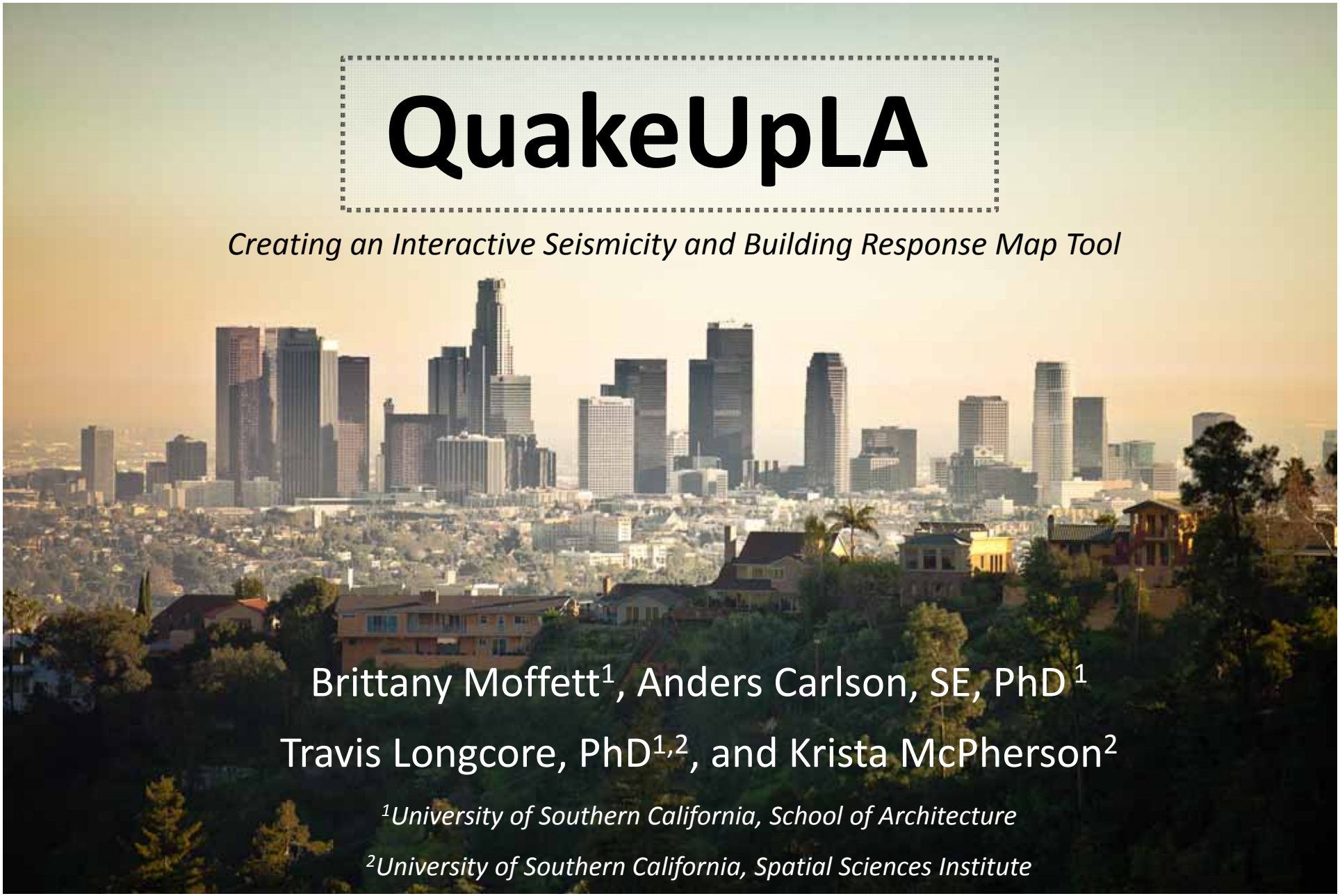

QuakeUpLA

Creating an Interactive Seismicity and Building Response Map Tool

Brittany Moffett[1], Anders Carlson, SE, PhD [1]

Travis Longcore, PhD[1,2], and Krista McPherson[2]

[1]University of Southern California, School of Architecture

[2]University of Southern California, Spatial Sciences Institute

Sunday, October 13, 2013

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SUNDAY, OCTOBER 13, 2013

latimes.com

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wsuits

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claims can be filed,
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ld feel secure that "past
are indeed in the past
not subject to further
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e also argued that the
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in part lifted the stat-
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because it singled out
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Scouts. Public schools
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or the teachers at
onte Elementary
in Los Angeles are no
rthy because of the
of the institution they
[See Abuse, A26]

MEL MELCON Los Angeles Times

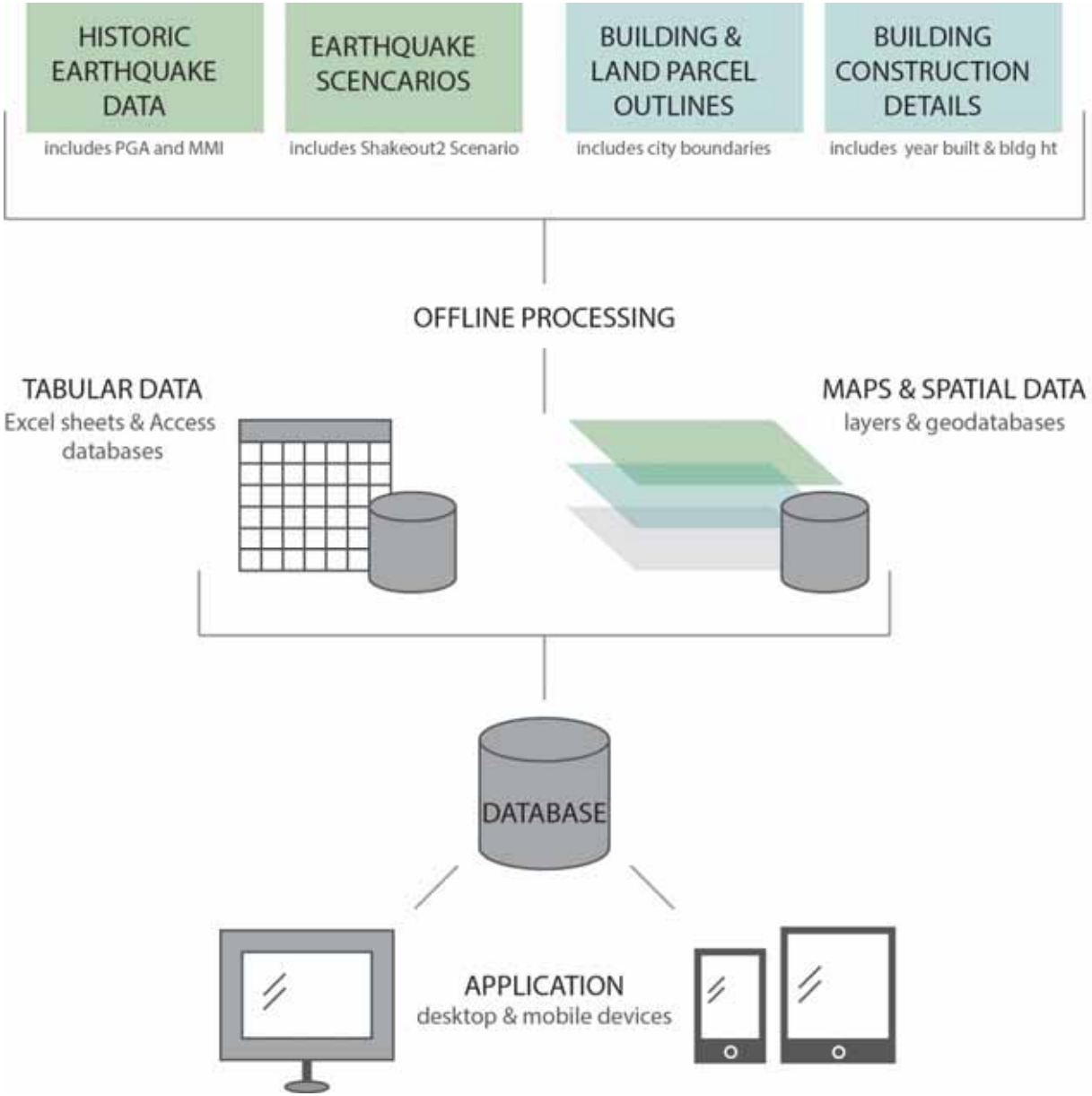
THE NEW MART in L.A.'s fashion district, a concrete building. After a 1985 quake in Mexico, Ethan Eller had a structural engineer assess the safety of his building. Most such structures have not had similar scrutiny.

