Plan Bay Area: Technical Summary of Preferred Scenario Equity Analysis Methodology

Technical Report

May 4, 2012

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1 BACKGROUND AND PURPOSE

This memorandum summarizes the methodology used by MTC and ABAG staff to create the equity analysis measures analyzed for the draft Preferred Scenario. The purpose of the equity analysis is to analyze the distribution of benefits and burdens of the draft Preferred Scenario between communities of concern and the remainder of the region using a set of five performance measures detailed in this document.

The methodology stems from more than a year's worth of work by MTC and ABAG staff, including extensive input from the Equity Working Group and other interested stakeholders, on both the identification of target populations (both low-income households and communities of concern) as well as equity performance measures to be analyzed for the Preferred Scenario and a base year for comparison. Staff is extremely grateful for the time and efforts put forth by Equity Working Group members to improve the equity analysis.

Staff will provide additional details on the results of the measures described here in a separate and forthcoming document.

2 TARGET POPULATIONS

Conducting an equity analysis requires dividing the regional population into different groups on some demographic or socioeconomic basis, so that comparisons between different groups can be made across the same set of measures (performance measures analyzed are described below under the heading **Performance Measures**).

2.1   Income-Based Analysis: Low-Income Households
Many of the measures analyzed using the regional travel model are able to produce results for all low-income households, or persons living in low-income households, throughout the region, regardless of their residential location. Low-income households are defined in MTC's travel model as having incomes of less than $30,000 a year 2000 dollars (approximately $38,000 in 2010 dollars); non-low-income households as a basis for comparison are defined as having incomes of $30,000 or more per year in 2000 dollars.

2.2   Geographic-Based Analysis: Communities of Concern
In discussing how to define target populations for equity analysis, Equity Working Group members emphasized the importance of spatial location within the region with respect to the

impacts of future development and transportation investments. Thus, staff worked with Working Group members to develop a spatial definition of communities of concern, against which performance measure results could be compared with non-communities of concern (typically referred to in the analysis as the "remainder of region"). Except where noted, data used to define communities of concern is from the 2005-09 American Community Survey, the most recent data set available for this analysis that is readily compatible with MTC's existing travel-analysis-zone definitions used for spatial analysis, which are based on 2000 Census geography.

In response to feedback that the analysis would be more informative with a more focused definition of communities of concern, and a recommendation to consider senior and disabled populations in addition to low-income and minority, staff proposed a revised definition which identifies communities with multiple overlapping potential disadvantage factors relevant to the Plan Bay Area planning process.

Thresholds were proposed to incorporate the most significant concentrations of the various target populations while minimizing inclusion of non-target population members. Concentration thresholds generally fall between the regional average and one standard deviation above the mean. The list of factors, reviewed by the Equity Working Group and approved by MTC's Planning Committee in October 2011, are summarized in Table 1.

Table 1. Target Populations and Thresholds Used in Overlapping-Factor Analysis.

Disadvantage Factor	% of Regional Population	Concentration Threshold
1. Minority Population	54%	70%
2. Low Income (<200% of Poverty) Population	23%	30%
3. Limited English Proficiency Population	9%	20%
4. Zero-Vehicle Households	9%	10%
5. Seniors 75 and Over	6%	10%
6. Population with a Disability	18%	25%
7. Single-Parent Families	14%	20%
8. Cost-burdened Renters	10%	15%

Source: 2005-09 American Community Survey and 2000 Census (#6)

Communities of concern are defined as **those tracts having concentrations <u>4 or more factors</u> listed above, or that have concentrations of <u>both</u> low-income <u>and</u> minority populations.**

