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Capturing the Effects of Smart Growth on Travel and Climate Change

Jerry Walters, Fehr & Peers

For Planning Horizons panel on *"Modeling for Regional and Interregional Planning"*
Caltrans Division of Transportation Planning
January 24, 2008 – Sacramento, CA

Office of Professional Development
Planning Horizons

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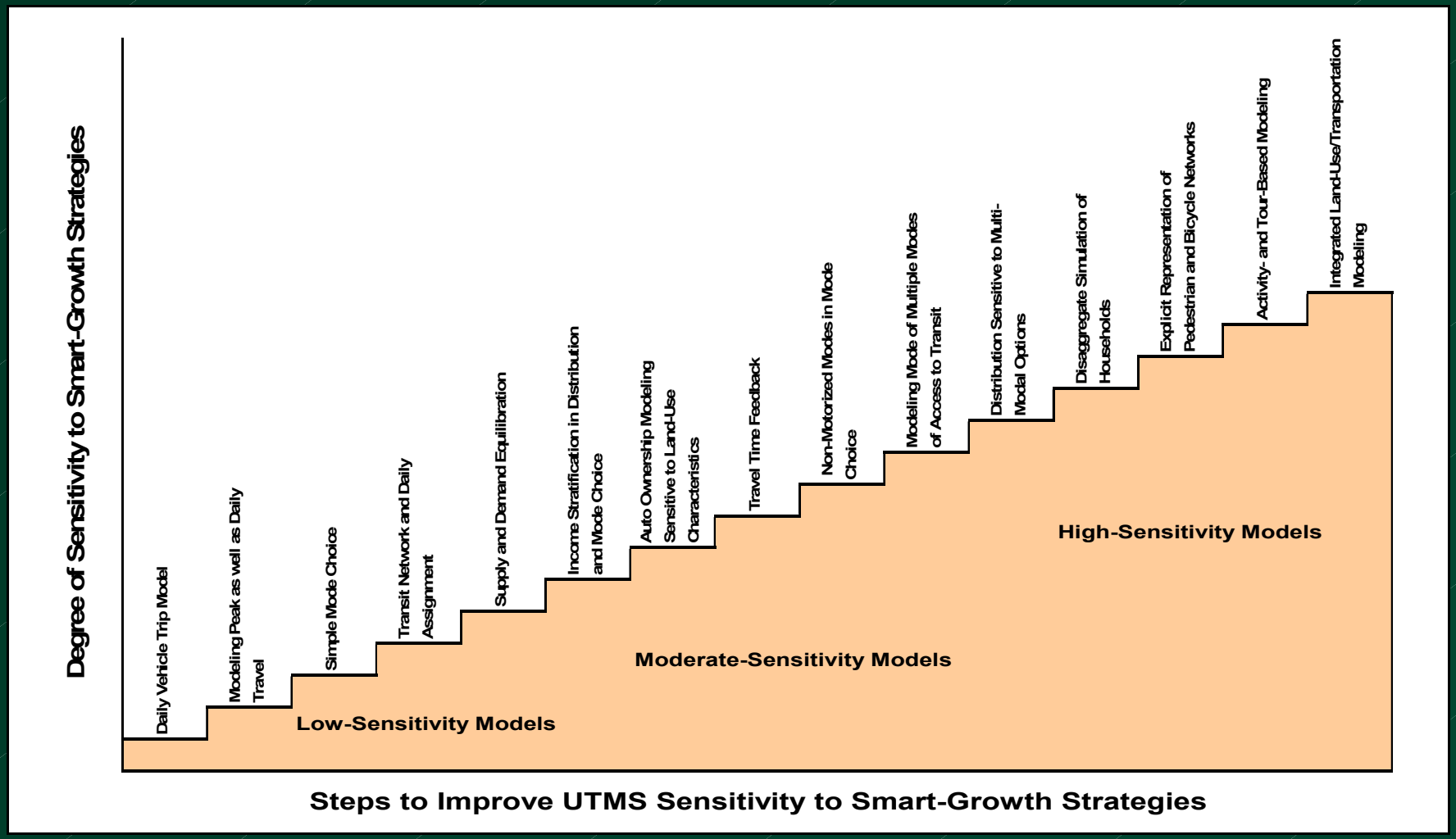
Levels of Model Sophistication:



Source: "Assessment of Local Models and Tools for Analyzing Smart-Growth Strategies" DKS, 2007

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Agenda (this presentation):

1. **Limitations of 4-Step Travel Models**
2. **“4D” Effects of Land Use on Travel**
3. **Application in a “Smart Growth Blueprint” -- Case Study**

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Agenda

1. Limitations of 4-Step Travel Models
2. "4D" Effects of Land Use on Travel
3. Application in a "Smart Growth Blueprint" -- Case Study

Shortcomings of Conventional Travel Models in Assessing Smart Growth

- Primary use is to forecast long-distance auto travel on freeways and major roads
- Secondary use is to forecast system-level transit use
- Short-distance travel, local roads, non-motorized travel modes are not addressed in model validation

