

# Policy Analysis

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Routing

## *The Planning Tax* *The Case against* *Regional Growth-Management Planning* by Randal O'Toole

### Executive Summary

Regional growth-management planning makes housing unaffordable and contributes to a business-unfriendly environment that slows economic growth. The high housing prices caused by growth-management planning were an essential element of the housing bubble that has recently shaken our economy: for the most part, this bubble was limited to urban regions with growth-management planning.

In 2006, the price of a median home in the 10 states that have passed laws requiring local governments to do growth-management planning was five times the median family income in those states. At that price, a median family devoting 31 percent of its income (the maximum allowed for FHA-insured loans) to a mortgage at 6 percent, with a 10 percent down payment, could not pay off the mortgage on a median home in less than 59 years. In contrast, a median home in the 22 states that have no growth-management laws or institutions cost only 2.7 times the median family income. This meant a family could pay off a home in just 12.5 years.

Growth-management tools such as urban-

growth boundaries, adequate-public-facilities ordinances, and growth limits all drive up the cost of housing by artificially restricting the amount of land available or the number of permits granted for home construction. On average, homebuyers in 2006 had to pay \$130,000 more for every home sold in states with mandatory growth-management planning than they would have had to pay if home price-to-income ratios were less than 3. This is, in effect, a *planning tax* that increases the costs of retail, commercial, and industrial developments as well as housing.

The key to keeping housing affordable is the presence of large amounts of relatively unregulated vacant land that can be developed for housing and other purposes. The availability of such low-cost land encourages cities to keep housing affordable within their boundaries. But when state or other planning institutions allow cities to gain control over the rate of development or rural areas, they lose this incentive, and housing quickly becomes unaffordable. States with growth-management laws should repeal them, and other states should avoid passing them.

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## Introduction

More than two out of three Americans live in an urbanized area, which the Census Bureau defines as “a densely settled area that has a census population of at least 50,000.”<sup>1</sup> Urbanized areas are identified by the name of the most prominent city or cities in the area, such as St. Louis or Minneapolis–St. Paul. But, in fact, most urban areas are made up of dozens, and sometimes hundreds, of municipal units of government, including cities, towns, villages, counties, and special districts of various kinds.

What is the best way to govern these urbanized areas? Should cities and other municipal governments be allowed to compete with one another for residents, businesses, and funding from state and federal governments? Or should planning and certain other regional functions be given to a regional government that oversees each urban area?

Many planners and some economists have argued that regional governments are better suited than local governments to solving problems such as housing. Urban planners say that regional governments can make cities and their suburbs more livable and affordable for both businesses and residents. Planners specifically oppose *leap-frog development*, in which a developer builds housing or other development on land that is physically separated from existing urbanized land. More recently, planners have tried to discourage all greenfield development, even if it is physically next to existing urbanized land, preferring instead *in-fill* development, or development of vacant parcels within an urban area.

One of the major claims for infill development is that it is less expensive than development on the urban fringe. A 2002 report from the Rutgers University Center for Urban Policy Research titled *The Costs of Sprawl—2000* estimated that low-density suburban development at the urban fringe imposes about \$11,000 more in urban-service costs on communities than more compact development.<sup>2</sup>

To avoid such costs, planners favor a form of planning known as *growth-management plan-*

*ning*, which uses urban-growth or urban-service boundaries, rules requiring adequate financing for urban services before the issuance of building permits, and similar tools to direct growth to certain areas and away from areas designated as preserves or reserves.

Economists have focused on specific urban problems. Harvard economist Edward Glaeser sees regional governments as a solution to housing affordability problems. “Land use regulations seem to drive housing supply and determine which regions are growing,” Glaeser observes. “A more regional approach to housing supply *might* reduce the tendency of many localities to block new construction” (emphasis added).<sup>3</sup>

Despite these claims and speculations, there has been little research showing whether regional governments can actually make urban areas more attractive and more affordable. As UC Berkeley political scientist Margaret Weir observes, the literature on regional governments “does not connect regional processes with regional outcomes, [so] we do not know enough about what makes regions successful.”<sup>4</sup>

Another argument for planning is that there are certain problems that are regional, and only a regional government staffed by regional planners can solve those problems. This argument has been strongly promoted by former Albuquerque mayor David Rusk.<sup>5</sup> In fact, most of the supposedly regional problems—including housing, open space, solid waste, infrastructure, and transportation—can easily be handled at the local level. The few problems that are difficult to solve locally are not made any easier by magnifying those problems to a regional scale. As Jane Jacobs wryly observed, a region is “an area safely larger than the last one to whose problems we found no solution.”<sup>6</sup>

A close look at the data for America’s urbanized areas reveals that regional growth-management planning generally does not produce the benefits claimed for it. States and regions with strong regional governments tend to have the least affordable housing and are often growing more slowly than regions with weak regional governments. This sug-

gests that state and local officials should dismantle or avoid regional governments, and in particular regional growth-management planning.