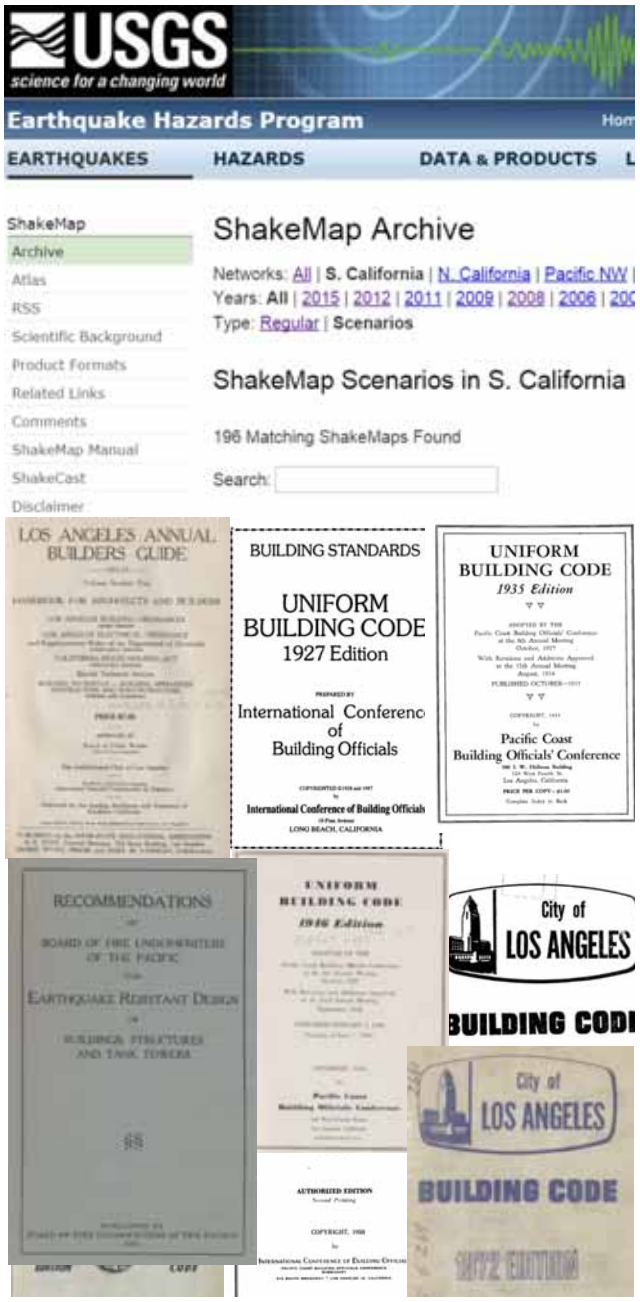
A CONCRETE RISK

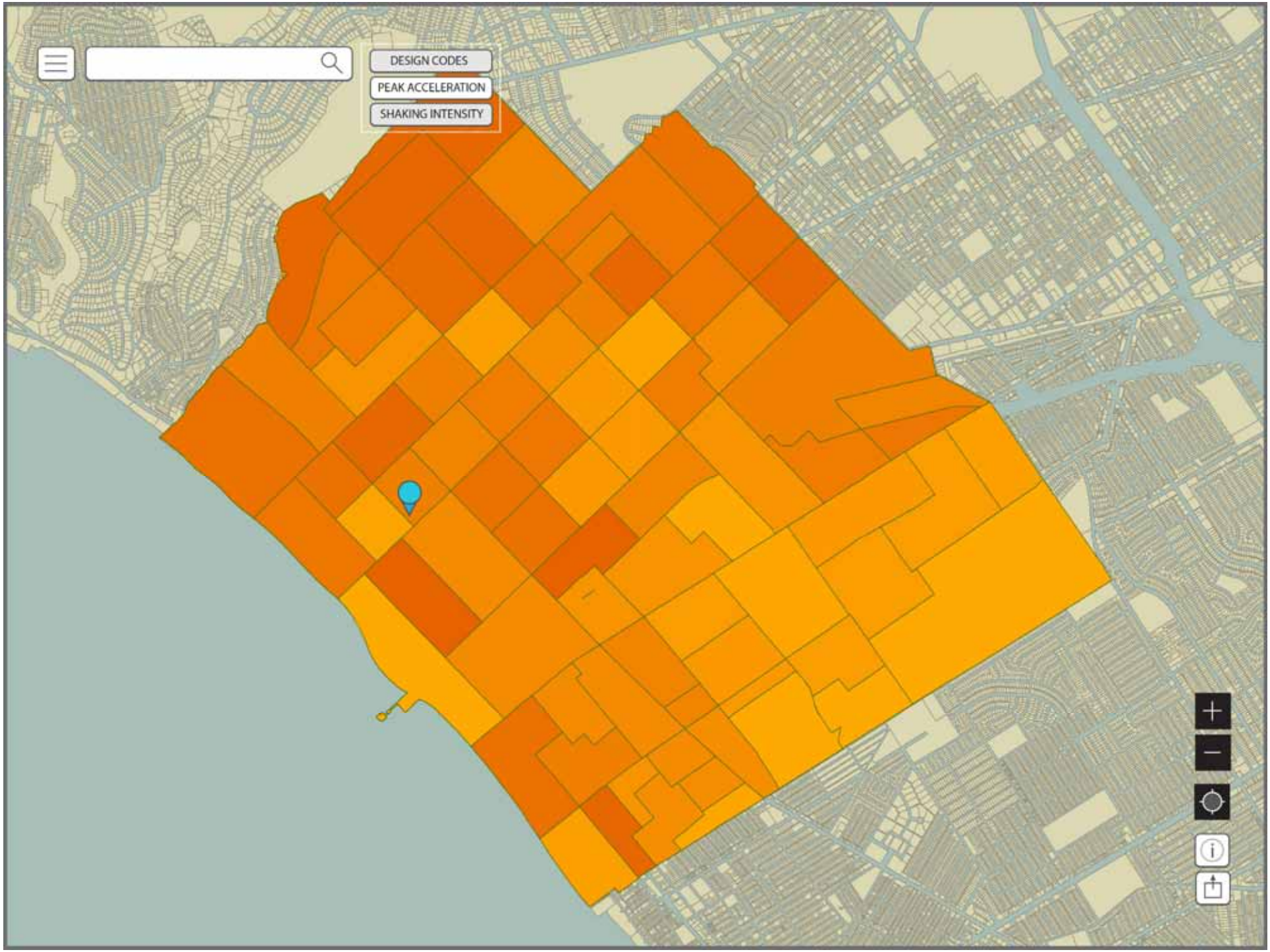
Short on steel support, hundreds of L.A. buildings are a threat in quakes

