

Locational Precision, Critical Infrastructure, and Potential Hazard Impact

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Critical Infrastructure

Vital to Homeland Security

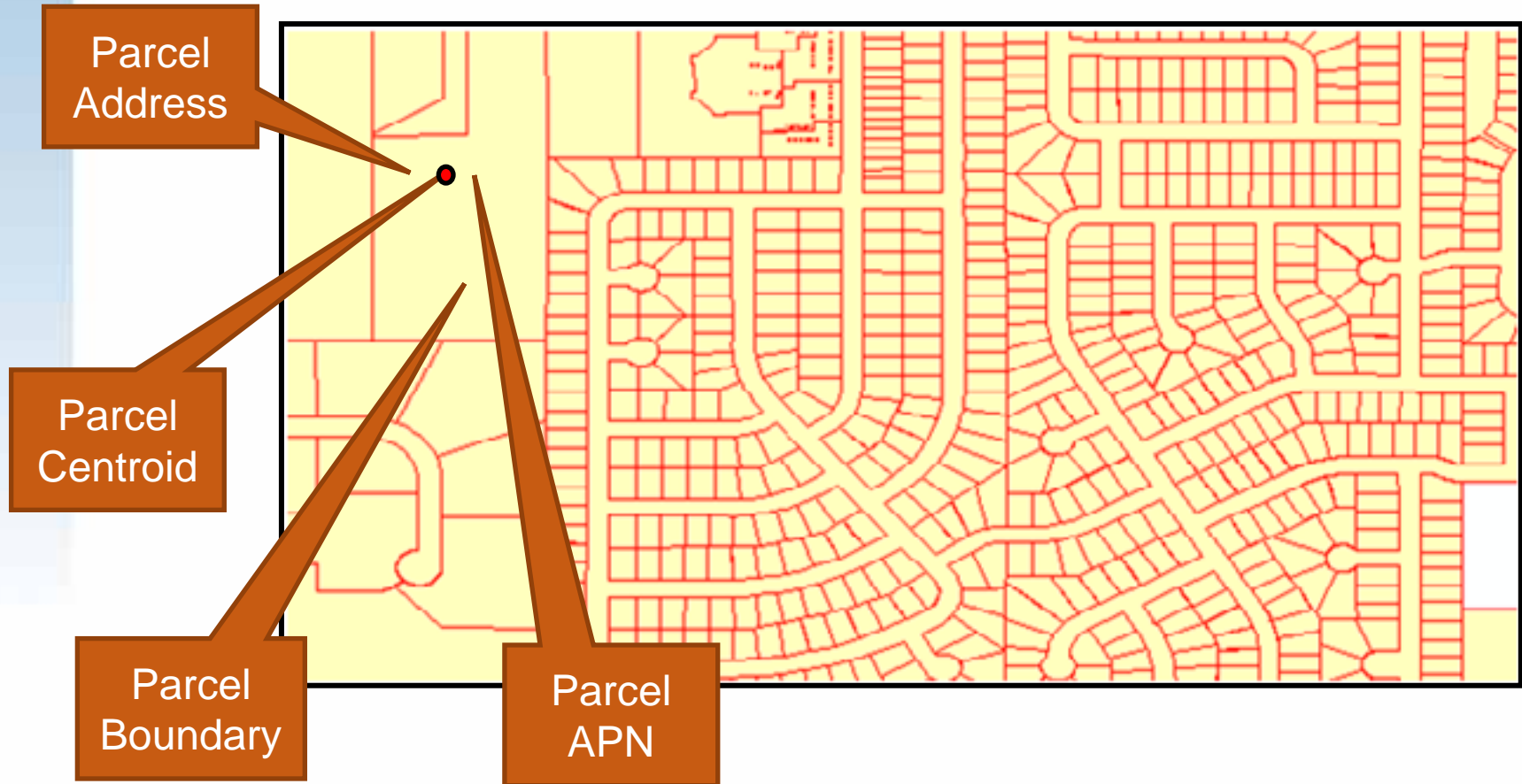
- Infrastructure protection vital
 - ◆ Natural disasters (this discussion)
 - ◆ Human caused disasters, including terrorism
- Infrastructure:
 - ◆ Composed of many large and small parts
 - ◆ Often, one small element can bring down a larger chain
- Inventory and remediation of small infrastructure elements imperative
- The smaller the asset the greater the need for locational precision

Critical Infrastructure Elements

Discussion focused on smaller elements

- Electrical substations
- Pumping stations
- Pipeline compression stations
- Police/fire stations
- Disaster supply storage/staging facilities

Infrastructure elements reside on parcels!



We are parcel-centric!

