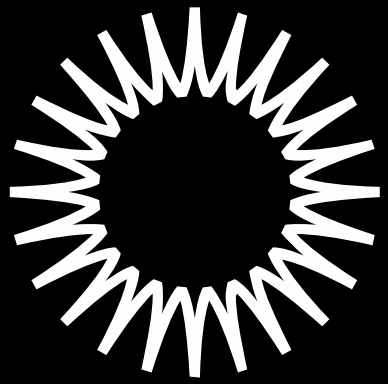

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Analytical Modeling at the Metropolitan Transportation Commission

February 28, 2017

Lisa Zorn (lzorn@mtc.ca.gov) &
Michael Reilly (mreilly@mtc.ca.gov)

Overview

- Models in regional planning
- Mike on UrbanSim, the land use model
- Lisa on Travel Model One, the transportation model
- Questions

Please note

- Today's talk is not a formal presentation in the Plan Bay Area 2040 process
  - Scenarios are earlier versions
- Any comments will not be part of the EIR process
- Please see http://planbayarea.org if you would like to learn more or participate

What are Regional Models?

- Complex, data-hungry computer programs
- Use economics and statistics to forecast how different parts of the city work and interact in an attempt to forecast the future
- At MTC, they use microsimulation
  - Explicit prediction of choices (e.g., Where do I want to live? What time will I drive home?)

Why Use Regional Models?

- Forecast the future to better understand trajectory and plan/evaluate transportation investments
  - Rigorous, consistent, and comprehensive
- Test the efficacy of transport and land use policies
  - Better understand how the region works and what might ameliorate our problems
- **Evaluating alternate futures or scenarios**

Regional Models at MTC

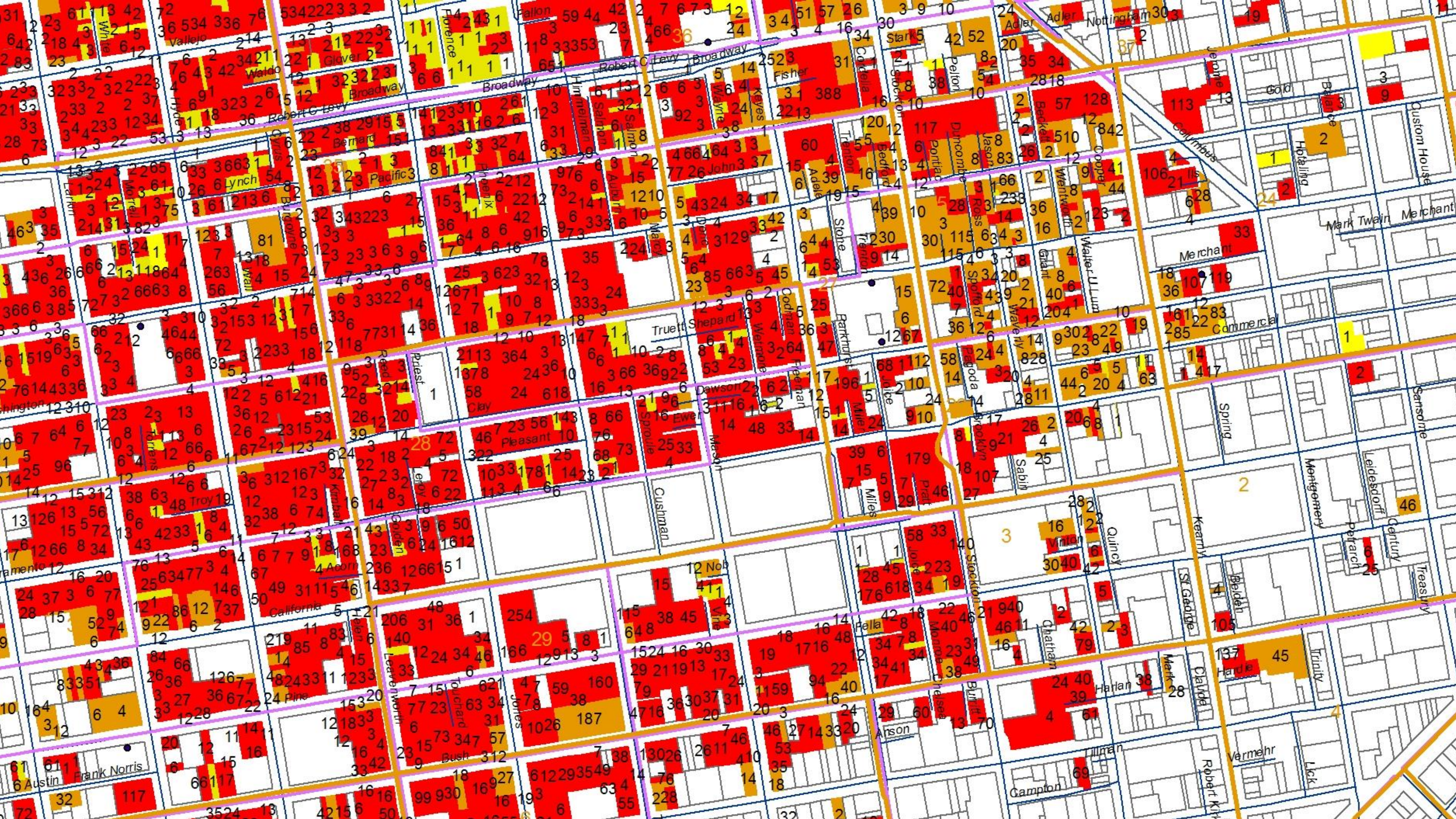
- Various software forms an integrated model
  - Regionwide total forecast: REMI
  - **Local land use forecast: UrbanSim**
  - **Transportation behavior: CT-RAMP**
  - Emissions: EMFAC
  - Other: health, benefit-cost, equity assessment

Land Use Modeling

- UrbanSim land use model
  - Developed by Paul Waddell, UCB
  - Forecasts the intra-regional location of households and jobs (and the buildings that contain them) for a series of future years

Supply in UrbanSim

- Start with map of all current buildings
  - Attributes such as size, age, price
  - All households and jobs are explicitly assigned using recent data on their locations



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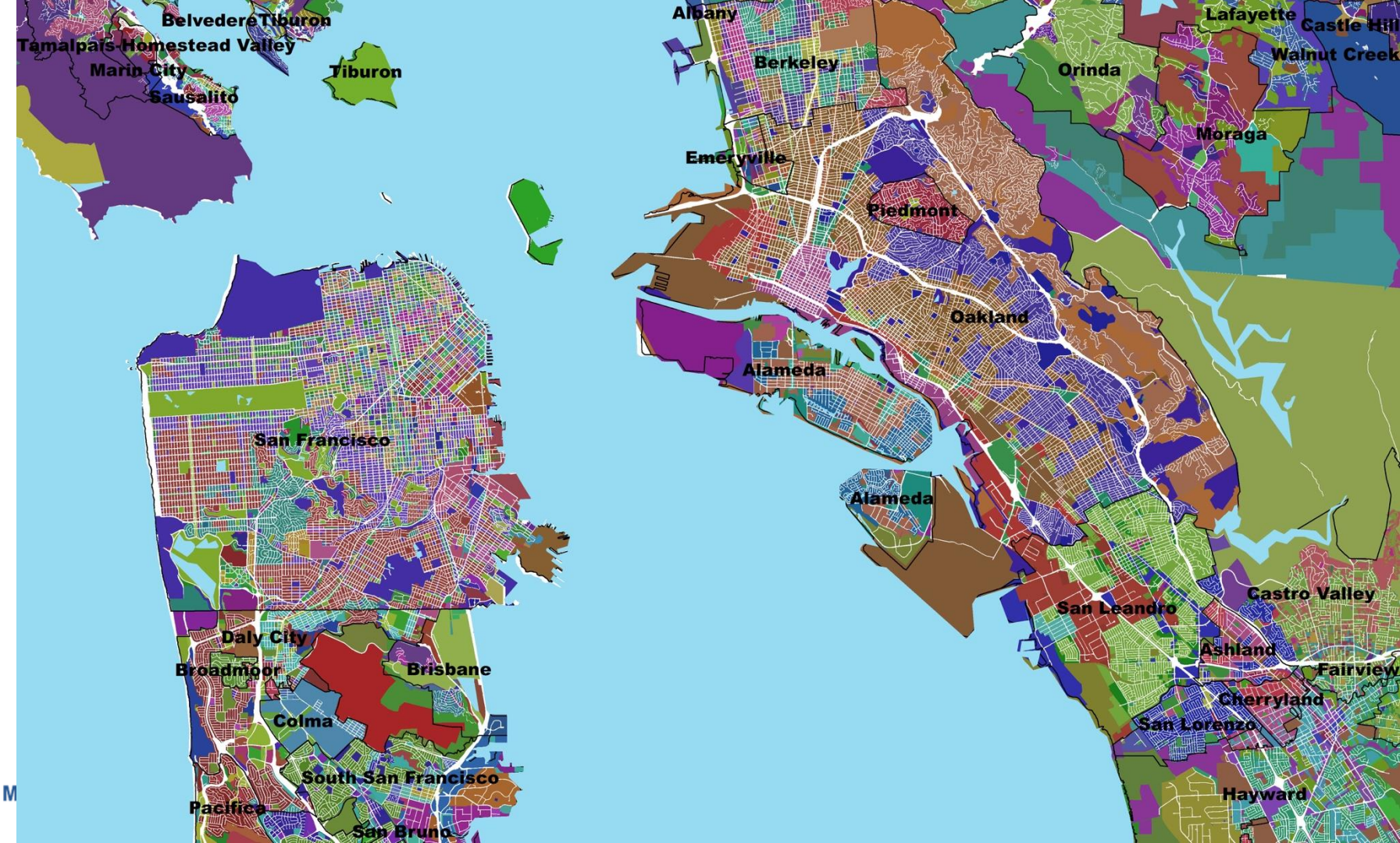
Demand in UrbanSim