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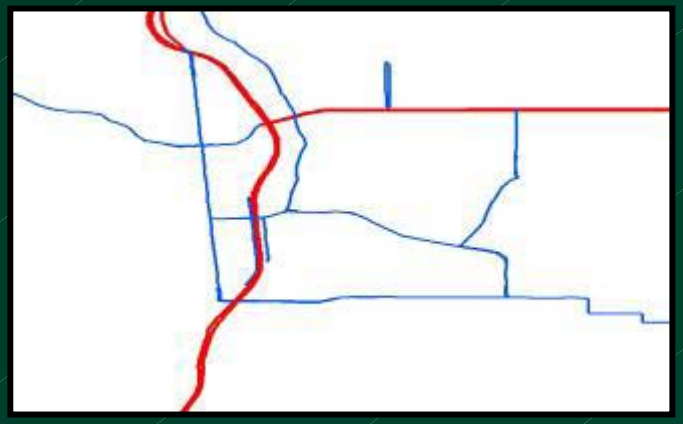
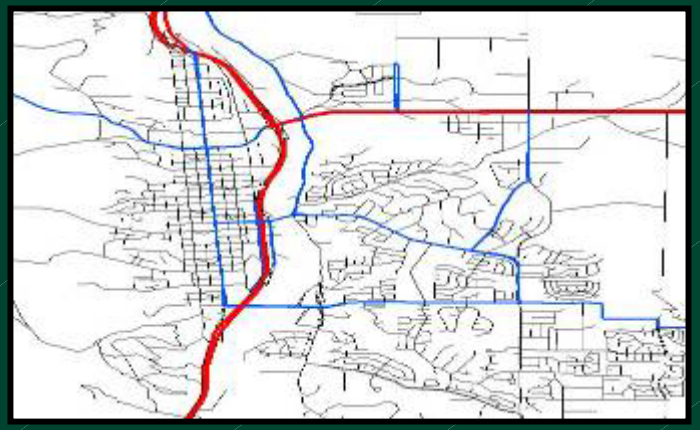
Typical Travel Model "Blind Spots"

- Abstract consideration of distances between land uses within a given TAZ or among neighboring TAZ's
- Limited or no consideration intra-zonal or neighbor-zone transit connections



Network in Model



Network in Field

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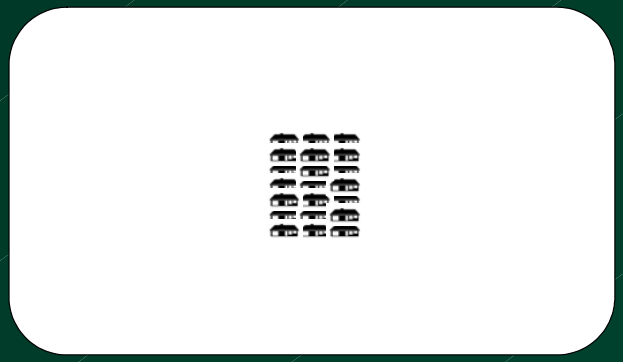
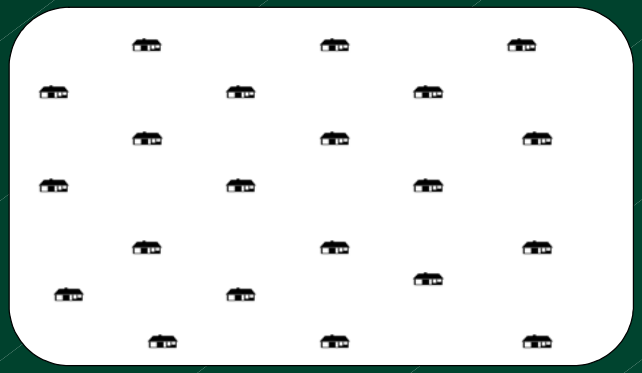
Typical Model "Blind Spots"

- Sidewalk completeness, route directness, block size generally not considered.

Typical Model "Blind Spots"

- Little consideration is given to spatial relationship between land uses within a given TAZ (density)





- Interactions between different non-residential land uses (e.g. offices and restaurants) not well represented