A total of 305 out of 1,405 tracts were identified as communities of concern. These locations, shown in Figure 1, were then corresponded to 323 out of the region's 1,454 travel analysis zones for the purpose of extracting and tabulating travel model output on a geographic basis in order to summarize results for communities of concern. Most TAZs in the region correspond to census tract boundaries, except for some locations in the region's densest areas where more than one TAZ may "nest" within a singe census tract.
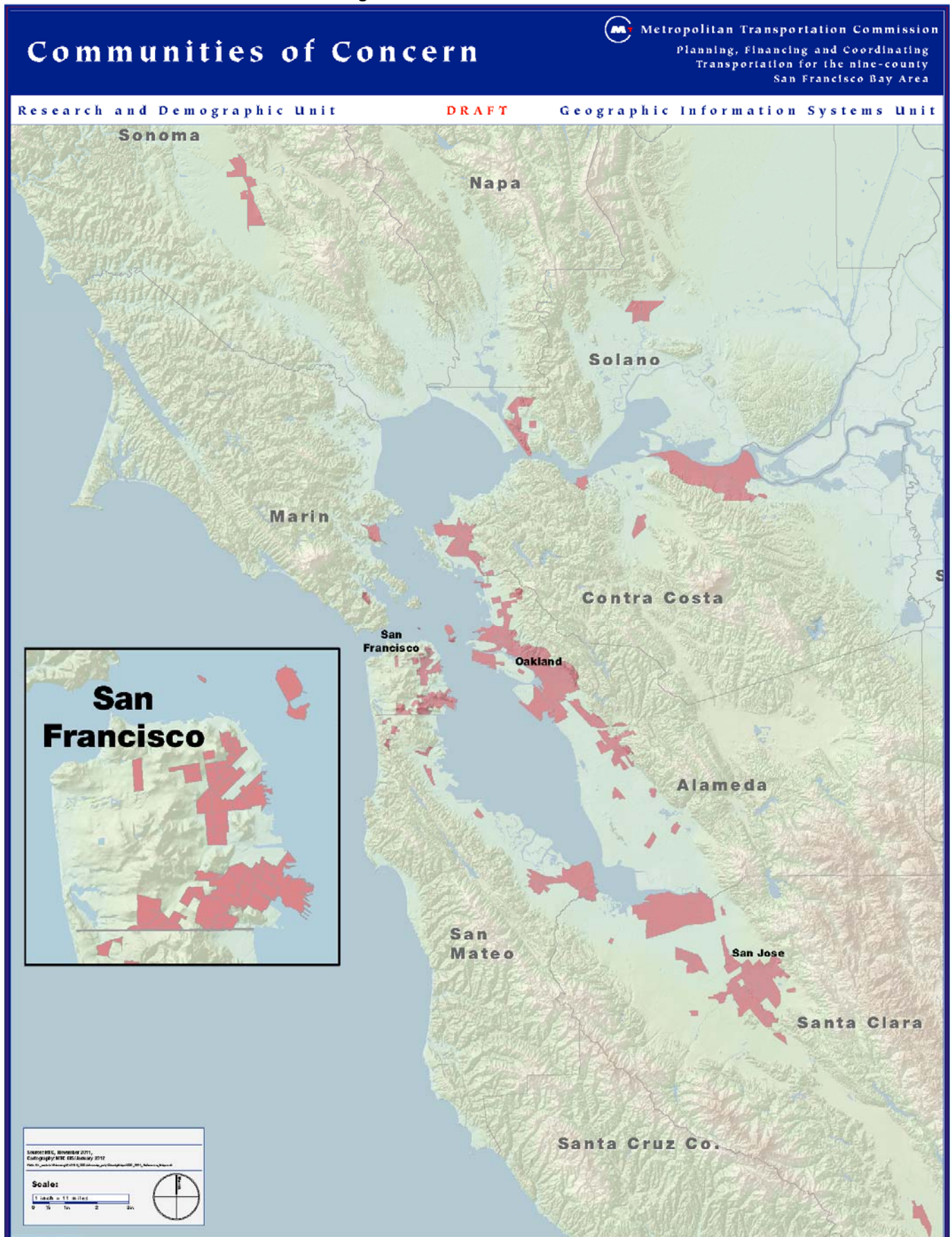
Figure 1. Communities of Concern

Table 2 shows the total populations captured within areas of communities of concern and the remainder of the region in 2005 and 2035. Nearly 1.5 million residents currently reside in communities of concern, 21% of the region's total population. Population growth in communities of concern is forecast to outpace growth in the remainder of the region between 2005 and 2035.

Table 2. Population in Communities of Concern and Remainder of Region, 2005 and 2035.

	2005		2035		% Change 2005-2035
	#	% of Total	#	% of Total	
Communities of Concern	1,499,706	21%	1,958,569	22%	31%
Remainder of Region	5,596,763	79%	6,836,346	78%	22%
Total	7,096,469	100%	8,794,915	100%	24%

Source: ABAG forecasts

An interactive map showing locations of communities of concern with detailed data as of the 2005-09 American Community Survey timeframe can be found at http://geocommons.com/maps/118675.

An interactive map showing the varying degrees of overlap among the 8 different population concentrations can be found at: http://geocommons.com/maps/121158.

Descriptions of the potential disadvantage factors contributing to the community-of-concern definition are provided below. Generally speaking, to define "concentrations" of various populations, thresholds are established at a value between the regional average (mean) share of a tract's total population belonging to a given group, and one standard deviation above the mean, and reflect differences between how different populations are distributed spatially throughout the region. Some populations, such as zero-vehicle households, are highly concentrated in a relatively small number of tracts; other populations, such as seniors over 75+, are much more evenly spread out throughout the region.

Minority Community

A **minority community** is defined as having 70% or more residents who are members of any of the following groups defined by the Census Bureau: Black or African-American, Asian, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, some other race, two or more races, or Hispanic/Latino of any race.

Low-Income Community

A **low income community** is defined as having 30% or more residents who are identified by the Census Bureau as being below 200% of the federal poverty level. MTC established the 200% of poverty threshold in 2001 to account for the Bay Area's high cost of living; the Census Bureau does not adjust the poverty level for different parts of the continental U.S. with different costs of living to factor into the varying affordability of basic necessities.

The Census Bureau establishes poverty status based on a combination of both household size and income. As of 2010, the 200% threshold represents a household income of roughly $22,000 a year for a single person living alone, and $44,000 a year for a family of four.[1] The definition of a **low-income community** based on the Census Bureau's characterization of populations in relation to poverty thresholds is distinct from the definition of a **low-income household** described under "income-based analysis" above.

Limited English Proficiency Community

A **Limited English Proficiency community** is defined as a community where 20% or more of residents speak English "not well" or "not at all" according to the Census Bureau.

Zero-Vehicle Households

A concentration of **zero-vehicle households** is defined as a community where 10% or more of households do not have access to at least one vehicle according to the Census Bureau.

Seniors 75+

A concentration of **seniors** is defined as a community where 10% or more of residents are age 75 and over according to the Census Bureau. Although area-specific data on driving habits, mobility, and travel independence by specific ages is not available, age 75 was chosen to approximate a point at which seniors' mobility and independence may soon begin or have already begun to diminish relative to that of younger adults.