- Statistical equations developed from past behavior explain the consistencies in location preferences
- Every year new households (from REMI) and some existing households choose a new housing unit
  - Very individual but there are correlations
  - Place them in these locations
- Jobs are similar

Increasing Supply

- Map of land use policies
  - Mostly zoning, but also caps, fees, subsidies
- UrbanSim Developer Model simulates construction
  - Pro forma estimates profit = revenue – costs
    - Costs from existing use, fees, constuction
    - Revenue starts with current prices, goes up in areas of high demand
  - Build the most profitable buildings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Lafayette
Castle Hill
Walnut Creek
Orinda
Moraga
San Francisco
Daly City
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Pacifica
San Bruno
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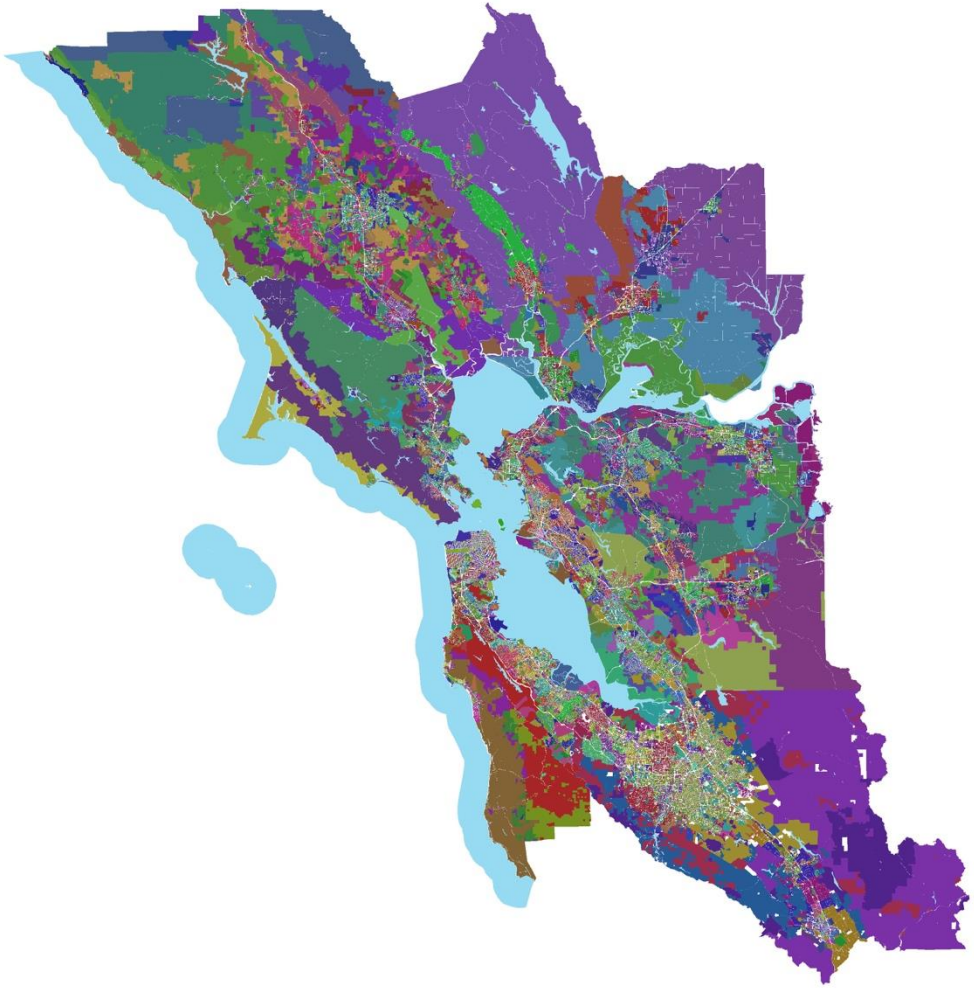
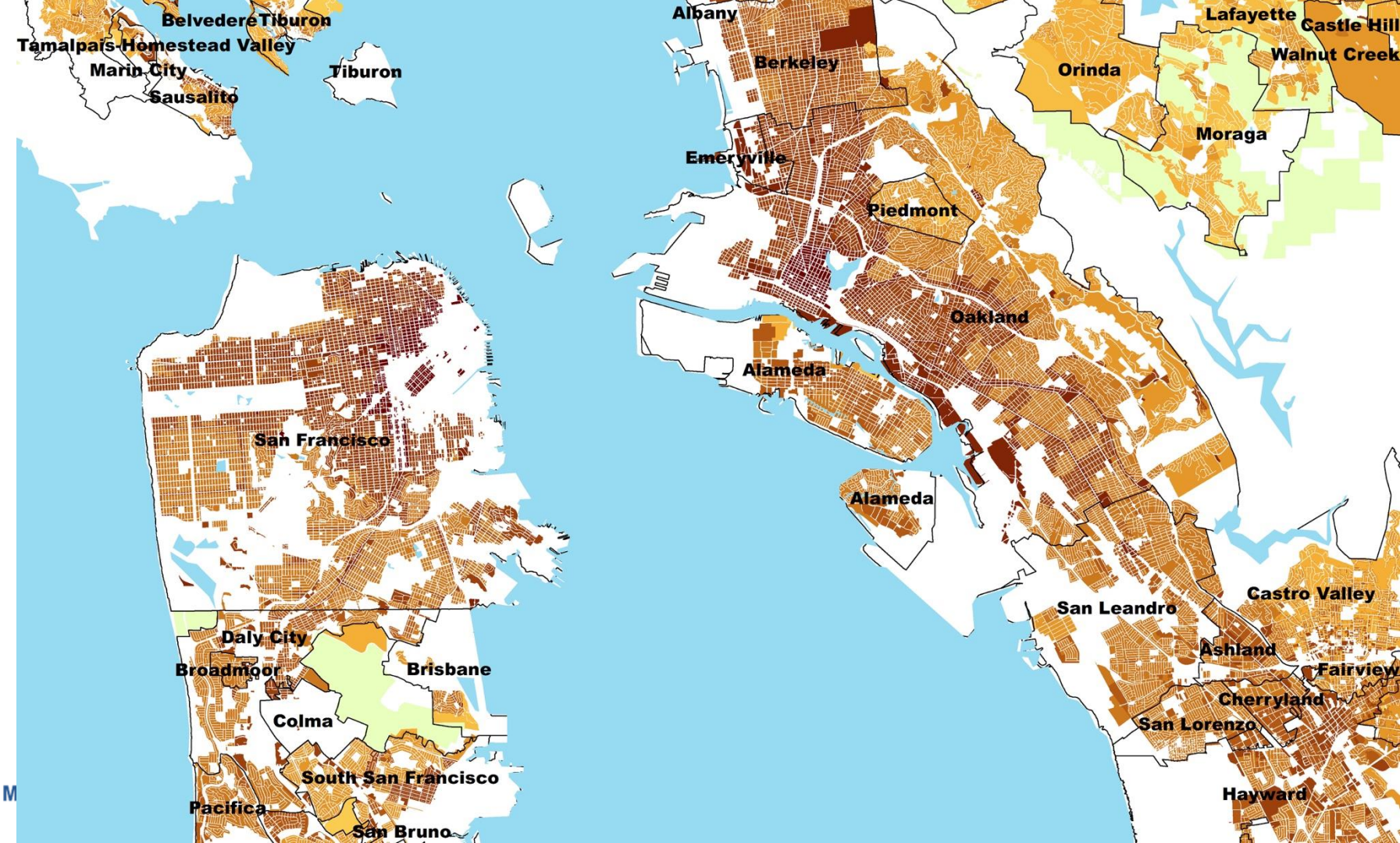
Castro Valley
Ashland
Fairview
Cherryland
San Lorenzo
Hayward