Parcel Level vs. Versus Address Interpolation

Parcel Level
Geocodes



Address
Range
Interpolated
Geocodes







Address:
1692 Cardinal Av
Reedley, CA 93654

Correct Address
Parcel

Geocoding
Engine

-  Municipal Boundary
-  County Boundary



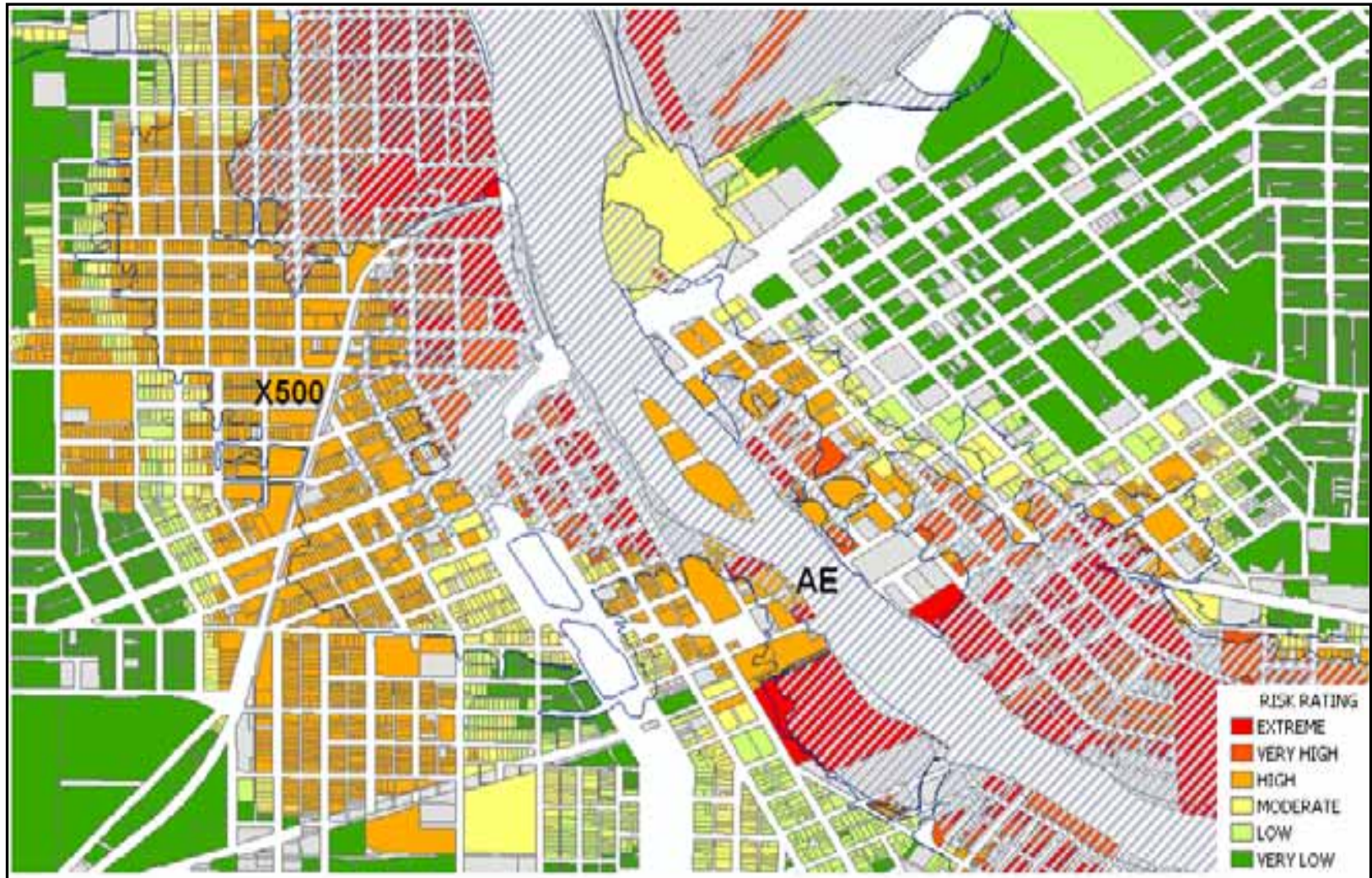
- Street segment geocode
- Parcel geocode

Natural Disasters

- Effects can be very granular
- Effects can vary from parcel to parcel
- Flood
- Storm surge
- Brushfire
- Earthquake (soil conditions)

