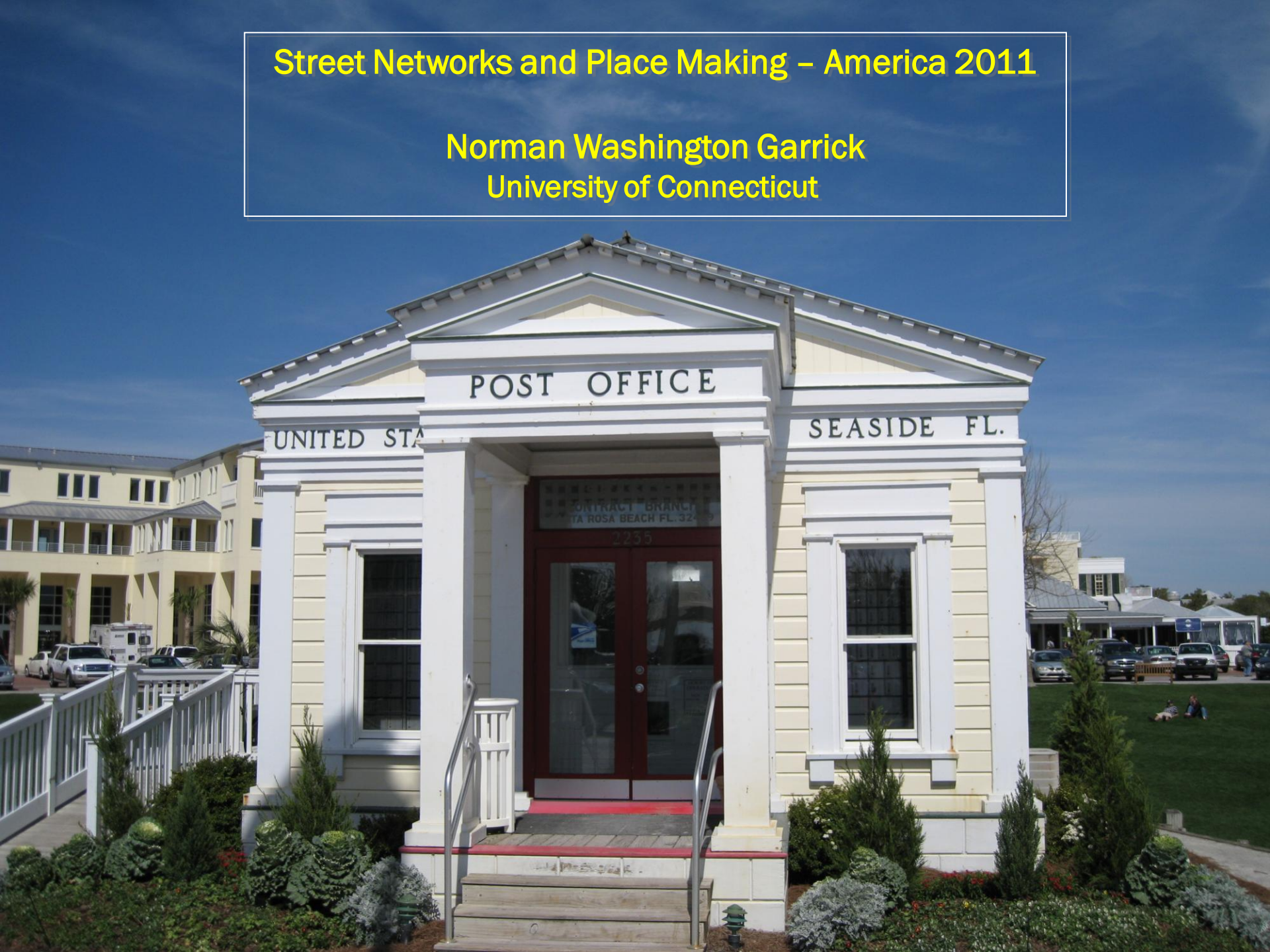
Street Networks and Place Making – America 2011

Norman Washington Garrick
University of Connecticut

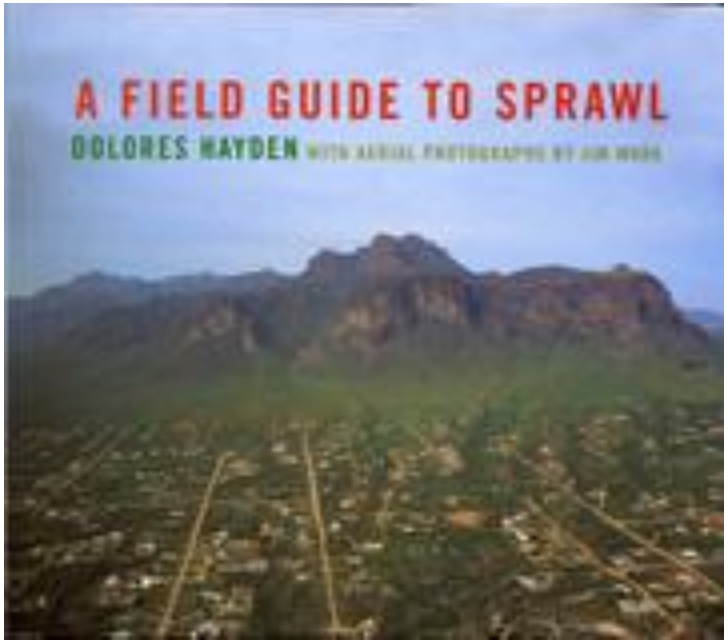


Seaside, Florida
Founded: **1981**

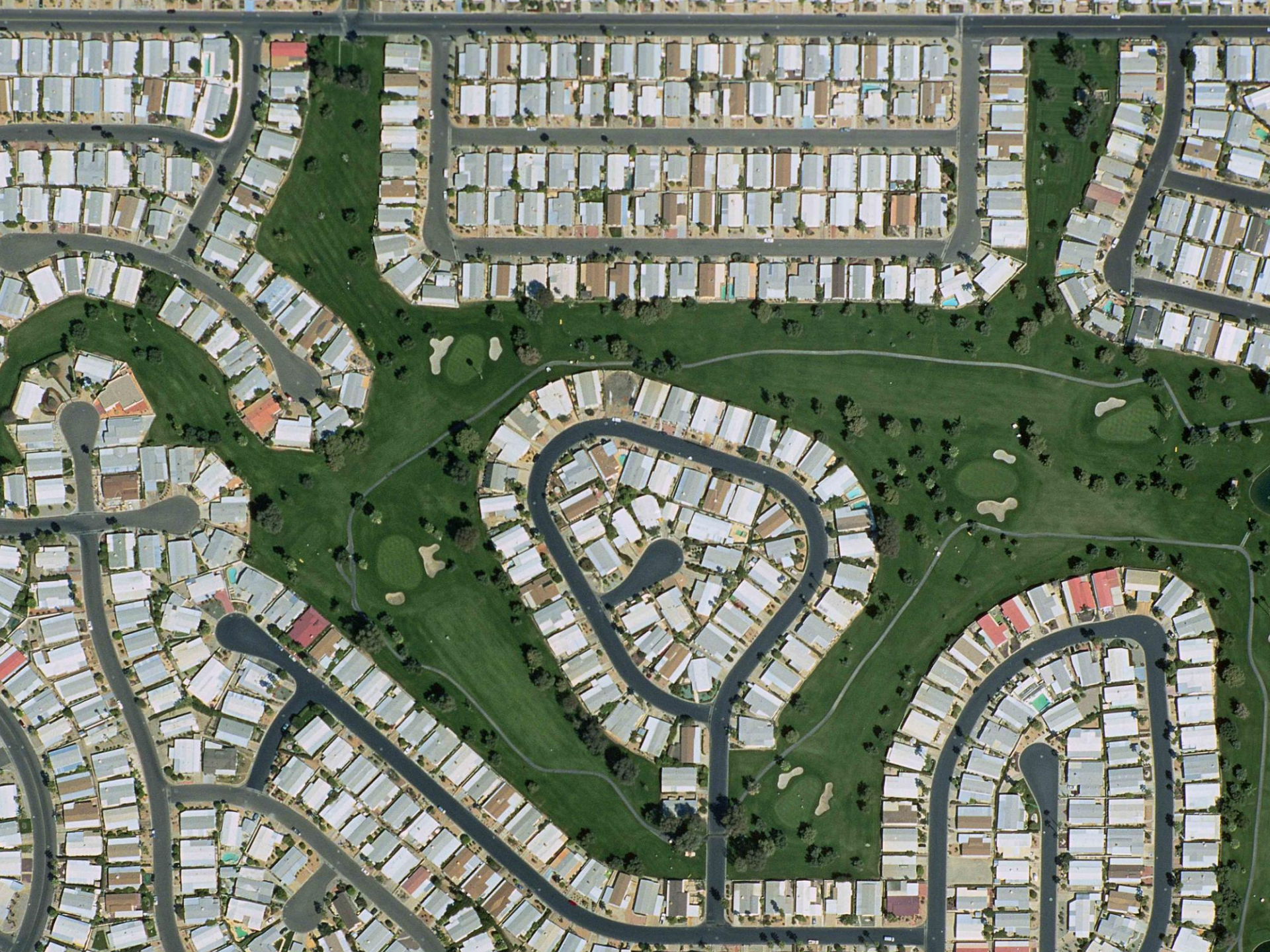
Designed by
Andrés Duany and **Liz Plater-Zyberg**