## A History of Regional Government

Regional government was a moot point during most of the 19th century, when urban Americans nearly all lived in cities and those cities readily annexed new developments that took place on their fringes. But in 1873, Brookline, Massachusetts, became the first suburb to reject a major city's offer to be annexed.<sup>7</sup> This started a trend that soon led to a clear split between the center cities and their suburbs.

By the mid-20th century, many suburbanites viewed the cities as cesspools of corruption, and they didn't want to see their taxes going into the pockets of aldermen or their contractor friends. Most states did not allow cities to annex without the permission of the people being annexed, and that permission was often difficult to obtain.

Central city officials, meanwhile, complained that the average income of the people who moved to the suburbs was higher than the people left behind, which tended to mean lower tax revenues for the cities. The cities came to view suburbanites as parasites, enjoying the economic and cultural benefits of the cities without paying their full share of the costs.

Urban planners who advocated regional government were not primarily concerned with municipal finance. They spoke instead of "rapid and often chaotic growth," which they contrasted with their "visions of promoting orderly urban regions with planned communities and efficient infrastructure systems."<sup>8</sup> "Central cities and suburbs are interdependent and cannot survive in the present governmental and physical chaos," argued one planning professor.<sup>9</sup> The repeated use of vague terms like "chaos" and "order" suggests that planners were trying to make their ideas attractive to a broad range of people

without explicitly stating just what their ideas really were.

Planners, however, had few tools that they could use to promote their idea of orderly growth, whatever that was. The first zoning codes, passed by New York City in 1919 and other cities soon after, focused on maintaining the existing character and quality of neighborhoods of single-family homes. When a real estate developer in Euclid, Ohio, challenged one of these zoning codes, it was overturned by lower courts as an unconstitutional taking of property without compensation. When the case reached the Supreme Court, the court rejected arguments by the city of Euclid that the code was needed to preserve the character of the neighborhood. However, the court agreed with the argument of an intervener that the code was a constitutional exercise of police powers to prevent nuisances.<sup>10</sup>

If zoning could be used only to prevent nuisances, then regional planners would have little ability to control growth. It might be easy to show that pollution-emitting factory in the middle of a residential neighborhood would be a nuisance, but it would be much harder to show that someone developing vacant land on the edge of a city was creating a nuisance.

Cities could exercise some control over development by limiting the expansion of urban services such as sewer and water. However, they could not prevent developers from providing their own sewer, water, and other services by creating special service districts or incorporating their own cities. As long as developers had such freedom, regional planners were helpless to direct or control new development.

One response was the idea of city-city or city-county consolidations. Such consolidations would give the central city greater control over what happened in areas that were previously outside of its jurisdiction. Before World War II, several cities were able to persuade some or all of their suburbs to consolidate, including New York City (1898), Denver (1902), and Honolulu (1907). But suburbs of Oakland, St. Louis,

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Pittsburgh, and several other regions rejected such consolidations. After World War II, Baton Rouge (1947), Newport News (1952), Virginia Beach and Nashville (1962), Jacksonville, Florida (1967), Anchorage (1975), Kansas City (1997), and Louisville (2003) all consolidated with their county governments. However, voters rejected many other proposed consolidations, including those in Birmingham, Miami, Albuquerque, Memphis, St. Louis, Portland, and Sacramento.<sup>11</sup>

Congress struck a blow for regional government when the Federal-Aid Highway Act of 1962 included a requirement that the various cities in urban areas work together on a “continuing, comprehensive and cooperative” transportation planning process. Similarly, the Housing and Urban Development Act of 1965 required urban areas to form “organizations composed of public officials . . . representative of the political jurisdictions within a metropolitan or urban region.” Regions that wanted to receive federal transportation and housing grants had to meet these requirements, and the reasoning at the time was that it would be easier for federal agencies to allocate grants among a few hundred urban areas than to decide among proposals from tens of thousands of municipal governments.