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2. "4D" Effects of Land Use on Travel
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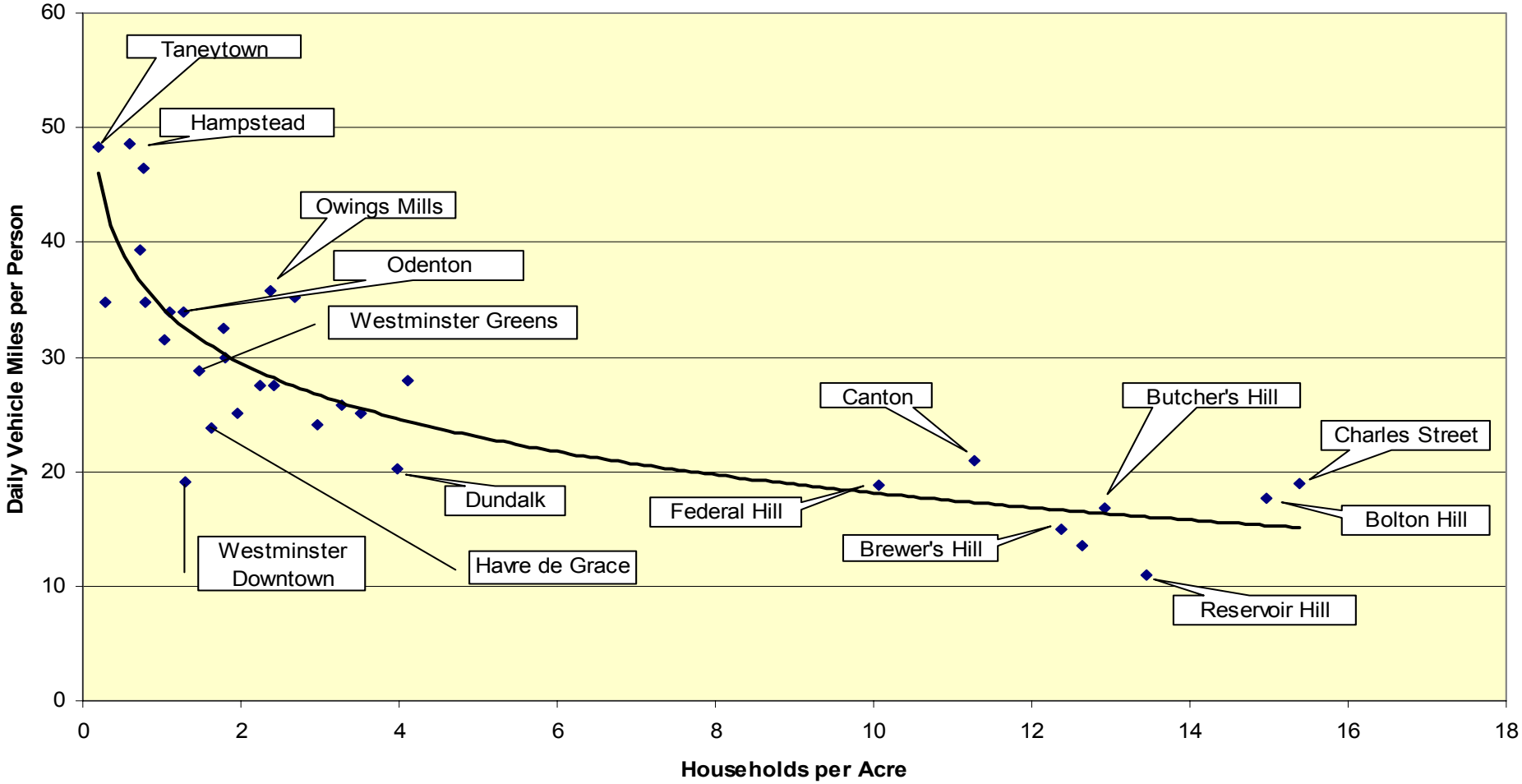
Daily Vehicle Miles per Person vs. Residential Density

Source: Baltimore Metropolitan Council, 2001 Travel Survey



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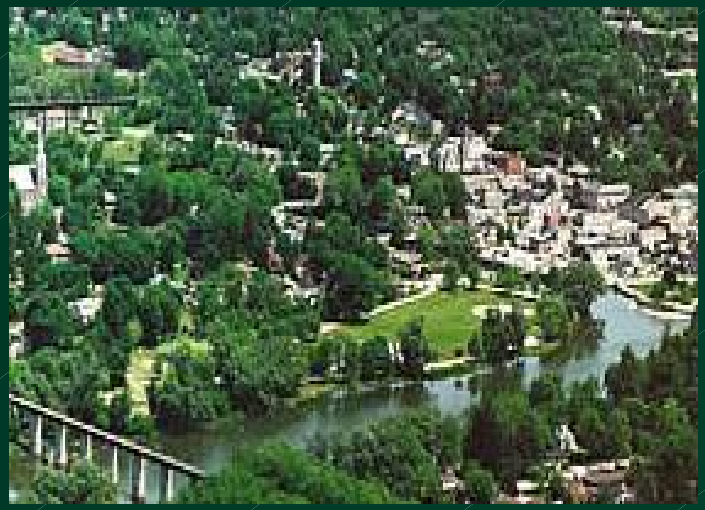
Trip generation is directly related to Ds:



Density dwellings, jobs per acre

Diversity mix of housing, jobs, retail

Design connectivity, walkability

Destinations regional accessibility

Distance to Transit rail proximity

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Density (jobs and dwellings per acre)

- Shortens trip lengths

- More walking/biking

- Supports quality transit

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Diversity (mix of housing, jobs, retail)

- Links trips, shortens distances

- Mo re walking/ biking

- Allows shared parking

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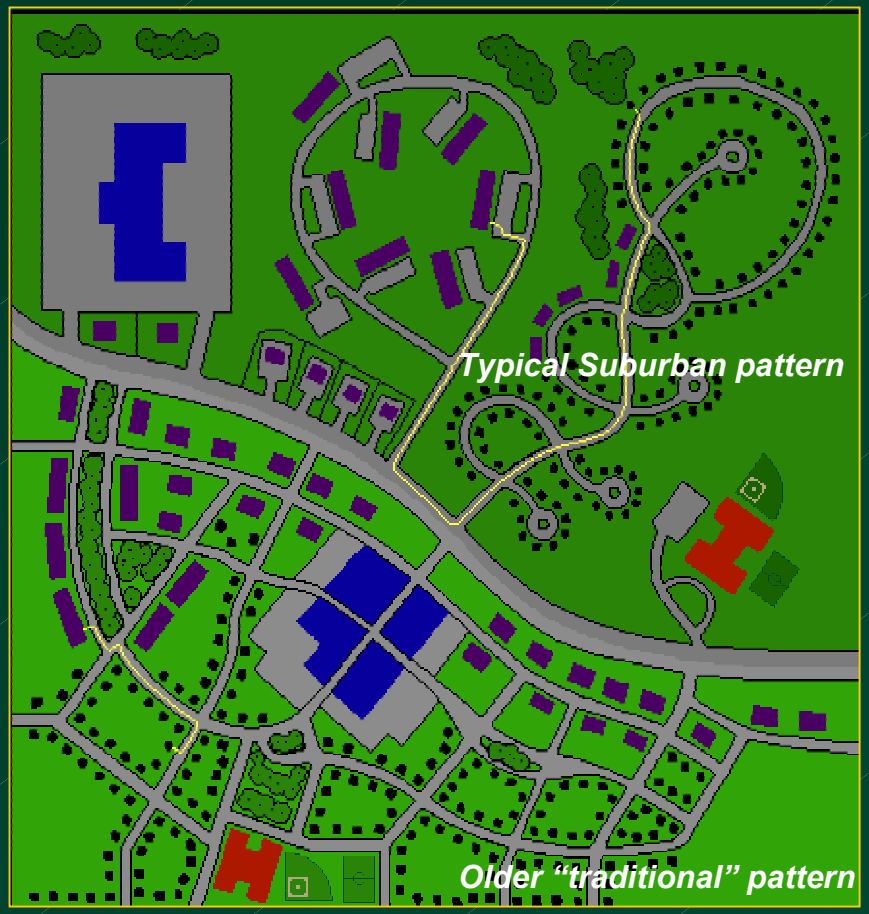
Design (connectivity, walkability)