Congress for the New Urbanism
Multidisciplinary Urban Planning and Design

ES



A FIELD GUIDE TO SPRAWL
Dolores Hayden and Jim Welk



Founded 1690

http://www.loc.gov/exhibits/haventohome/haven-haven.html

QUEEN ST

QUEEN ST
GMC
F150

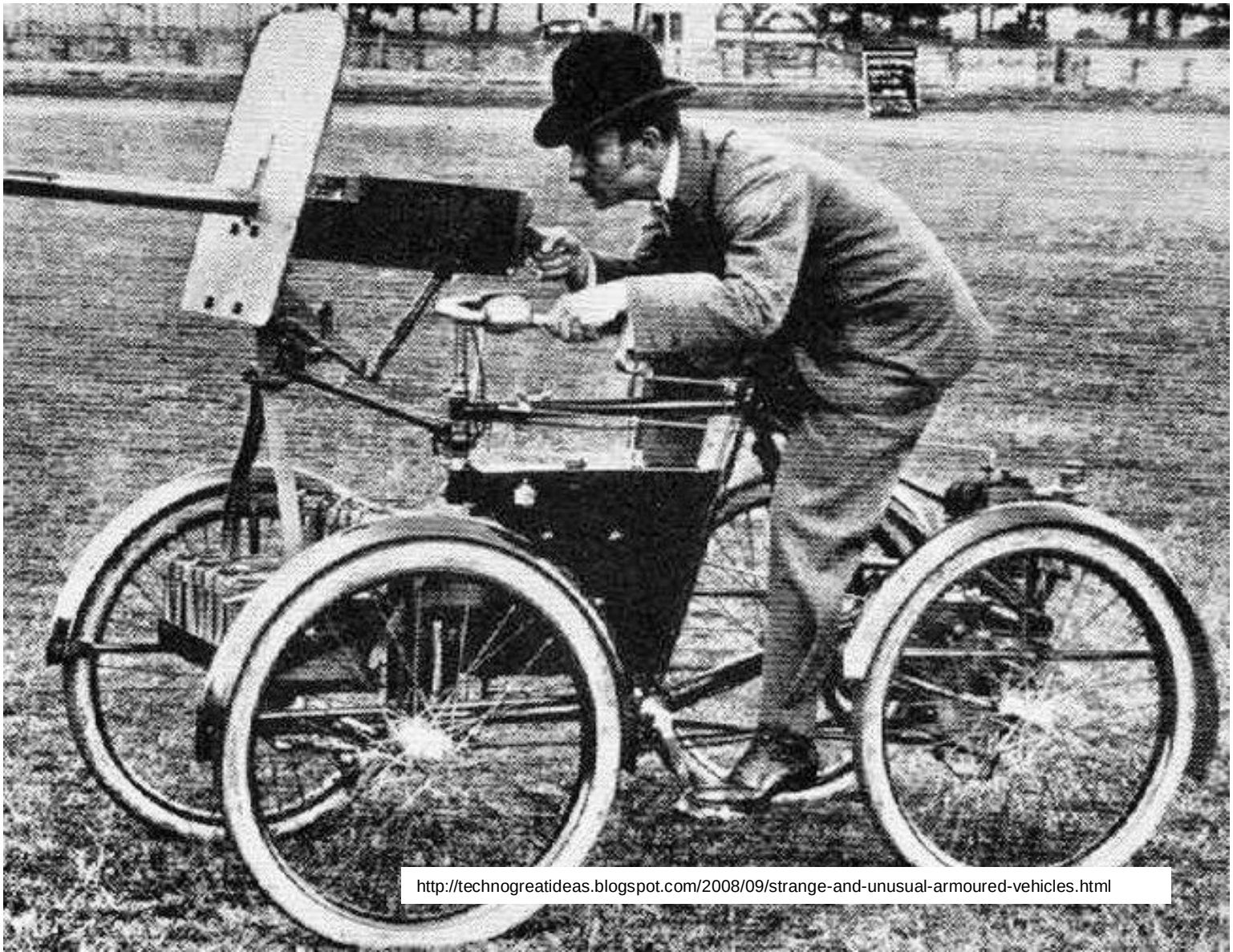
Davis, CA

14 % of people ride to work

Davis, CA

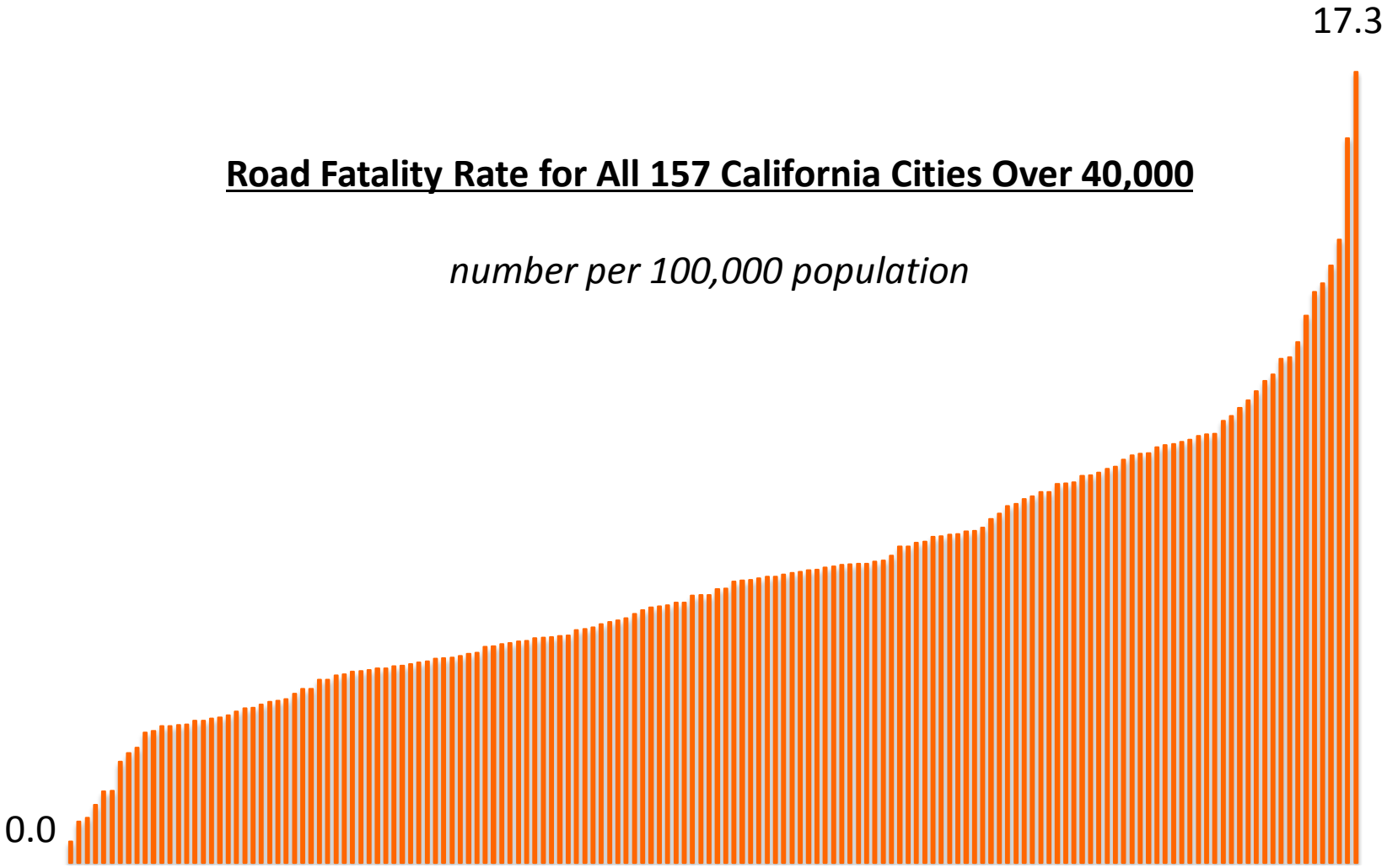
Road Fatality Rate: **1 per 100,000**

INVulnerable Road Users



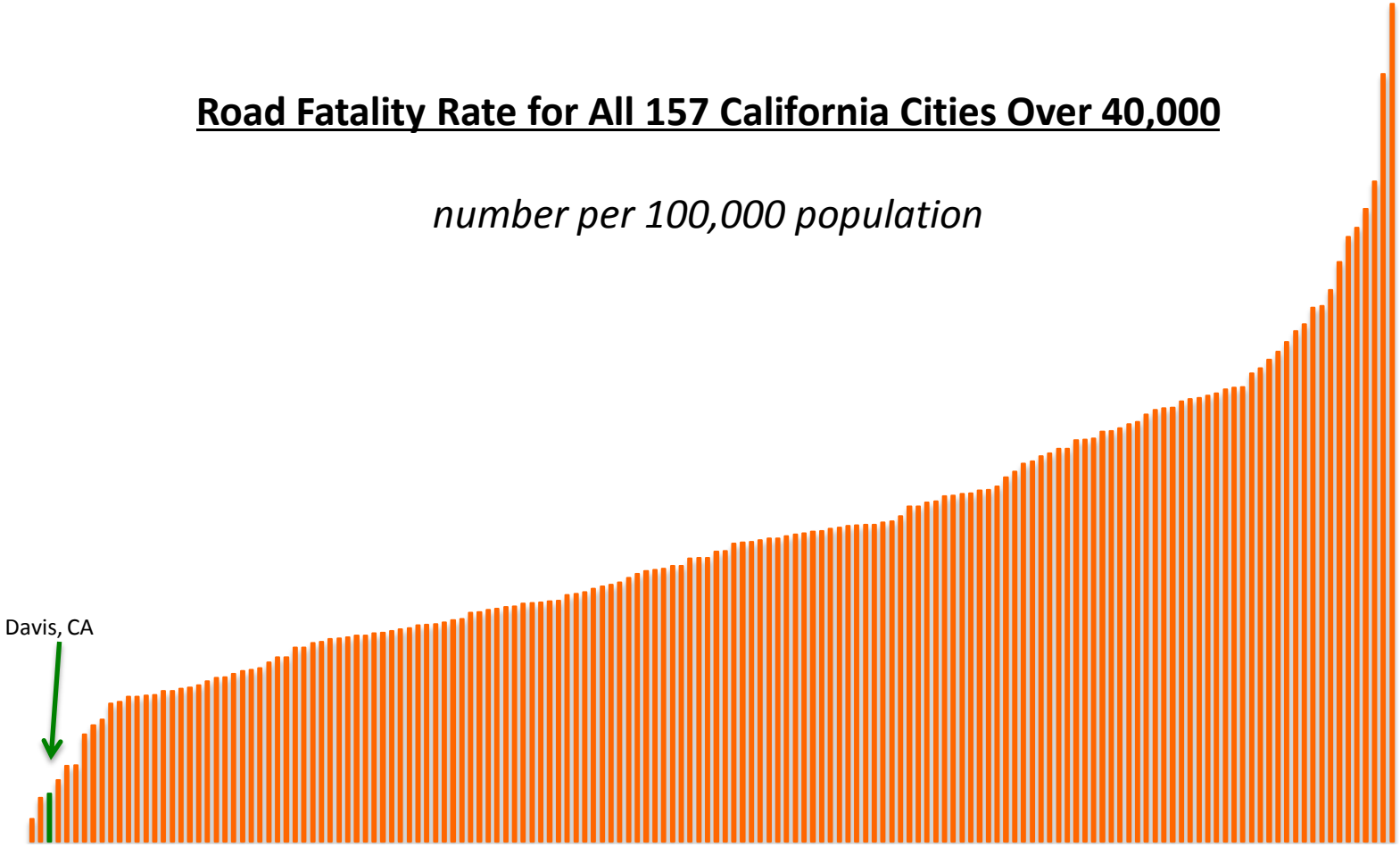
Road Fatality Rate for All 157 California Cities Over 40,000