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

DATA STRUCTURE



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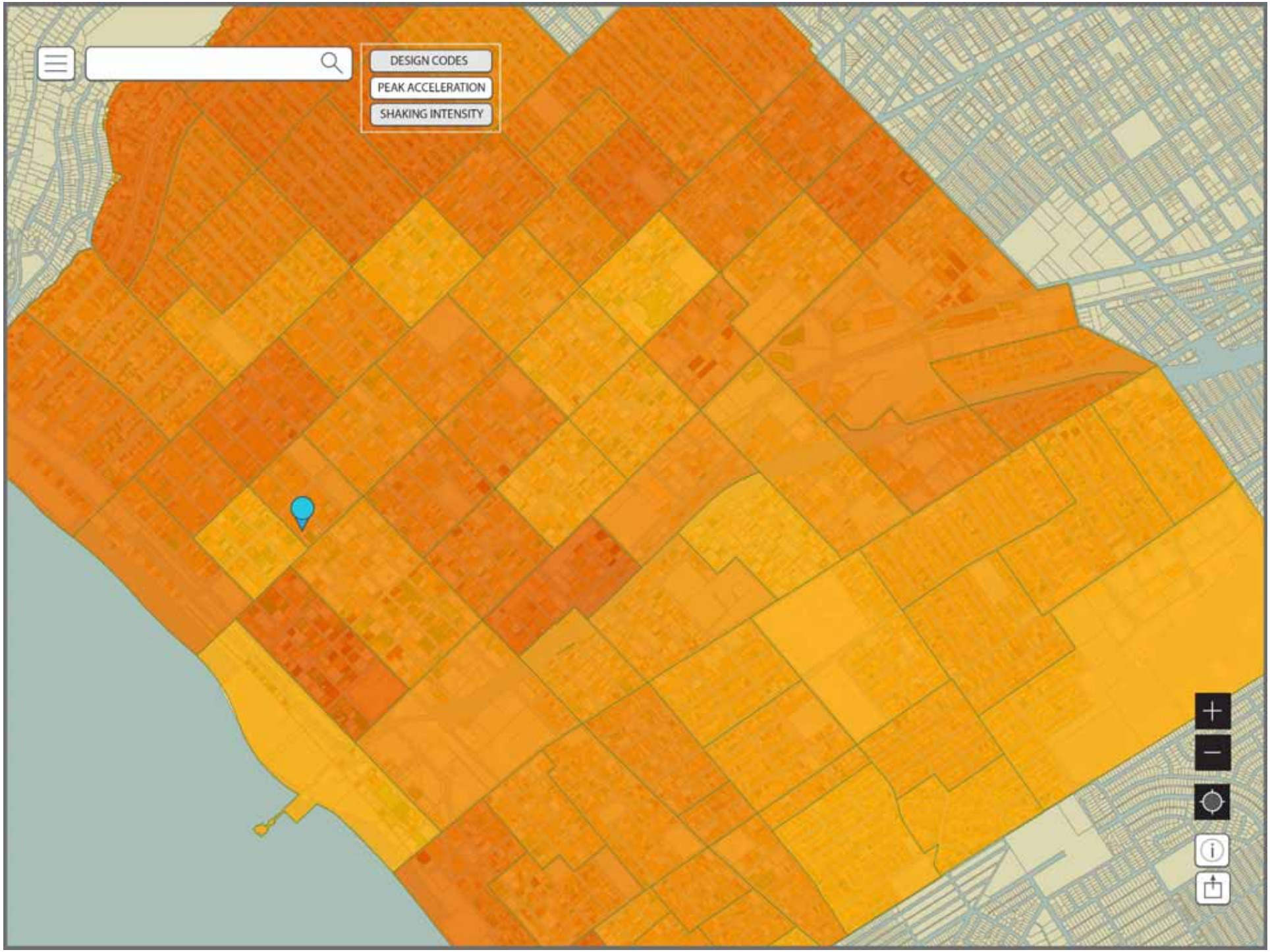
SHAKING INTENSITY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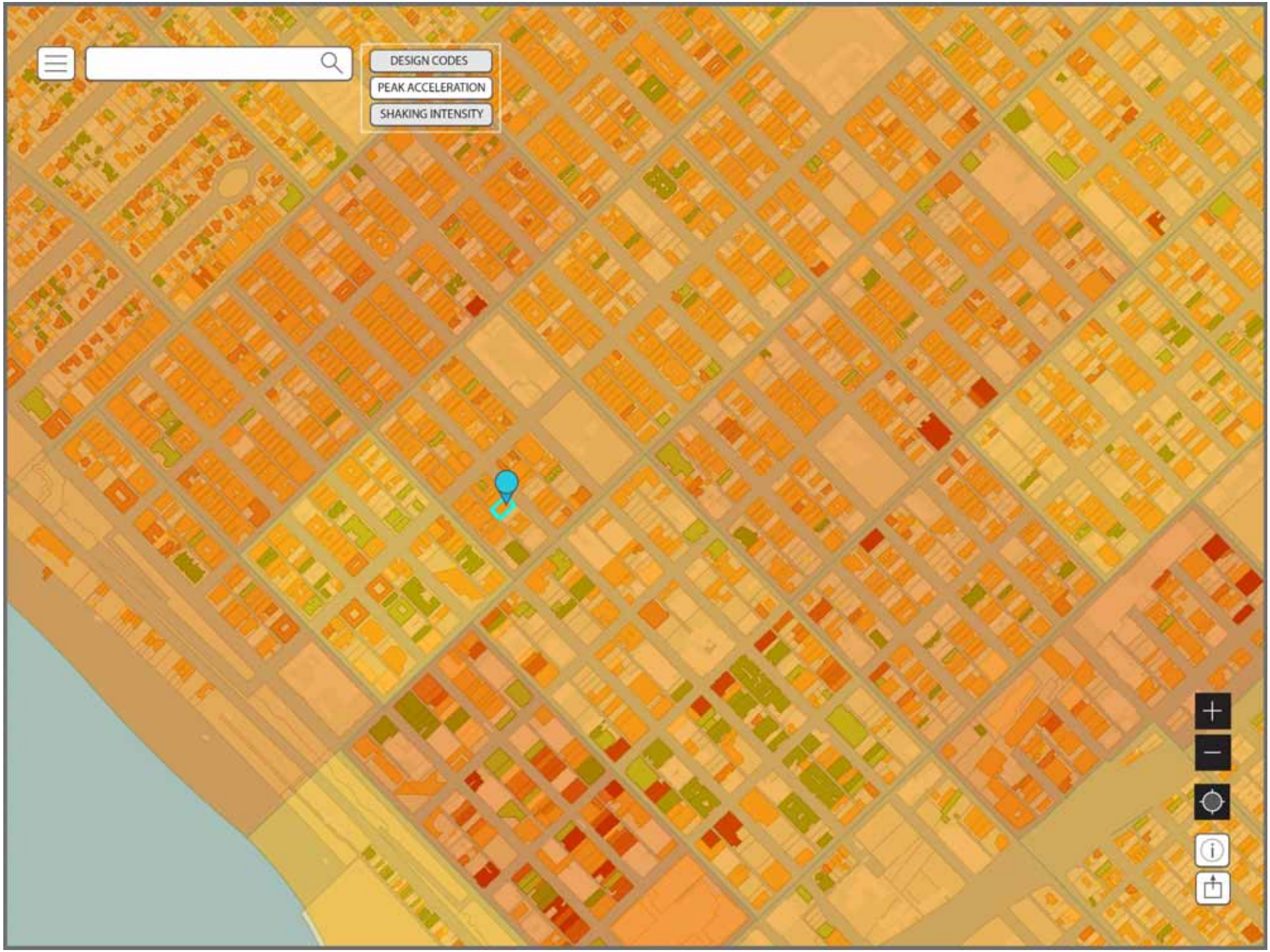
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DESIGN CODES
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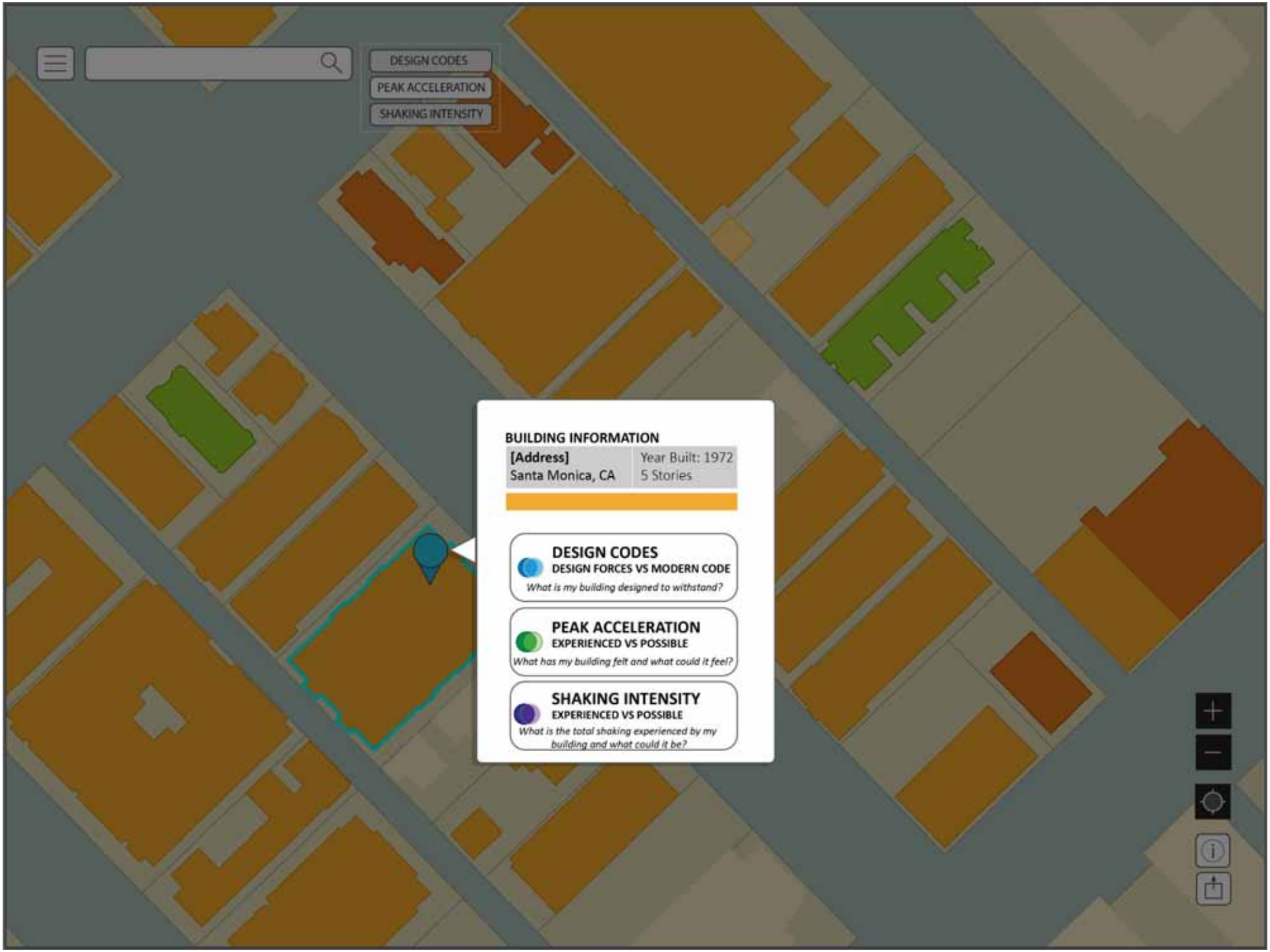
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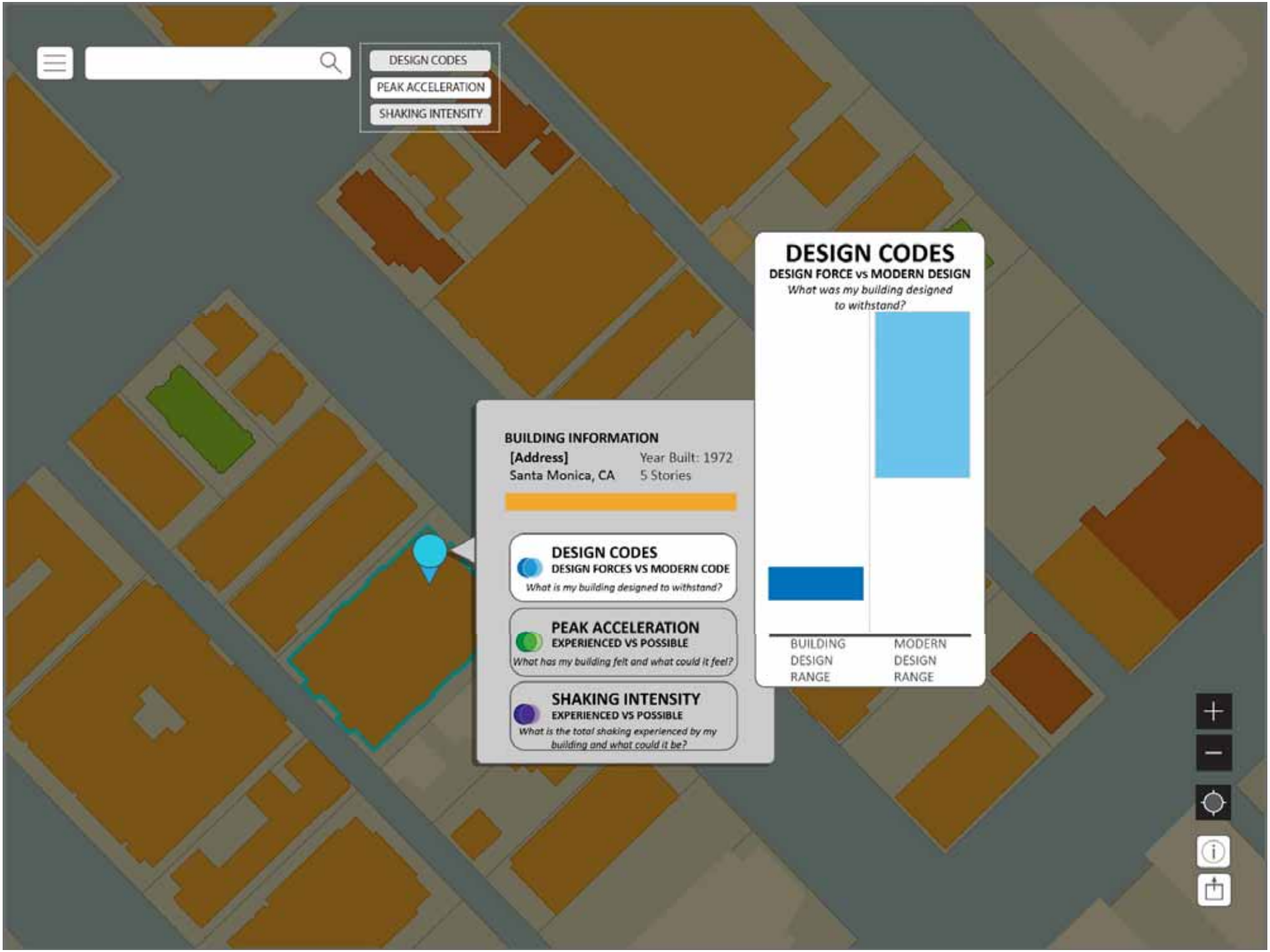
BUILDING INFORMATION
[Address]
Santa Monica, CA
Year Built: 1972
5 Stories
DESIGN CODES
DESIGN FORCES VS MODERN CODE
What is my building designed to withstand?
PEAK ACCELERATION
EXPERIENCED VS POSSIBLE
What has my building felt and what could it feel?