Persons with Disabilities

A concentration of **persons with disabilities** is defined as a community where 25% or more of persons over the age of 5 has one or more disabilities according to the Census Bureau. Because the Census Bureau redefined how questions regarding disability are asked in 2008, data for this definition is from the 2000 Census, the most recent year that disability data is available at the tract level.

Single-Parent Families

A concentration of **single-parent-family households** is defined as a community where 20% or more of family households are headed by a single parent with children present. Inclusion of this group is intended to capture households with unique economic vulnerability, as well as distinct travel needs and patterns from other household types.

Overburdened Renters

A concentration of **overburdened renters** is defined as a community where 15% or more of occupied housing units (including both renters and owners) are occupied by renters paying more

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[1] For a complete listing of poverty guidelines used by the Census Bureau, see
http://www.census.gov/hhes/www/poverty/data/threshld/index.html.

than 50% of their income in rent. This definition is also incorporated into the Displacement Risk equity measure described in the following section on performance measures.

3 PERFORMANCE MEASURES

This section describes the methodology used to produce results for each of the performance measures across the different scenarios.

3.1 Housing and Transportation (H+T) Affordability

Housing and Transportation Affordability is expressed as the share of average household income spent on housing and transportation costs. Results for this measure are produced/approximated for low-income households (less than $30,000 per year in 2000 dollars) vs. non-low-income households (incomes greater than $30,000 per year in 2000 dollars).

The Affordability metric is expressed as a percentage in terms of

$$\frac{\text{Avg. Housing Cost} + \text{Avg. Transportation Cost}}{\text{Avg. Household Income}}$$

Generating these estimates relies on a combination of observed, estimated, and forecast values for each of four income levels are shown in Table 3:

Table 3. Sources for H+T Estimates/Forecasts.

Variable	Base Year Data Source	Forecast Year Data Source
Avg. Housing Cost by Income Level	American Community Survey 2005-09	ABAG Forecasts
Avg. Transportation Cost by Income Level	MTC Travel Model	MTC Travel Model
Avg. Household Income by Income Level	American Community Survey 2005-09	ABAG Forecasts

Base Year Housing and Income Data

Base Year housing and income data are developed based on the Census Bureau's 2005-09 American Community Survey data on share of income spent on housing. The data for monthly housing costs as a percentage of household income are developed from a distribution of "Selected Monthly Owner Costs as a Percentage of Household Income" for owner-occupied and "Gross Rent as a Percentage of Household Income" for renter-occupied units, which includes any utilities included in rent. The owner-occupied categories are further separated into those with a mortgage and those without a mortgage.

"Household income" reported by the Census Bureau includes both earned income as well as cash benefits received, both public and private, by all household members, but **does not include** certain other kinds of income, transfers, and non-cash public benefits, including most notably for the purposes of this analysis, in-kind public housing subsidies. All forms of income included and excluded from Census Bureau data are summarized in Table 4.

Table 4. Items Included in and Excluded from Household Incomes Reported by the Census Bureau.

Included as income	Not included as income
• wage or salary income; • net self-employment income; • interest, dividends, or net rental or royalty income or income from estates and trusts; • Social Security or railroad retirement income; • Supplemental Security Income (SSI); • public assistance or welfare payments; • retirement, survivor, or disability pensions; and all other income.	• capital gains, money received from the sale of property; • the value of income "in kind" from food stamps, public housing subsidies, medical care, employer contributions for individuals, etc.; • withdrawal of bank deposits; money borrowed; • tax refunds; exchange of money between relatives living in the same household; • gifts and lump-sum inheritances, insurance payments, and other types of lump-sum receipts.

Fore more information on housing cost and income data in the American Community Survey, see http://www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2009_ACS SubjectDefinitions.pdf.

Adjustment for Subsidized Housing

In order to reflect housing affordability in terms of existing housing subsidies not reported to the Census Bureau as either income or housing costs in the analysis, the share of income spent on housing was adjusted to account for the provision of subsidized housing.

According to regional data obtained by ABAG staff, there were 118,229 HUD-funded subsidized units in the region, and an additional 19,491 Section 8 units, for a total of 137,720 subsidized units. Housing costs for these units were assigned to low income households with costs assumed to be fixed at 30% of household income. The regional average income spent on housing for low-income households of 50% reported by the ACS data was then applied to the remaining households assumed to be unsubsidized, and an adjusted total calculated by weighting by number of households. For the forecast year, the same approach was applied assuming the same share of low-income housing would remain subsidized at 19% of housing units, as shown in Table 5. This adjustment resulted in a drop of roughly 4 percentage points in the effective share of income spent on housing by low-income households, from 50% to 46% in the base year, and from 49% to 45% in the forecast year.

Table 5. Low-Income Subsidized Housing Adjustment for Base and Forecast Years

	Base Year		Draft Preferred Scenario	
	# Households	% of Income Spent on Housing	# Households	% of Income Spent on Housing
Subsidized (19%)	137,720	30%	179,299	30%
Unsubsidized (81%)	581,040	50%	756,461	49%
Low Income Total (100%)	718,760	46%	935,760	45%

Source: MTC/ABAG estimates

Projected Incomes

The analysis translated industry sector-level employment forecasts by county into estimated growth in households in four income groups: very low (less than 50% of median county household incomes), low income (50-80%), moderate income (80% to 120%), and above moderate income (greater than 120%). The model linked ABAG's sector-level employment forecasts with occupations and median wages for those occupations. From median wages, household incomes were derived (Table 6).