number per 100,000 population



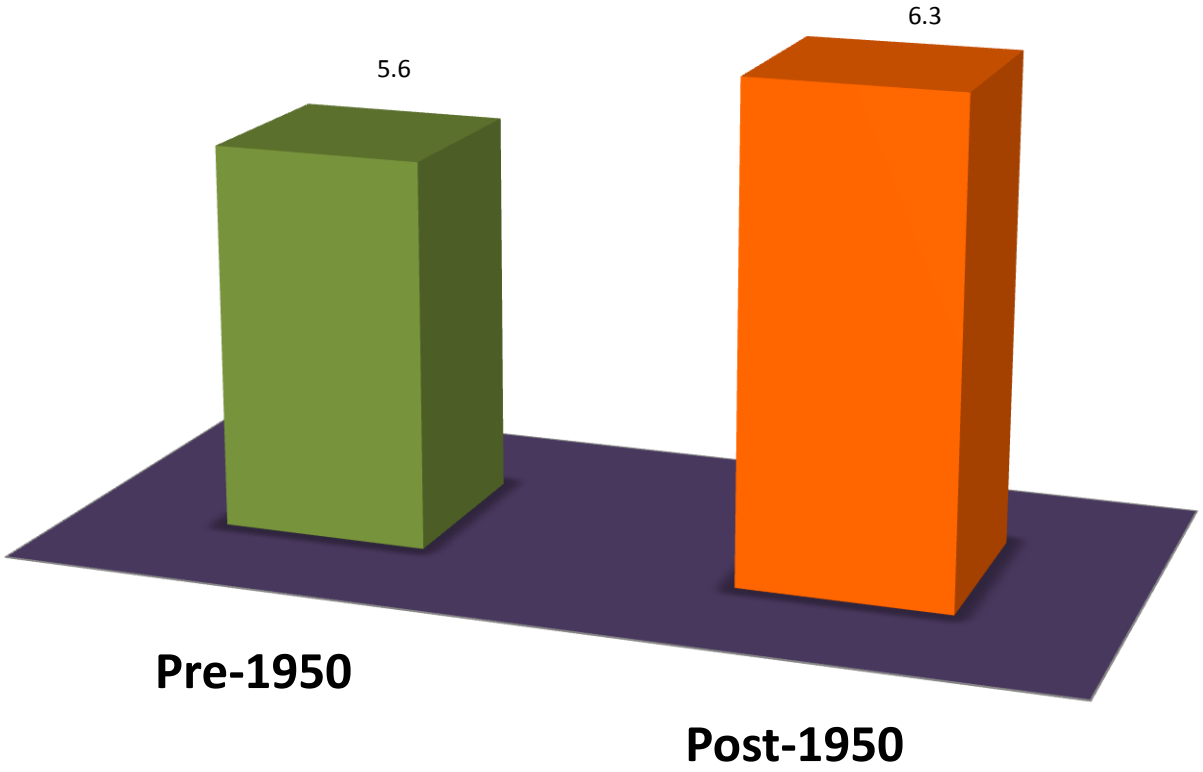
Road Fatality Rate for All 157 California Cities Over 40,000

number per 100,000 population

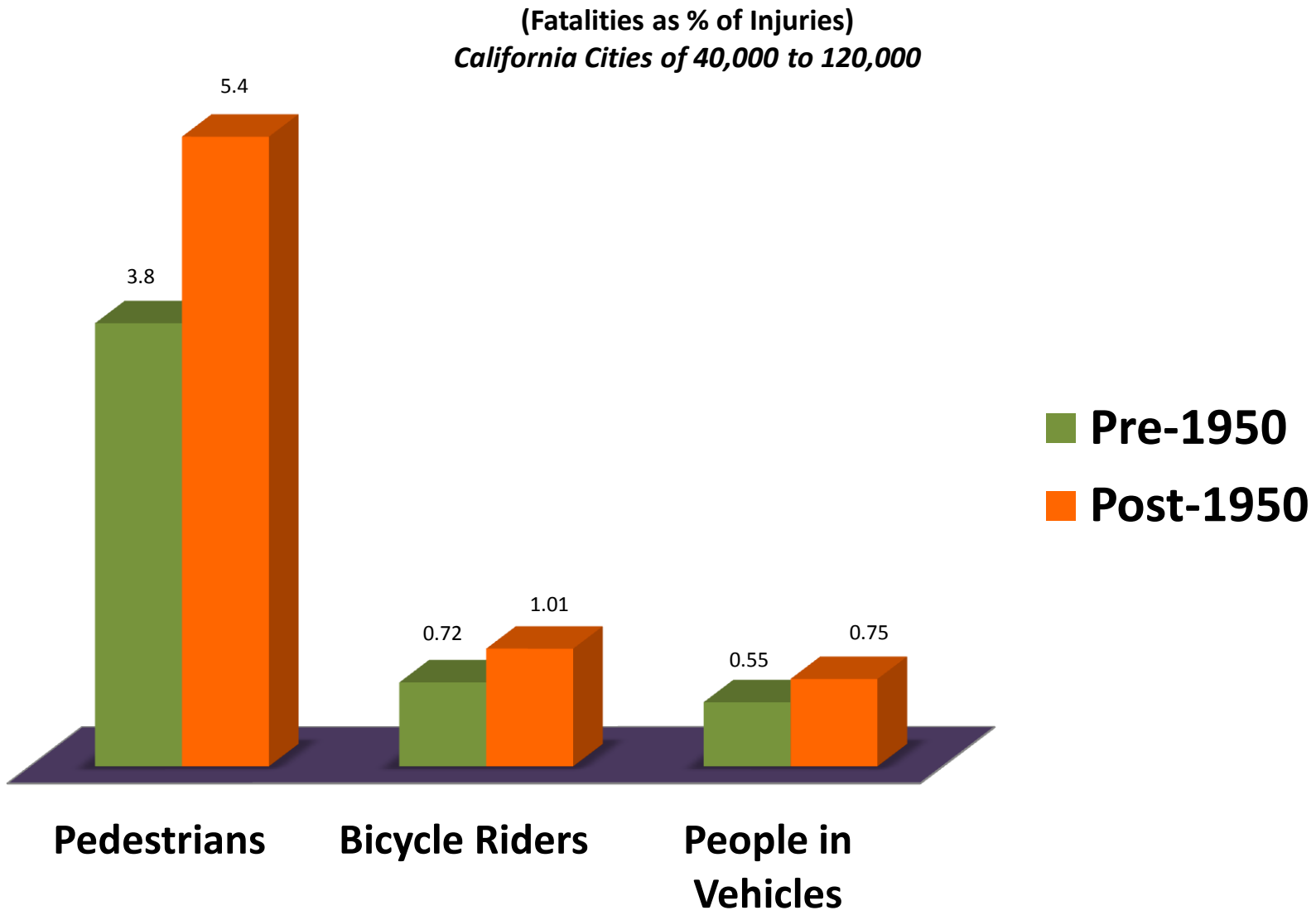


Road Fatalities per 100,000

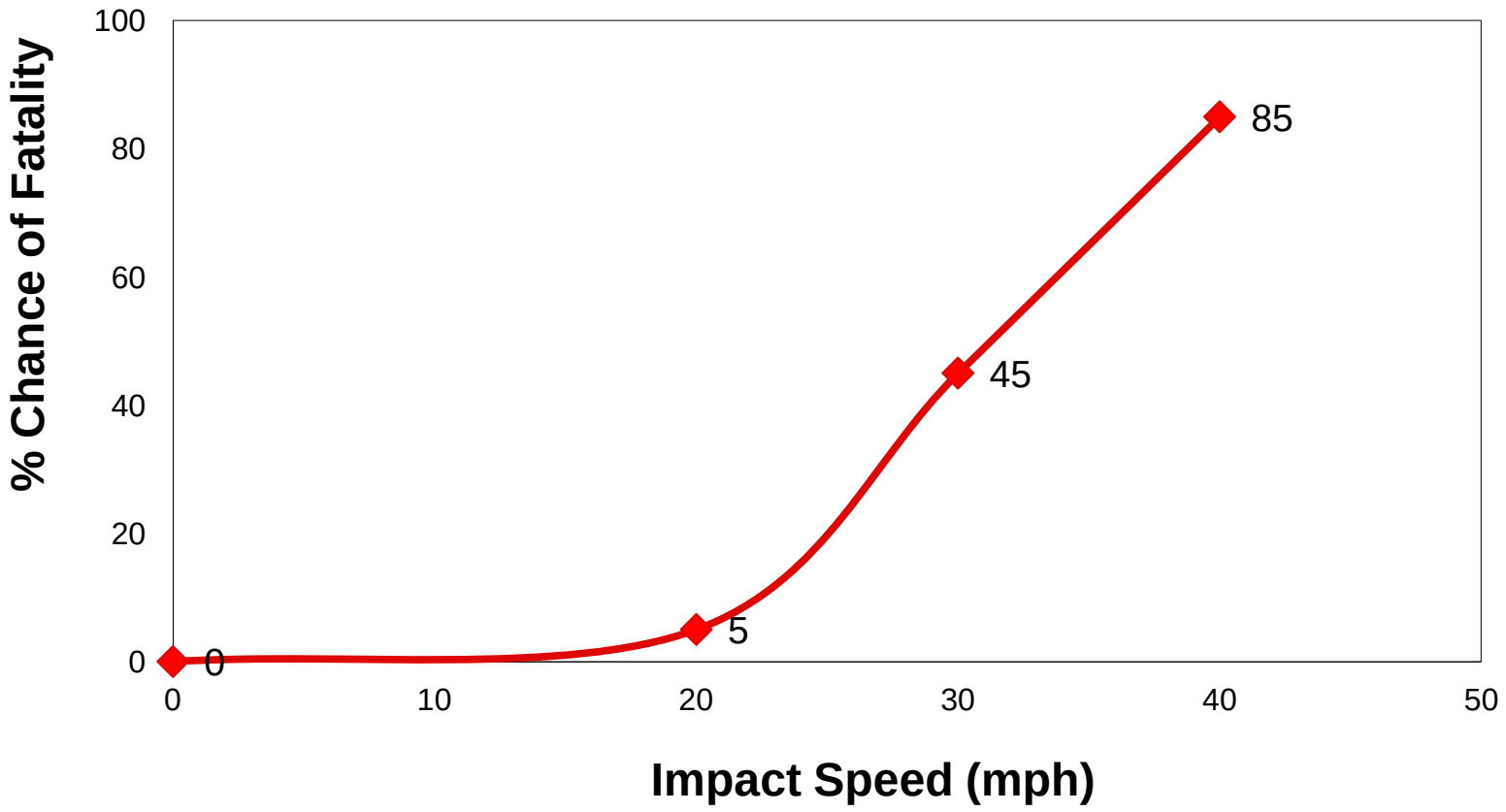
California Cities of 40,000 to 120,000



Risk of Fatality



Chance of Pedestrian Fatality vs. Impact Speed



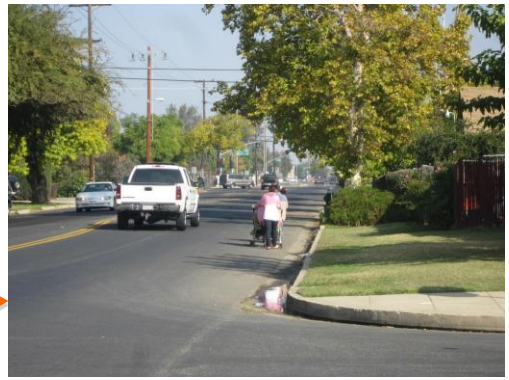
Source: Ashton and Mackay, 1979.