SHAKING INTENSITY
EXPERIENCED VS POSSIBLE
What is the total shaking experienced by my building and what could it be?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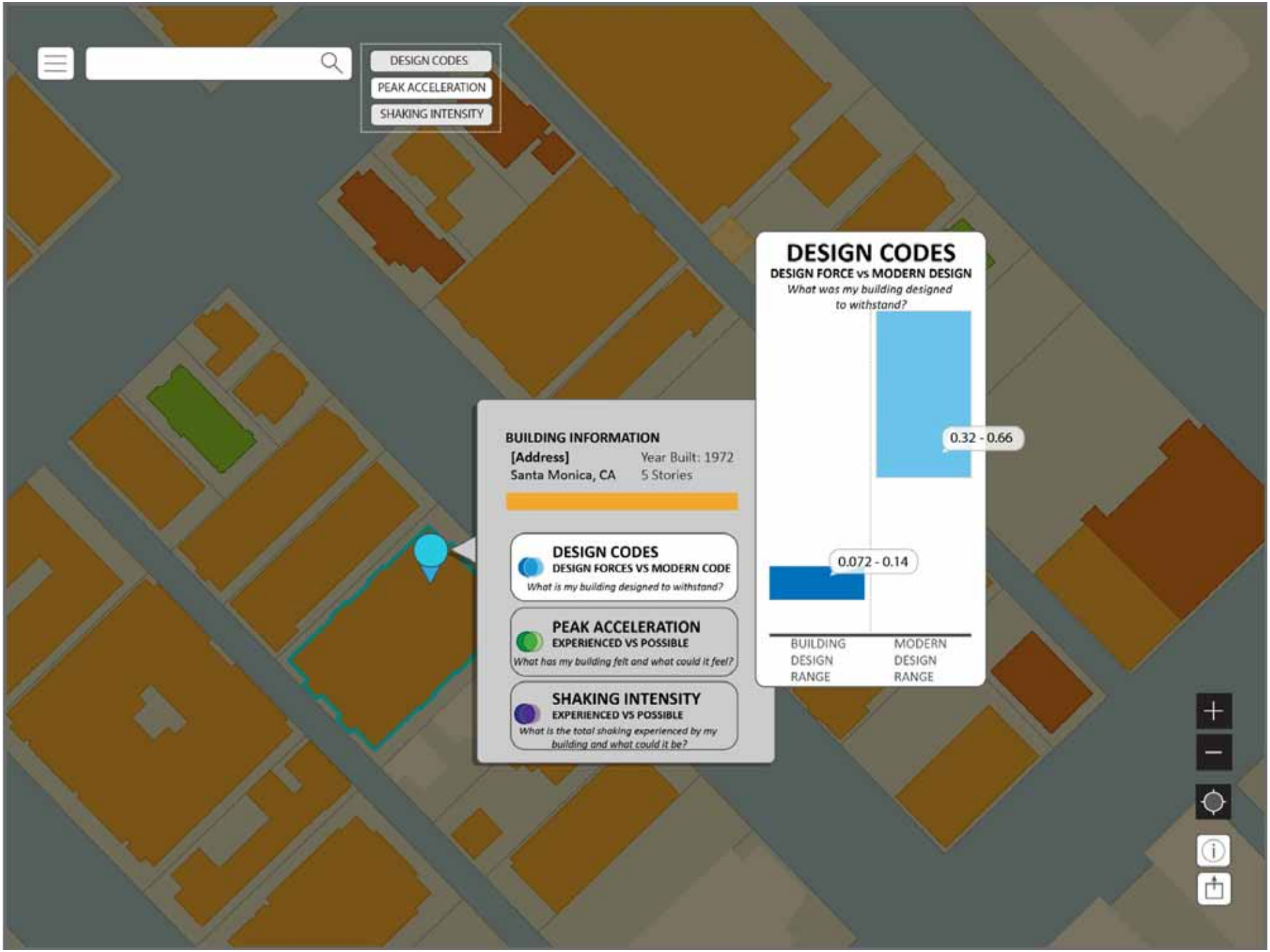
DESIGN CODES
DESIGN FORCE vs MODERN DESIGN
What was my building designed to withstand?
BUILDING DESIGN RANGE
MODERN DESIGN RANGE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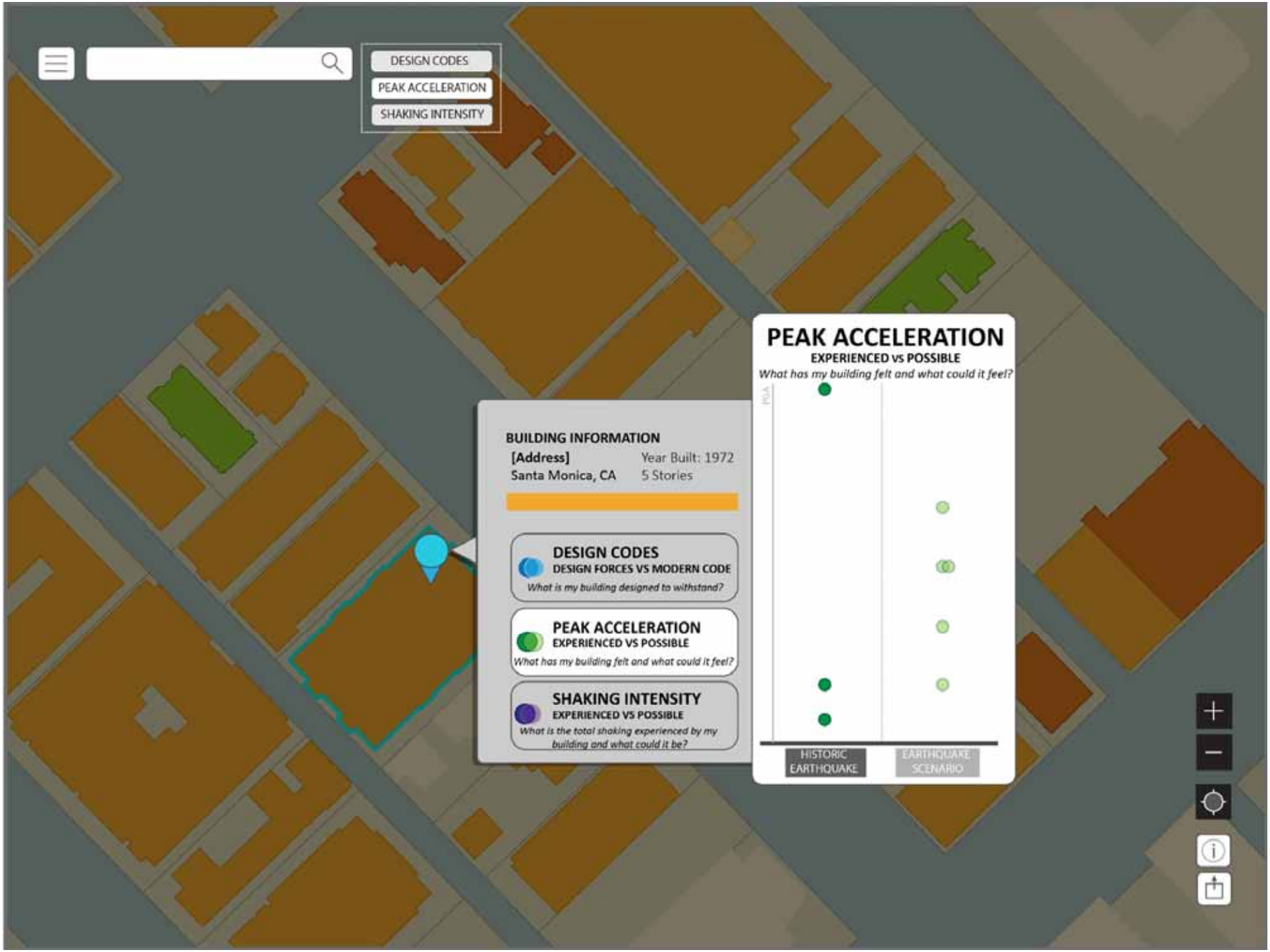
DESIGN CODES
DESIGN FORCE vs MODERN DESIGN
What was my building designed to withstand?
0.32 - 0.66
0.072 - 0.14
BUILDING DESIGN RANGE
MODERN DESIGN RANGE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SHAKING INTENSITY
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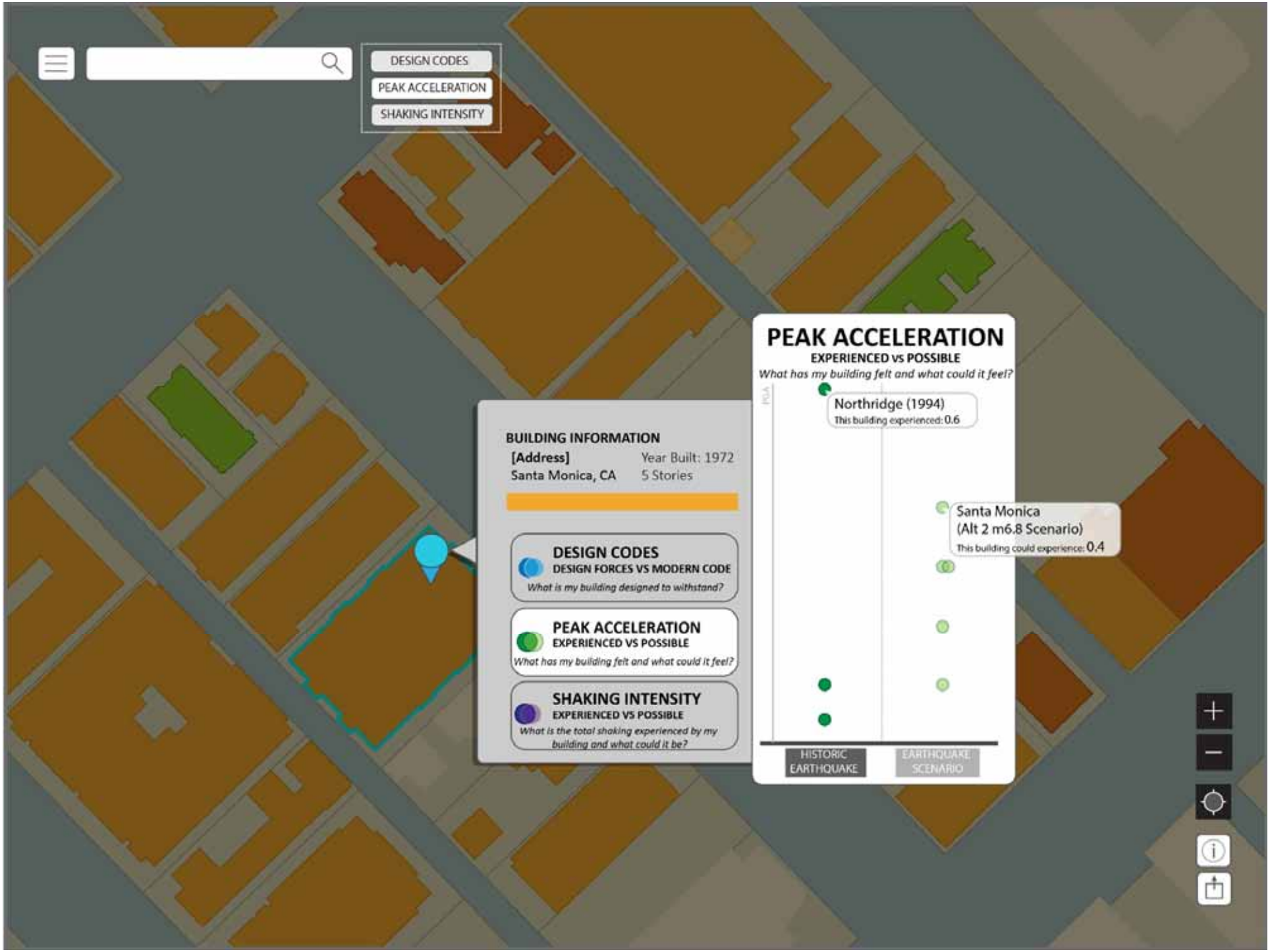