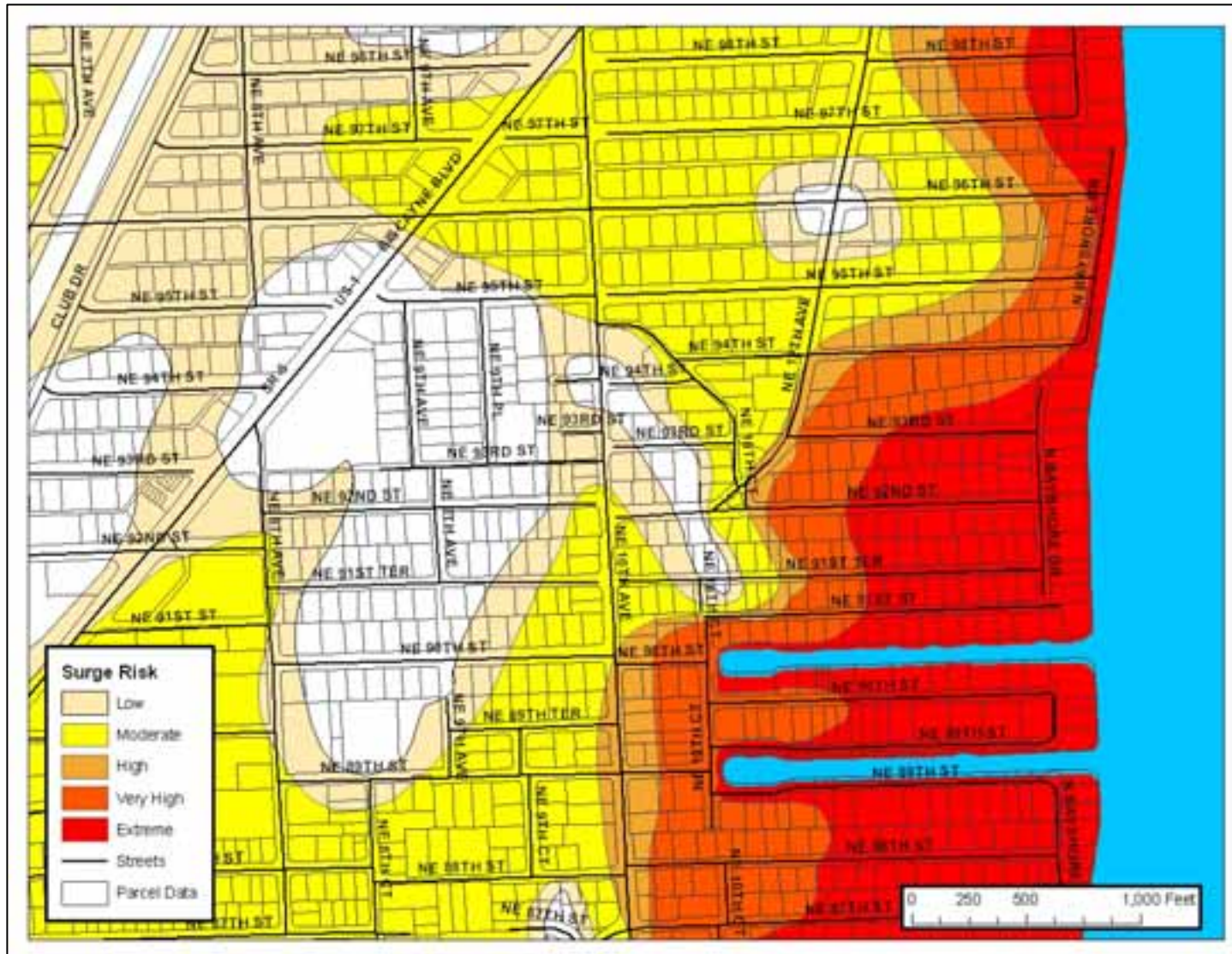
Cedar Rapids, IA Flood Risk (FEMA & 500 year)