The 224 urbanized areas at the time quickly formed *metropolitan planning organizations* (MPOs). Sometimes called “councils of governments,” “regional planning commissions,” or similar names, these MPOs typically are governed by elected officials from most or all of the cities and counties in the region. Initially, most MPOs were little more than committees with post office boxes, and they did little other than distribute federal transportation and housing grants to local governments. But over time, most have grown to employ dozens or hundreds of urban planners, and a few exercise near-dictatorial controls over planning and zoning of much of the land in their regions.

The Supreme Court gave planners a new tool in 1978 when it decided the case of *Penn Central v. New York City*. Penn Central wanted to build an office tower above its Grand

Central Terminal, but New York City’s historic landmarks law prevented it. The city did not claim that the office tower would create a nuisance. In essence, it argued instead that the building would change the character of the area. Penn Central argued that its passenger terminal lost money, and a rule prohibiting it from building an office tower was an unconstitutional taking of its property without compensation. The court sided with the city, saying that even if the terminal lost money, Penn Central should use its revenue from its other real estate to cover those losses.<sup>12</sup>

In short, the Supreme Court overturned the *Euclid* ruling and authorized cities to downzone people’s property, effectively taking away most of the economic value of that property, without compensation, even if the downzoning was not needed to prevent a nuisance. That led to a dramatic escalation in regional planning and zoning.

Despite the federal laws, the real impetus behind the growth in regional government has been from state laws. Several states—notably California, Oregon, Washington, and Florida—have passed laws requiring some form of regional planning in some or all urban areas in the states. Other state legislatures have authorized, but not required, such planning. Many other states provide no framework for regional planning or governance. These differences make it possible to compare the effects of regional government on such things as housing affordability and growth.

## **The Evolution of Growth-Management Planning**

Until 1970, urban growth and development in the United States was driven almost entirely by landowners and developers who were responding to market demands for residential, commercial, retail, and industrial uses. Once an area was developed, cities used zoning to provide homeowners and other landowners assurance that the character of their neighborhoods would not dramatically

**In the 1978 Penn Central decision, the Supreme Court authorized cities to take most of the economic value of private property without compensation.**

change through the intrusion of some incompatible use. Vacant lands were either unzoned or placed in a low-density “holding zone” that cities would readily change when landowners or developers presented proposals to develop the lands.

Growing concerns over environmental issues combined with fears that existing residents were somehow subsidizing growth led to a transformation of planning starting in 1970. In that year, Ramapo, New York, a suburb of New York City, passed the first *adequate public facilities ordinance*, also known as a *concurrency ordinance*. Instead of allowing developers to build homes and commercial areas and then providing the sewer, water, and other urban services needed by those areas, Ramapo decided that it would approve new developments only after the capital improvements needed for the development were fully financed.<sup>13</sup>

In 1972, the city of Petaluma, California, took a different approach. Instead of conditioning growth on urban finances, the city simply decided to issue no more than 500 residential building permits a year.<sup>14</sup> Soon after, Boulder, Colorado, decided to limit the number of building permits so that it would grow no faster than 2 percent per year. Boulder was also the first city in the United States to pass a tax dedicated to open space preservation, and the city and county of Boulder have since purchased a greenbelt around the city that is several times the land area of the city itself.<sup>15</sup>

In 1974, San Jose and Santa Clara County (of which San Jose is the seat) drew one of the first urban-growth boundaries outside of which development would be prohibited or restricted. Other places have used urban-service boundaries that limit the extension of sewer, water, and other services, effectively preventing large-scale developments.

All of these practices—concurrency, growth limits, greenbelts, and growth boundaries—are collectively known as *growth-management planning*. While Petaluma and Boulder have tried to control the *rate* of growth, most growth management focuses instead on controlling the *location and density* of growth. This variation of growth management is sometimes

called *smart growth*. Also, as practiced by Petaluma and Boulder, growth management can simply drive growth to other nearby communities. So planners in recent decades have focused on creating regional structures that can manage growth throughout an urbanized area and the rural lands beyond its fringes.

Regional growth-management planning plays a major role in the development of seventeen to nineteen different states plus several urban areas in other states. Growth management has evolved in these states and urban areas in five different ways.

First, 10 states have passed planning laws requiring local and regional planners to coordinate the development of growth-management plans. These states include Hawaii (1961), Vermont (1970), Oregon (1973), Florida (1985), New Jersey (1986), Rhode Island (1988), Washington (1990), Maryland (1992), Tennessee (1998), and Arizona (1998). In Hawaii’s case, the state itself writes the plan.