EXPERIENCED VS POSSIBLE
What has my building felt and what could it feel?
PGA
HISTORIC EARTHQUAKE
EARTHQUAKE SCENARIO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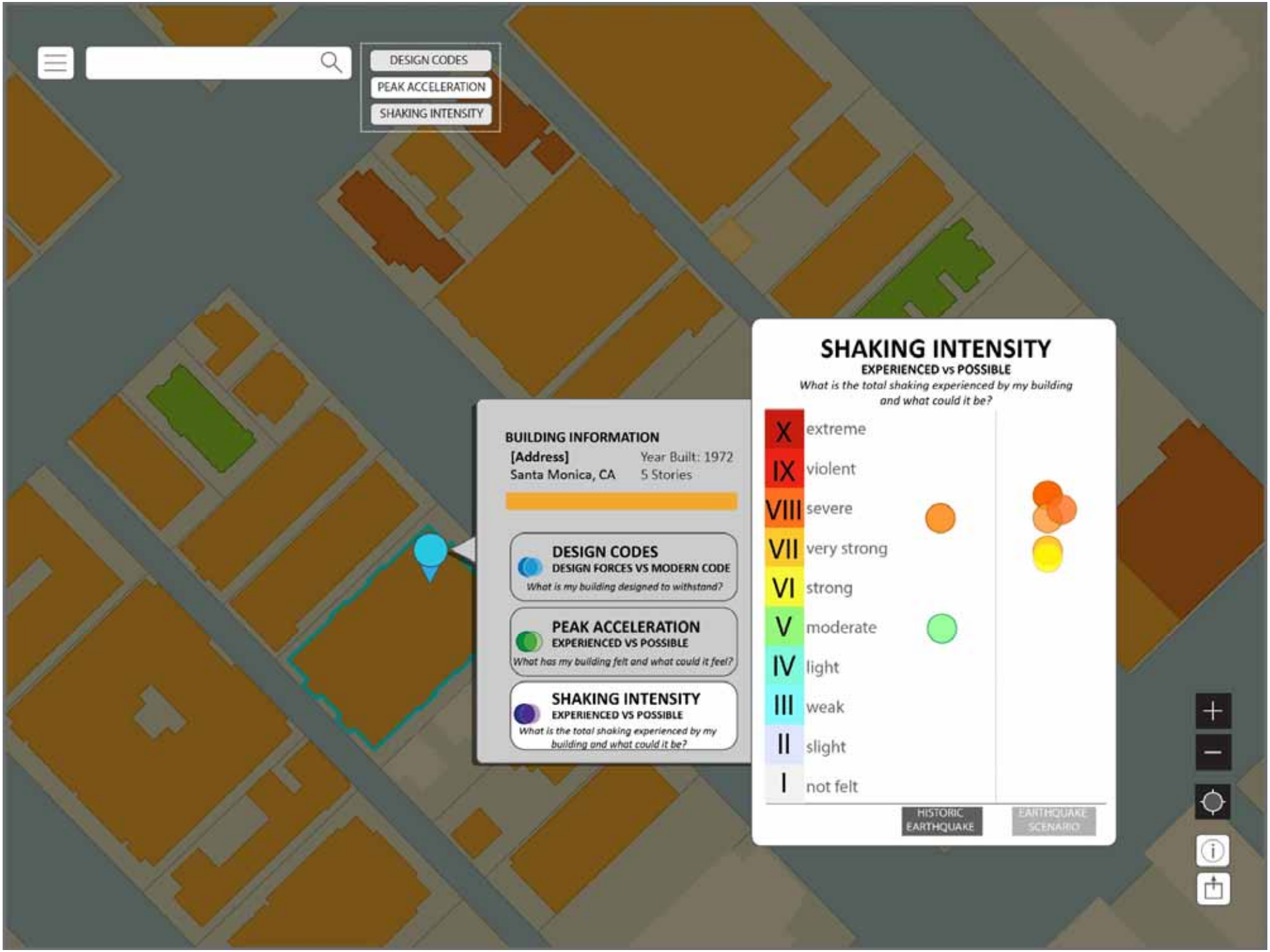
SHAKING INTENSITY
EXPERIENCED VS POSSIBLE
What is the total shaking experienced by my building and what could it be?
PEAK ACCELERATION
EXPERIENCED VS POSSIBLE
What has my building felt and what could it feel?
PGA
Northridge (1994)
This building experienced: 0.6
Santa Monica
(Alt 2 m6.8 Scenario)
This building could experience: 0.4
HISTORIC EARTHQUAKE
EARTHQUAKE SCENARIO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BUILDING INFORMATION
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EXPERIENCED VS POSSIBLE