http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/foi/responses/2005/nov/203040message/paperaboutthedepartments20302445

California Cities Study

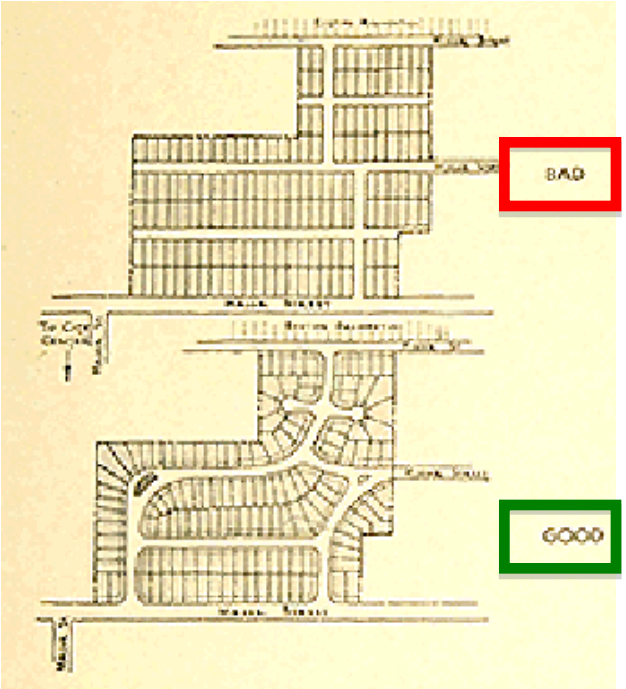
For Safety Does the Street Network Matter?

Twenty-four Cities

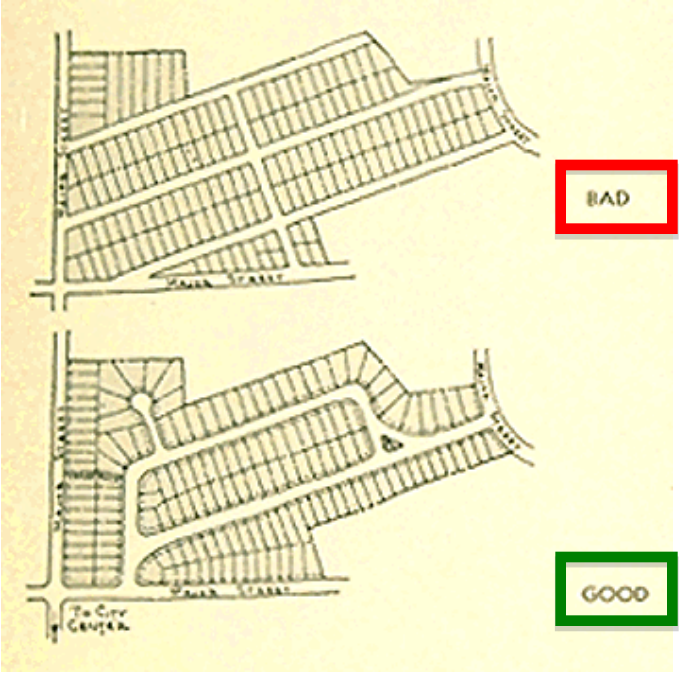


ERIE RAILROAD
PLAZA ROAD SOUTH
PLAZA ROAD NORTH
FAIRLAWN AVENUE
RADBURN ROAD SOUTH
RADBURN ROAD NORTH
LEGEND
BUILDINGS COMPLETED OR ABOUT TO BE CONSTRUCTED
GROUPS PROPOSED FOR FUTURE DEVELOPMENT
SCALE
RADBURN N.J.
REGISTERED TRADE MARK
PLAN OF NORTHWEST & SOUTHWEST
RESIDENTIAL DISTRICTS
NOVEMBER 1929
CLARENCE S. STEIN & HENRY WRIGHT
ARCHITECTS ASSOCIATED NEW YORK

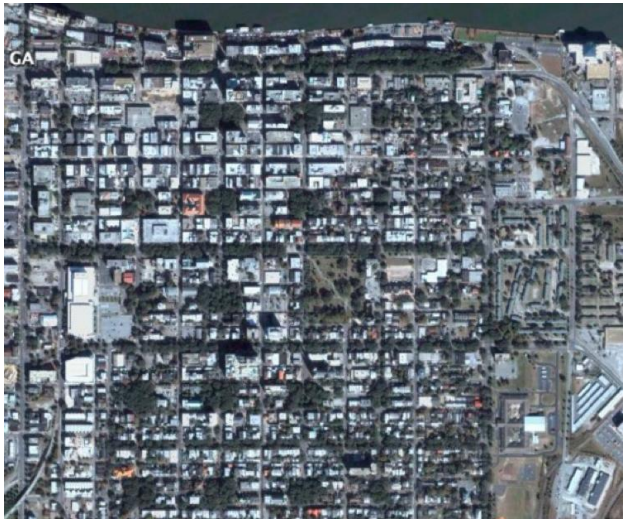
How Did This Drastic Change Occur?



One important agency in getting rid of the grid network was the ***Federal Housing Authority***



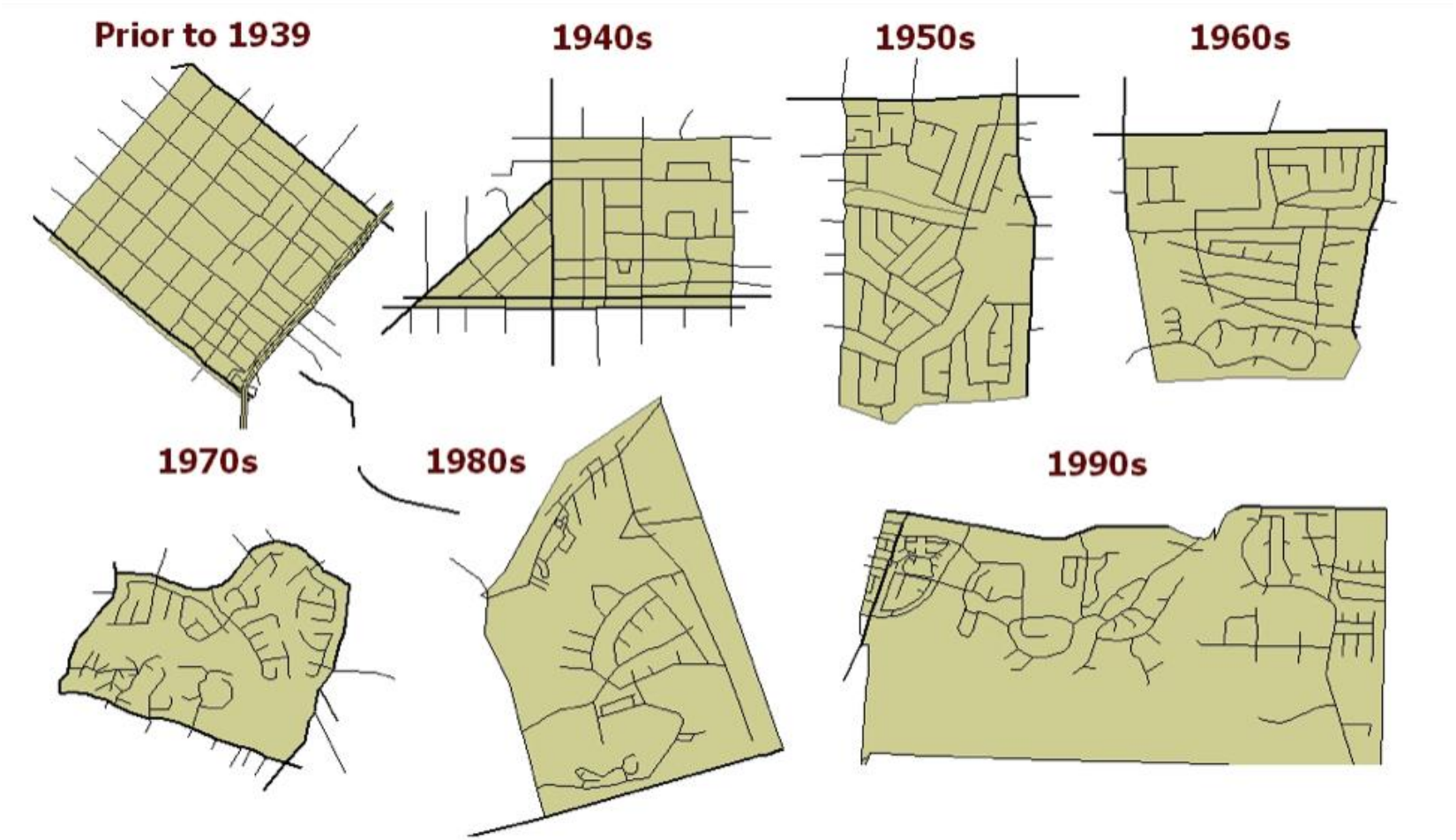
FHA Technical Bulletin No. 7 (1938)
Planning Profitable Neighborhoods



