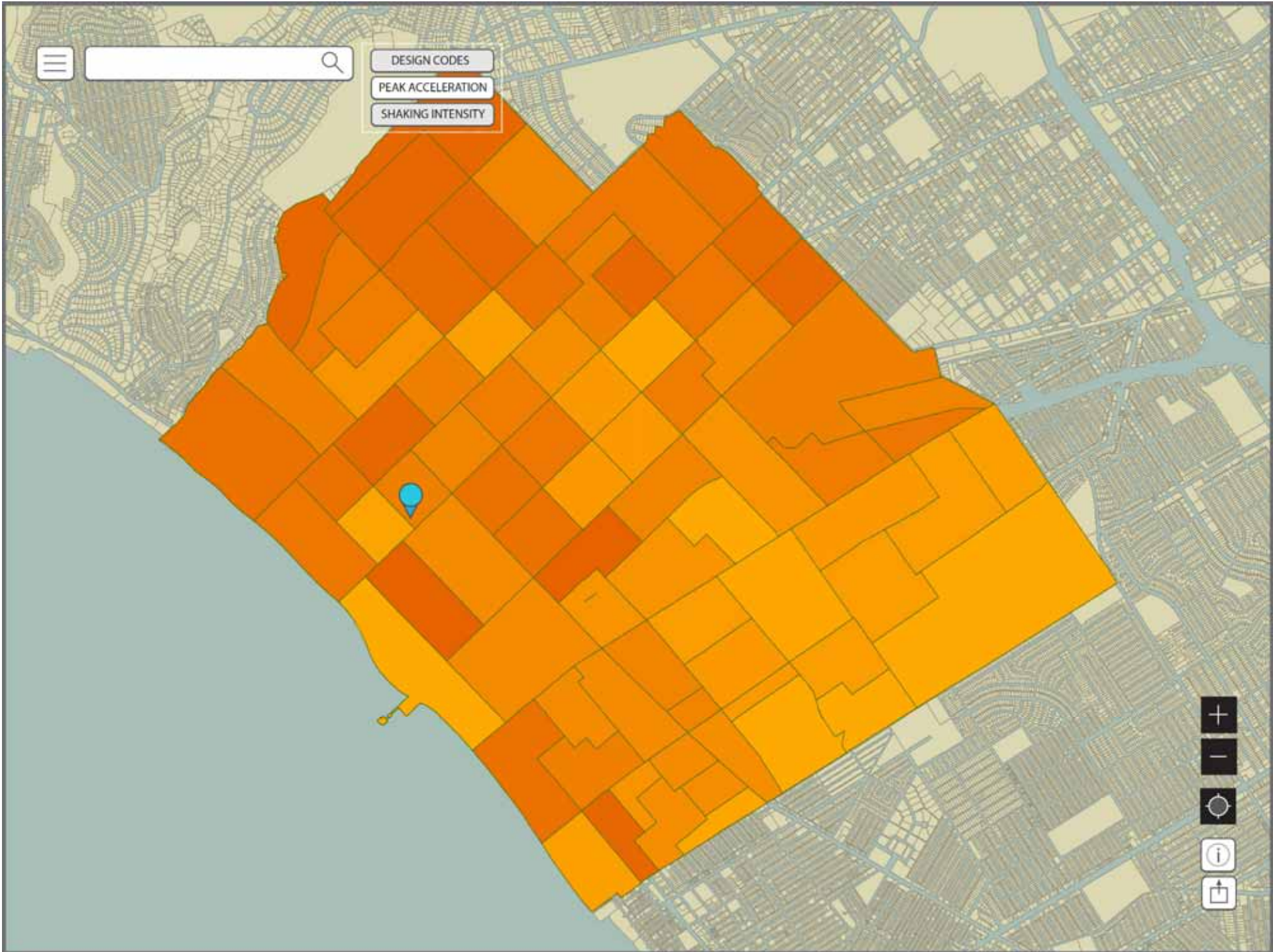


The city has rejected calls to make a list of concrete buildings at risk of collapsing in a major quake, but a Times analysis finds there could be more than 1,000 — many of them homes and offices.