Second, seven states have passed laws authorizing but not requiring cities and counties to write growth-management plans. Usually, these laws are accompanied by incentives that may range from grants to support the development of the plan to limits on the use of state infrastructure funds in communities that have not written a plan. These states include Connecticut (1971), Maine (1988), Georgia (1989), Minnesota (1997), New Hampshire (1999), Pennsylvania (1999), and Wisconsin (2000). Washington’s 1990 law is unique in that it is mandatory in the western half of the state and optional in the eastern half.

Third, in California and New England, institutional structures that were not originally designed to be regional governments have evolved into mechanisms for implementing growth-management plans. In 1963, various California urban areas had seen disputes over which city would get to annex developable land. So California required every county (except San Francisco, which has no competing jurisdictions) to form a *local agency formation commission* or LAFCo that would approve such annexations. LAFCos could also veto the incorporation of new cities or special service

**To prevent growth from fleeing to nearby communities, planners have focused on creating regional structures that can manage growth throughout an urbanized area and the rural lands beyond its fringes.**

districts, thus giving cities control over the rate of development on unincorporated county lands. Each LAFCo consisted of representatives of every city in the county, so by the early 1970s LAFCos morphed into regional governments that attempted to manage growth and limit sprawl.<sup>16</sup>

The six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont) have largely given up the county form of government and turned most rural planning over to cities and towns. Connecticut and Rhode Island have no county governments, and Massachusetts has abolished many of its counties. These three states have no “unincorporated areas”—every acre in the state is under the jurisdiction of a city or town effectively acting as a regional government. The unincorporated portions of New Hampshire and Vermont are very small, housing just a few hundred people. Maine still has extensive unincorporated areas, but most residents live in an incorporated city or town.<sup>17</sup>

Fourth, in states that have not passed growth-management laws, the federally mandated metropolitan planning organizations have sometimes morphed into true regional governments. To write an enforceable regional plan, MPOs need the approval of a majority of their members and the willingness on the part of that majority to use the MPO’s power to distribute federal funds to coerce reluctant local governments into cooperating with the plan.

For example, in 1999 the chair of the Minneapolis–St. Paul MPO, Ted Mondale (son of the former vice president), began promoting an aggressive growth-management agenda that called for a strict urban-service boundary and increased suburban densities instead of further development at the urban fringe. “If we’re giving money to communities that are thumbing their noses” at the MPO’s plan, asked Mondale, “then what’s it all about? It’s a charade!”<sup>18</sup> Despite “spirited community opposition,” the MPO successfully pressured various suburbs to rezone areas for much higher densities.<sup>19</sup> The Denver Regional Council of Governments adopted a similar plan in 1997.<sup>20</sup>

Lastly, in some cases cities and counties have jointly developed urban-growth boundaries and other growth-management tools that do not necessarily extend to the entire metropolitan area. Five years before Washington passed its growth-management act, King County (Seattle) adopted an urban-growth boundary in support of a plan that emphasized high-density infill and discouraged auto-oriented low-density housing.<sup>21</sup>

In contrast with the above states, most states in the South (except Florida, Georgia, and Tennessee), the Midwest (except Minnesota and Wisconsin), and the interior West (except Arizona, northwest Colorado, and Salt Lake City) have done little to promote regional growth management. That makes it possible to compare the effects of planning on states and regions with and without such plans.

## Housing Affordability

The question of whether growth management reduces housing affordability is hotly debated by planners and economists.<sup>22</sup> As Virginia Tech urban planning professor Robert Lang notes, “growth management schemes exist that can be neutral” with regard to housing. “But in practice, growth management generally affects housing prices.”<sup>23</sup>

In freely functioning markets without entry barriers, the price of existing housing cannot rise significantly above the cost of new construction because, if it did, developers would enter the market and build new housing until the price of existing housing was at least equal to and probably below the price of new housing. In what is perhaps the most comprehensive study to date, Harvard economist Edward Glaeser and Wharton economist Joseph Gyourko compared a database of local land-use regulations with the average cost of owner-occupied housing (as a proxy for the marginal cost of new home construction). They found that, in some parts of the country, the prices of existing homes are not significantly different from the nominal cost of new construction, while in other

**The metropolitan planning organization for Minneapolis–St. Paul used its power to distribute federal funds to coerce local governments into rezoning reluctant neighborhoods for much higher densities.**

regions existing-home price are well above the costs of new construction.