Table 6. Employment Growth by Income Category, 2040

Employment	Very Low Income	Low Income	Moderate Income	Above Moderate Income	Total
Profess. Bus. Svc	24%	34%	14%	29%	365,673
Health, Education	16%	27%	22%	35%	244,482
Arts, Rec., Other	87%	5%	3%	4%	185,686
Construction	4%	55%	27%	14%	80,694
Government	6%	11%	25%	59%	72,595
Retail	78%	6%	11%	6%	52,396
Finance and Leasing	0%	37%	4%	60%	48,596
Information	-4%	5%	57%	42%	36,497
Transport., Utilities	48%	40%	4%	7%	28,898
Manufact., Whole	113%	-112%	-40%	139%	5,700
Agriculture	106%	-32%	32%	-5%	-1,300
Total	**32%**	**25%**	**16%**	**28%**	**1,119,918**

Source: ABAG forecasts

This resulted in a slight increase in the share of very low and low income groups while those in the moderate and above moderate categories decreased between 2010 and 2040 (Table 7).

Table 7. Total Households by Income Group, 2010 and 2040

	Very Low	Low	Moderate	Above Moderate	Total
2010	25%	15%	18%	42%	100%
2040	26%	17%	17%	39%	100%

Source: ABAG forecasts

Future Housing Costs

Several factors including projected employment growth were then used to estimate future housing costs. To do this, a regression model was developed from available historic data (1989-2009) which identified those factors most responsible for observed price change. These factors, which together produced a combined R-squared of 0.72, include:

- change in the type of jobs by occupation
- local area employment growth
- transit accessibility (within ½ mile of fixed rail transit)
- population with college degrees or higher
- underutilized land (with a building to land ratio of less than 1)

Projected Housing Costs by Area

Projected change in the factors above was then used to estimate the cost of housing in the future. The results of this analysis suggest that the general trend of increasing housing cost in relation to income observed historically are likely to continue in the future, (expensive areas remain expensive and affordable areas remain affordable), if the same factors continue to drive price appreciation.

Projected Housing Cost by Building Type and Impacts on Future Housing Costs

The cost of housing by building type was also analyzed as follows:
- Cost of construction information was reviewed from the most recent RS Means Cost manual for the Bay Area by product type. Housing experts were also consulted (including BAE, San Francisco Planning). Three general product types were selected for the analysis, single family/townhouse, low-mid-rise multifamily, and mid-high-rise multi-family. Costs were reviewed on both a per square foot dwelling units per acre basis. On a per square foot basis costs escalate with building density, but at the regional level as more units can be fit on the same parcel of land, cost per dwelling unit on an acre basis were lowest for low-mid-rise multifamily (see Figure 2).
- Using the results of this analysis, areas for housing were grouped in three categories: high-cost PDAs, other PDAs (low cost), and non-PDA areas (same cost).
- Building types were then linked to areas with high-mid-rise buildings assumed for high-cost PDAs, low-mid-rise multifamily assumed for other (low cost) PDAs, and single-family assumed for areas not in PDAs.

Figure 2. Building Type Construction Costs per Acre
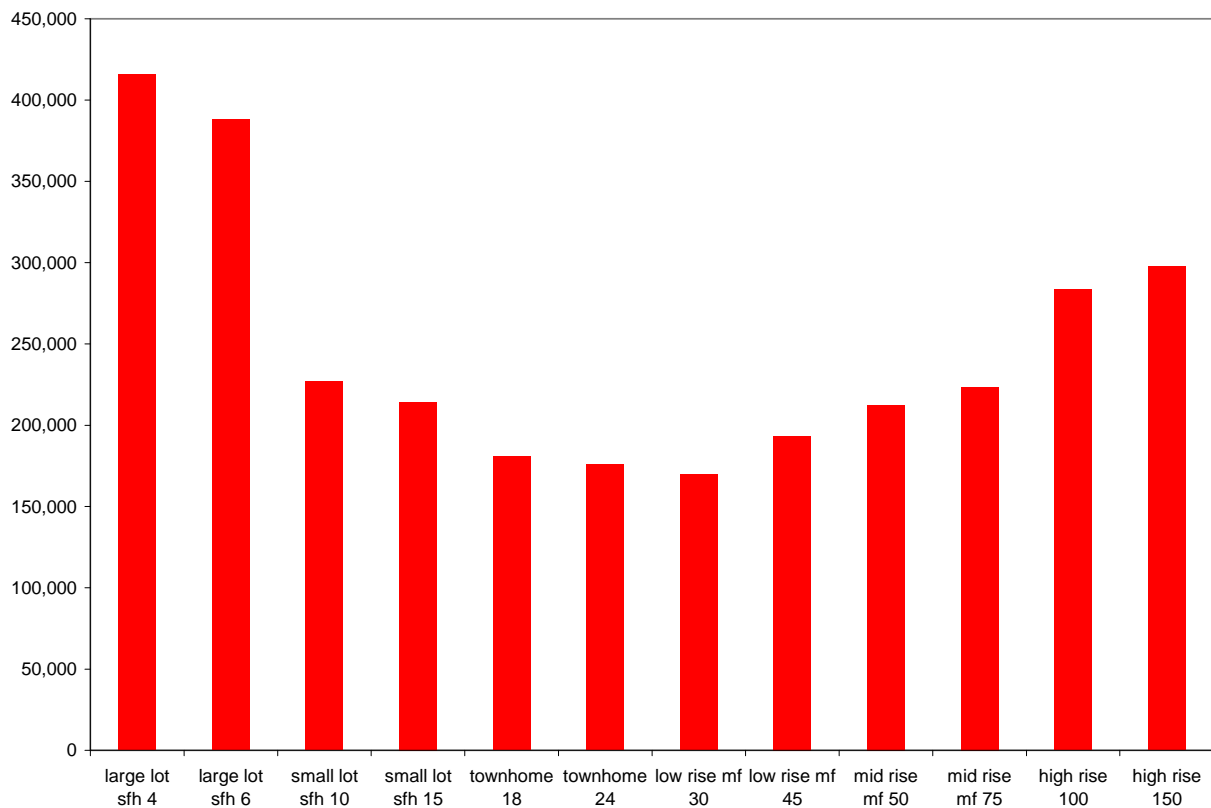
Source: RS Means 2012 Bay Area and ABAG estimates