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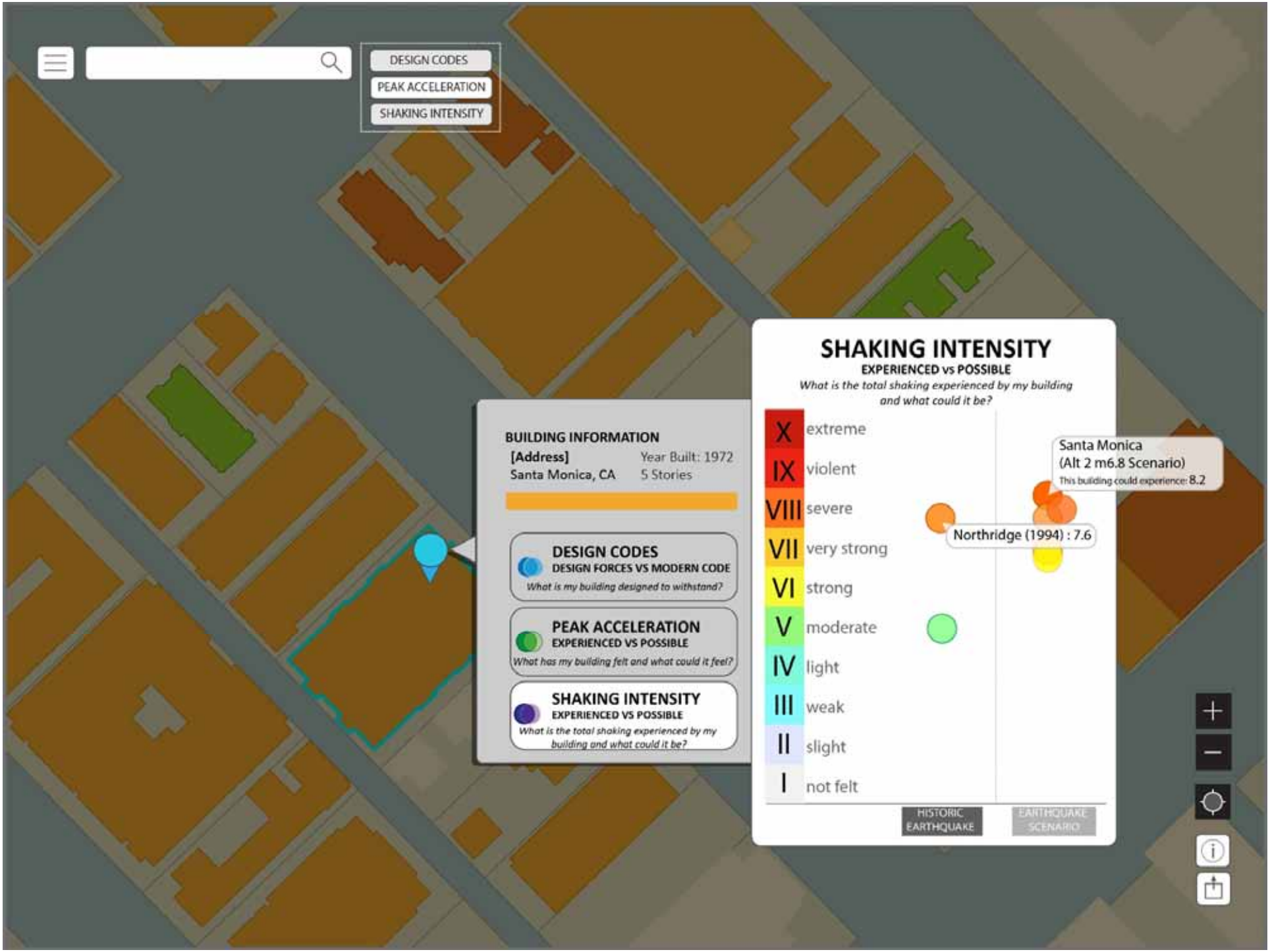
SHAKING INTENSITY
EXPERIENCED VS POSSIBLE
What is the total shaking experienced by my building and what could it be?
X extreme
IX violent
VIII severe
VII very strong
VI strong
V moderate
IV light
III weak
II slight
I not felt
HISTORIC EARTHQUAKE
EARTHQUAKE SCENARIO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PEAK ACCELERATION
SHAKING INTENSITY
BUILDING INFORMATION
[Address]
Santa Monica, CA
Year Built: 1972
5 Stories
DESIGN CODES
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What is my building designed to withstand?
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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?
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