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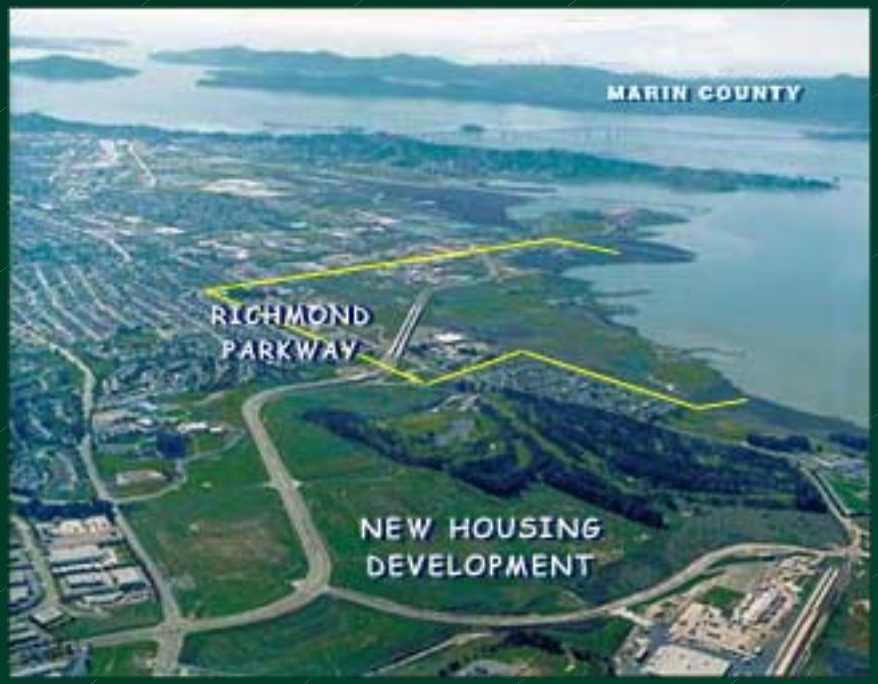
Destinations (accessibility to regional activities)



Development at infill or close-in locations reduces vehicle trips and miles

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Distance to Transit

Transit shares are higher within ¼ mile and ½ mile of rail stations

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4D "Elasticities" Ranges

	Vehicle Trips Per Capita	VMT per Capita
Density	4% to 12%	1% to 17%
Diversity	1% to 11%	1% to 13%
Design	2% to 5%	2% to 13%
Destinations	5% to 29%	20% to 51%

Sources: National Syntheses, Twin Cities, Sacramento, Holtzclaw

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5th D - Sensitivity to Distance from Transit

Re: Vehicle miles traveled, compared to regional average:

- 42% reduction for households within ½ mile of transit
- 21% reduction for households between ½ and 1 mile

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Land Use Clustering, Mixing, Traditional Neighborhood Design – All reduce travel

Why it matters: 55% to 65% of trips are less than 3 miles. Up to 80% are less than 5 miles.