To account for household moves that result in "filtering" of the housing stock from one income group to another, the supply and demand of housing by building type to 2040 was calculated. The analysis used the same factors cited by Arthur C. Nelson[2] including changing preferences and demographics (increase in the senior and non-white population and demand among generation Y for urban housing for example). It was assumed that filtering would occur in building types with the least demand. Table 8 shows the results of this analysis.

Table 8. Housing Supply and Demand by Building Type, 2040

Building Type	Supply 2010	Demand 2035	New Unit Demand 2010-2040
Multifamily	717,000	1,206,121	489,121
Attached / Townhouse	508,000	888,021	380,021
Detached / Single Family	1,535,000	1,365,858	(169,142)
Total	2,760,000	3,460,000	700,000

Source: ABAG estimates based on Arthur C. Nelson "The New California Dream," Urban Land Institute 2011.

Given demographic and other projected changes, an oversupply of single family detached homes was estimated at 169,000 by 2040. Ten percent each was assumed to filter to very low and low

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[2] Arthur C. Nelson. "The New California Dream: How Economic and Demographic Trends May Shape the Housing Market." Urban Land Institute. November 2011.

income categories, while 40% each was assumed to filter to moderate and above moderate categories.

The Jobs Housing Connection land use strategy assumes a modest decline in the household income shown (above) spent on housing as a result. While earlier land use scenarios assume a "business as usual" pattern, the proposed land use framework assumes the following:

- The PDA land use strategy shifts the production of housing from 55% multifamily to 73% multifamily in low to mid-rise buildings. This affects the overall cost of housing by 15% in the following ways:
    - Although price per square foot construction costs are higher for multi-family units overall, building construction cost data suggest that low to mid-rise buildings can be cheaper on a per acre basis as more units can be "fit" on the same piece of land.[3]
    - Because of this space efficiency, they consume less energy and require less maintenance further reducing housing cost. This holds true for larger family-sized units with several bedrooms that are on average smaller than their single-family equivalents.
    - Multifamily units constructed in lower land-cost suburban PDAs are less expensive than single-family homes in the same area.
- Changes to CEQA that make building in-fill housing cheaper could also reduce multi-family housing prices, including SB 375[4] and SB 266[5]. Coupled with permit streamlining linked to PDAs costs could be reduced by up to 5%.[6]
- This analysis assumes that a replacement for Redevelopment Agency funds will occur at the local level.

Transportation Costs

A household's estimated transportation costs include fixed costs related to owning automobiles (such as car payments and insurance), and variable costs (such as fuel, parking charges, and/or transit fares) related to how much and what kind of travel people choose to make day-to-day. Travel costs are forecast as out-of-pocket expenses incurred by travelers on a "typical day" for:

- Bridge tolls
- High Occupancy Toll (HOT) lane prices
- Transit fares
- Auto operating costs, which include assumptions about the price of fuel and fuel economy of vehicles based on modeled vehicle travel
- Parking costs

Out-of-pocket travel costs for a typical day of travel are annualized by multiplying these costs by 300. These annualized costs are then added to a household's annual auto ownership costs (derived from Bureau of Labor Statistics' Consumer Expenditure Survey data by household

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[3] R.S. Means; Housing Consultants polled including feedback from BAE
[4] http://opr.ca.gov/docs/SB375-Intro-Charts.pdf
[5] http://opr.ca.gov/s_sb226.php
[6] Permit costs

income level, as shown in Table 9), which vary by scenario as different land use and transportation inputs will result in differing levels of automobile ownership per household.

Table 9. Automobile Ownership Costs per Auto by Income Level (2000 dollars)

Household Income Category	Annual Automobile Ownership Costs
Less than $30,000	$2,392
$30,000 to $60,000	$2,999
$60,000 to $100,000	$3,347
More than $100,000	$4,376

Source: 2009 Bureau of Labor Statistics Consumer Expenditure Survey

3.2   Displacement Risk

Displacement risk ties the proposed new development in the Preferred Scenario to the probability that current residents may be adversely impacted by changes in the housing market. Very low, low, and even moderate income renters may experience displacement if new investment in a neighborhood leads to increased desirability, higher demand for housing and rising rents.