Glaeser and Gyourko used several economic tests to show that these differences in prices were not due to a stronger demand for existing housing in high-priced areas. Instead, they concluded, “Government regulation is responsible for high housing costs where they exist.”<sup>24</sup> However, they did not specifically define what sorts of regulation was responsible for those high prices. Instead, they merely attributed it to “zoning.”

In another paper, Gyourko and two colleagues showed that limits on new home construction in growing regions lead wealthy people to outbid the poor for the regions’ stock of housing. The result is that the poor are pushed out, creating “superstar cities” composed mainly of wealthy people.<sup>25</sup> These cities regard themselves as successful and (ironically) progressive, when in fact their policies are highly regressive.

For example, the San Francisco–Oakland and Dallas–Ft. Worth metro areas each have about the same number of families with incomes greater than \$100,000 per year. But Dallas–Ft. Worth’s affordable housing market welcomes two-thirds more families with incomes of \$50,000 to \$100,000 and twice as many families with incomes under \$50,000 per year. Dallas–Ft. Worth’s income distribution is much closer to that of the U.S. as a whole than San Francisco–Oakland’s.<sup>26</sup> This makes San Francisco–Oakland appear to be a superstar region, when in fact—thanks to restrictive land-use rules—it is just an elitist region. As urban writer Joel Kotkin observes, it is “an oddity” that “the fashionable ‘left’ defines successful urbanism by its ability to lure the superaffluent” while it pushes out the poor.<sup>27</sup>

More than 80 percent of American homes are in areas that are municipally zoned, but only about 40 percent of America’s housing is in unaffordable markets. Some forms of zoning seem to make housing unaffordable, while others do not. A close comparison of affordable and unaffordable housing markets makes it clear that the difference is growth-management planning.

Euclidean zoning—zoning that seeks only to prevent nuisances from disrupting neighborhoods in developed areas—seems to be compatible with affordable housing. Growth-management planning—planning and zoning that seeks to promote the general welfare by controlling the development of all urban and rural land within a state or region—makes housing unaffordable by limiting the amount of vacant land that is readily accessible for new housing.

Looking at Florida’s growth-management law, Jerry Anthony, an assistant professor of urban planning at the University of Iowa, found “a statistically significant increase in the price of single-family houses attributable to statewide growth management.” Though Anthony supports growth-management planning, he warns, “housing prices could become the Achilles heel of growth management programs and thwart their implementation.”<sup>28</sup>

The basic argument of this paper is that

1. By restricting the amount of land available for new housing, the number of permits issued each year, the cost of permits, and/or the amount of time required to obtain permits, growth-management planning constrains the supply of new homes.
2. Because the demand for new housing is *inelastic*, small constraints on the supply of new homes lead to large increases in the price of those homes.<sup>29</sup>
3. Sellers of existing homes respond to increases in the price of new homes by increasing the prices they ask for their homes. Thus, small restrictions on the supply of new homes can lead to large increases in the price of *all* homes in a market.

As Glaeser and Gyourko found, the median value of homes in a market is a good indication of any constraints on the supply of new homes. In wealthier communities, homes are likely to be larger or of higher quality. To account for this, a standard measure of housing affordability is median home price divided

**Growth-management planning creates what appear to be “superstar cities” by making housing so unaffordable that only the wealthy can afford to live there and the poor are pushed out.**