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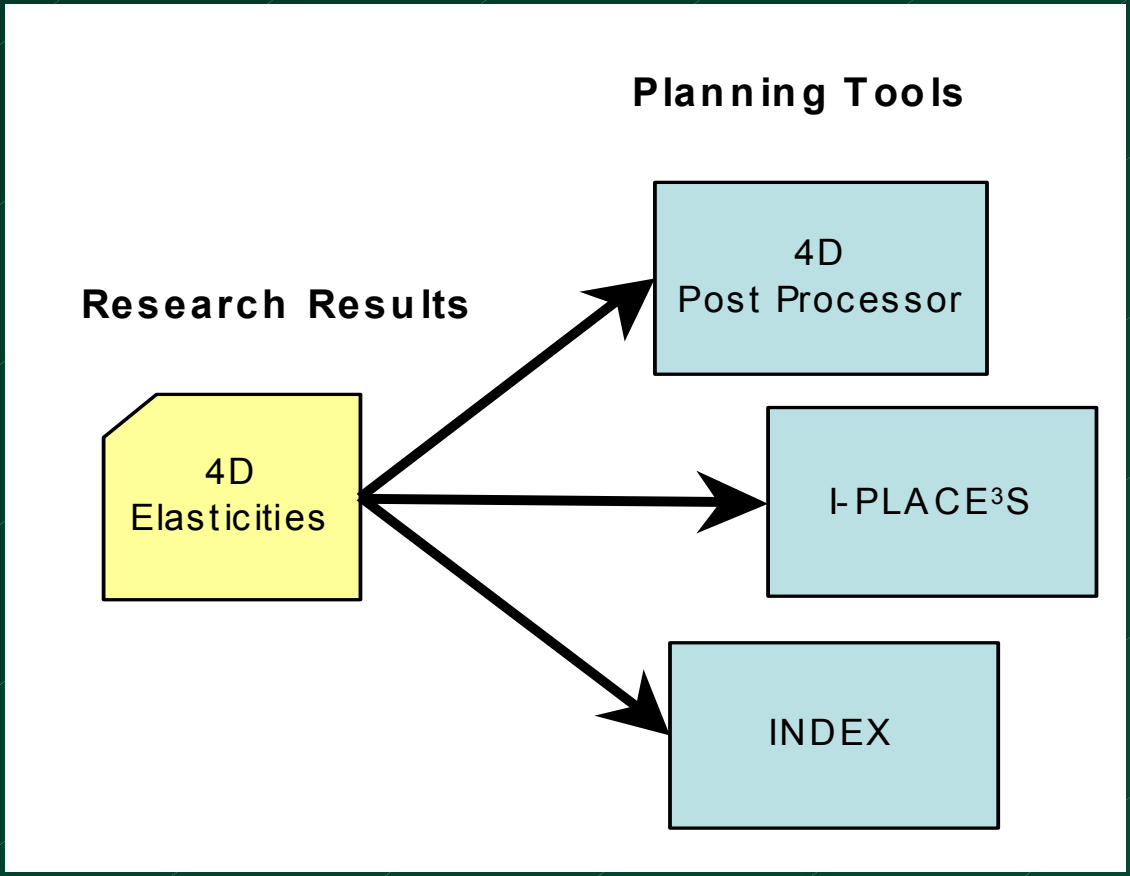
Study* Recommendation:

Use 4Ds to compensate for lack of Smart Growth sensitivity in presiding travel model.



Assessment of Local Models and Tools for Analyzing Smart-Growth Strategies
July, 2007 – DKS with UC Irvine (Caltrans-funded).

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Average VMT Elasticities to Added Capacity

	Facility-Specific Studies	Areawide Studies
Short-Term	0	0.4
Medium-Term	0.27	NA
Long-Term	0.63	0.73

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Investment in System Continuity

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Report's Recommendations on Modeling*
Land Use < > Transportation < > Climate Change

1. Test existing model's sensitivity and use 4Ds to compensate for any limitations
2. Use scenario planning or integrated land use/ economic/transportation models to assess land use and transportation
3. Conduct constraints analysis for critical corridors to refine/prioritize improvements

**Assessment of Local Models and Tools for Analyzing Smart-Growth Strategies*
July, 2007 – DKS with UC Irvine (Caltrans-funded):
http://www.dot.ca.gov/newtech/researchreports/reports/2007/local_models_tools.pdf

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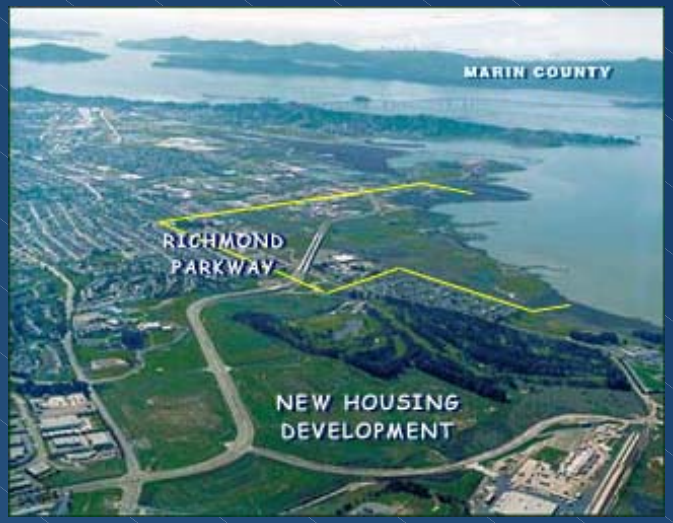
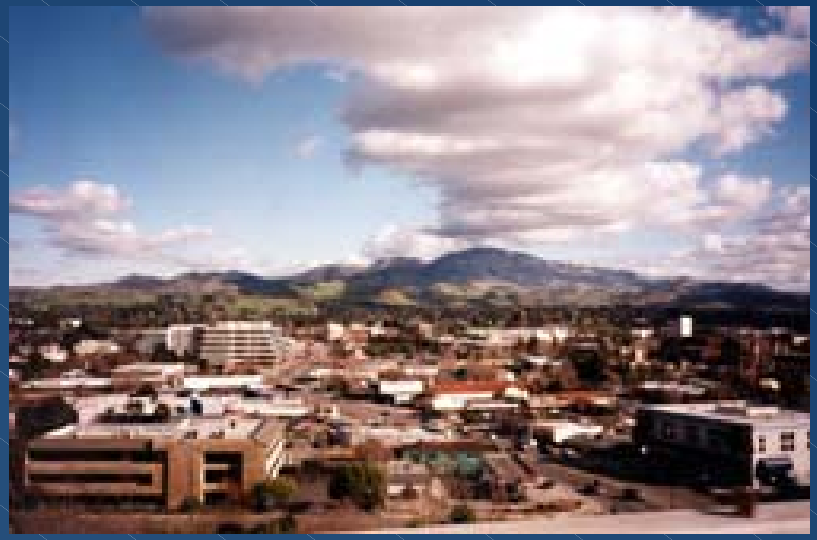