This metric captures the number of households currently considered "over-burdened renters" in relationship to the proposed growth. In a given census tract, if more than 15% of the housing units are occupied by renters who pay more than 50% of their income for housing (as characterized in the community of concern definition described in Section 2.2 above), *and* the projected household growth in the travel analysis zone (TAZ) corresponding to that tract is more than 30% above current conditions, the over-burdened households in that area are considered *at risk* for displacement (see Figure 3).

Thresholds for over-burdened renters are set based on the regional mean and standard deviation from the regional average, identical to the threshold used to define Communities of Concern as described in the preceding section. The 30% threshold for growth highlights those areas whose percent growth exceeds the regional average for the Preferred Scenario. A higher-than-average percentage of growth is assumed to reflect future market interest in the area, which may yield upward pressure on housing costs. The number of households at risk for displacement includes over-burdened renters in all income categories, since in many cases moderate-income or even upper income households may move in response to rising rents (see Figure 4).

The measure does not predict affordability levels of future housing, nor take into account policies to preserve existing levels of affordability. Bay Area jurisdictions with strong rent protections have still seen large migration shifts in low-income populations.[7] It is also important to emphasize that while the measure focuses on potential displacement tied to significant increases in development, rising housing costs may also increase displacement pressure where growth has been constrained.

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[7] Association of Bay Area Governments. Development without Displacement. December 2009.
http://www.bayareavision.org/initiatives/dwd-final.pdf

Figure 3. Overburdened Renters and Locations with Above-Average Household Growth, 2005 and 2035.
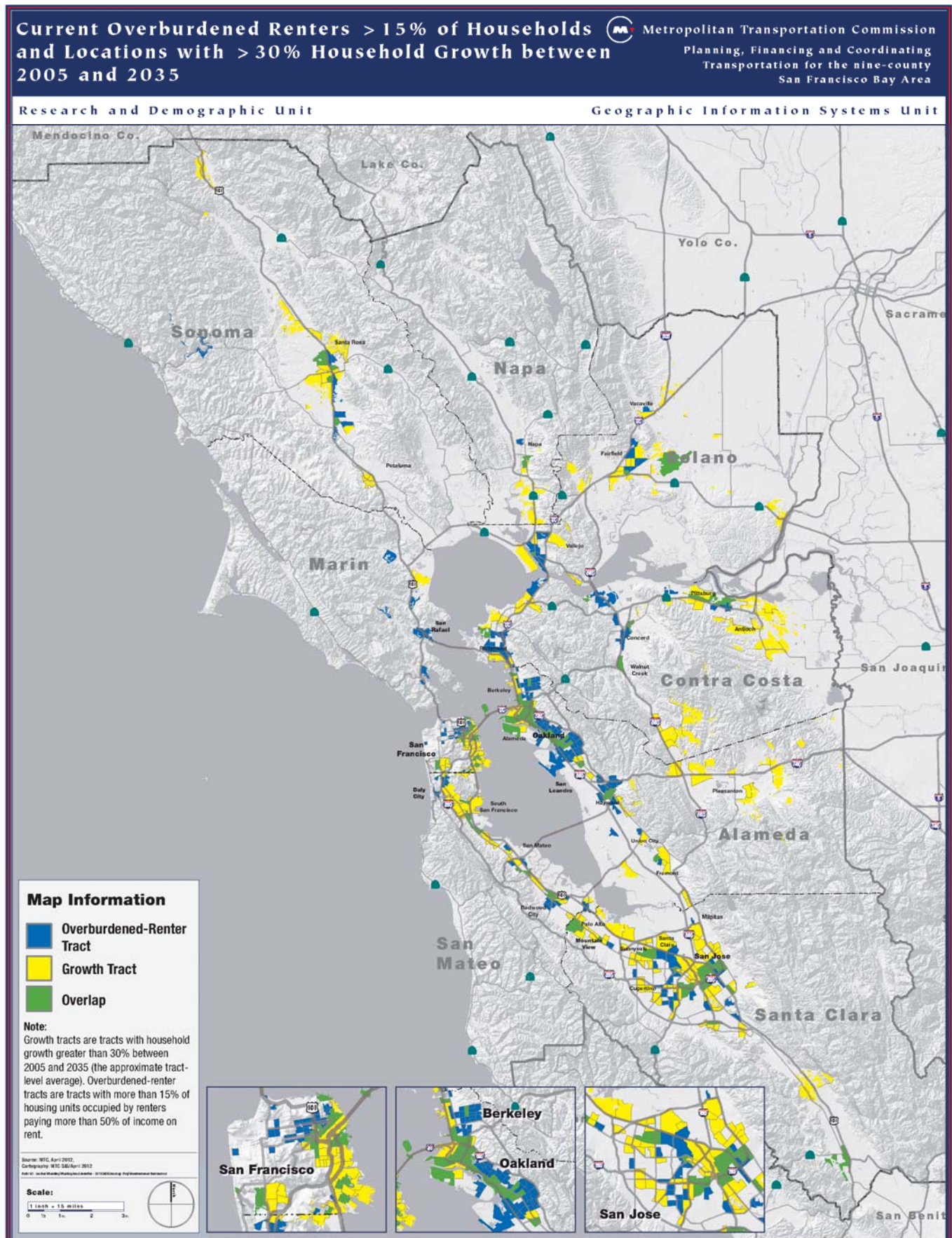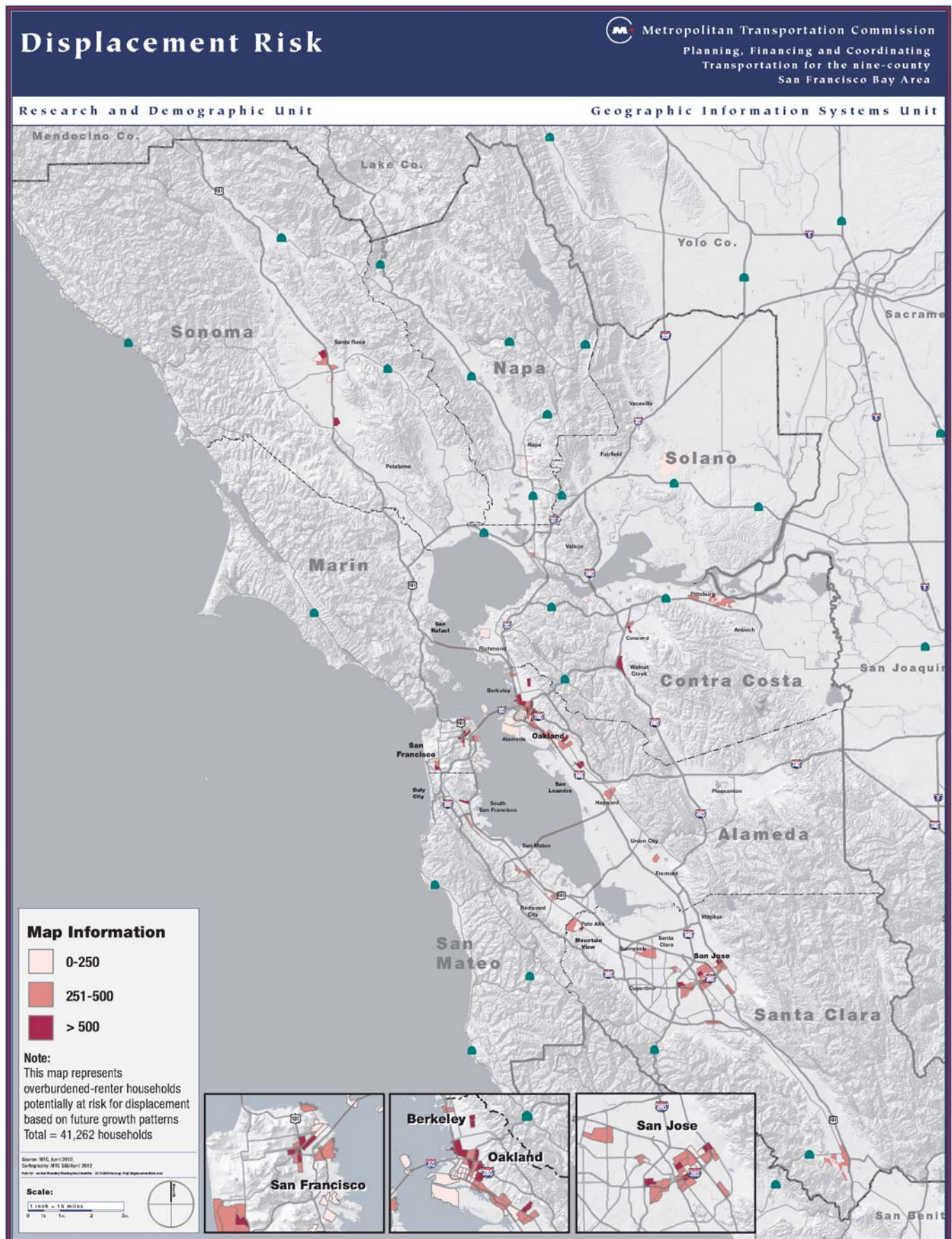
Figure 4. Households at Risk for Displacement by Location