Adjacent parcels can have very different risk potential



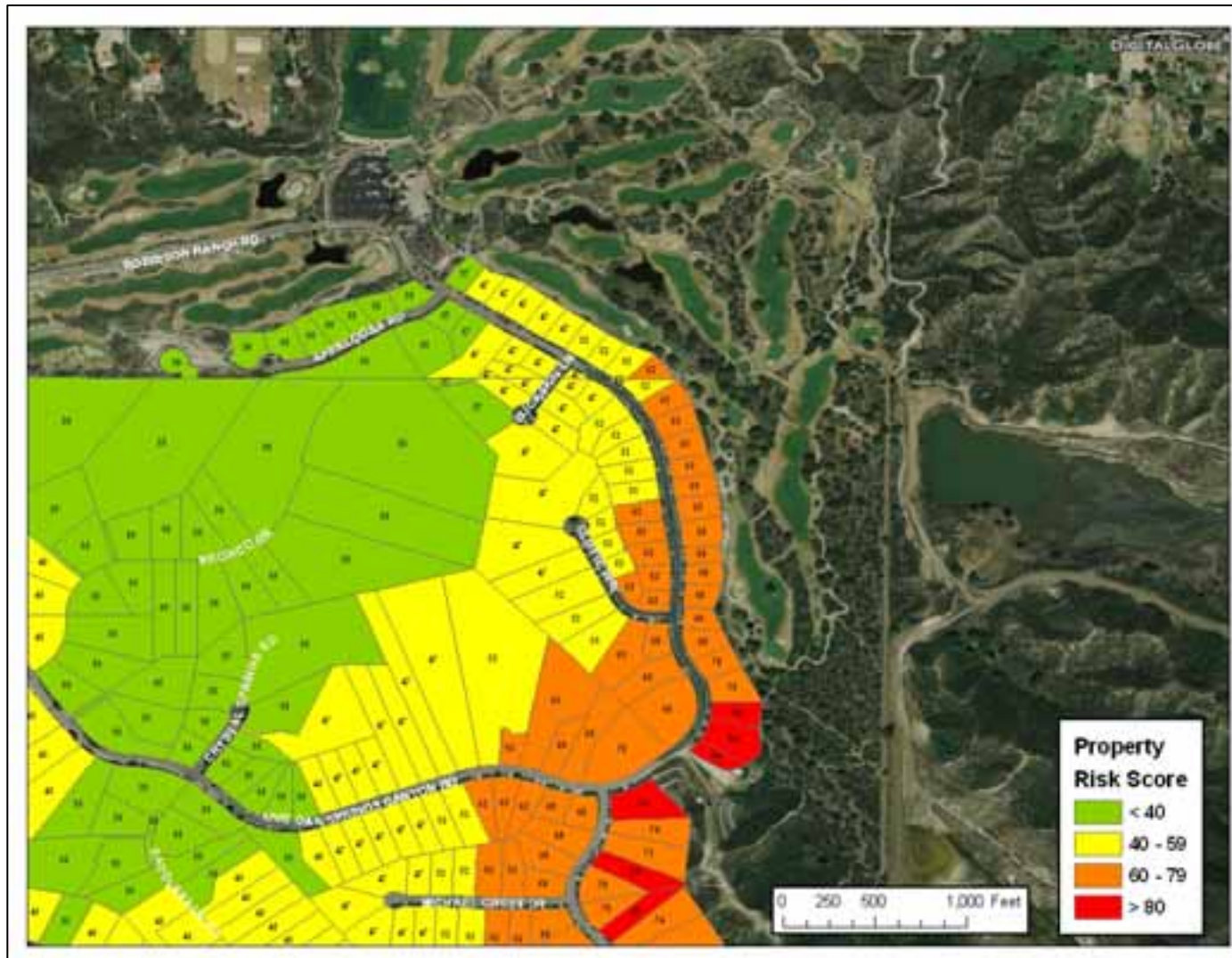
Cat V Storm Surge, Miami, FL

Islands of zero risk surrounded by high risk



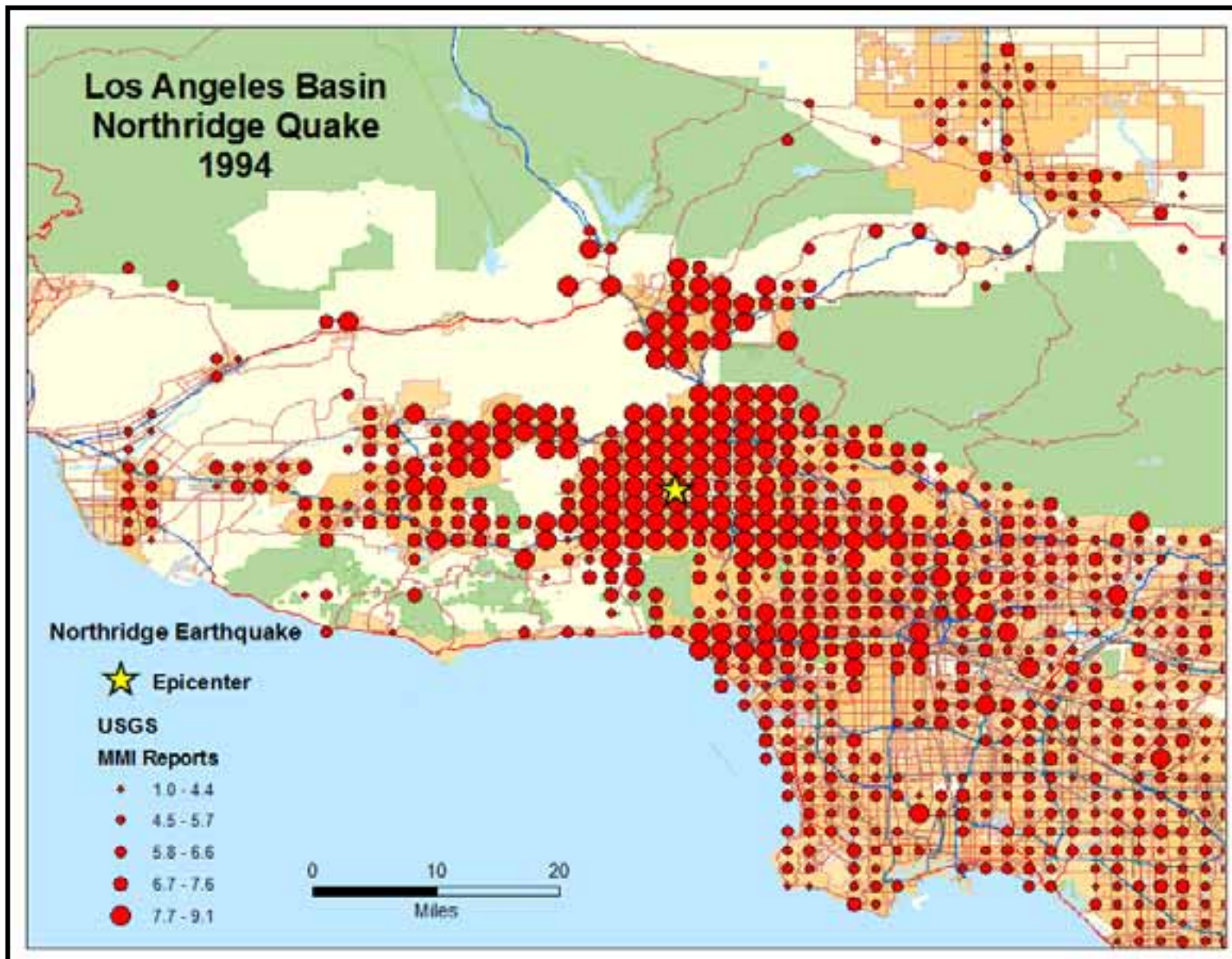