**Table 1**  
**Median Home Price to Median Family Income Ratios, and Population Growth**

State	Price-to-Income	Growth from 2000 to 2006	State	Price-to-Income	Growth from 2000 to 2006
Hawaii	8.7	6.1%	Pennsylvania	2.7	1.3%
California	8.3	7.2%	Wyoming	2.7	4.2%
District of Columbia	7.3	1.8%	Wisconsin	2.7	3.4%
Nevada	5.0	23.6%	Georgia	2.5	13.8%
New York	4.9	1.6%	North Carolina	2.5	9.6%
Massachusetts	4.8	1.2%	Louisiana	2.4	-4.1%
Rhode Island	4.7	1.6%	Tennessee	2.4	5.9%
Washington	4.6	8.2%	Iowa	2.4	1.8%
New Jersey	4.5	3.4%	Michigan	2.4	1.4%
Oregon	4.4	7.8%	South Carolina	2.3	7.4%
Arizona	4.4	19.3%	Missouri	2.3	4.2%
Maryland	4.3	5.7%	Illinois	2.2	3.1%
Idaho	4.2	12.8%	Mississippi	2.2	2.2%
Florida	4.2	12.7%	Ohio	2.2	1.0%
Virginia	3.8	7.6%	Kentucky	2.2	3.9%
Connecticut	3.7	2.7%	Arkansas	2.1	4.9%
Colorado	3.7	9.8%	Alabama	2.1	3.3%
New Hampshire	3.6	6.0%	West Virginia	2.0	0.6%
Utah	3.6	13.7%	South Dakota	2.0	3.5%
Delaware	3.5	8.5%	Texas	2.0	12.2%
Montana	3.4	4.5%	Oklahoma	1.9	3.6%
Vermont	3.4	2.3%	Nebraska	1.9	3.2%
New Mexico	3.3	7.3%	Kansas	1.9	2.6%
Maine	3.2	3.5%	North Dakota	1.8	-0.8%
Alaska	3.1	6.8%	Indiana	1.8	3.6%
Minnesota	3.1	4.7%			

Source: Census Bureau, Office of Federal Housing Enterprise Oversight, and Department of Housing and Urban Development; see notes in text for specific tables and sources.

by median family income, or price-to-income ratio. This price-to-income ratio can be used to detect possible constraints on the supply of new homes.

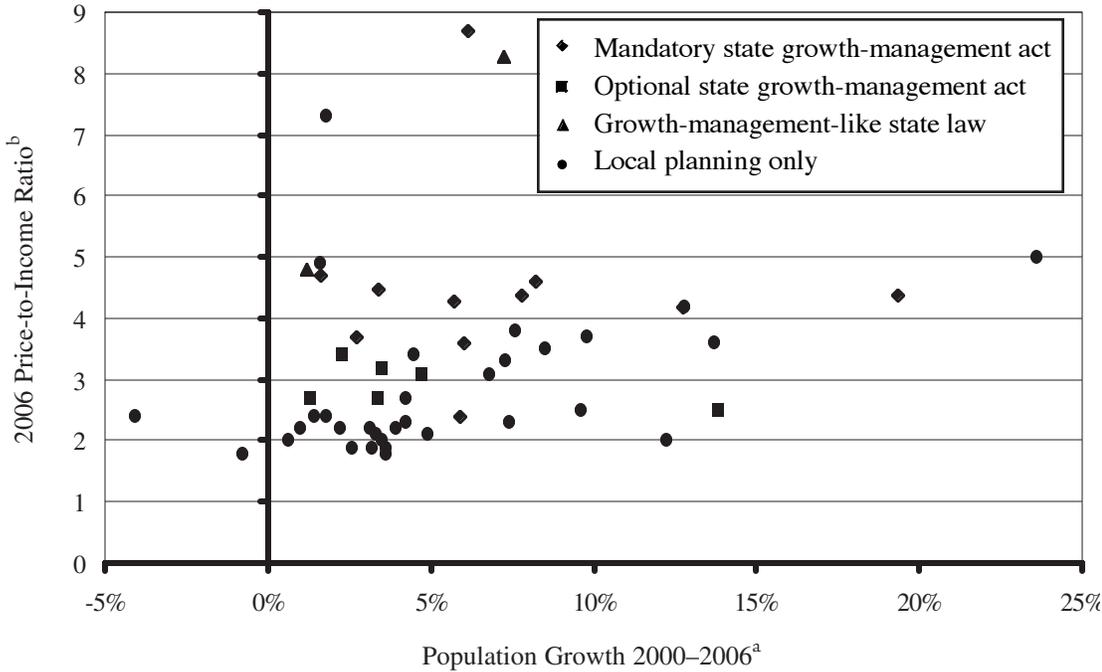
Price-to-income ratios determine how long it would take for a family to pay off a home under standard lending rules. At a 6 percent interest rate and a ratio of 3, for example, a family making a 10 percent down payment and devoting 31 percent of its income to its mortgage could pay off the remaining cost of its home in 15 years. At a price-to-income ratio of 5 it would take nearly 60 years, which—since most mortgages are for no more than 30 years—makes housing unaffordable.