3.3   VMT Density

The unit of measurement for this analysis is total VMT per day per sq. km of developed area

Where:

   VMT includes vehicular traffic on roadway facilities carrying 10,000 or more vehicles per day

   Per day means a "typical" weekday

   Developed area includes residential, commercial, or industrial land within 1,000 feet of the centerline of roadway facilities carrying 10,000 or more vehicles per day

Calculating this measure relies on identifying affected roadway links as those carrying 10,000 or more vehicles per day, and identifying areas of developed land proximate to these roadway links, to include areas of residential, commercial, or industrial land within 1,000 feet of the centerline of the selected roadway links. This calculation methodology is consistent with the Bay Area Air Quality Management District's (BAAQMD) "Recommended Methods for Screening and Modeling Local Risks and Hazards" (May 2011, version 2.0) as part of their California Environmental Quality Act (CEQA) review guidance for proposed land use projects.

The vehicle-miles of travel (VMT) for each affected roadway link are forecasted using MTC's travel model across different scenarios. This estimate provides the VMT Density measure according to the following formula:

   VMT / Developed land area = VMT Density

Because different scenarios analyzed may capture slightly different subsets of roadway links meeting the threshold of carrying 10,000 or more vehicles per day, analysis across all scenarios (both the base year and the forecast year) will use the same land area captured, defined as the union of all buffers within 1,000 feet of the centerline of any roadway link that carries 10,000 or more vehicles per day in any scenario.

Finally, to account for variations in the distribution of population potentially affected by vehicle travel on heavily used roadways near developed areas, TAZ-level results were then weighted by population in both 2005 and 2035. This weighting accounts for the fact that population densities vary across different parts of the region being analyzed, and generally more people are exposed to negative impacts of VMT in denser areas.