Canyon County, CA Brushfire Risk

Adjacent parcels can have very different risk potential

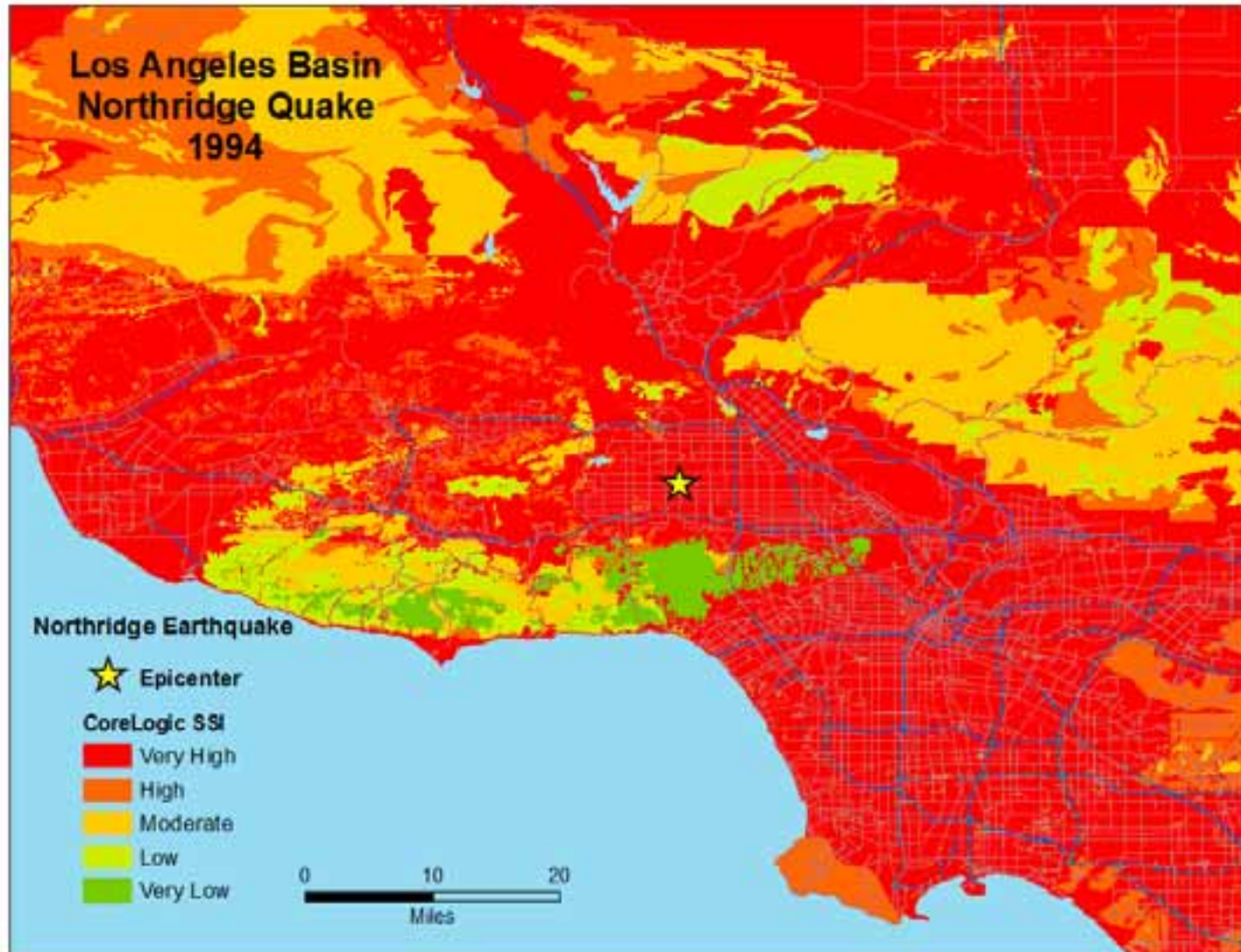


Northridge Earthquake - 1994



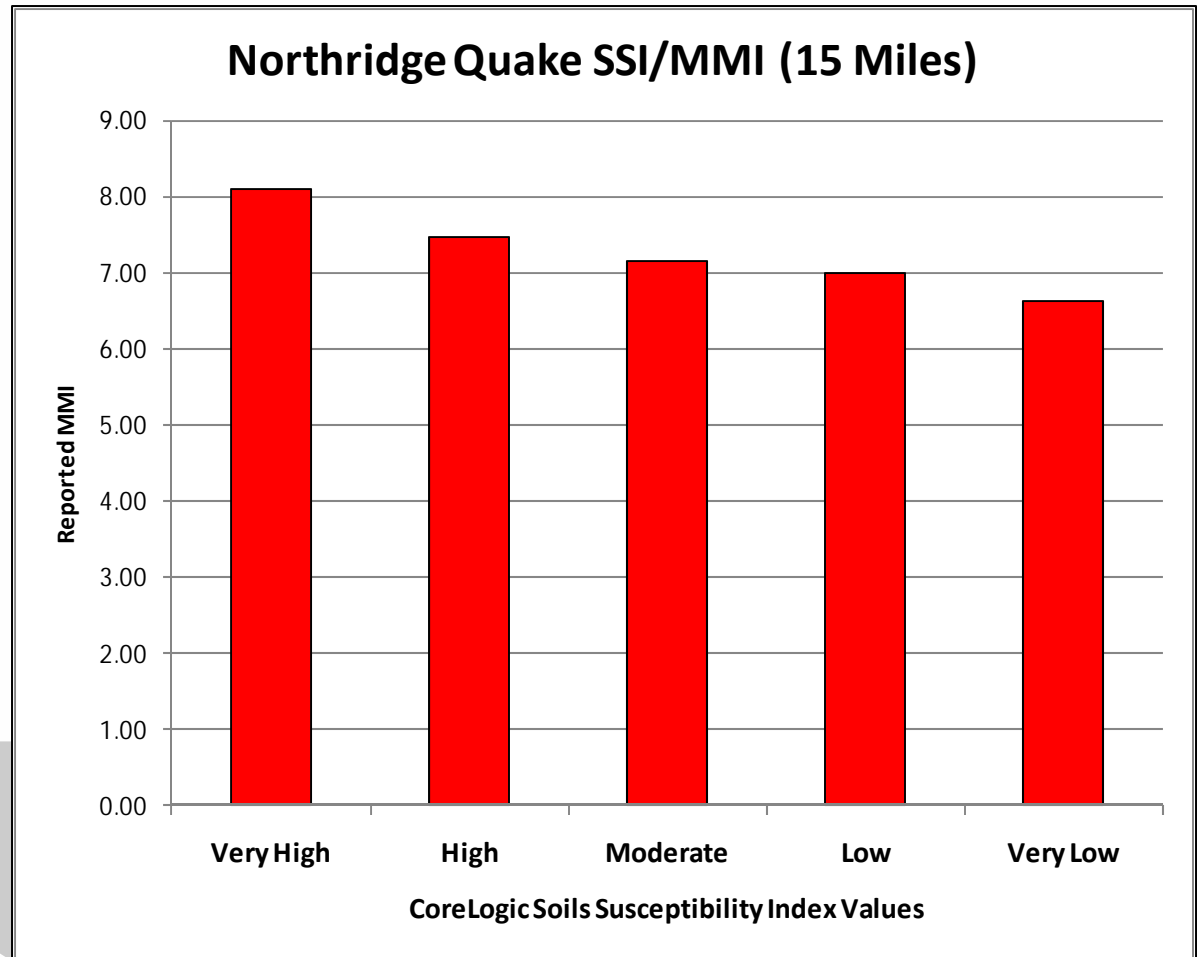


Soils Susceptibility Index



Higher SSI = higher MMI

- **MMI amplified by high SSI values.**



Northridge Quake Study (1,110 Sample)

Business Study

Extensive loss of business continuity.