The Census Bureau has estimated median home values and median family incomes in each decennial census (for the year before each census) since at least 1960.<sup>30</sup> Since the last decennial census, the Department of Housing and Urban Development has annually updated estimates of median family incomes by metropolitan area.<sup>31</sup> The Department of Commerce's Office of Federal Housing Enterprise Oversight publishes a quarterly index of home prices by metropolitan area that can be used to update median home values.<sup>32</sup>

Table 1, showing 2006 price-to-income ratios by state, reveals that all of the states with growth-management laws have price-to-in-

**None of the 18 states with the most affordable housing have passed growth-management laws.**

**Figure 1**  
**Price-to-Income Ratios vs. Growth**



<sup>a</sup> Data from Census Bureau, “2006 Community Survey,” Table C19101 for metropolitan statistical areas, tinyurl.com/ufd9.

<sup>b</sup> Based on Office of Policy Development and Research, Department of Housing and Urban Development, “FY 2006 Income Limits,” tinyurl.com/3dsd5w.

Note: Housing price data from Table H8 from the 200 census, adjusted using the home price index, Office of Federal Housing Enterprise Oversight, tinyurl.com/2nhr7z.

come ratios of 3 or more except Georgia, Tennessee, and Wisconsin. The laws in Georgia and Wisconsin are optional, and housing in those states is becoming unaffordable in selected urban areas, notably Savannah, Madison, and Milwaukee. Minnesota’s law is also optional, and housing there is unaffordable only in the Twin Cities region. Tennessee’s 1998 law may be too new to have yet influenced housing prices.

Contrary to claims by some that high housing prices are solely a function of demand, there is little correlation between growth rates and price-to-income ratios: Texas and Georgia are two of the fastest growing states in the United States, yet they remain very affordable (see Figure 1).

Georgia and Texas show that homebuilders can readily meet just about any demand for

housing without driving up prices, provided they can find land for development. Between 2000 and 2006, the Atlanta, Dallas–Ft. Worth, and Houston metropolitan areas each grew by more than 130,000 people—approximately the population of Alexandria, Virginia, or Bridgeport, Connecticut—*per year*. At the same time, low interest rates and easy lending contributed to the most rapid growth in housing prices ever seen in this country. Yet by 2006 Atlanta’s price-to-income ratio remained an affordable 2.75, while Houston’s and Dallas–Ft. Worth’s were very affordable at 2.00 to 2.06.

There is a strong correlation between the passage of growth-management laws or plans and declining housing affordability. Table 2 shows the date when price-to-income ratios first increased above 3.0 in various states and

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**Table 2  
Growth-Management Laws and Plans and Unaffordable Housing**

State or Region	Law or Plan	Year P:I>3
Hawaii	1961 law	1969
California	1963 law	1979
Boulder	1972 plan	1979
Oregon	1973 law	1979
NYC area	NJ & CT laws	1979
DC area	MD laws and VA plans	1989
CT, MA, RI, NH	NE town governments	1989
Seattle/King County	1985 plan	1989
Western Washington	1990 law	1999
Missoula	1992 plan	1999
Denver	1997 plan	1999
Florida	1985 law	2006
Vermont	1988 law	2006
Portland, ME	1989 optional law	2006
Twin Cities	1997 optional law	2006
Baltimore, Hagerstown	1997 optional law	2006
Arizona	1998 law	2006
Madison, Milwaukee	2000 optional law	2006
New Hampshire	2000 law	2006
Nevada	Federal land sales slow	2006

Source: Jerry Anthony, “Do State Growth Management Regulations Reduce Sprawl?” *Urban Affairs Review* 39, no. 3 (2004): 376–97. The year P:I>3 is based on the data in Randal O’Toole, *The Planning Penalty: How Smart Growth Makes Housing Unaffordable* (Bandon, OR: American Dream Coalition, 2006), [tinyurl.com/yqzpyy](http://tinyurl.com/yqzpyy) and the 2006 data cited in that paper.

**In most cases, housing price to family income ratios exceed 3.0 soon after passage of growth-management laws or plans.**

metropolitan areas. In most cases, declining housing affordability was preceded by passage of growth-management laws (which were optional in Maine, Maryland, Minnesota, and Wisconsin) or plans.<sup>33</sup>

New York state has no regional planning law, and most of its communities outside the New York City region are affordable. But the city is hemmed in by New Jersey to the south and Connecticut to the northeast, which have some of the strictest planning laws in the nation. Suburbs to the west such as Ramapo pioneered growth-management planning in 1970. In addition, regulation in the city itself tends to limit further construction of homes and apartments. That leaves the New York City urban area with little room to grow. Washington, D.C., is similarly limited by Maryland’s

planning laws on the north. While Virginia’s state laws are less strict, many local governments in Washington’s Virginia suburbs have imposed building moratoria and growth boundaries in the form of large-lot zoning of rural areas.<sup>34</sup>