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San Francisco
Daly City
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Colma
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Pacifica
San Bruno
San Leandro
Castro Valley
Ashland
Fairview
Cherryland
San Lorenzo
Hayward


Davey Glen Rd - Google Maps
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Davey Glen Rd
Belmont, California
Street View - Jul 2016
Davey Glen Rd
Google
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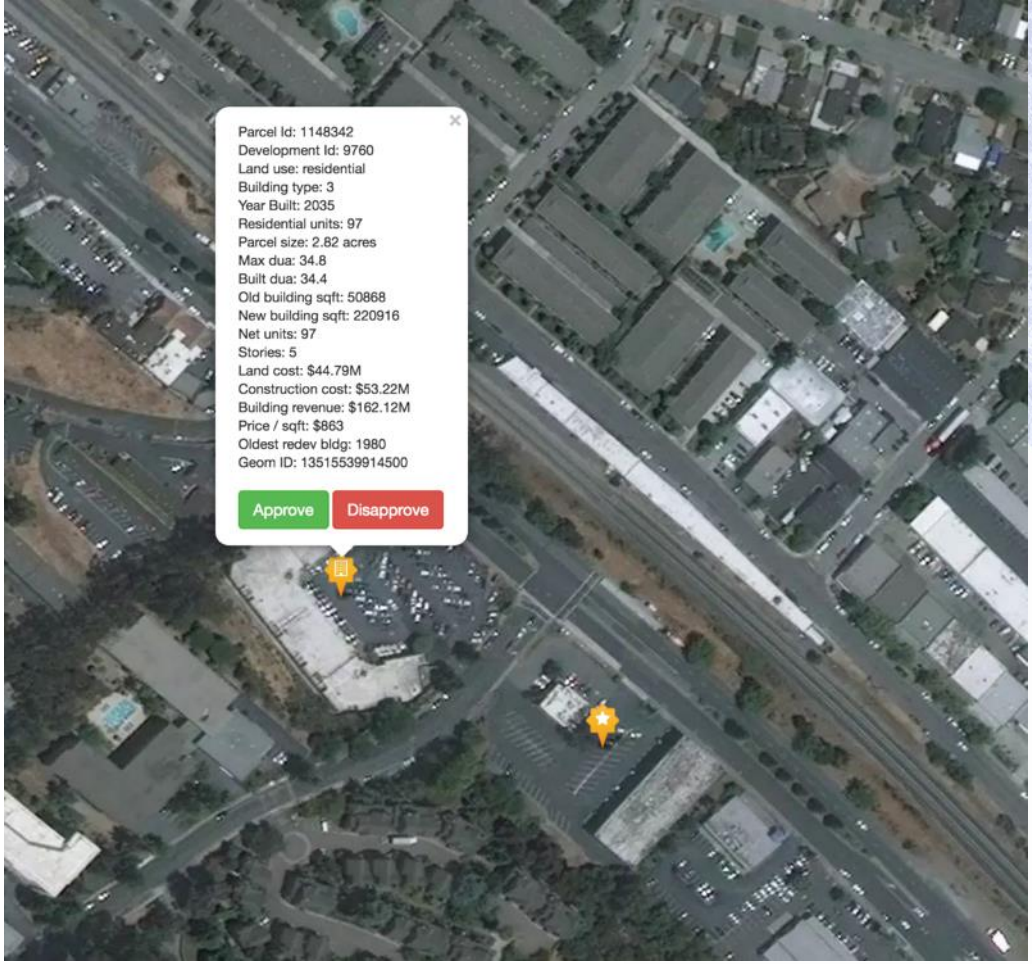
Report a problem

Mini Pro Forma

Costs	–$98m
Revenue	$162m
Profit	$64m


Parcel Id: 1148342
Development Id: 9760
Land use: residential
Building type: 3
Year Built: 2035
Residential units: 97
Parcel size: 2.82 acres
Max dua: 34.8
Built dua: 34.4
Old building sqft: 50868
New building sqft: 220916
Net units: 97
Stories: 5
Land cost: $44.79M
Construction cost: $53.22M
Building revenue: $162.12M
Price / sqft: $863
Oldest redev bldg: 1980
Geom ID: 13515539914500
Approve
Disapprove

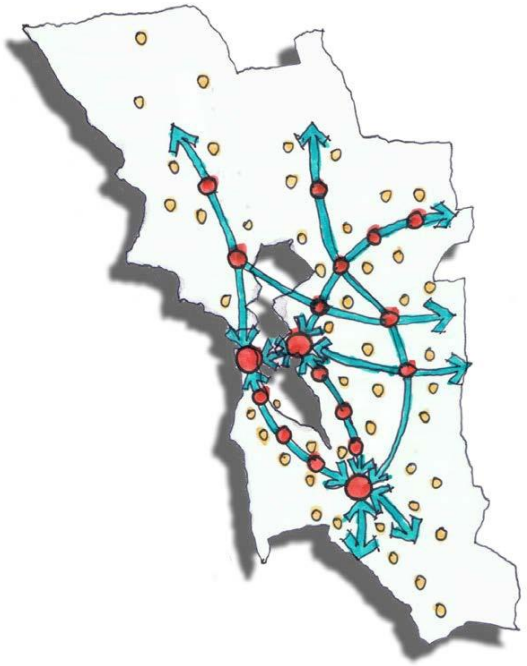
Scenarios

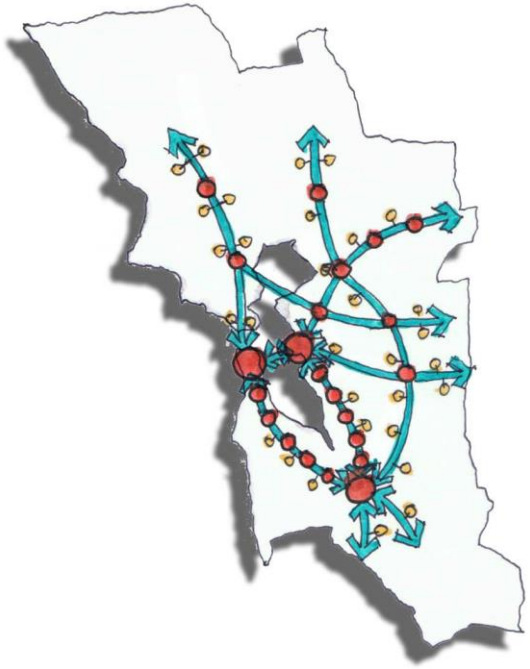
- Built multiple scenarios with stakeholders
  - Different visions relating to where growth ought to go
    - **Use policies within the model to achieve**
  - Different transportation investments and policies