Other Earthquake Impacts

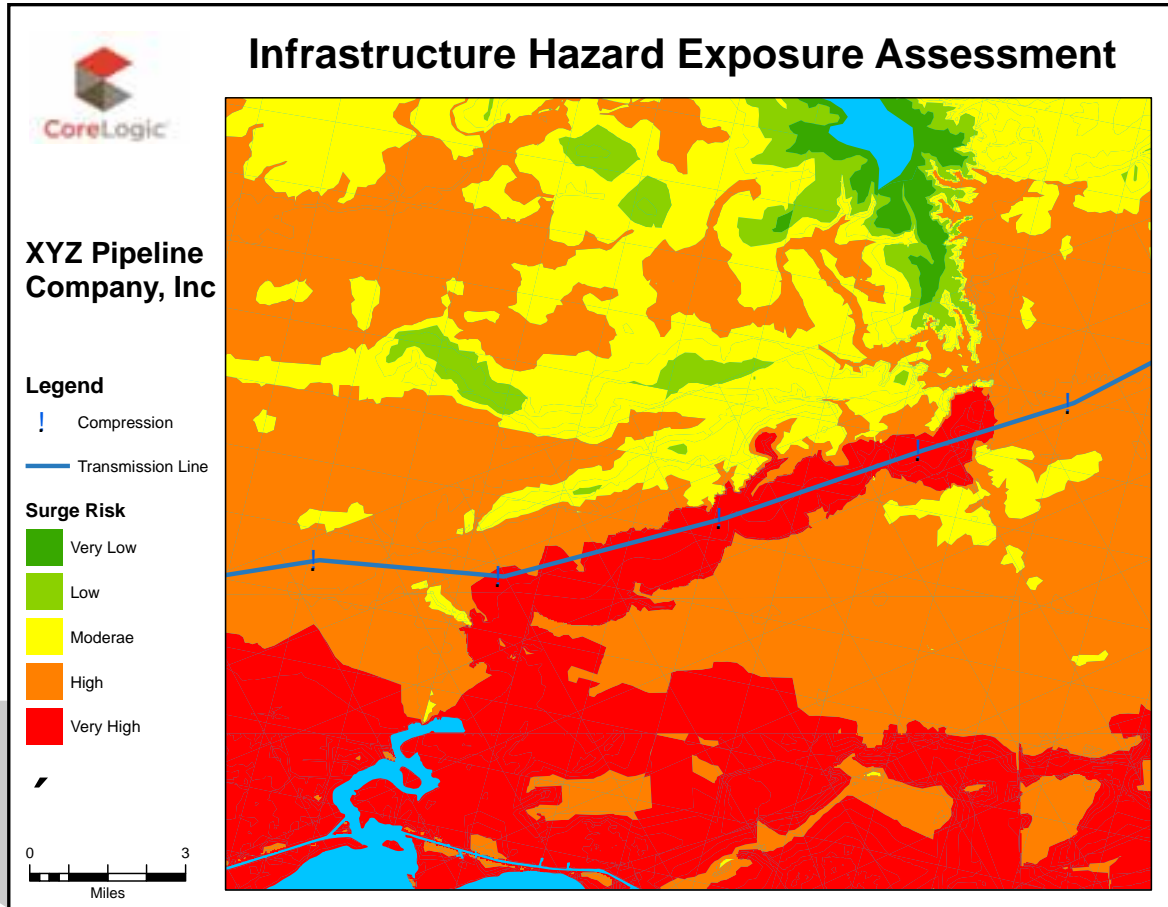
Lifeline Disruption: Percent of Businesses that Lost

Electricity	61.0
Telephones	54.1
Water	19.0
Sewer or Waste Water Treatment	4.4
Natural Gas (Asked Only of Those Using Gas)	16.7

Combined Physical Damage and Disruption of One or More Lifelines	47.0
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Earthquake-Related Operational Problems

Employees Unable to Get to Work	57.5%
Damage to Owner's Other Property	49.2
Few or No Customers	39.0
Unable to Deliver Products/Services	23.5
Unable to Obtain Needed Materials/Supplies	16.3
Couldn't Afford to Pay Employees	7.7