# DATA STRUCTURE





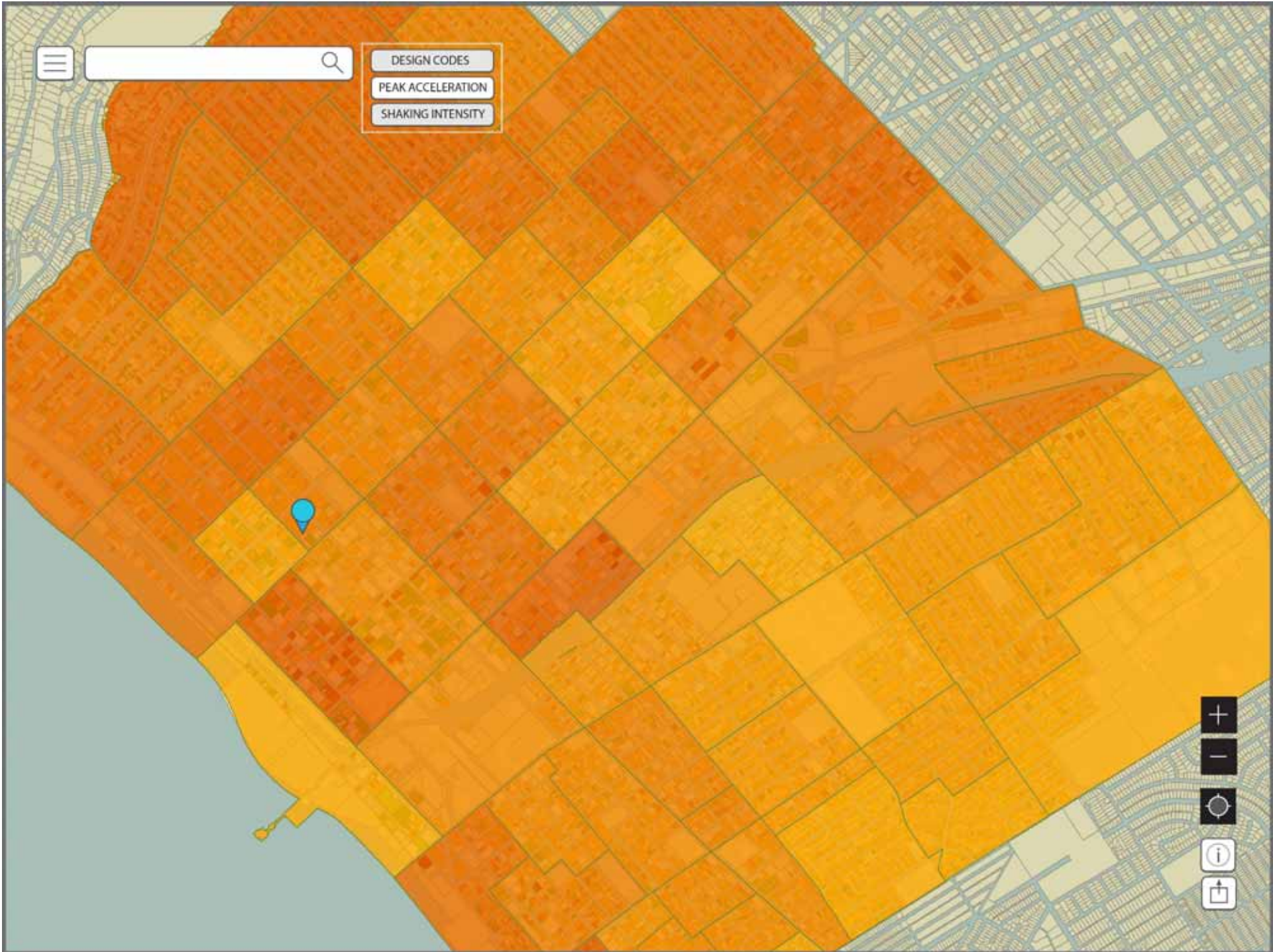
DESIGN CODES

PEAK ACCELERATION

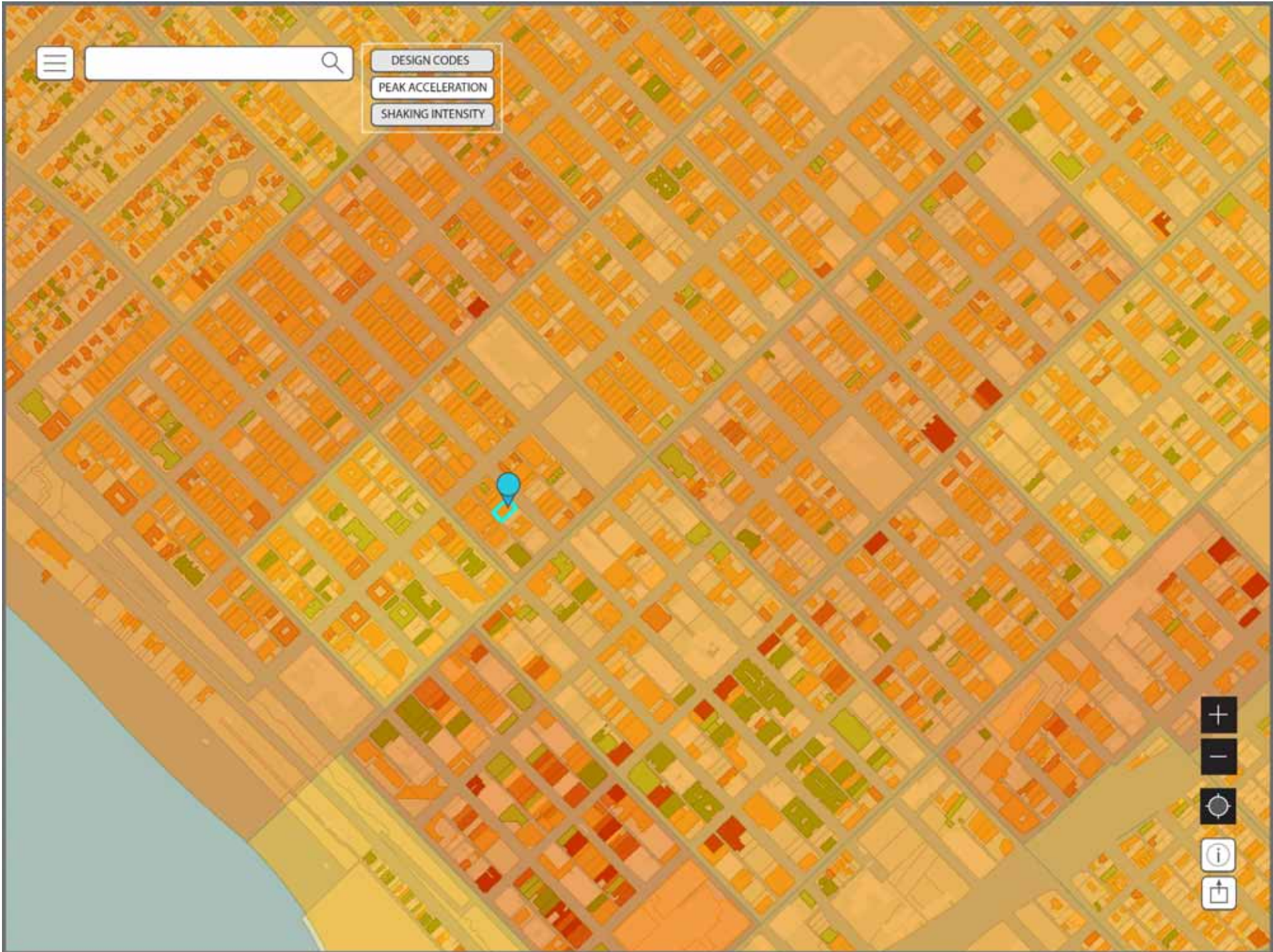
SHAKING INTENSITY





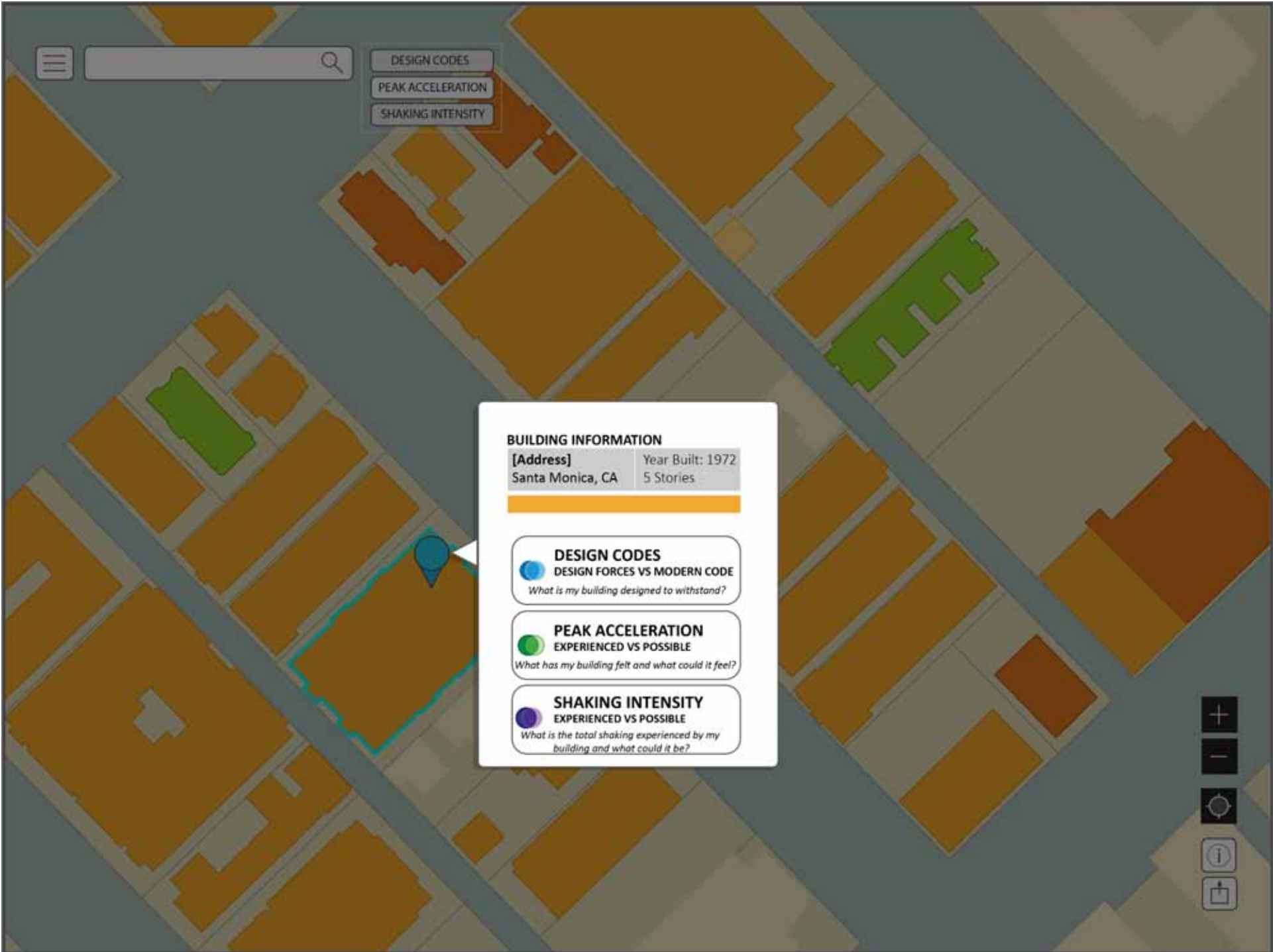












DESIGN CODES

PEAK ACCELERATION

SHAKING INTENSITY

#### BUILDING INFORMATION

[Address]	Year Built: 1972
Santa Monica, CA	5 Stories

**DESIGN CODES**  
DESIGN FORCES VS MODERN CODE  
*What is my building designed to withstand?*

**PEAK ACCELERATION**  
EXPERIENCED VS POSSIBLE  
*What has my building felt and what could it feel?*

**SHAKING INTENSITY**  
EXPERIENCED VS POSSIBLE  
*What is the total shaking experienced by my building and what could it be?*