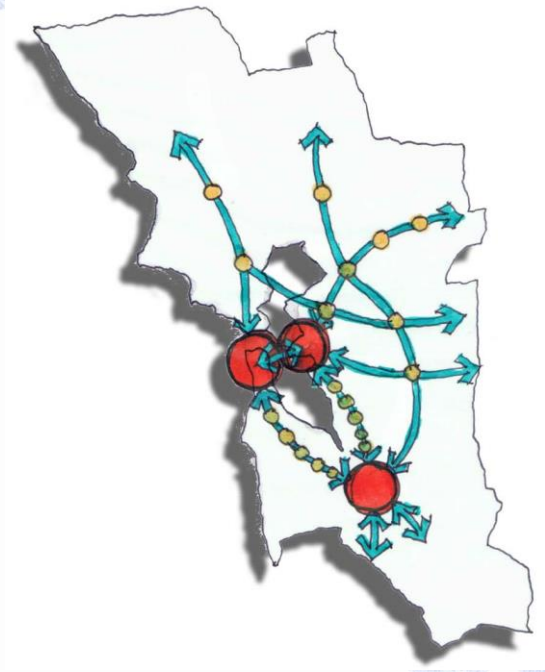
Four Initial PBA Scenarios

- No Project and

PBA40 Scenarios Visions







LAND USE STRATEGIES

Plan BayArea 2040

Land Use Strategy	 Main Streets	 Connected Neighborhoods	 Big Cities
Upzoning	Select suburban areas	PDAs	Big 3 & neighbors
Open space/UGB expansion	Modest	None	None
Reduce parking minimums	PDAs along regional rail	PDAs along corridors	Big 3 & neighbors
Inclusionary zoning	High-opportunity areas	Jurisdictions with PDAs	Big 3
Fees/subsidies for deed-restricted units in low-VMT areas	Yes- fee on new commercial in high VMT areas	None	Yes- fee on new residential in high VMT areas
Other tax policies	Assume new taxes/fees providing over $500M annual for affordable housing	None	Assume revenue-neutral property tax assessment modification in Big 3 cities

	Main Streets	Connected Neighborhoods	Big Cities
2040 Share of Total Households			
% Share of Total Jobs			
Household % of Growth in PDAs	54%	69%	55%
Employment % of Growth in PDAs	40%	41%	43%

Key

- **Big 3** (the region's three largest cities: San Jose, San Francisco, Oakland)
- **Bayside** (generally directly adjacent to San Francisco Bay - e.g. Hayward, San Mateo, Richmond)
- **Inland, Coastal, and Delta** (generally cities just outside of Bayside - e.g. Walnut Creek, Dublin, Santa Rosa, Antioch, Brentwood, Dixon)

Transportation Modeling

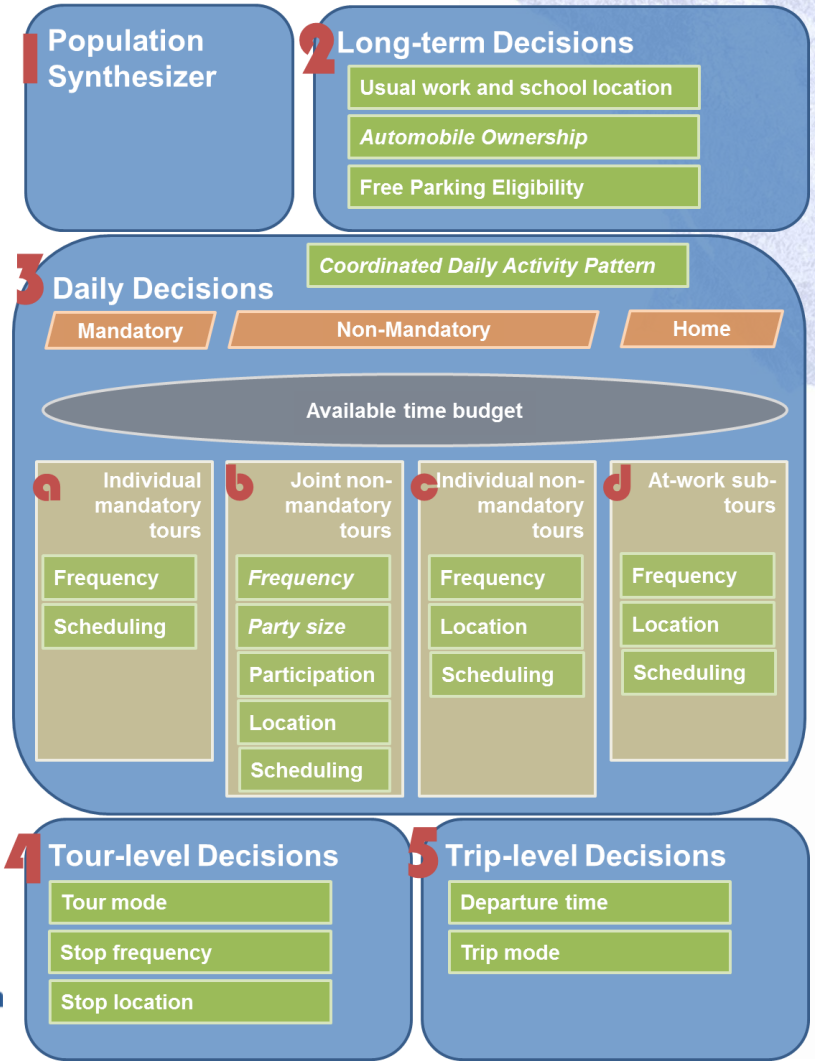
Travel Model 1 forecasts the travel behavior of every resident on a typical weekday in the future

Demand in TM 1

- Travel is a derived demand
  - Start with land use model output: where do people live and where are their destinations?
- Explicit representation of people in households making many interrelated choices
  - Car ownership, where working, shopping, when leave for a trip, what mode (car, walk, transit…)

Supply in TM 1

- Detailed representation of the travel network
  - Roads with capacity, tolls
  - Transit with frequency, costs
- How do the trips generated by the demand model combine throughout the day to generate congestion and affect travel speeds/times


1 Population Synthesizer
2 Long-term Decisions
Usual work and school location
Automobile Ownership
Free Parking Eligibility
3 Daily Decisions
Coordinated Daily Activity Pattern
Mandatory
Non-Mandatory
Home
Available time budget
a Individual mandatory tours
Frequency
Scheduling
b Joint non-mandatory tours
Frequency
Party size
Participation
Location
Scheduling
c Individual non-mandatory tours
Frequency
Location
Scheduling
d At-work sub-tours
Frequency
Location
Scheduling
4 Tour-level Decisions
Tour mode
Stop frequency
Stop location
5 Trip-level Decisions
Departure time
Trip mode

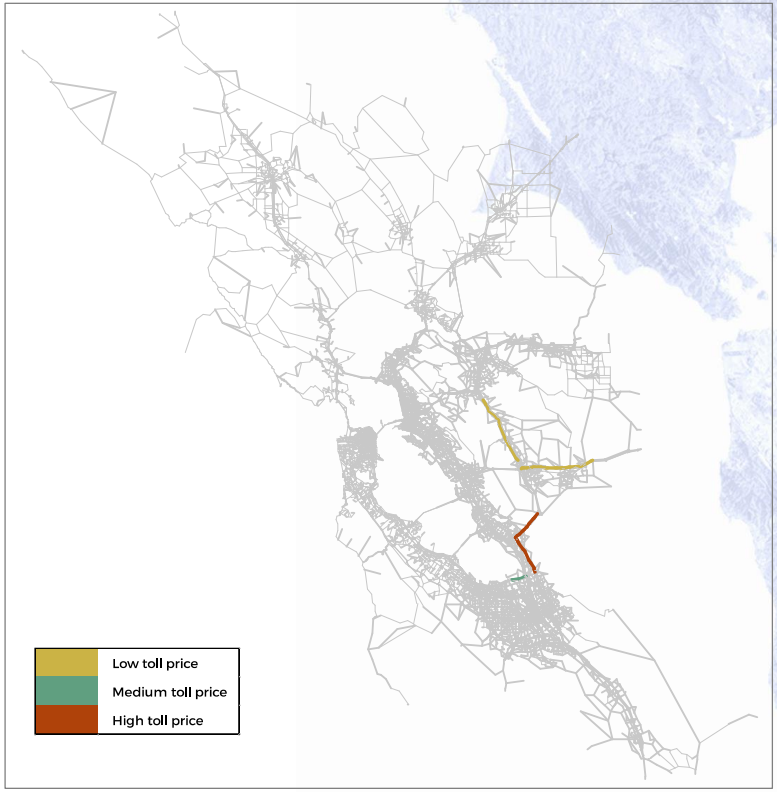


Figure 5: Morning Commute Express Lane Prices for Scenario 0 - No Project and Scenario 2 – Connected Neighborhoods