According to the FHA the grid layout was

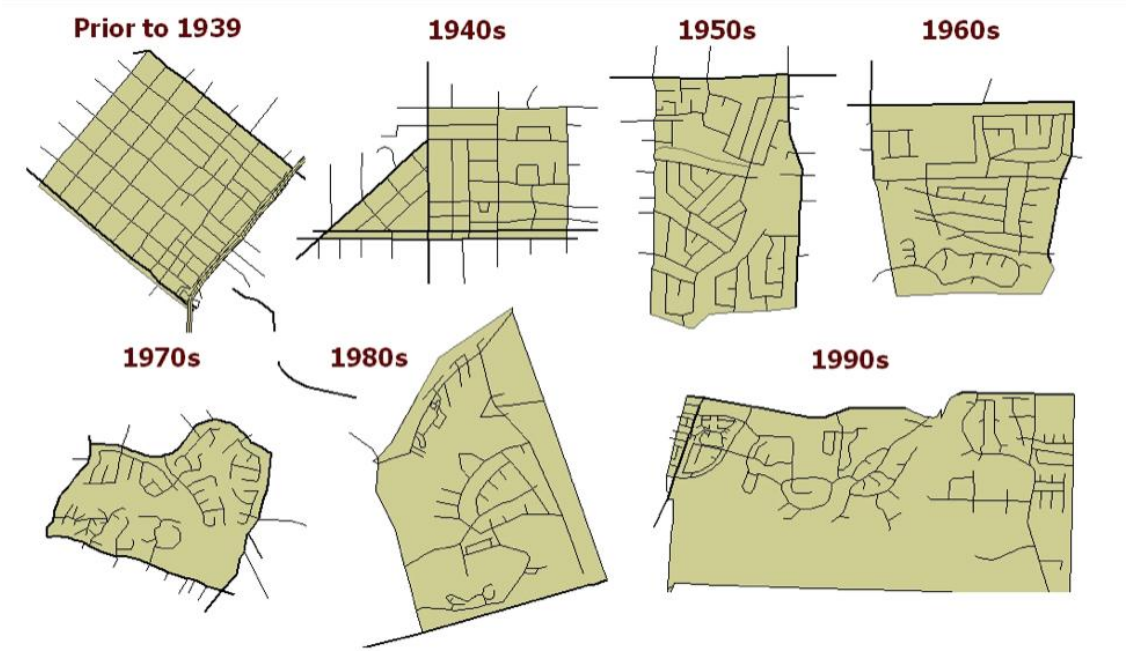
- Monotonous
- Had Little Character
- Uneconomical
- Posed Safety Concerns

Evolution of the Street Network in California



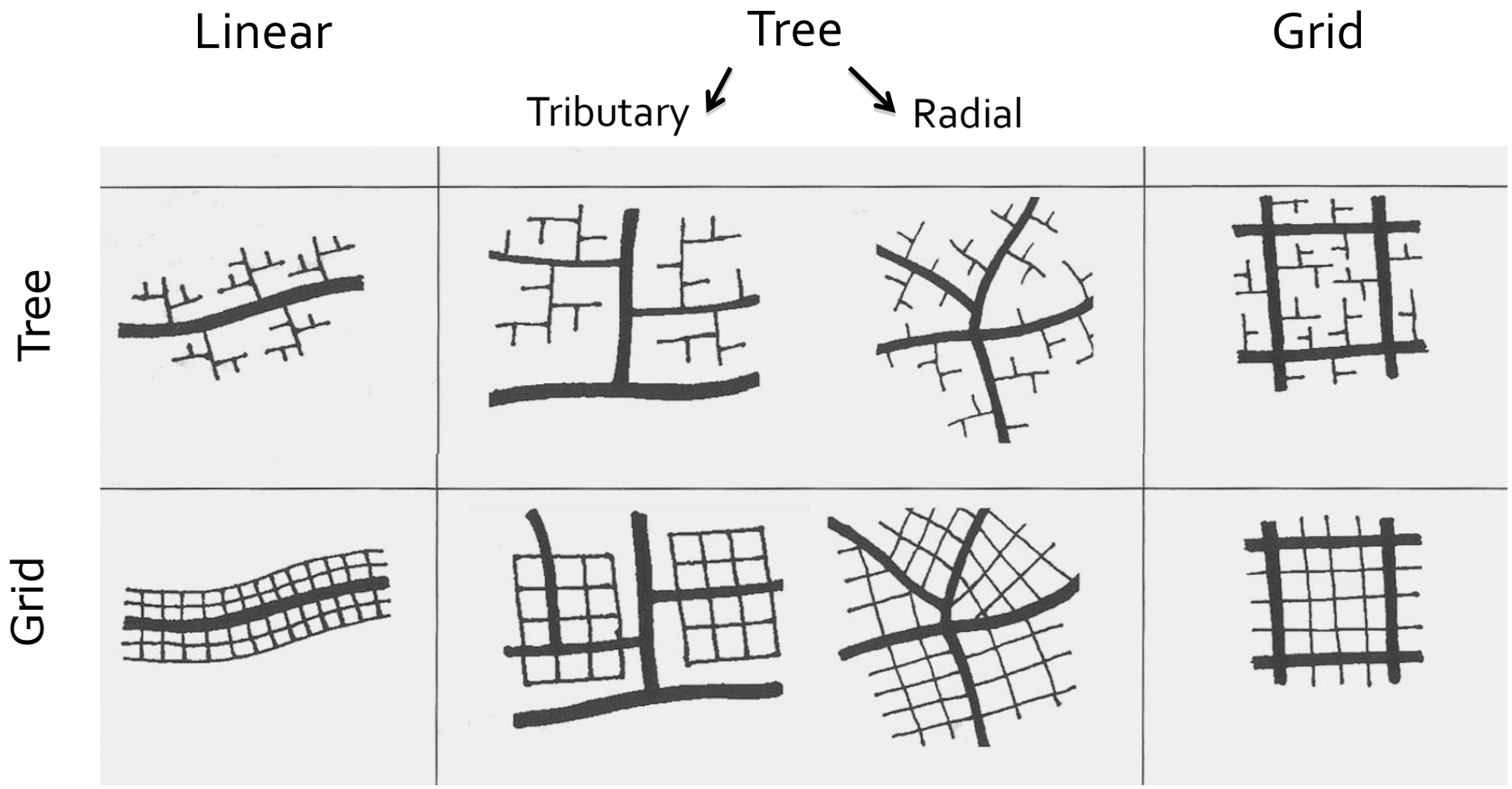
Characterizing the the Street Network

- Shape and Configuration
- Street Network Scale
- Street Network Connectivity



Citywide Street Network

Neighborhood Street Network

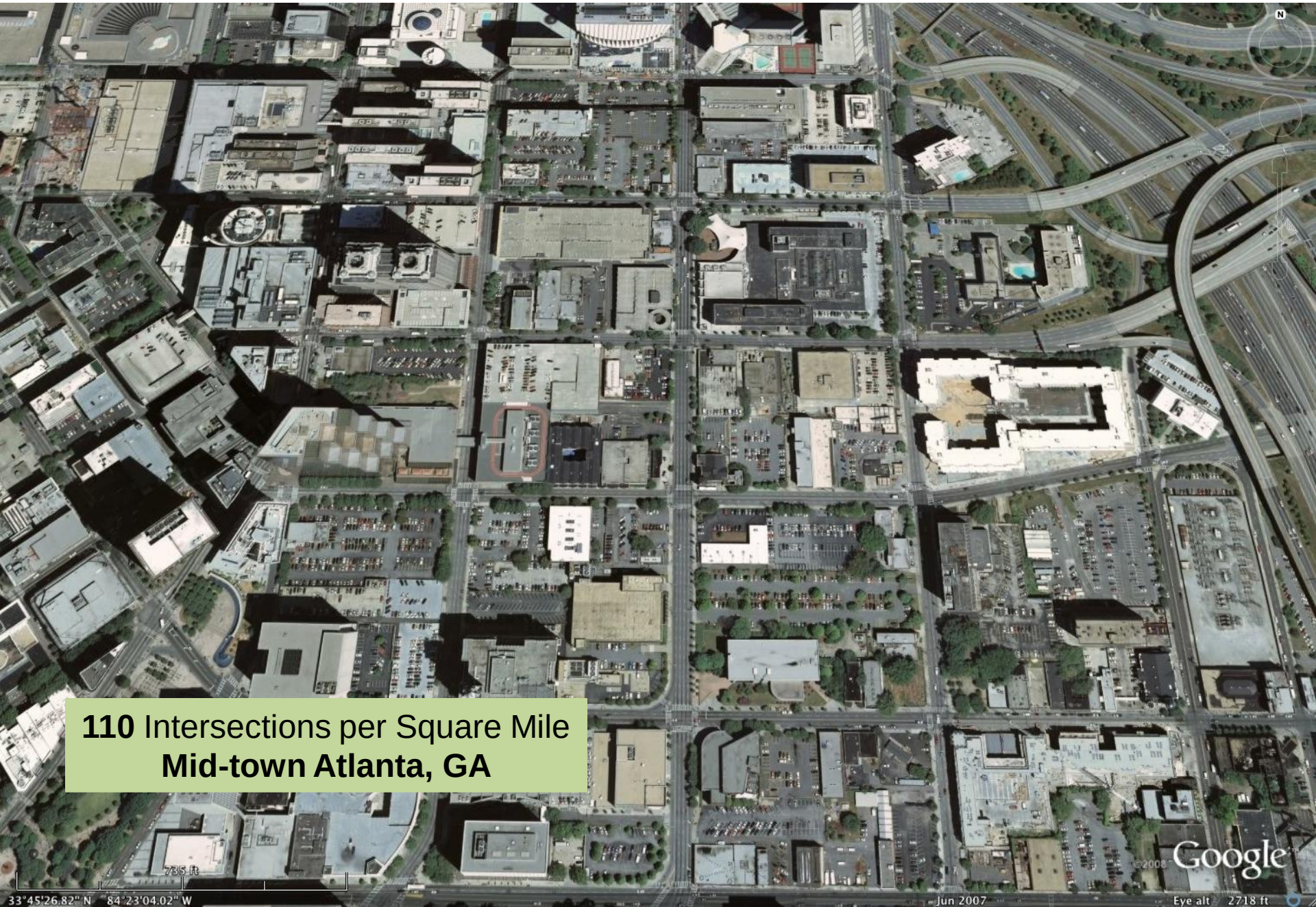


Adapted from Stephen Marshall, *Streets & Patterns*

Network Scale

550 Intersections per Square Mile
Portland, Oregon

Network Scale



110 Intersections per Square Mile
Mid-town Atlanta, GA

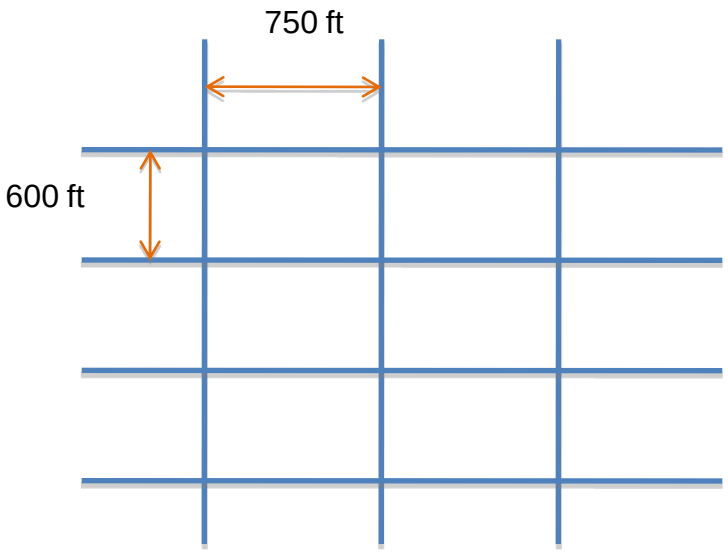
Network Scale

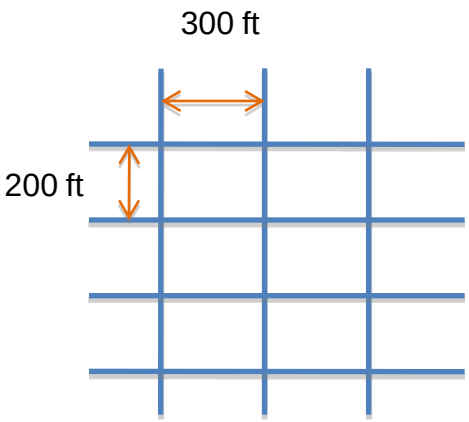
45 Intersections per Square Mile
Salt Lake City, Utah