DESIGN CODES

PEAK ACCELERATION

SHAKING INTENSITY

### BUILDING INFORMATION

[Address] Year Built: 1972  
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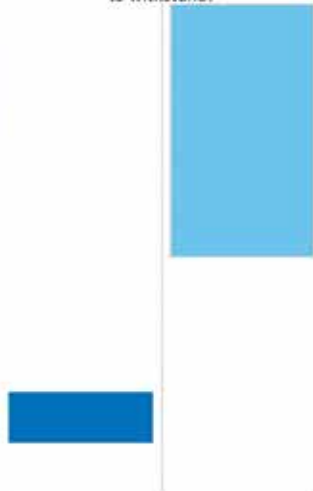
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EXPERIENCED VS POSSIBLE  
*What is the total shaking experienced by my building and what could it be?*

### DESIGN CODES

DESIGN FORCE vs MODERN DESIGN  
*What was my building designed to withstand?*



BUILDING DESIGN RANGE	MODERN DESIGN RANGE
[Blue bar]	[Light blue bar]



☰  🔍

- DESIGN CODES
- PEAK ACCELERATION
- SHAKING INTENSITY

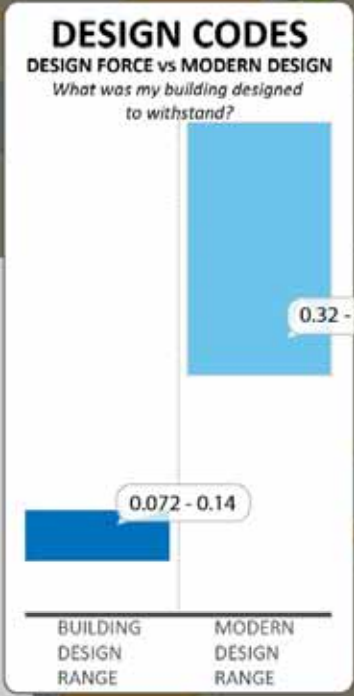
**BUILDING INFORMATION**  
[Address] Year Built: 1972  
Santa Monica, CA 5 Stories

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What has my building felt and what could it feel?

#### SHAKING INTENSITY

EXPERIENCED VS POSSIBLE

What is the total shaking experienced by my building and what could it be?

### PEAK ACCELERATION

EXPERIENCED VS POSSIBLE

What has my building felt and what could it feel?



HISTORIC EARTHQUAKE

EARTHQUAKE SCENARIO









DESIGN CODES

PEAK ACCELERATION

SHAKING INTENSITY

### BUILDING INFORMATION

[Address] Year Built: 1972  
Santa Monica, CA 5 Stories

**DESIGN CODES**  
DESIGN FORCES VS MODERN CODE  
*What is my building designed to withstand?*

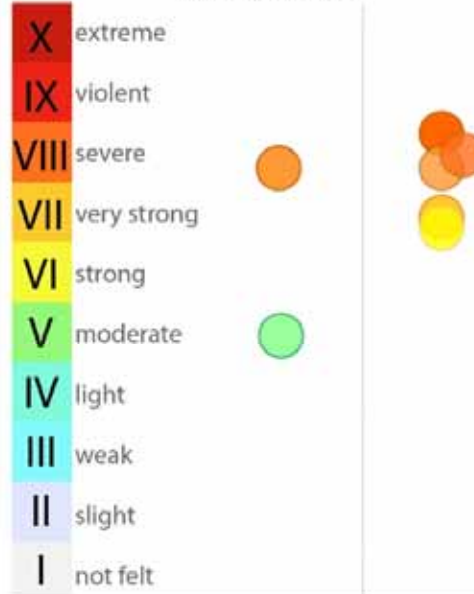
**PEAK ACCELERATION**  
EXPERIENCED VS POSSIBLE  
*What has my building felt and what could it feel?*

**SHAKING INTENSITY**  
EXPERIENCED VS POSSIBLE  
*What is the total shaking experienced by my building and what could it be?*

## SHAKING INTENSITY

EXPERIENCED vs POSSIBLE

*What is the total shaking experienced by my building and what could it be?*



HISTORIC EARTHQUAKE

EARTHQUAKE SCENARIO





DESIGN CODES

PEAK ACCELERATION

SHAKING INTENSITY

### BUILDING INFORMATION

[Address] Year Built: 1972  
Santa Monica, CA 5 Stories

#### DESIGN CODES

DESIGN FORCES VS MODERN CODE

*What is my building designed to withstand?*

#### PEAK ACCELERATION

EXPERIENCED VS POSSIBLE

*What has my building felt and what could it feel?*

#### SHAKING INTENSITY

EXPERIENCED VS POSSIBLE

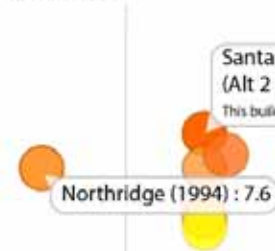
*What is the total shaking experienced by my building and what could it be?*