Contra Costa County: Shaping Our Future



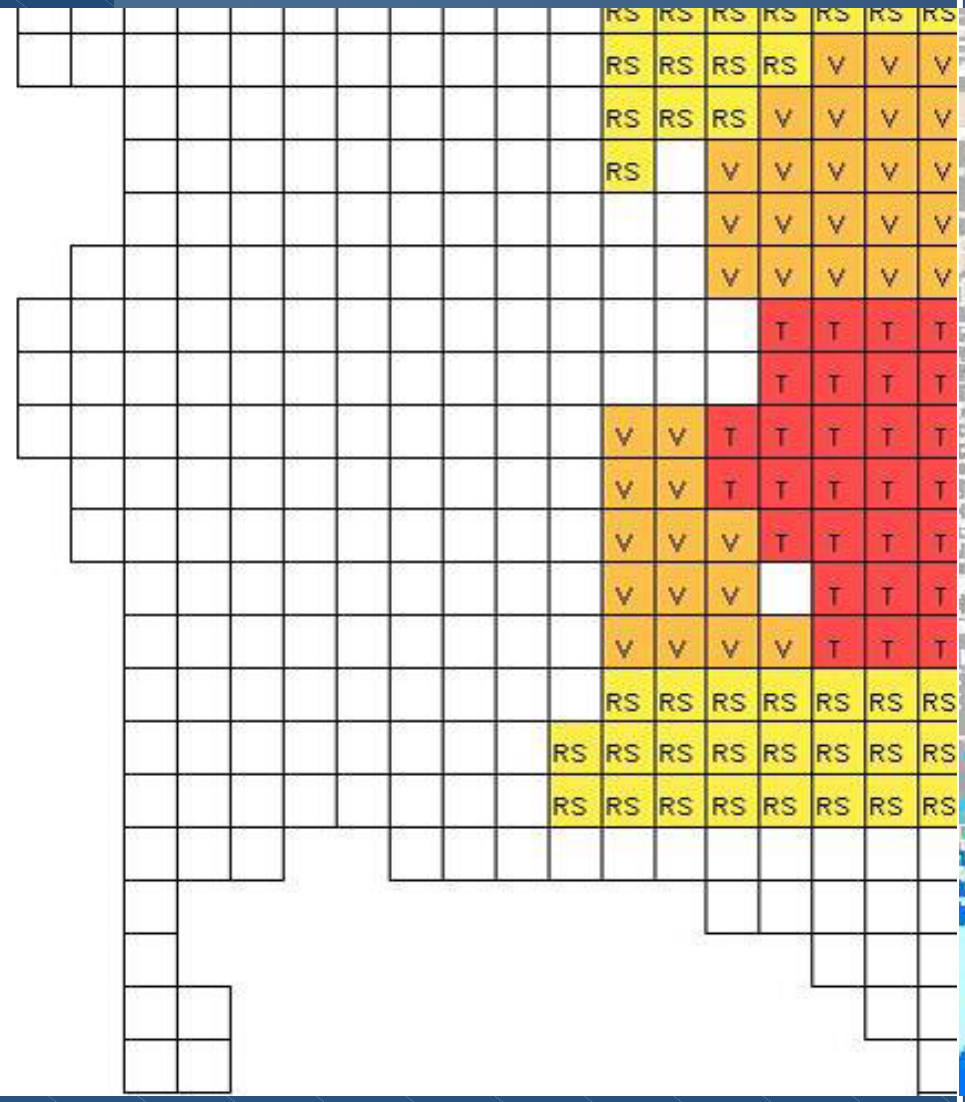
Integrated Land Use/ Transportation Visioning and Planning Strategy