Network Scale

Calculating the Street Network Scale

Intersection Density per Square Mile



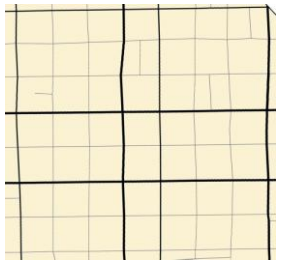


Number of intersections in a mile along the X direction = (5280/750) + 1 = 8.0
Number of intersections in a mile along the Y direction = (5280/600) + 1 = 9.8
Intersection Density = 8.0 X 9.8 = 79 Intersections per square mile

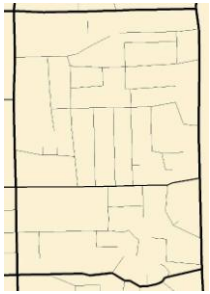
Intersection Density
79 Intersection/sq. mile

Intersection Density
510 Intersection/sq. mile

Network Connectivity



Link-to-Node Ratio = 1.61



Link-to-Node Ratio = 1.13

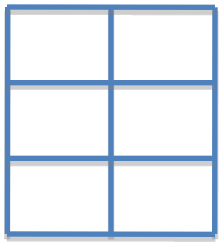
Link-to-Node Ratio = 1.16

A Link-to-Node Ratio > 1.40 is indicative of a connected street network

Calculating the Connectivity of the Street Network Scale

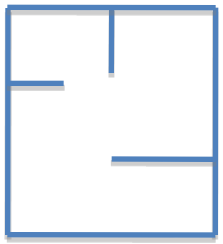
Link to Node Ratio

A node is an intersection or a dead-end
A link is a street segment between two nodes



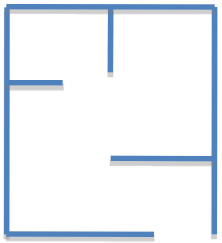
Number of Links = 17
Number of Nodes = 12
Link to Node Ratio = 17/12 = 1.42

Link to Node Ratio
1.42



Number of Links = 10
Number of Nodes = 10
Link to Node Ratio = 10/10 = 1.00

Link to Node Ratio
1.00



Number of Links = 10
Number of Nodes = 11
Link to Node Ratio = 10/11 = 0.91

Link to Node Ratio
0.91

Variables included in Our Safety and Travel Choice Models

Street Network Properties

Street Design Properties

- Average Total Number of Lanes
- Average Outside Shoulder Width
- Raised Median
- Painted Median
- On-Street Parking
- Bike Lanes
- Raised Curbs

Travel and Activity Level

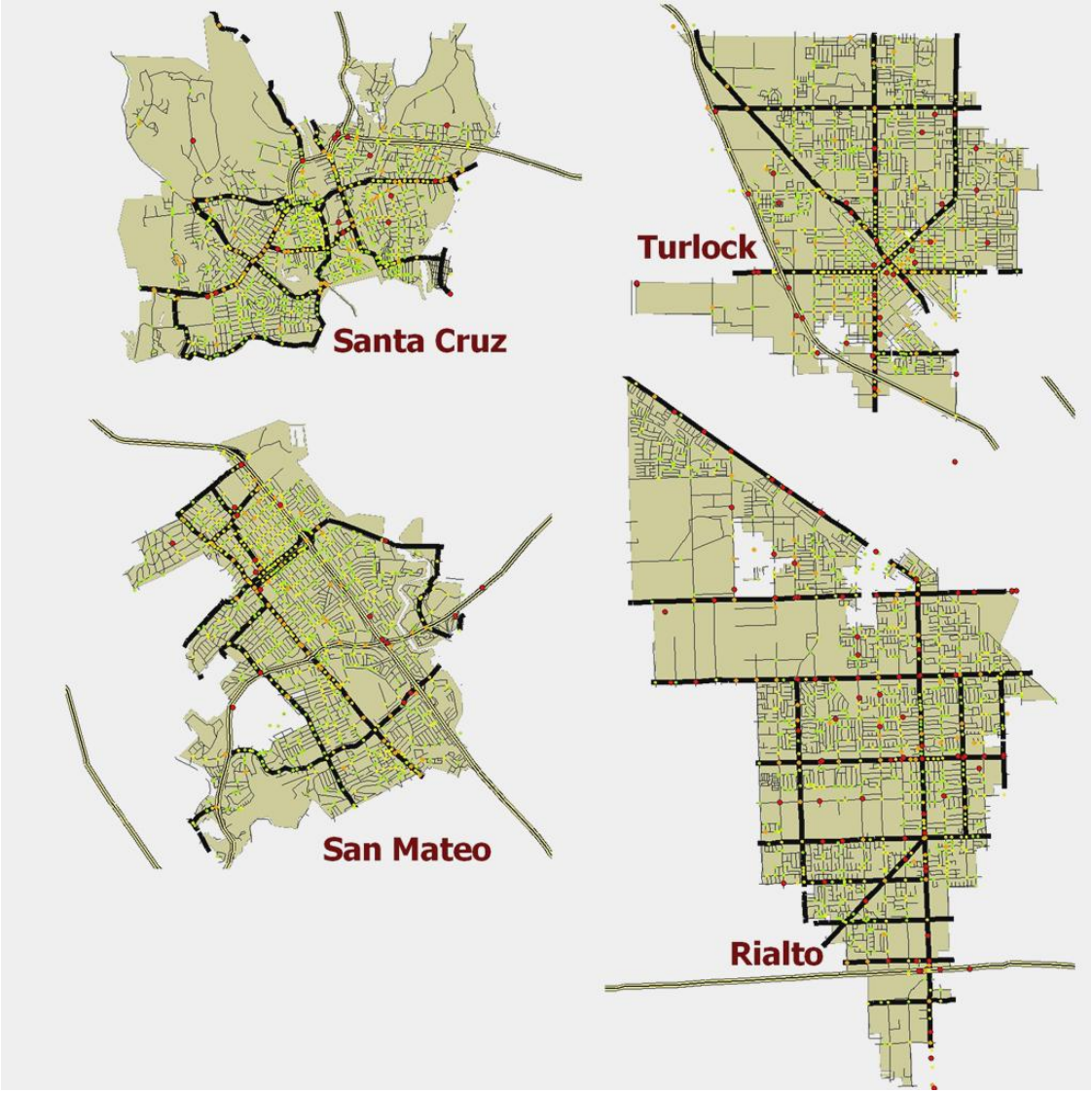
Distance from City Center

Income

Mix of Land Use

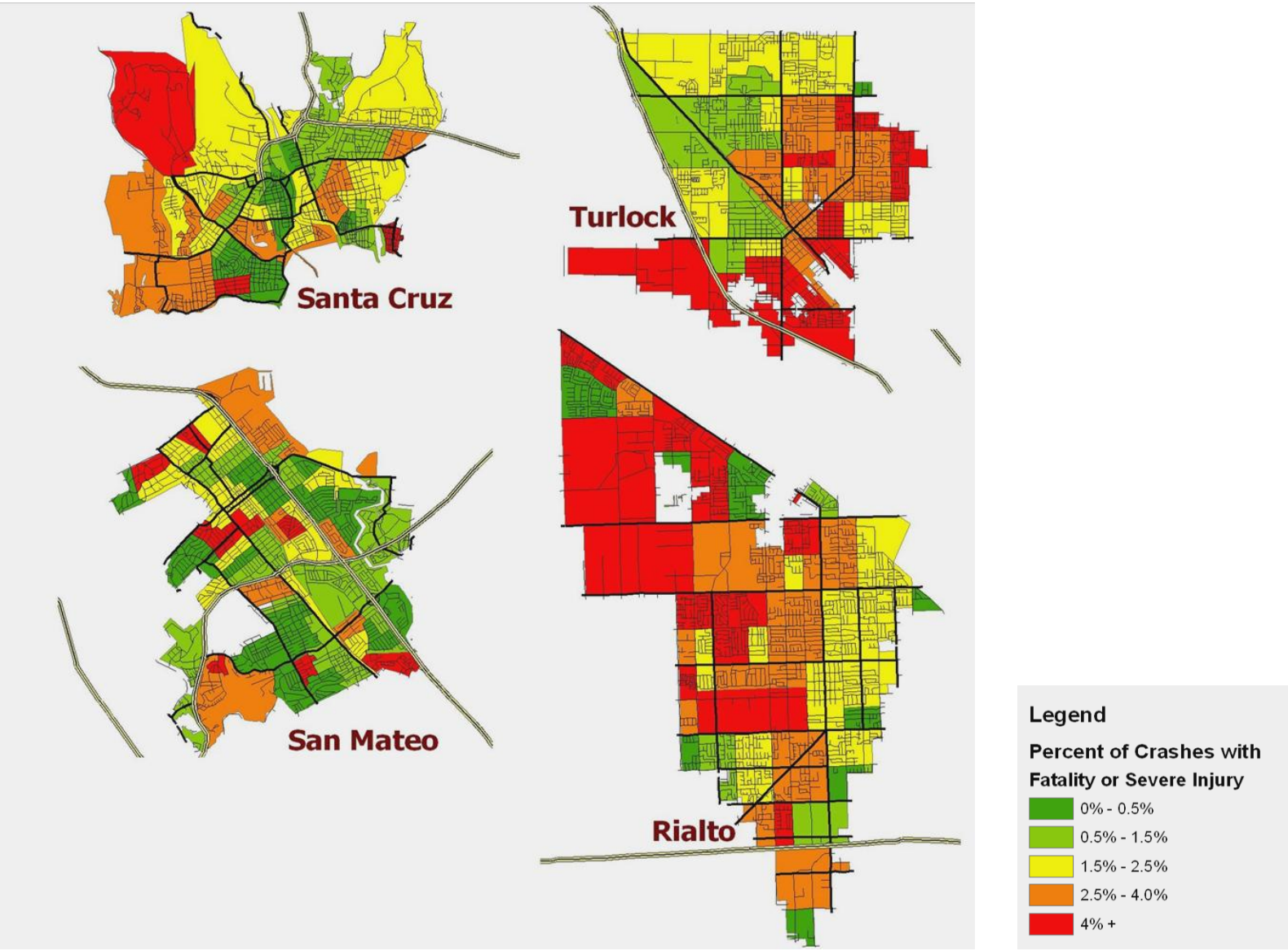
Safety Analysis Based on Geo-coding 230,000 Accident Records

in 24 California Cities



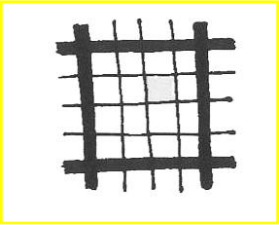
Safety and Travel Choice Analysis done for 1040 Census Block Groups