## SHAKING INTENSITY

EXPERIENCED vs POSSIBLE

*What is the total shaking experienced by my building and what could it be?*

- X extreme
- IX violent
- VIII severe
- VII very strong
- VI strong
- V moderate
- IV light
- III weak
- II slight
- I not felt



Santa Monica  
(Alt 2 m6.8 Scenario)  
This building could experience: 8.2

Northridge (1994) : 7.6

HISTORIC EARTHQUAKE

EARTHQUAKE SCENARIO



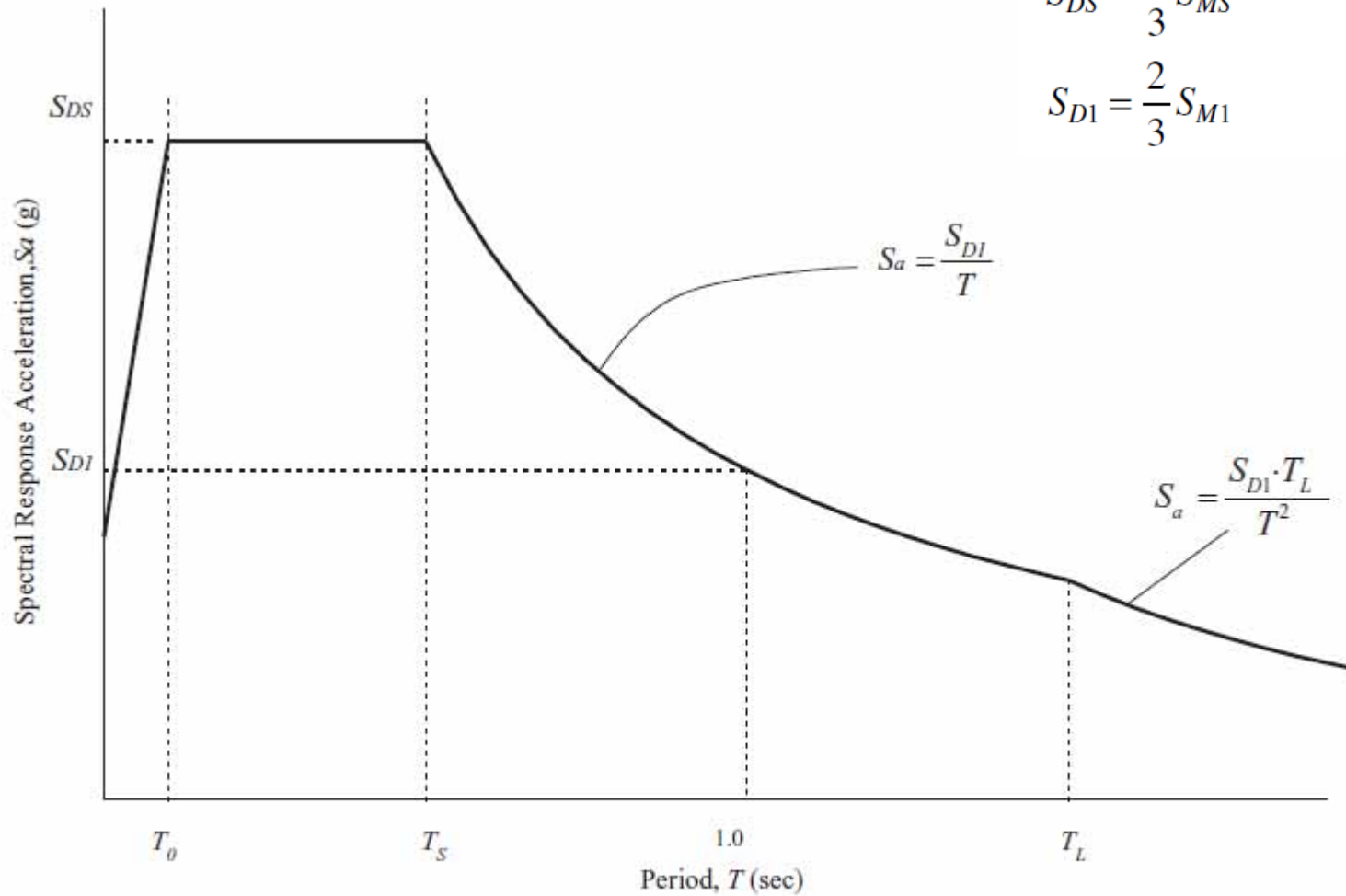


$$S_{MS} = F_a S_S \quad (11.4-1)$$

$$S_{M1} = F_v S_1 \quad (11.4-2)$$

$$S_{DS} = \frac{2}{3} S_{MS} \quad (11.4-3)$$

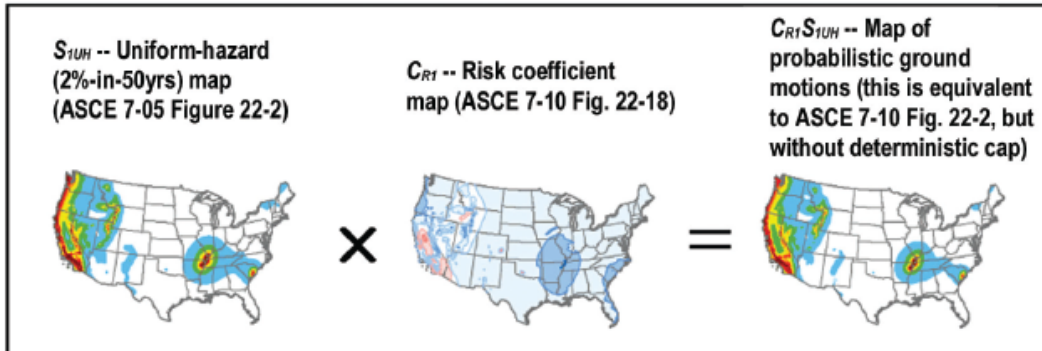
$$S_{D1} = \frac{2}{3} S_{M1} \quad (11.4-4)$$



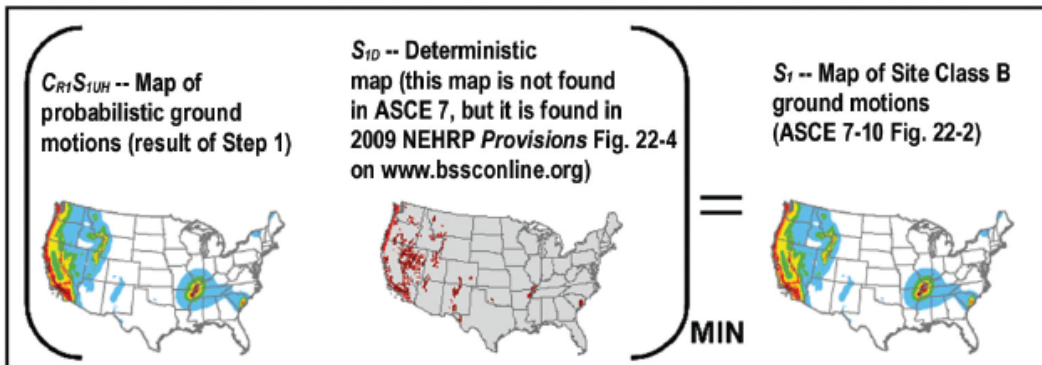
**FIGURE 11.4-1 Design Response Spectrum**

## STEPS INVOLVED IN THE CREATION OF ASCE 7-10 SEISMIC MAPS

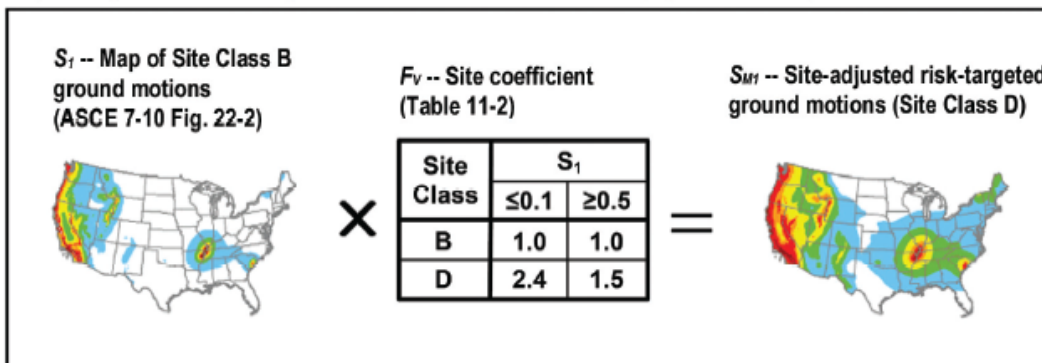
Step 1 - Adjust ASCE 7-05 map which is based on uniform-hazard ground motions (Site Class B) for target risk of collapse



Step 2 - Take minimum of probabilistic and deterministic ground motions (Site Class B) and create map



Step 3 - Adjust Site Class B ground motions for site conditions (e.g. Site Class D)



## What we use

**User Note:** Electronic values of mapped acceleration parameters and other seismic design parameters are provided at the USGS website at <http://earthquake.usgs.gov/design-maps>, or through the SEI website at <http://content.seinstitute.org>.

Table 11.4-1 Site Coefficient,  $F_a$

Site Class	Mapped Risk-Targeted Maximum Considered Earthquake (MCE <sub>R</sub> ) Spectral Response Acceleration Parameter at Short Period				
	$S_s \leq 0.25$	$S_s = 0.5$	$S_s = 0.75$	$S_s = 1.0$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7				

Note: Use straight-line interpolation for intermediate values of  $S_s$ .

Table 11.4-2 Site Coefficient,  $F_v$

Site Class	Mapped Risk-Targeted Maximum Considered Earthquake (MCE <sub>R</sub> ) Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7				

Note: Use straight-line interpolation for intermediate values of  $S_1$ .



**Table 20.3-1 Site Classification**

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard rock	>5,000 ft/s	NA	NA
B. Rock	2,500 to 5,000 ft/s	NA	NA
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
<p>Any profile with more than 10 ft of soil having the following characteristics:</p> <ul style="list-style-type: none"> <li>—Plasticity index <math>PI &gt; 20</math>,</li> <li>—Moisture content <math>w \geq 40\%</math>,</li> <li>—Undrained shear strength <math>\bar{s}_u &lt; 500</math> psf</li> </ul>			
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1 ft/s = 0.3048 m/s; 1 lb/ft<sup>2</sup> = 0.0479 kN/m<sup>2</sup>.