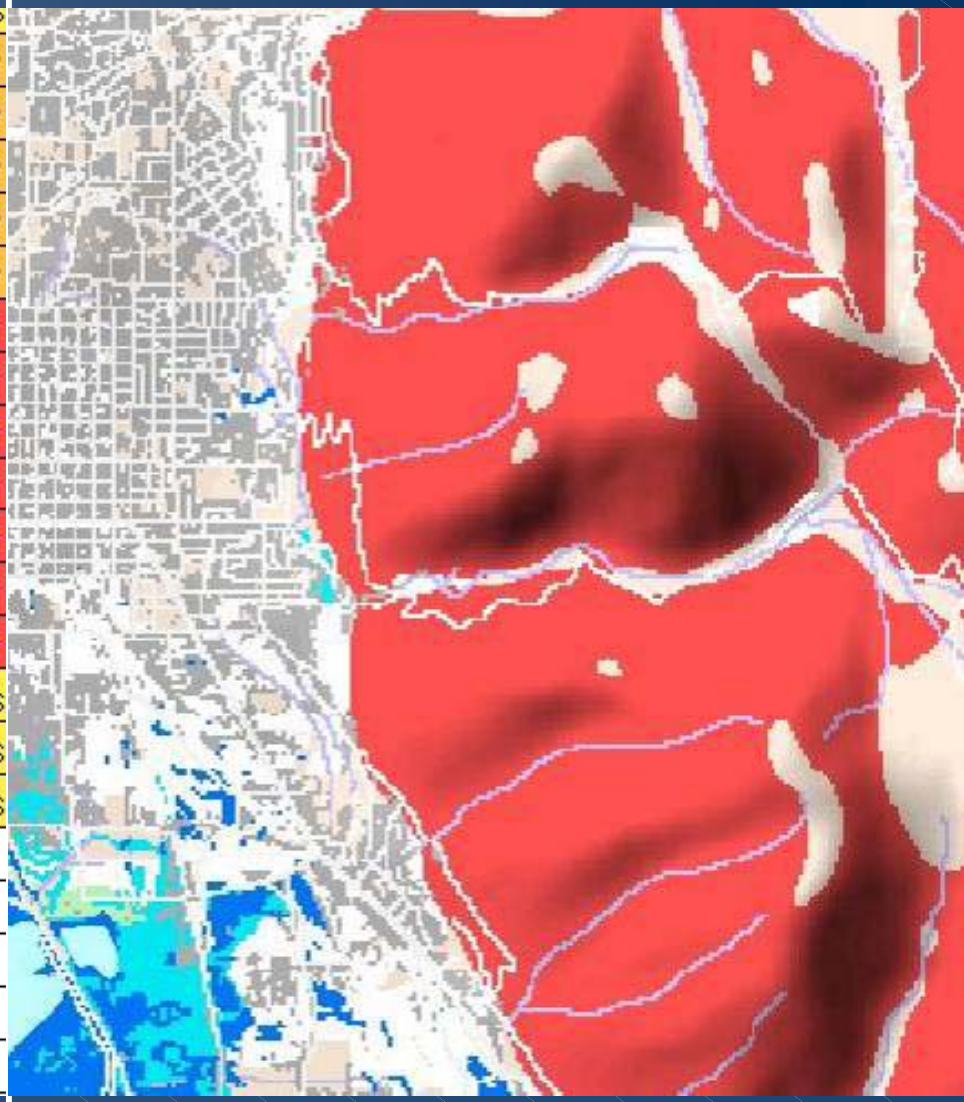
Contra Costa: Shaping Our Future

- Emphasize development forms known to reduce travel per capita: density, mix, transit-oriented design, infill and close-in locations
- Concentrate land use around potential transit nodes
- Prioritize transportation system expansions that work best with compact, transit oriented development.

Scenario Overlay Merged Environmental Constraints Map

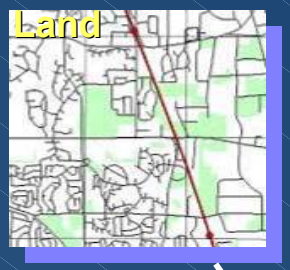
Contra Costa: Shaping Our Future





Contra Costa Model Overview

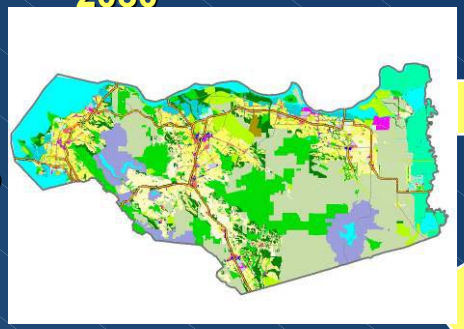
Modeling Future Development Scenarios



Jobs & Population Forecast

Development Policy Scenario

Future Transportation & Land Use Model, 2030

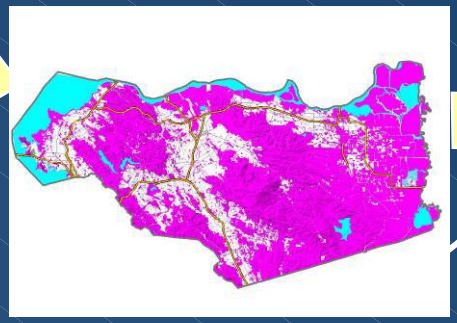


Measurements and Metrics:

- Economic Analysis
- Environmental Impact
- Land Conversion
- Social/Demographic Impacts
- Other Metrics

Land Use Modeling

Transportation Modeling



Virtual Land Use Future, 2030

Transportation Policies

Transportation Network

1. Higher development densities reduce trip lengths and vehicle travel

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Forecast Scenario increases development density for new growth by 11%.

2. Diversifying local land uses reduces vehicle trips and lengths

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Compared with Base Case, Forecast Scenario increases mixing at local level by 23%.

3. Traditional Neighborhood Design reduces vehicle trips and lengths

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Forecast Scenario has up to 25% greater potential for "traditional neighborhood development" than Base Case.