24 California Cities

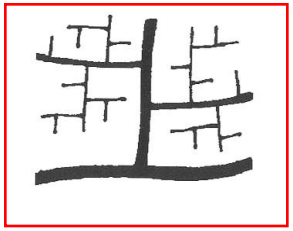


versus

Risk of Severe Injury or Fatality*



versus



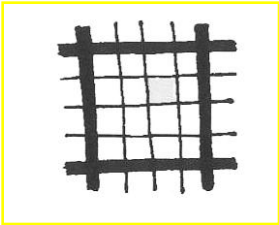
Chance of being Severely Injured

30% Higher

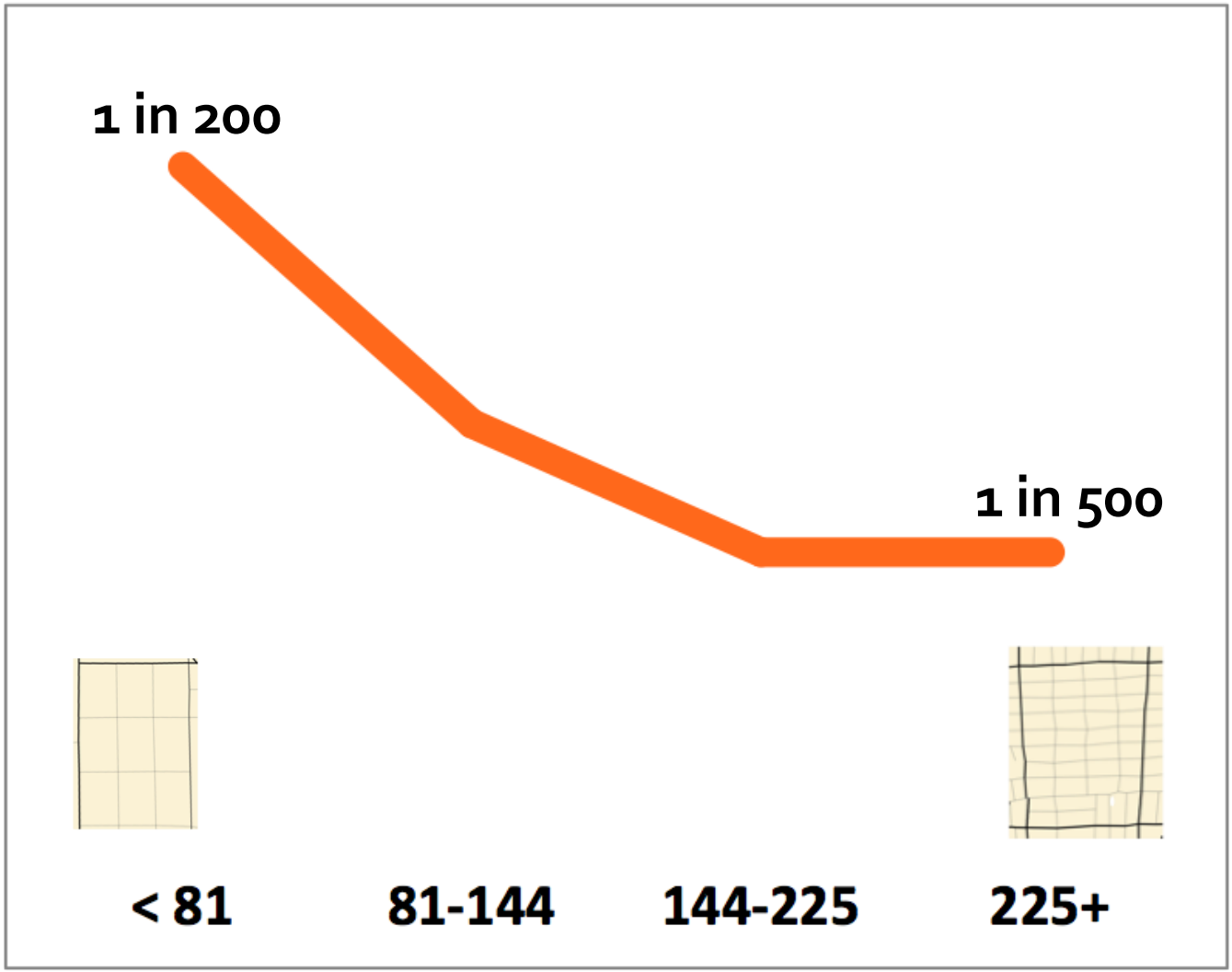
Chance of being Killed

50% Higher

*Given that an injury occurred

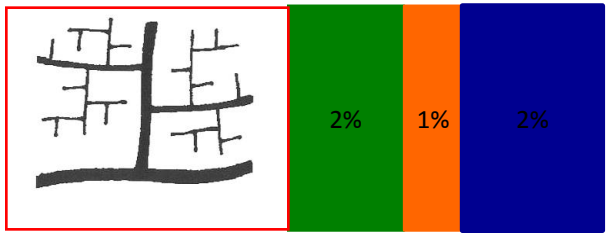


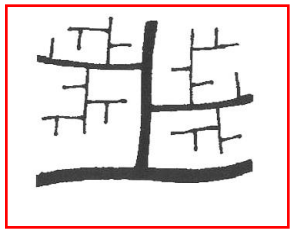
Odds of Dying in a Road Accident based on Intersection Density*



*Given that an injury occurred

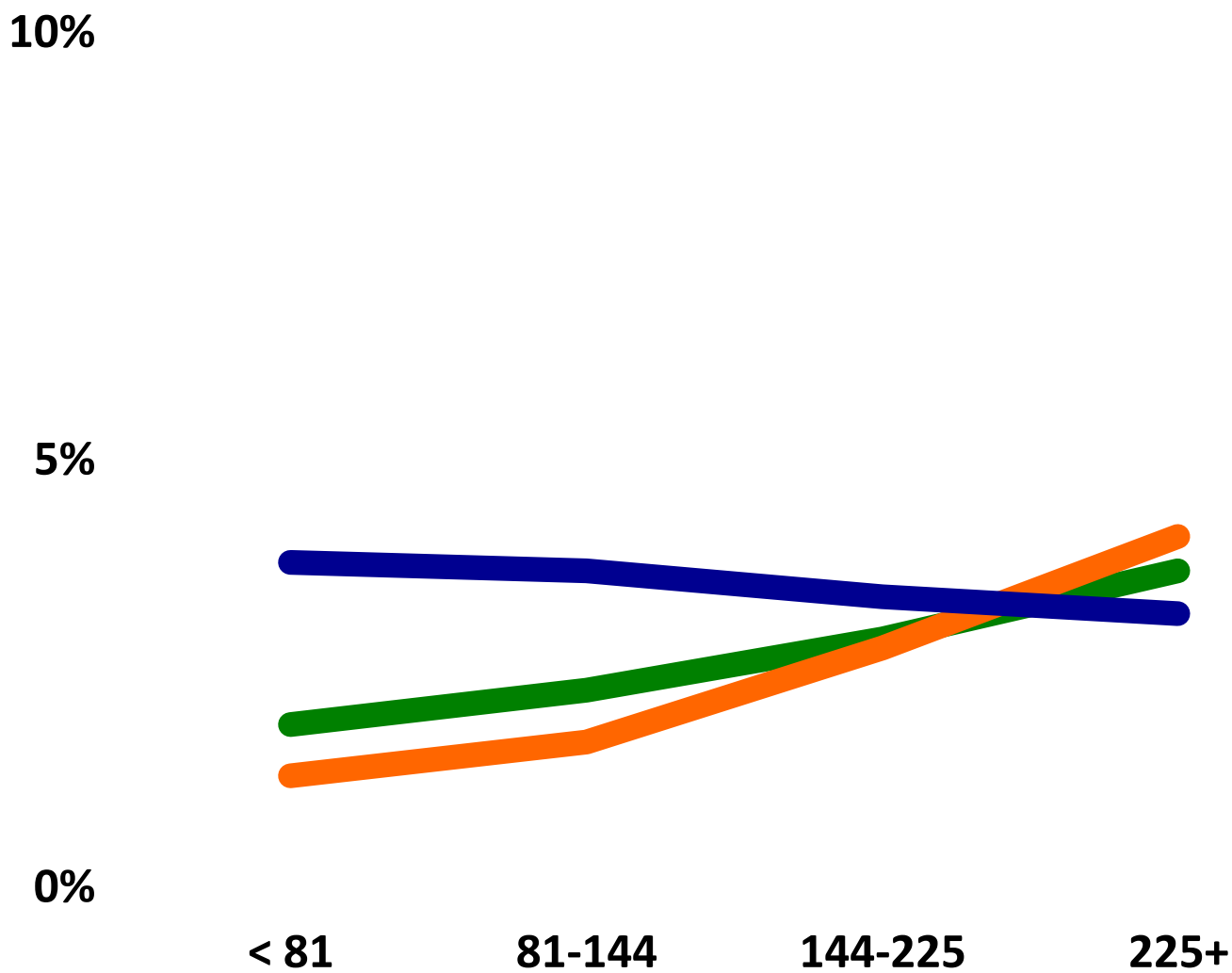
Percentage of People Walking, Biking or Taking Transit