Scenario Output

- Back to the scenarios introduced earlier
- Travel Model used to assess alternate futures
  - Different land use patterns means a different set of origins and destinations for trips
  - Vary transportation investments and policies
- Assess which one (or combinations) best achieve regional goals

TRANSPORTATION STRATEGIES

Plan BayArea 2040

by Mode and Purpose		Main Streets	Connected Neighborhoods	Big Cities
Streets & Highways	State of Good Repair	●●●	●●	●
	Efficiency	●●●	●●●	●●
	Expansion / Extension	●●●	●●	●
Public Transit	State of Good Repair	●●●	●●	●
	Efficiency / Operations	●●	●●●	●●●
	Expansion / Extension	●	●●	●●●
	Bicycle / Pedestrian	●●	●●	●●
	Climate Strategies	●●●	●●●	●●●

Figure 2: Change in Roadway Lane Miles from 2010

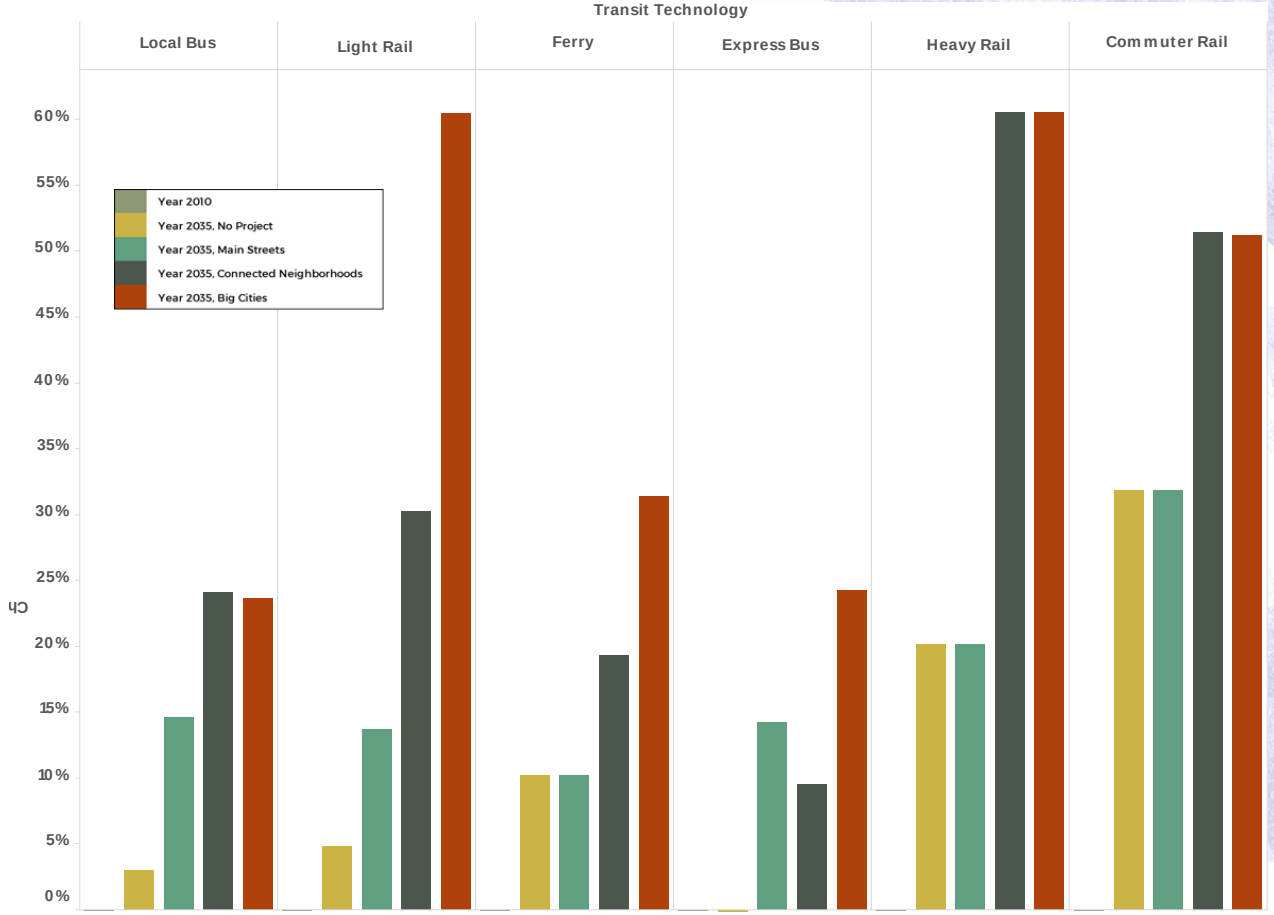


Figure 3: Change in Transit Passenger Seat Miles from Year 2010

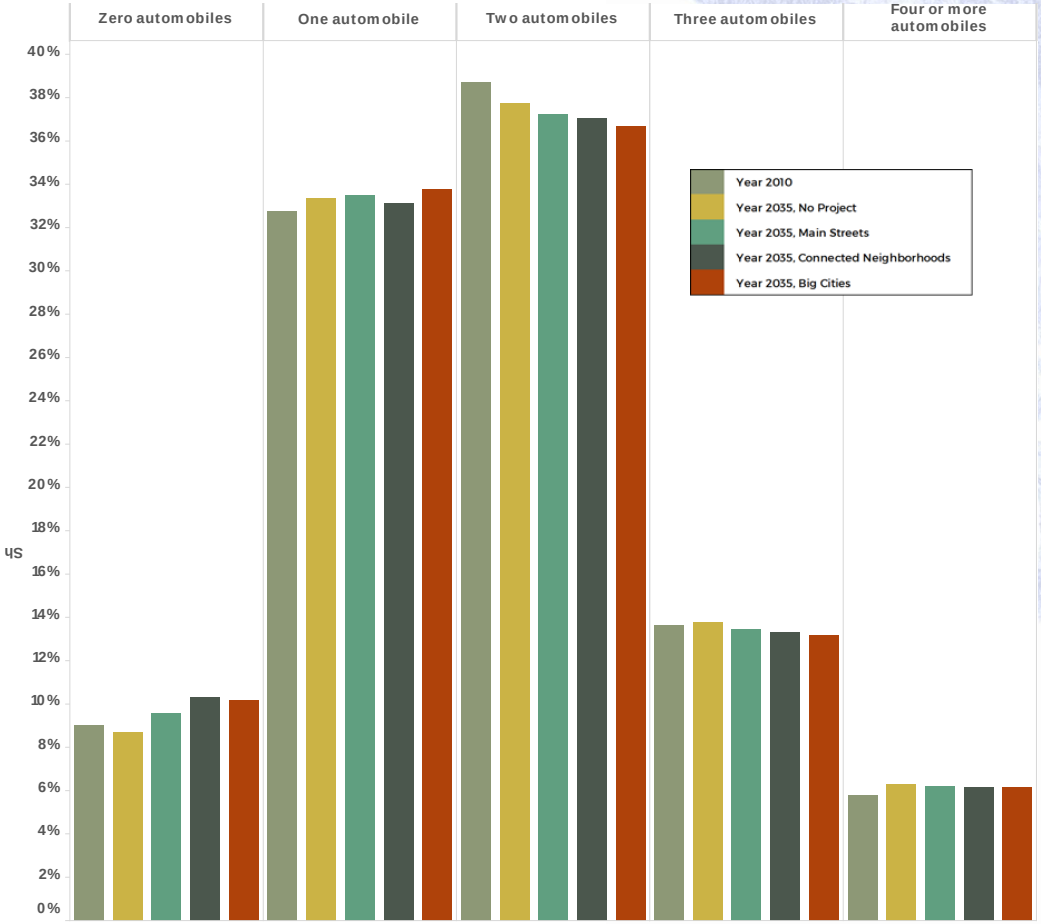


Figure 9: Year 2035 Automobile Ownership Results

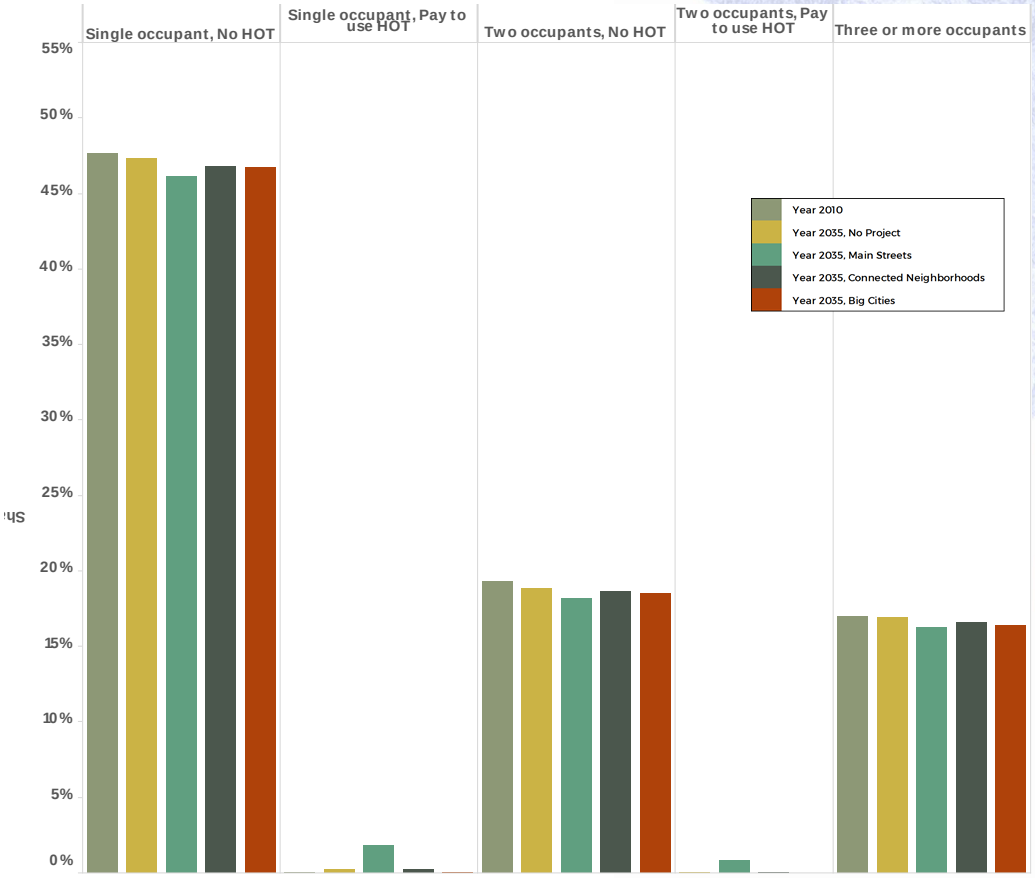


Figure 12: Year 2035 Automobile Mode Shares for All Travel