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

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

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

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

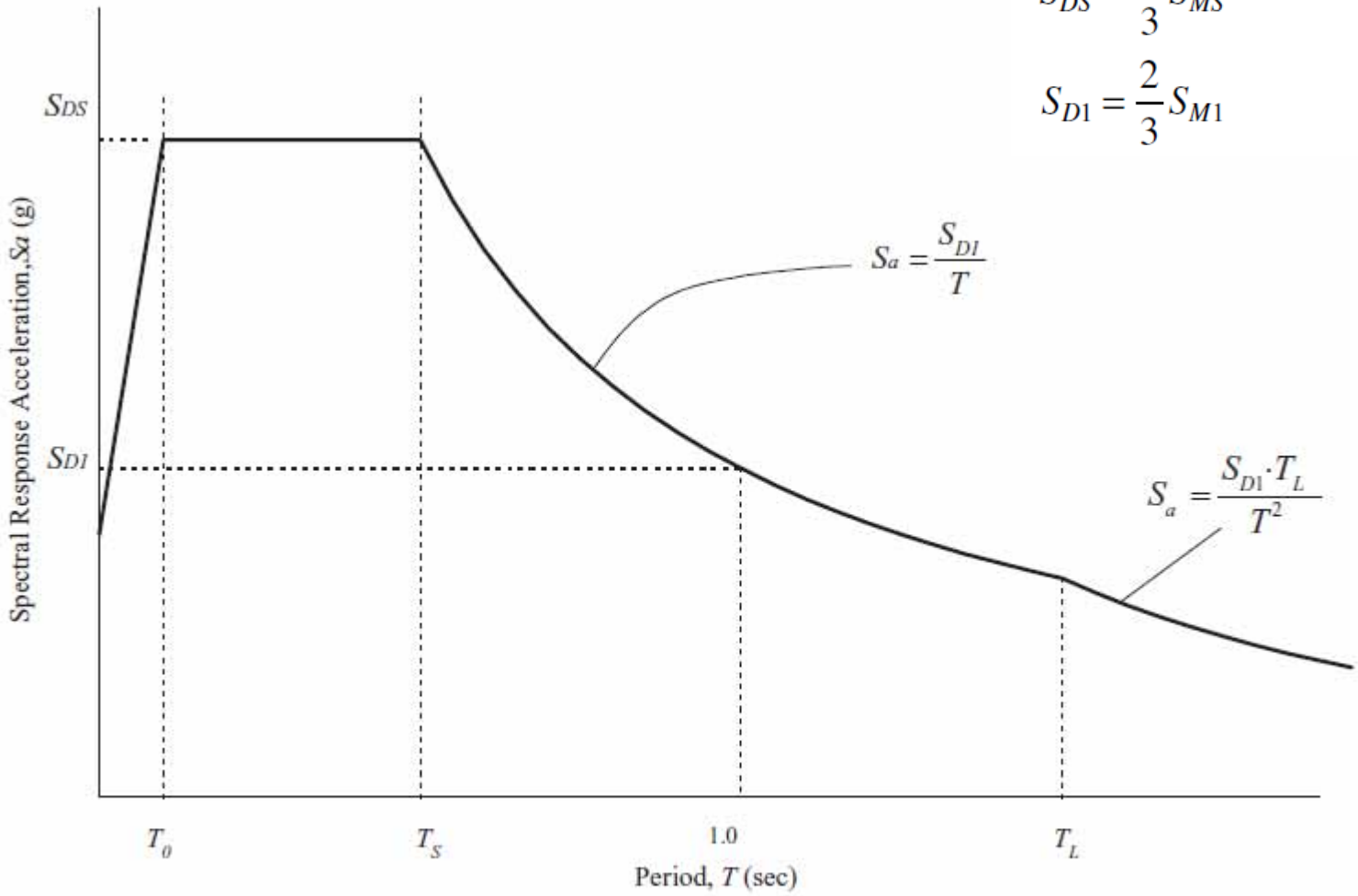
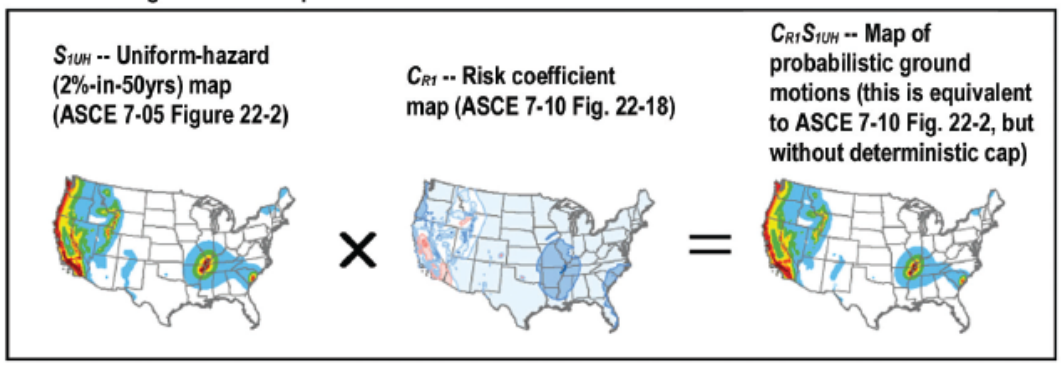


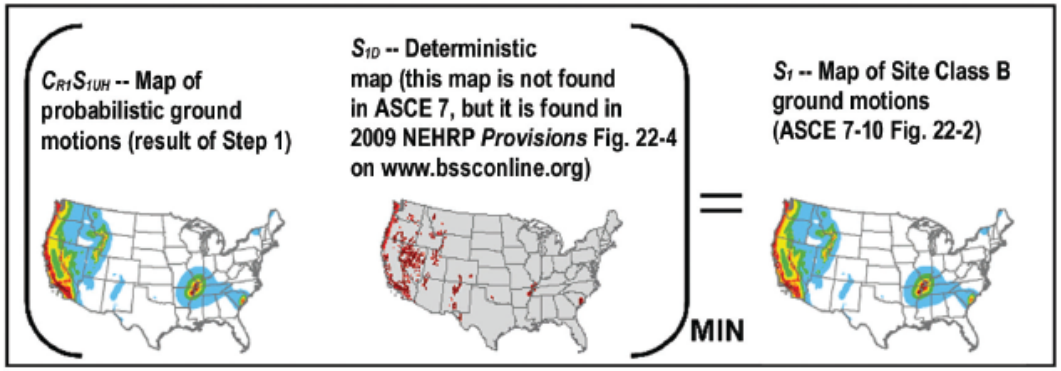
FIGURE 11.4-1 Design Response Spectrum

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

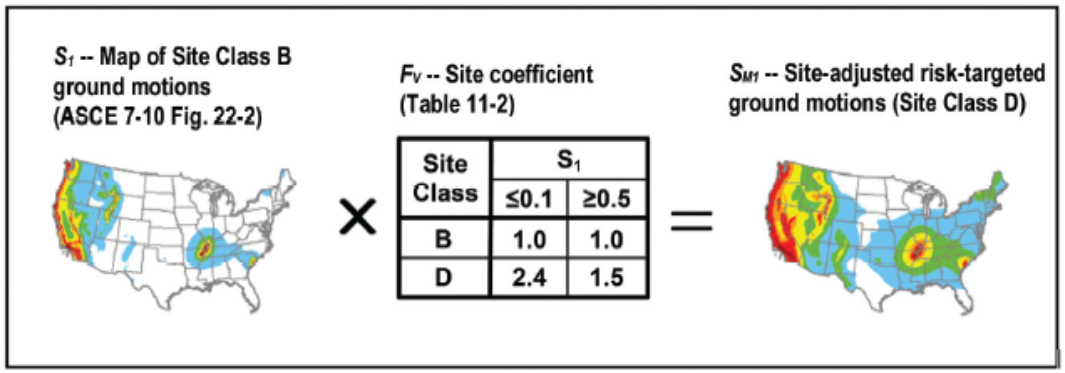
Step 1 - Adjust ASCE 7-05 map which is based on uniform-hazard ground motions (Site Class B) for target risk of collapse



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)



Site Class	S_1 ≤0.1	S_1 ≥0.5
B	1.0	1.0
D	2.4	1.5

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_R) Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.5$	$S_S = 0.75$	$S_S = 1.0$	$S_S \ge 1.25$
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_R) Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \le 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \ge 0.5$
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.

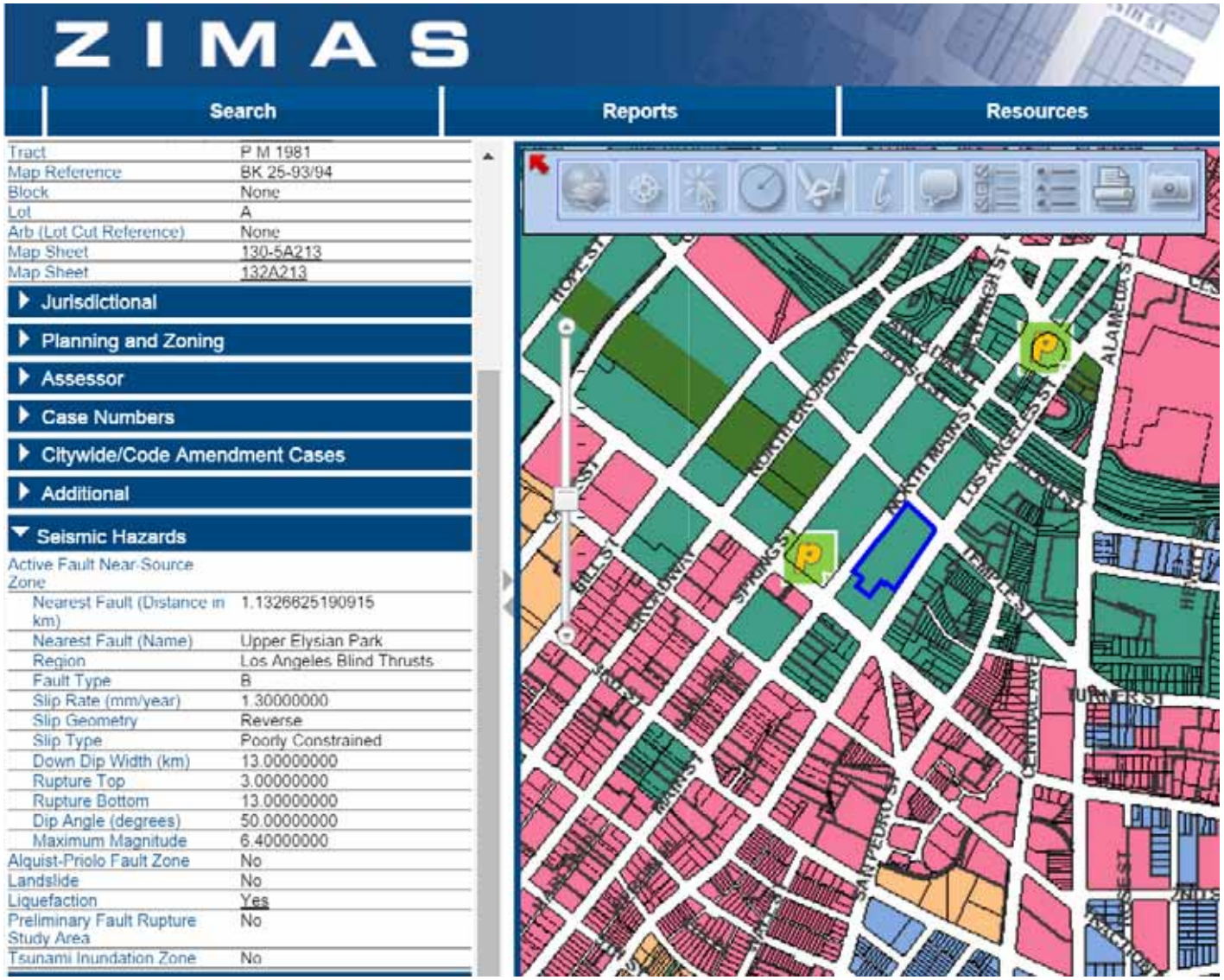
What we need

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
	Any profile with more than 10 ft of soil having the following characteristics: —Plasticity index $PI > 20$, —Moisture content $w \geq 40\%$, —Undrained shear strength $\bar{s}_u < 500$ psf		
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^2 = 0.0479 kN/m^2.