3.4   Non-commute Travel Time

This measure provides average travel time per trip for non-mandatory tours by all modes. Non-commute trips are analyzed because:

   • Commute travel to work is analyzed separately as a measure of jobs-housing fit.

- Low-income travelers are more likely than higher-income travelers to be non-workers, students, or retirees, who have distinct trip-making patterns.[8]
- Non-commute trips outnumber commute trips for low-income travelers[9] (though commute trips are generally longer than non-commute trips in terms of time and distance). Non-commute trips are also more likely to occur at off-peak travel times.
- Non-commute trips capture a wider variety of travel purposes including shopping, accessing health care and social services, and social and recreational trips, and as such provide a better indication of whether residents live in "complete communities" where a wide variety of daily needs are located nearby.

Results of this measure in average number of minutes per trip are produced for
- Communities of concern and the remainder of the region (all residents of each)
- Low-income travelers vs. non-low-income travelers, regardless of community of residence.

"Non-commute" travel defined for the purposes of this analysis includes travel not associated with a tour involving work or school. For example, going to the grocery store and back home would be included in this definition. These "non-mandatory" tour purposes include such activities as shopping, recreational trips, visiting, escorting others, eating out, and "other" trips.

Factors that go into estimating travel time are similar for both non-mandatory tours as well as commute trips (which are described in the following section). Across all kinds of trips, decisions about how, where, and when to travel are complex; MTC's travel model attempts to represent some of this complex behavior by operating on a synthetic population that includes representative households and persons for each actual household and person in the nine-county Bay Area – both in the base year and in forecast years. Travelers move through a space that is segmented into "travel analysis zones."[10] A series of travel-related choices are simulated for each household and person within each household; these choices are simulated in the following sequence:
- Usual workplace and school location – Each worker, student, and working student in the synthetic population selects a travel analysis zone in which to work or attend school (or one zone to work and another to attend school);
- Household automobile ownership – Each household, given the household location and demographics as well as each members' work and/or school locations, decides how many vehicles to own;
- Daily activity pattern – Each household determines, together, the daily activity pattern of each household member, the choices being mandatory (go to work or school), non-mandatory (leave the house, but not for work or school), or stay at home.

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[8] Source: Bay Area Travel Survey 2000, as cited in MTC's Snapshot Analysis Development Report, June 2010. http://www.mtc.ca.gov/planning/snapshot/Snapshot%20Development%20Report-0609.pdf. Note "Low Income" is defined as travelers living in households with incomes below $35,000 per year.

[9] See April 6, 2011 staff memorandum to Equity Working Group "Additional Initial Vision Scenario Data Results," Figures 4 and 6. http://apps.mtc.ca.gov/meeting_packet_documents/agenda_1649/ April_13_Equity_Working_Group_packet.pdf

[10] An interactive map of MTC's travel analysis zones is available here: http://geocommons.com/maps/58264

- Work/school tour frequency and scheduling – Each worker, student, and working student decides how many round-trips they will make to work and/or school, and then schedules a time to leave home for work and/or school as well as a time to return home;
- Joint non-mandatory tour frequency, party size, participation, destination, and scheduling – Each household determines the number and type (e.g. to eat, to visit friends, etc) of "joint" (i.e. two or more members of the same household traveling together) non-mandatory (i.e. not work or school) round trips in which to engage, then determines which members of the household will participate, where and at what time the tour (i.e. the time leaving home and the time returning home) will occur;
- Non-mandatory tour frequency, destination, and scheduling – Each person determines the number and type of non-mandatory (e.g. to eat, to visit friends, to shop, etc) round trips to engage in during the model day, where to engage in them, and at what time to leave and return home;
- Tour travel mode – The tour-level travel mode choice (e.g. drive alone, walk, take transit, etc) decision is simulated separately for each tour and represents the best[11] mode of travel for the round trip (a "tour" is a round trip from either home or the workplace);
- Stop frequency and location – Each traveler or group of travelers decide whether to make a stop on an outbound (from home) or inbound (to home) leg of a travel tour, and if a stop is to be made, where the stop is made, all given the round trip tour mode;
- Trip travel mode – A trip is a portion of a tour, either from the tour origin to a stop, a stop to another stop, or a stop to a tour destination, and a separate mode choice decision is made for each trip, doing so with awareness of the prior tour mode choice decision;
- Assignment – Vehicle trips for each synthetic traveler are aggregated to build time-of-day-specific matrices (i.e. tables of trips segmented by origin and destination) that are assigned via the standard static user-equilibrium procedures to the highway network (i.e. each vehicle is assigned to his or her shortest cost – both monetary and non-monetary – path between the origin and destination); transit trips are assigned to time-of-day-specific transit networks.

3.5   Commute Time

This measure provides average travel time per trip for commute trips by all modes, based on the location of a worker's residence and place of work.

Commute travel time is analyzed separately because travel time between home and work generally provides an indication of the proximity of jobs and housing for different socioeconomic groups.

Results of this measure in average number of minutes per trip are produced for:
- Communities of concern and the remainder of the region (all residents of each)

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[11] The choice of travel mode, as well as most other choices represented in the model, is simulated within a random utility theory framework – additional information available here: http://en.wikipedia.org/wiki/Choice_modelling.

- Low-income travelers vs. non-low-income travelers, regardless of community of residence.

Details regarding how travel decisions are made for all kinds of trips, including commute trips, are described above under "**Non-commute Travel Time**."