What we would like to see

The screenshot displays the ZIMAS web application interface. At the top, the 'ZIMAS' logo is prominent. Below it, there are three main navigation tabs: 'Search', 'Reports', and 'Resources'. The 'Search' tab is active, showing a table of search results for 'Tract P M 1981'. Below the table is a list of categories with expandable arrows, including 'Jurisdictional', 'Planning and Zoning', 'Assessor', 'Case Numbers', 'Citywide/Code Amendment Cases', 'Additional', and 'Seismic Hazards'. The 'Seismic Hazards' section is expanded, showing detailed information about an 'Active Fault Near-Source Zone'. To the right of the search results is a map of a city grid with various colored overlays and a toolbar at the top.

Tract	P M 1981
Map Reference	BK 25-93/94
Block	None
Lot	A
Arb (Lot Cut Reference)	None
Map Sheet	130-5A213
Map Sheet	132A213

**Seismic Hazards**

Active Fault Near-Source Zone

Nearest Fault (Distance in km)	1.1326825190915
Nearest Fault (Name)	Upper Elysian Park
Region	Los Angeles Blind Thrusts
Fault Type	B
Slip Rate (mm/year)	1.30000000
Slip Geometry	Reverse
Slip Type	Poorly Constrained
Down Dip Width (km)	13.00000000
Rupture Top	3.00000000
Rupture Bottom	13.00000000
Dip Angle (degrees)	50.00000000
Maximum Magnitude	6.40000000
Alquist-Priolo Fault Zone	No
Landslide	No
Liquefaction	Yes
Preliminary Fault Rupture Study Area	No
Tsunami Inundation Zone	No



# REQUEST FOR AUDIENCE FEEDBACK

Please contact:

Brittany Moffett  
[bmoffett@usc.edu](mailto:bmoffett@usc.edu)

Anders Carlson, PhD  
[andersca@usc.edu](mailto:andersca@usc.edu)

## PRESENTATION

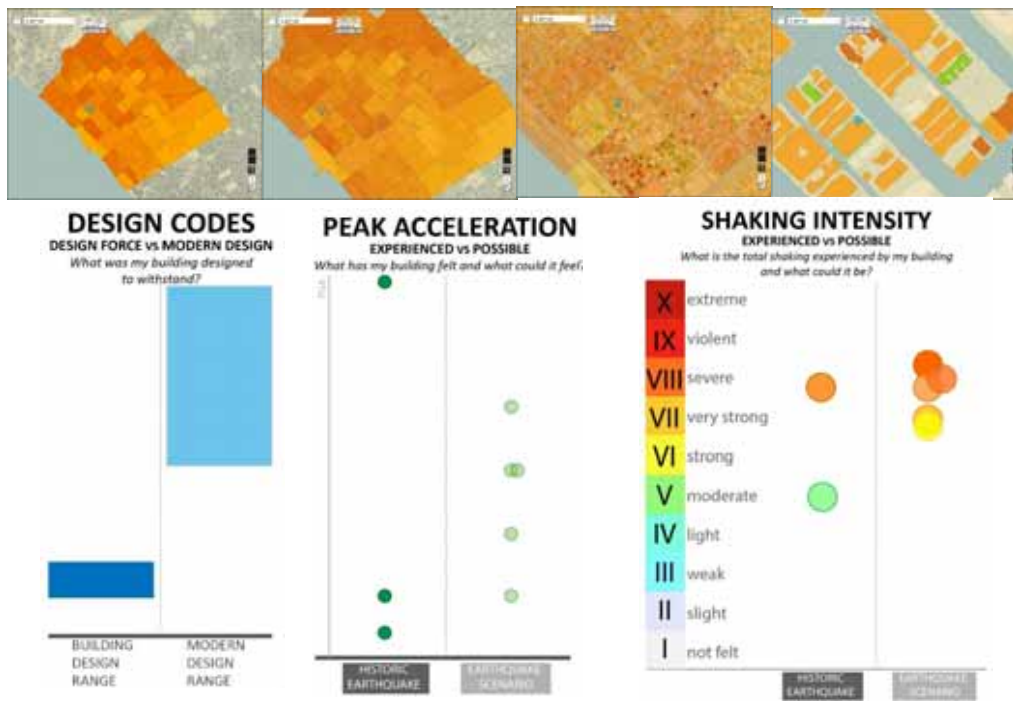
- Clarity
- Visual Appeal
- User Navigation

## INFORMATION

- Information used
- Information you would like to see

## COMMUNICATING RISK

- Primary target audience: building owners
- If you lived or worked in the region covered by the map, would you want to look up your building?