ASSET	TOTAL #	PERCENT AT RISK			
		FLOOD	SURGE*	WILDFIRE**	EARTHQUAKE
Wells	345	14%	19%	31%	0%
Pipeline Segments	98,516	35%	42%	42%	0%
Compression Stations	358	41%	22%	71%	0%
Storage/Staging	14	10%	50%	25%	0%

*Extreme **Texas only

National Grid Coordinates

- In 2005, the Department of Homeland Security (DHS) recommended that any DHS grant submission reference the use of a nationally defined coordinate system for all spatial referencing, mapping, and reporting.
- Approximately 147,000,000 parcels in U.S.
- We have approximately 130,000,000 of those parcels.
- Cover 96% of the population.
- Initiative to add National Grid coordinates to the centroid of each parcel (1 meter).
- First responders are asking for this.
- In many natural disasters, all street signs and addresses are obliterated.

Parcel Centroids



Addresses with National Grid Coordinates

ADDRESS	CITY	STATE	ZIP	LON	LAT	NATIONAL GRID
WATER ST	INDIANA	PA	15701	-79.17488135640	40.62503622200	17T PE 54366 98735
WATER ST	INDIANA	PA	15701	-79.17552347470	40.62432084910	17T PE 54313 98654
WATER ST	INDIANA	PA	15701	-79.17865587960	40.62489472240	17T PE 54047 98713
WATER ST	INDIANA	PA	15701	-79.17773709430	40.62454059030	17T PE 54125 98675
WATER ST	INDIANA	PA	15701	-79.15154281100	40.62393896040	17T PE 56342 98654
WATER ST	INDIANA	PA	15701	-79.14932189350	40.62405374630	17T PE 56530 98671
WATER ST	INDIANA	PA	15701	-79.16287108320	40.62486812820	17T PE 55382 98737
WATER ST	INDIANA	PA	15701	-79.16304293080	40.62486524770	17T PE 55368 98737
WATER ST	INDIANA	PA	15701	-79.15519656680	40.62475080270	17T PE 56032 98738
WATER ST	INDIANA	PA	15701	-79.16388535720	40.62488897330	17T PE 55296 98738
WATER ST	INDIANA	PA	15701	-79.15678817810	40.62462422930	17T PE 55897 98721
WATER ST	INDIANA	PA	15701	-79.16750001990	40.62434213290	17T PE 54992 98671
WATER ST	INDIANA	PA	15701	-79.15375101440	40.62475067360	17T PE 56154 98741
WATER ST	INDIANA	PA	15701	-79.17038522240	40.62496498750	17T PE 54746 98735
WATER ST	INDIANA	PA	15701	-79.17138184020	40.62427466460	17T PE 54664 98657
WATER ST	INDIANA	PA	15701	-79.17237198380	40.62442641920	17T PE 54580 98672
WATER ST	INDIANA	PA	15701	-79.17255359760	40.62428953350	17T PE 54564 98656
WATER ST	INDIANA	PA	15701	-79.17326600780	40.62443202960	17T PE 54504 98671
WATER ST	INDIANA	PA	15701	-79.17377707310	40.62443896000	17T PE 54461 98671
WATER BURNS AVE	INDIANA	PA	15701	-79.15658507420	40.62484340030	17T PE 55914 98746
WASHINGTON ST	INDIANA	PA	15701	-79.16292651670	40.61960594410	17T PE 55390 98153
WASHINGTON ST	INDIANA	PA	15701	-79.16255630060	40.61959868240	17T PE 55421 98153
WASHINGTON ST	INDIANA	PA	15701	-79.14945935930	40.61989567350	17T PE 56528 98209
WASH ST	INDIANA	PA	15701	-79.16240359330	40.61959297020	17T PE 55434 98153
WASH ST	INDIANA	PA	15701	-79.14895701600	40.61998959200	17T PE 56570 98221
WASH ST	INDIANA	PA	15701	-79.14864281290	40.61986163490	17T PE 56597 98207
WASH ST	INDIANA	PA	15701	-79.16811196080	40.61957343280	17T PE 54951 98140
WARREN ROAD	INDIANA	PA	15701	-79.18371917340	40.61332493930	17T PE 53645 97419
WARREN RD	INDIANA	PA	15701	-79.17608971220	40.61433337800	17T PE 54288 97545
WARREN AVE	INDIANA	PA	15701	-79.17836359790	40.61395965000	17T PE 54097 97499
W PHILA ST	INDIANA	PA	15701	-79.17556929950	40.62367028320	17T PE 54311 98582
W PHILA ST	INDIANA	PA	15701	-79.17490627730	40.62370859690	17T PE 54367 98588
W PHILA ST	INDIANA	PA	15701	-79.17590534360	40.62363882500	17T PE 54282 98578
VIRGINIA AVE	INDIANA	PA	15701	-79.15137160280	40.61463788510	17T PE 56379 97622



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Questions

Answers