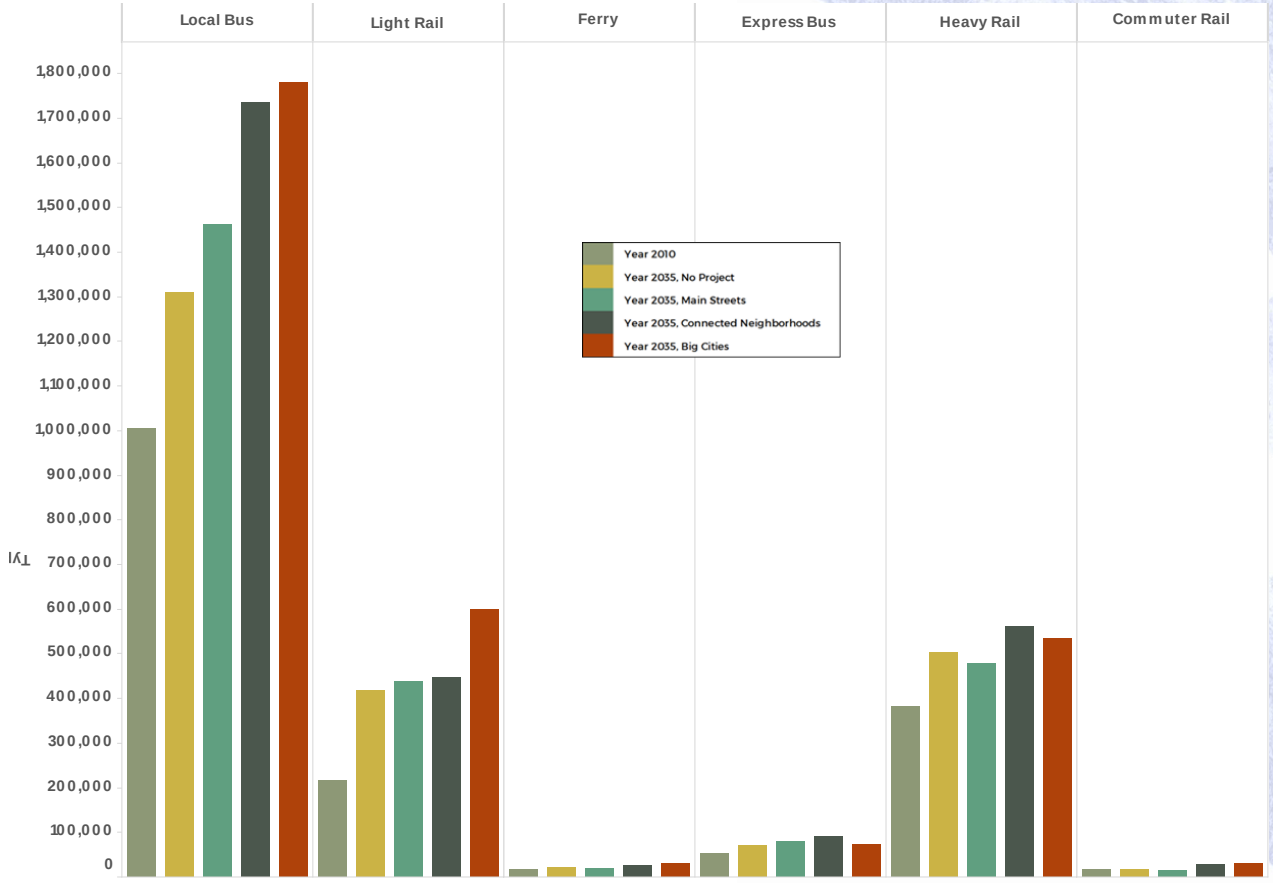


Figure 14: Year 2035 Typical Weekday Transit Boardings by Technology

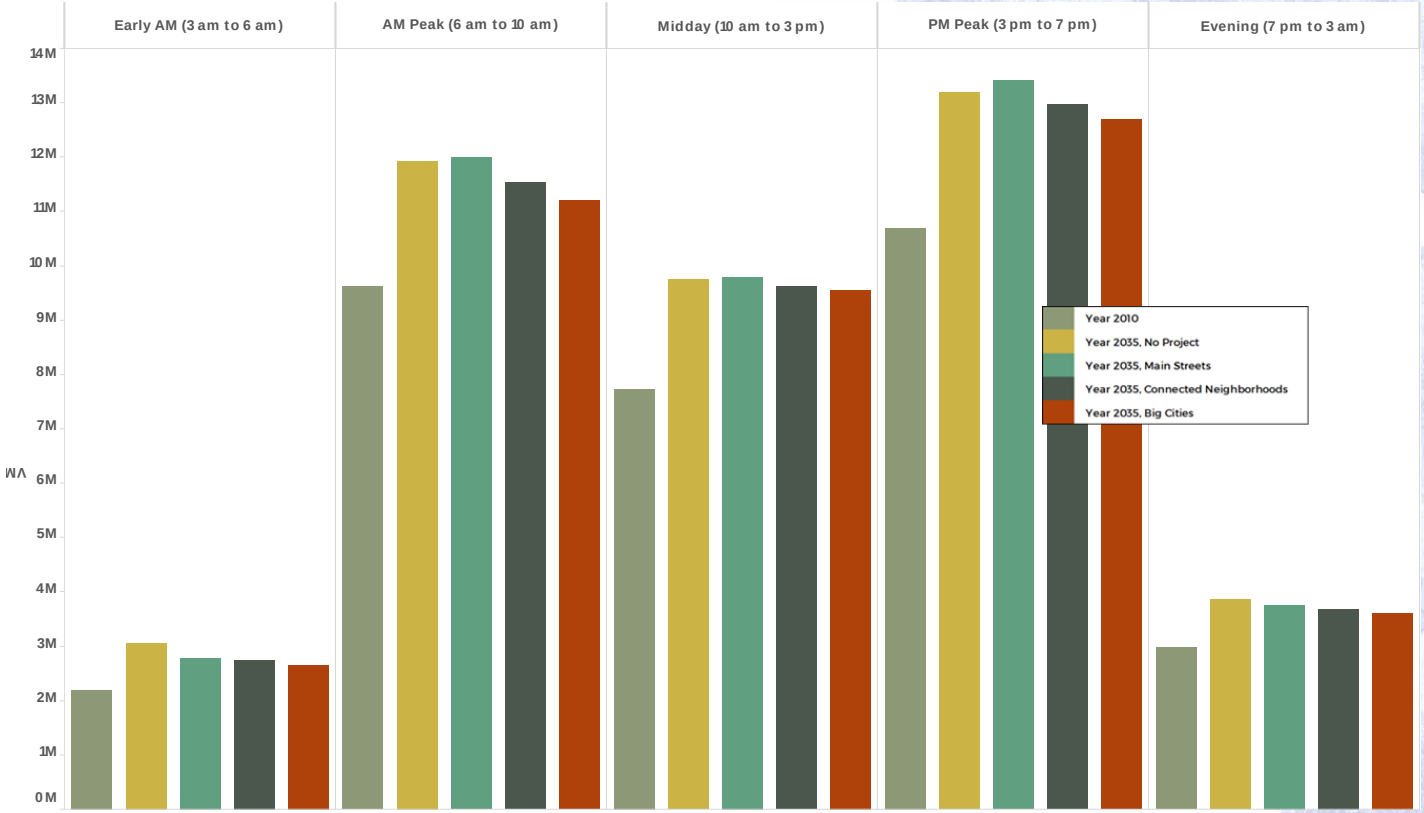


Figure 15: Year 2035 Vehicle Miles Traveled per Hour by Time Period

Table 6: Year 2035 On-Road Mobile Source Emission Estimates for the MTC Air Basin

Scenario	Tons per typical weekday for all vehicles (unless otherwise noted)							
	Carbon Dioxide (CO_2)†	CO_2† Pounds per Capita	Carbon Dioxide (CO_2)‡	Small Particulate Matter ($PM_{2.5}$)	Particulate Matter (PM_{10})*	Winter Nitrous Oxides (NO_x)	Reactive Organic Gases	Carbon Monoxide (CO)
Year 2005	64,640	18.5	64,640	8.54	14.09	221.4	112.0	995.8
Year 2035, No Project	84,780	18.8	65,060	4.60	11.12	24.54	20.91	132.3
Year 2035, Main Streets	83,490	18.5	64,330	4.58	11.09	24.41	20.79	130.4
Year 2035, Connected Neighborhoods	81,100	17.9	62,490	4.47	10.81	23.80	20.26	127.4
Year 2035, Big Cities	79,810	17.7	61,330	4.40	10.64	23.32	20.00	125.4

† – Passenger vehicle emissions for the nine-county Bay Area, excluding – per SB 375 – expected reductions from fuel and vehicle regulations. Excludes expected reductions from MTC's Climate Initiatives program.