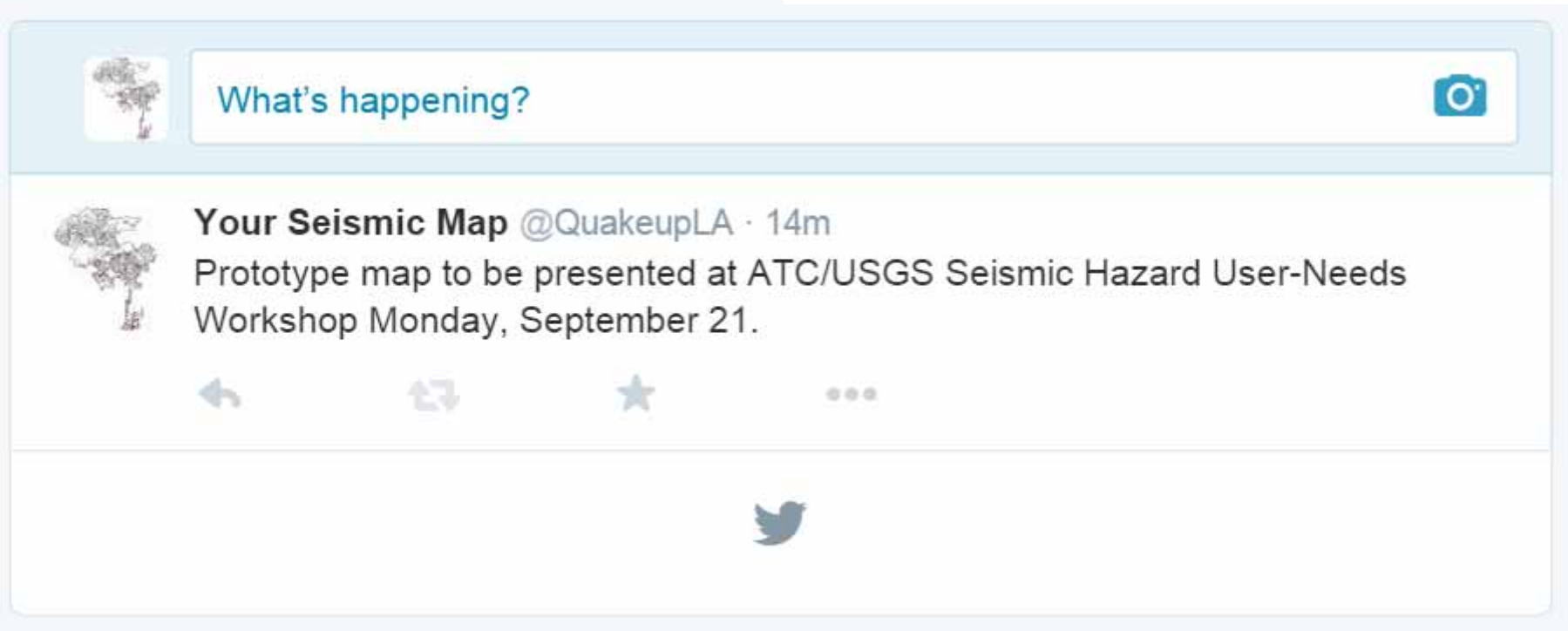


**Your Seismic Map**  
@QuakeupLA

TWEETS  
1

Brittany Moffett, [bmoffett@usc.edu](mailto:bmoffett@usc.edu)  
Anders Carlson, [andersca@usc.edu](mailto:andersca@usc.edu)

Map contact, [@QuakeupLA](https://twitter.com/QuakeupLA)



What's happening?

**Your Seismic Map** @QuakeupLA · 14m  
Prototype map to be presented at ATC/USGS Seismic Hazard User-Needs Workshop Monday, September 21.

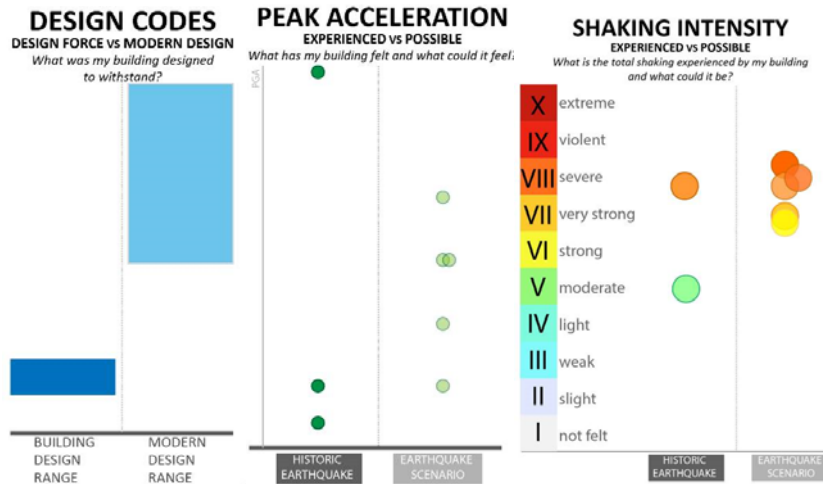
Reply Retweet Favorite More

Twitter



# QuakeUpLA – Brief Survey

*We would love your advice and expertise to improve this communication tool intended to increase awareness of the difference between what could happen versus what has happened and to urge building owners to seek seismic inspection and retrofit.*



**PRESENTATION** - What do you think worked well (visually, information provided, clarity, etc) and what should we improve on? After seeing the presentation, was there anything you felt unclear about?

**INFORMATION** - Is there any additional information you would have liked to see? Was there any information used that we should have excluded? Do you have any recommendations for additional datasets?

**COMMUNICATION** – Do you have suggestions for making this more clear and comprehensive for building owners? If you lived or worked in the region covered by the map, would you want to look up your building?

Thank you for participating in this survey. Please feel free to tweet us @QuakeupLA or email us with any other thoughts. Do you have any other suggestions for us as we continue to develop this map?

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