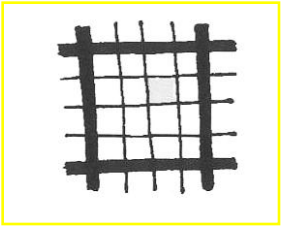




Percentage of People Walking, Biking or Taking Transit

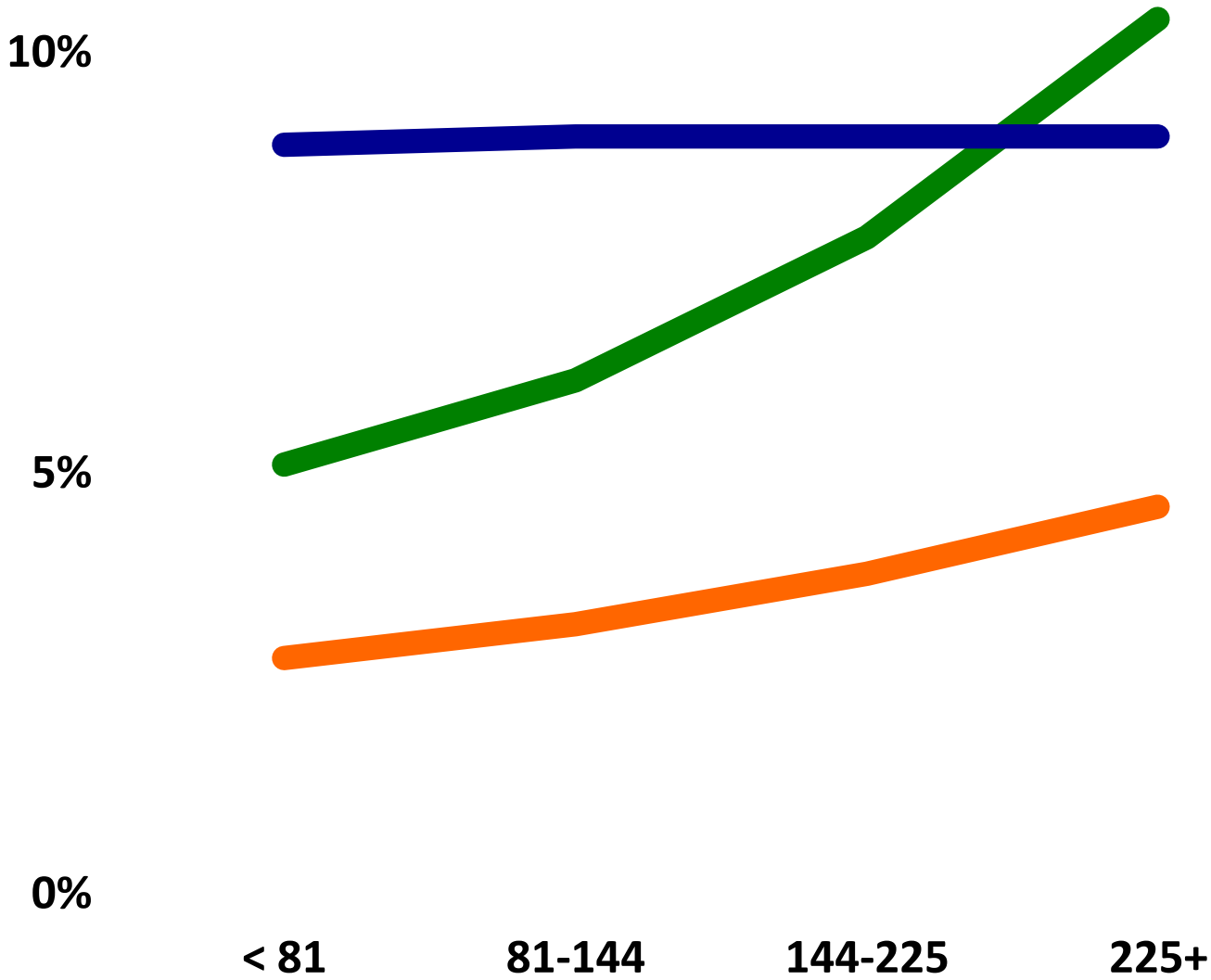
Effect of Intersection Density for Cul-de-sac Network



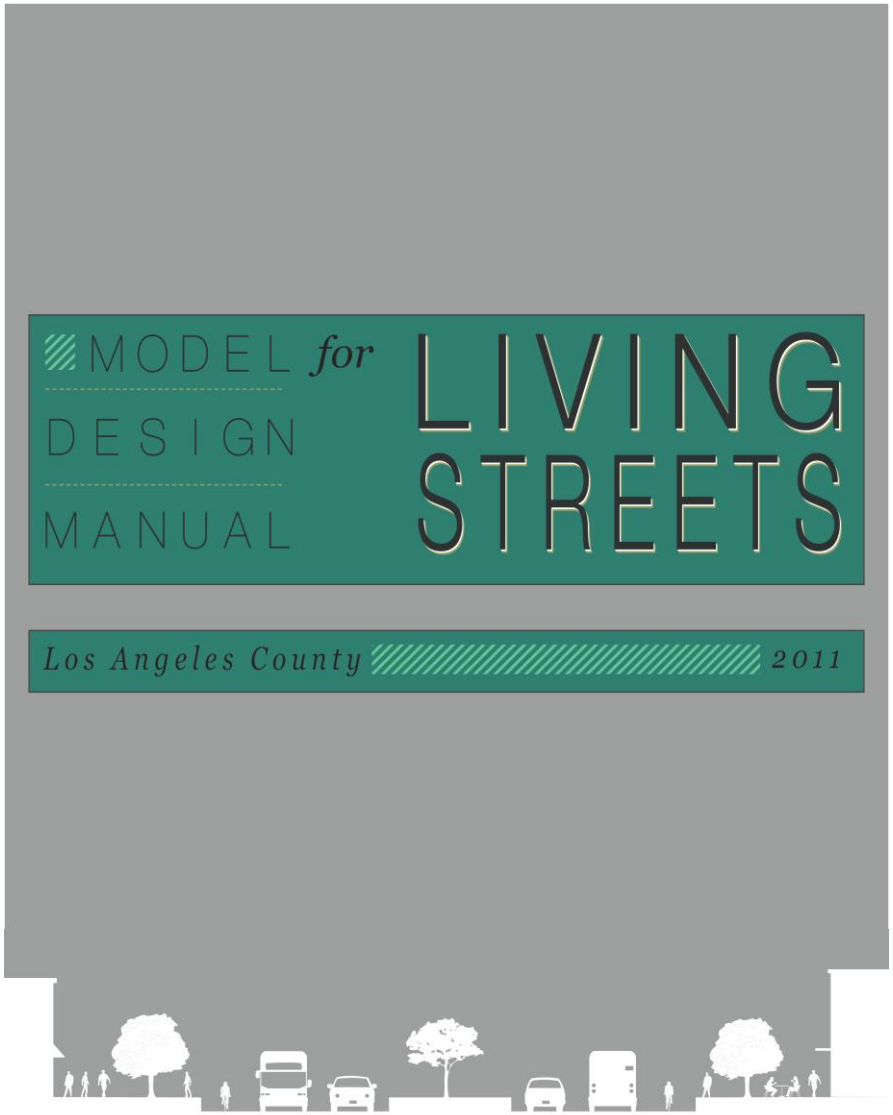


Percentage of People Walking, Biking or Taking Transit

Effect of Intersection Density for Gridded Network



Guideline for Sustainable Street Networks



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www.engr.uconn.edu/~garrick

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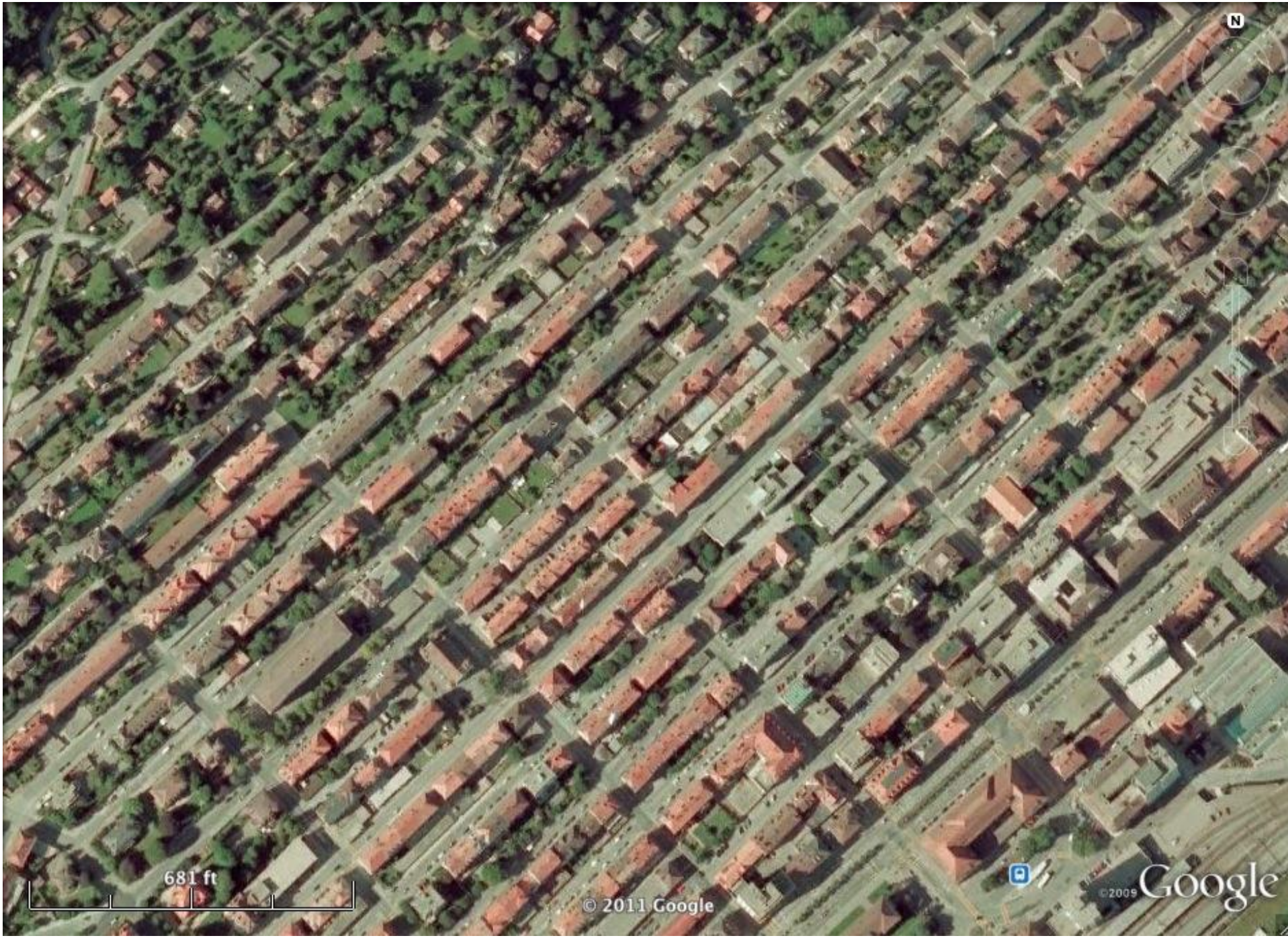
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