4. Dense, diverse, well-designed development is more effective at infill or close-in locations

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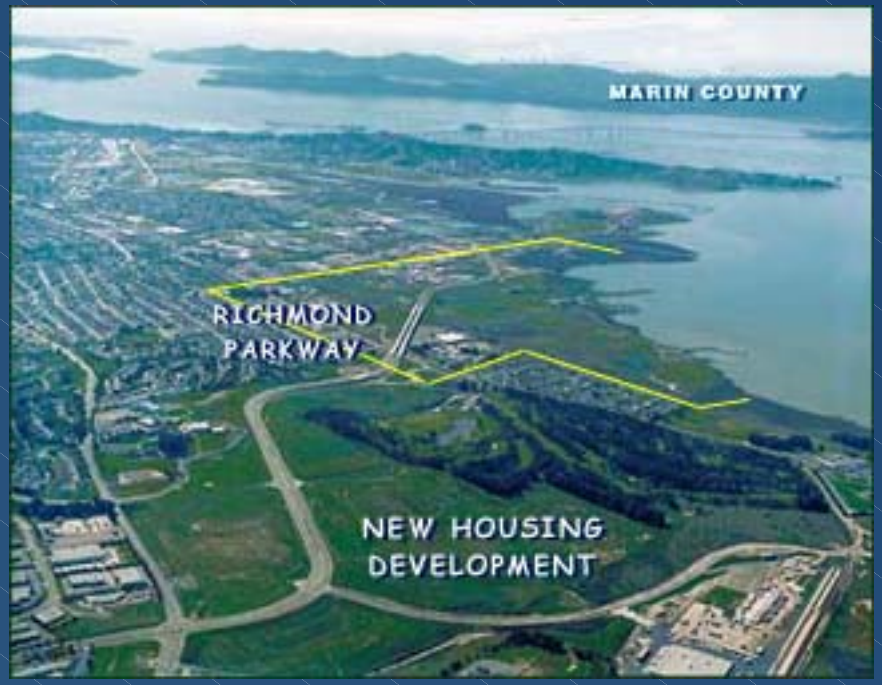
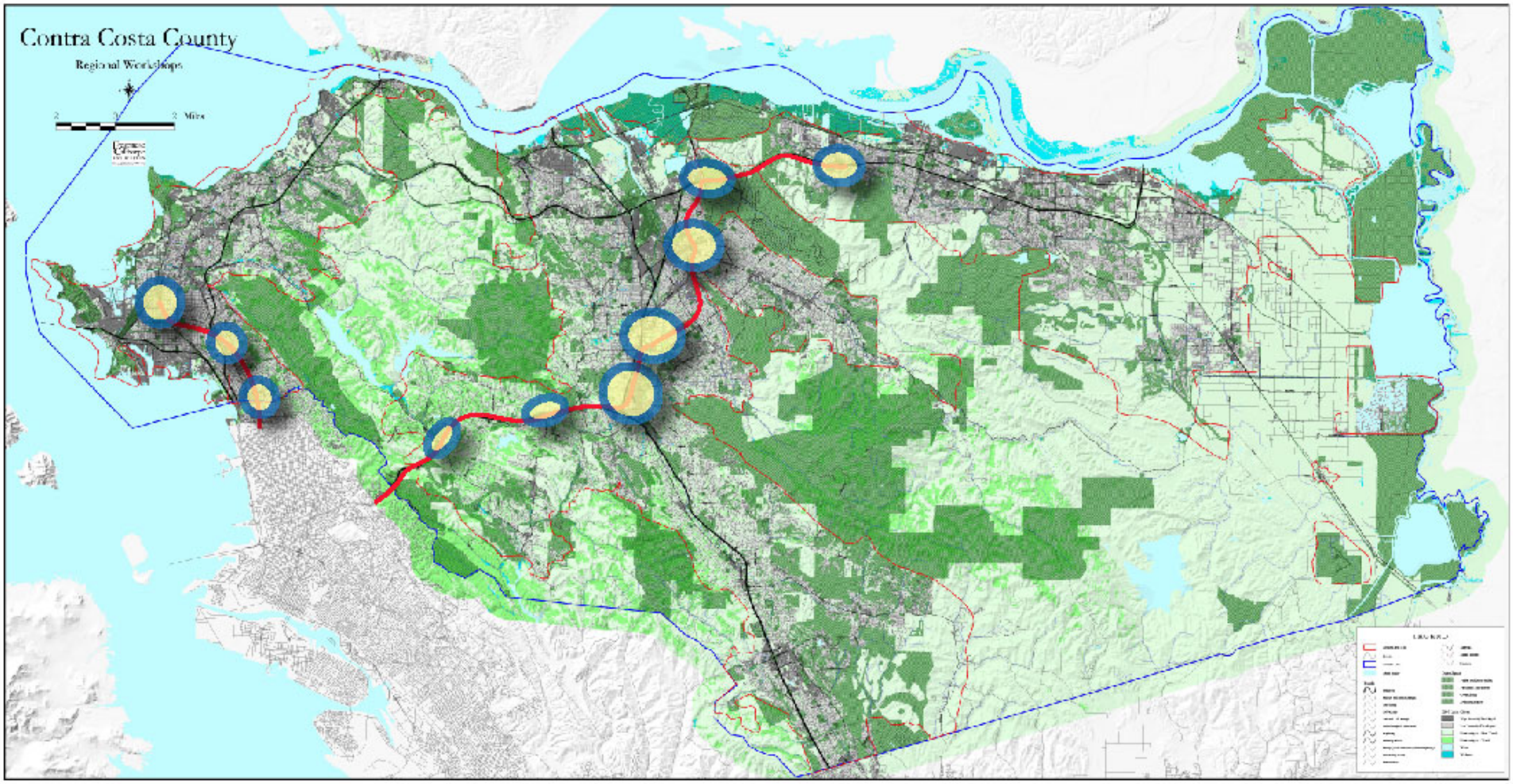


Scenario places more development at infill locations than Base Case.

5. Residents who live and work near transit, ride transit

- **8%** of new residents live within ½ mile of transit (1% under Base Case)
- **11%** of new jobs are within ½ mile of transit (8% under Base Case)



The Smart Growth Scenario improves the levels of congestion on major roads

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- **% of Arterial Miles Congested* - 42%**
  (Peak hour LOS E or F)

- **% of Freeway Miles Congested* - 15%**
  (Peak hr LOS E or F in at least 1 direction)

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