‡ – Passenger vehicle emissions for the nine-county Bay Area, including reductions expected from existing vehicle and fuel regulations. Excludes expected reductions from MTC's Climate Initiatives program.
* – Does not include road dust.

TARGETS - SUMMARY

Plan BayArea 2040

Goal		TARGET		No Project	Scenario 1	Scenario 2	Scenario 3
Climate Projection	1	Reduce per-capita CO_2 emissions*	-15%	-3%	-15%	-18%	-20%
Adequate Housing	2	House the region's population	100%	100%	100%	100%	100%
Healthy and Safe Communities	3	Reduce adverse health impacts	-10%	-0%	-0%	-1%	-1%
Open Space and Agricultural Preservation	4	Direct development within urban footprint	100%	71%	77%	100%	100%
Equitable Access	5	Decrease H+T share for lower-income households	-10%	+15%	+13%	+13%	+13%

Questions?

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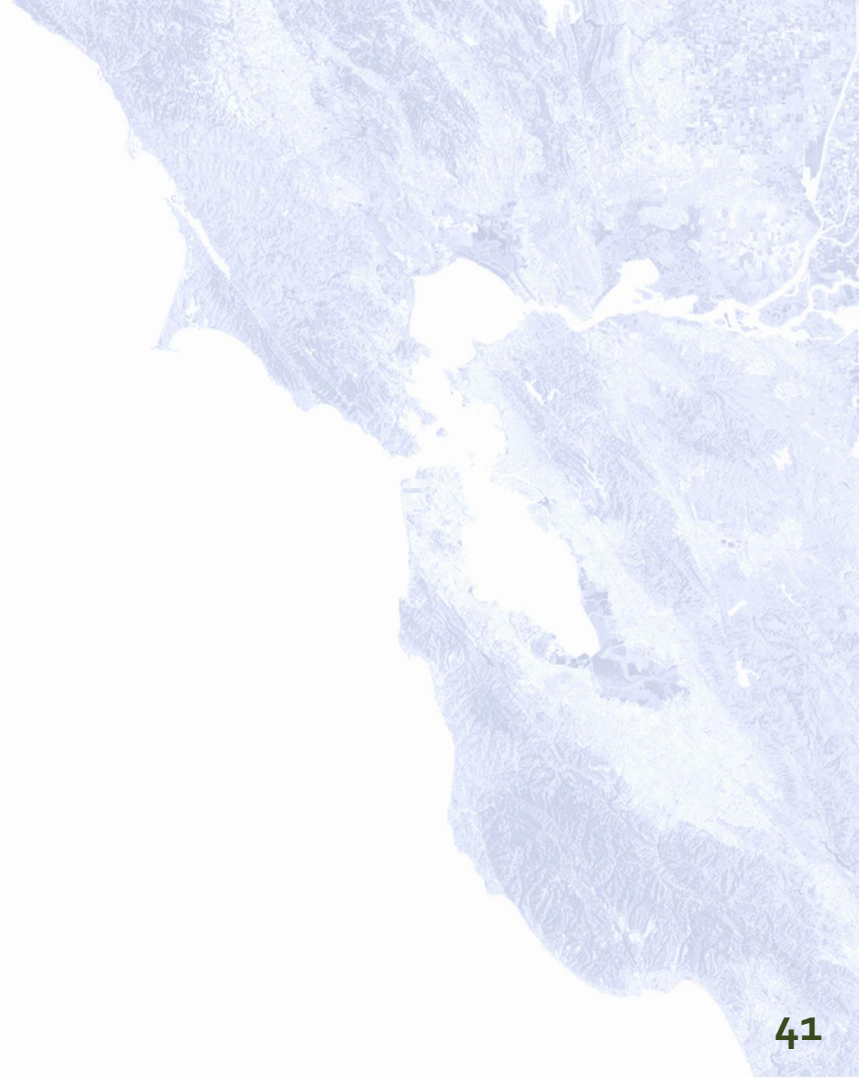
mreilly@mtc.ca.gov



Land use strategies influence the location of future housing and jobs.