What we would like to see



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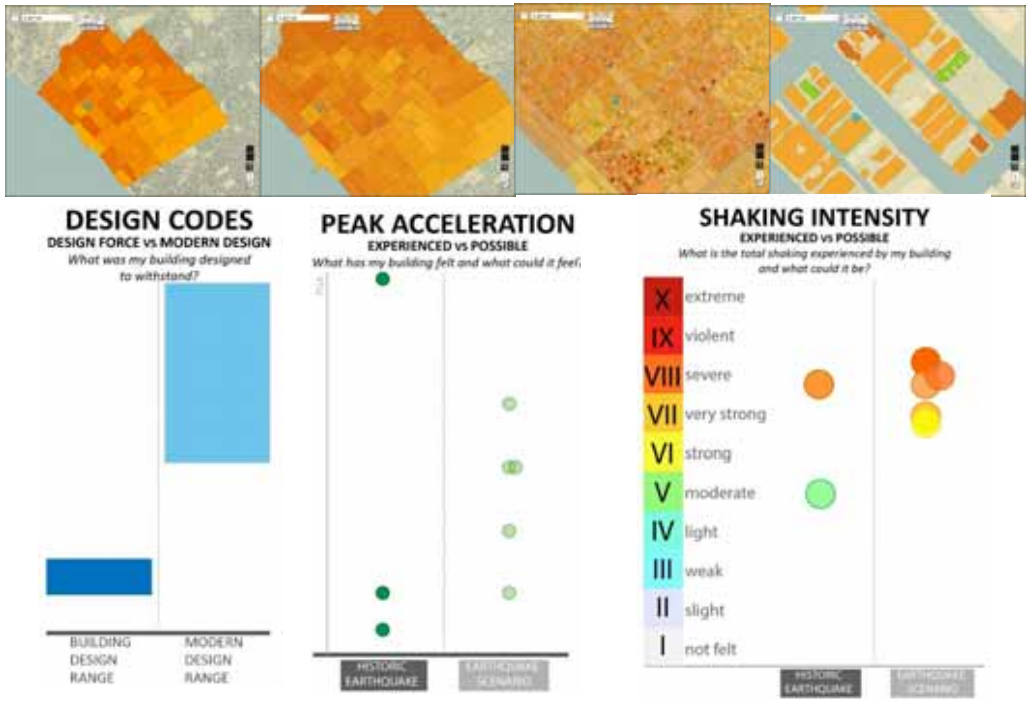
REQUEST FOR AUDIENCE FEEDBACK

Please contact:

Brittany Moffett
bmoffett@usc.edu

Anders Carlson, PhD
andersca@usc.edu



PRESENTATION

- Clarity
- Visual Appeal
- User Navigation

INFORMATION

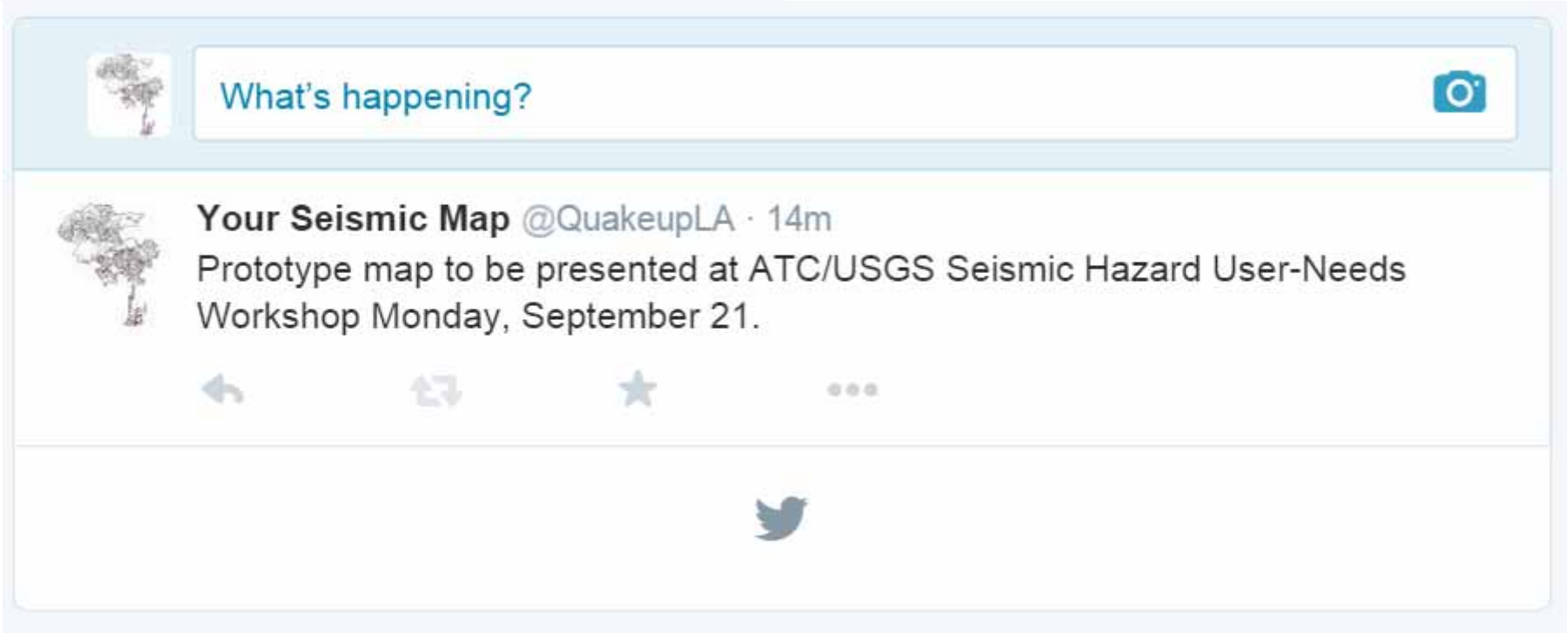
- Information used
- Information you would like to see

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?

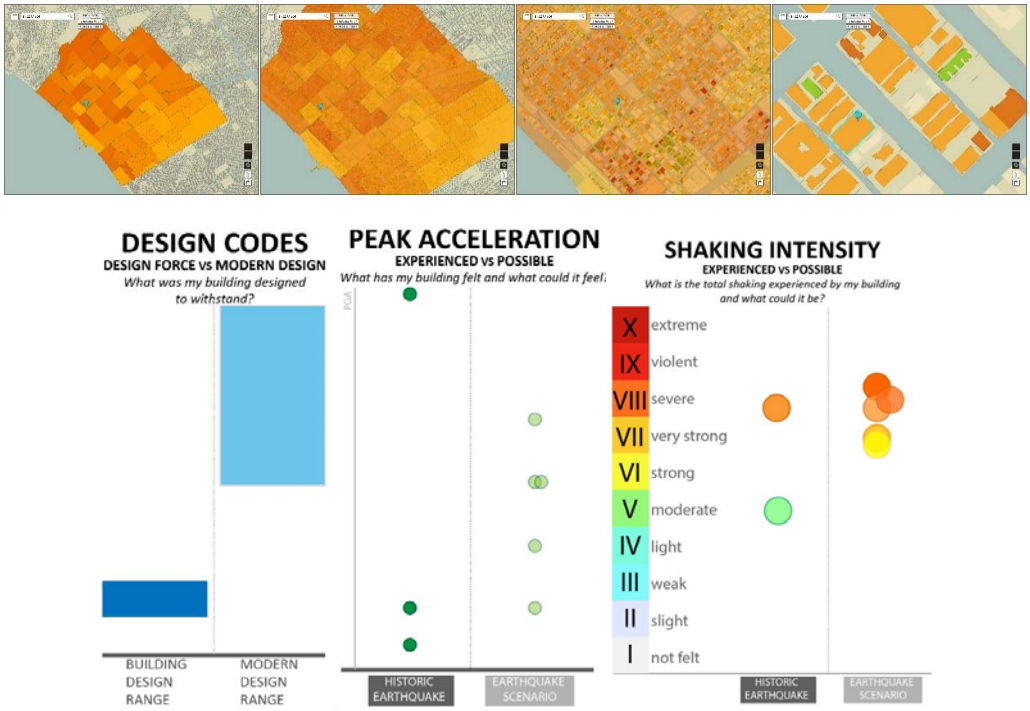
Brittany Moffett, bmoffett@usc.edu
Anders Carlson, andersca@usc.edu

Map contact, **@QuakeupLA**



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?

Brittany Moffett
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andersca@usc.edu