Plan BayArea 2040

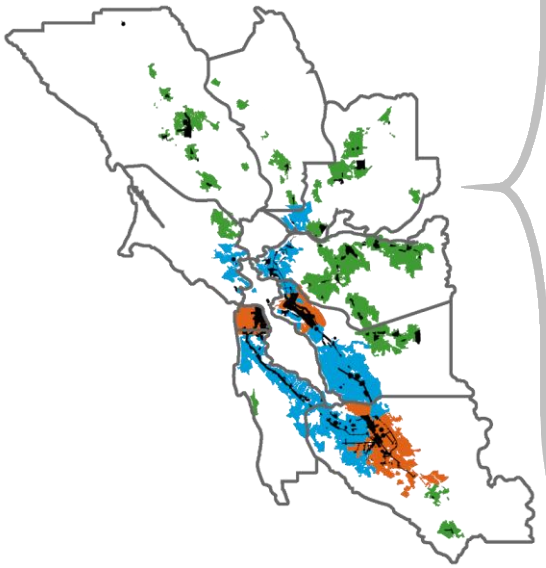
*The **Final Preferred Scenario** has the following key strategies for land use:*

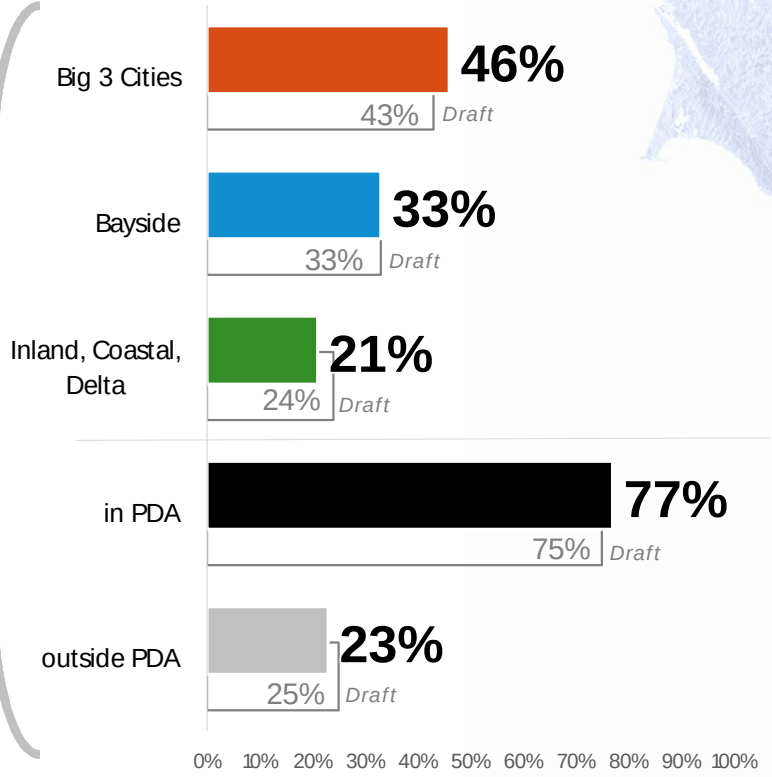
- Assign **higher densities** than currently allowed by cities to select PDAs.
- Keep **current urban growth boundaries** in place.
- Preserve and incorporate **office space caps** in job-rich cities.
- Assume for-profit housing developments make **10 percent of units deed-restricted** in perpetuity.
- Reduce the cost of building in PDAs and TPAs through **eased parking minimums** and **streamlined environmental clearance**.
- Assume **subsidies** stimulate housing and commercial development within PDAs.
- Assess **commercial development fee** based on VMT to improve jobs-housing ratio and to fund affordable housing in PDAs.

Compared to the Draft Preferred Scenario, the Final Preferred Scenario boosts housing growth in the "Big 3" cities.

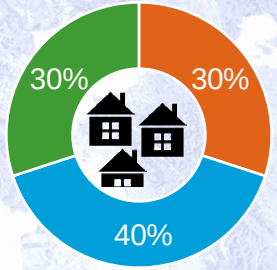
Plan BayArea 2040

Where will the region plan for the **820,000** new households?

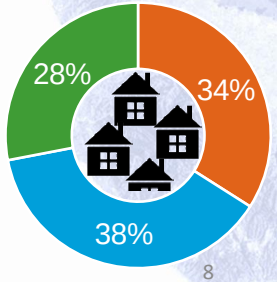




2010: **2.6 million** households



2040: **3.4 million** households



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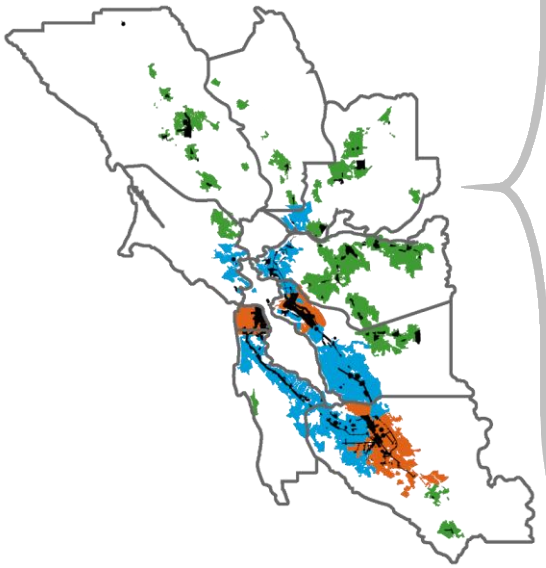
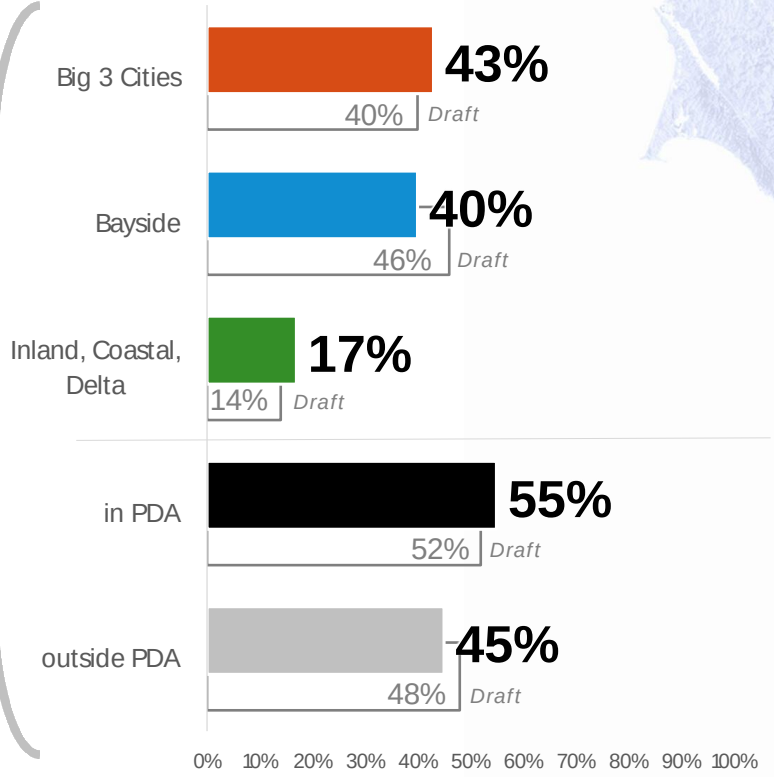
Metropolitan Transportation Commission

New strategies included in the Final Preferred Scenario shifted some job growth away from Bayside communities.

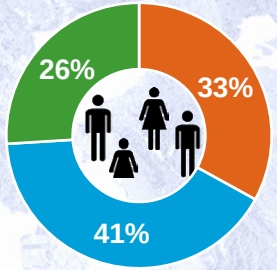
Plan BayArea 2040

Where will the region plan for the **1.3 million** new jobs?

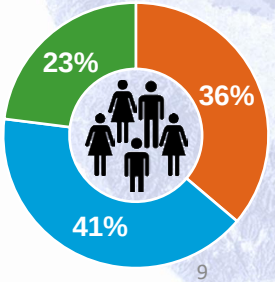




2010: **3.4 million** jobs



2040: **4.7 million** jobs



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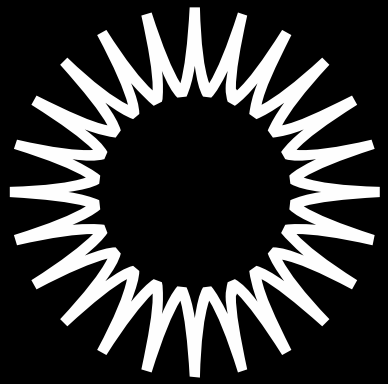
Metropolitan Transportation Commission



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