Nevada is the exception that tests the rule that declines in affordability are preceded by approval of growth-management plans. Nevada went from being reasonably affordable in 1989 and 1999 to dramatically unaffordable in 2006. Las Vegas and Reno are two of the fastest-growing urban areas in the nation. In a state where nearly 90 percent of the land is federally owned, this growth has relied on sales of federal land to developers. Those sales slowed after 2000, which led to a rapid rise in land and housing prices.<sup>35</sup>

Extensive government ownership of land has created land shortages and made housing unaffordable in a few other communities, such as Jackson, Wyoming; Aspen, Colorado; and Sun Valley, Idaho. But most expensive housing markets in the U.S. have plenty of private land that is physically suitable for development; it has just been closed to development by urban-growth boundaries or other government restrictions.

These examples show that the key to housing affordability is the existence of relatively unregulated private land in unincorporated areas near to the cities. Thanks to various state growth-management laws, little or no such land can be found in Florida, Hawaii, Maryland, Oregon, or most of Washington. Thanks to LAFCos, most unincorporated land in California is off limits to development. Thanks to New England's unusual forms of local government, little or no unincorporated land is available in those states. Thanks to regional growth-management plans, such land is scarce in Denver, Ft. Collins, Madison, Milwaukee, Missoula, Seattle, and the Twin Cities. Thanks to extensive federal ownership, there is also a shortage of such land in Nevada and a few other places.

If easily developable vacant land is available outside of incorporated cities, those cities will act competitively to minimize their planning obstacles and invite developers within their boundaries. That, in turn, will keep housing affordable. If, through LAFCos, regional governments, New England town governments, or other means, cities can gain control of development rates in the rural areas, then they will have far less of an incentive to make development easy within their borders. By limiting competition between municipalities, regional growth-management planning creates land and housing shortages.

When planning-induced housing shortages make housing unaffordable for most people in a region, planners' typical response is to pass ordinances or laws requiring developers to sell 10 to 20 percent of the homes they build to low-income people at below-market prices.<sup>36</sup> Such inclusionary zoning rules may provide

affordable homes for a small number of people. But several economic studies have shown that they further reduce the general level of housing affordability in a city or region. After looking at dozens of California communities, economists Benjamin Powell and Edward Stringham found that, after these communities passed inclusionary zoning rules, the number of homes built fell by an average of 31 percent and homebuilders lost anywhere from \$100,000 to more than \$1 million for each unit they had to sell below cost. The homebuilders presumably passed most or all of those losses on to the buyers of the remaining homes they built.<sup>37</sup>

## The Cost of Regional Planning

Between 1959 and 1999, price-to-income ratios in the United States averaged between 2.0 and 2.5. In 1999, they were 2.23. The recent housing boom pushed the average ratio to 3.4. In metropolitan areas—heavily weighted with areas having growth-management planning—it averaged 3.8, while in rural areas it averaged only 3.0.

It therefore seems likely that, in the absence of growth-management planning, price-to-income ratios in most of the nation would still be less than 3.0 today, the only exceptions being places with genuine shortages of land. When price-to-income ratios are inflated because of regional planning, the difference between actual housing costs and what they would be without planning is, in effect, a planning tax imposed on homebuyers. This tax can be conservatively calculated by comparing actual median home values with what home prices would be if price-to-income ratios were 3.0. This is conservative because price-to-income ratios would probably be less than 3.0 in many regions were it not for growth-management planning.

Table 3 shows the planning tax per median house in selected states and metropolitan areas. In a few areas, the tax is under \$10,000, but in many more it is above \$100,000. In dif-

**In the absence of growth-management planning, price-to-income ratios would be less than 3.0. In places with such planning, when prices exceed this ratio, the added cost can be considered a planning tax imposed on homebuyers.**

**Table 3**  
**The Cost of Growth-Management Planning**

	Planning Tax Per Median Home	Tax on All 2006 Sales (millions)		Planning Tax Per Median Home	Tax on All 2006 Sales (millions)
<b>States with Growth Management</b>					
Arizona	77,400	6,860	Maryland	100,440	7,826
Flagstaff	109,030	150	Baltimore	77,588	2,657
Phoenix	92,144	4,561	Bethesda-Frederick	194,173	2,922
Tucson	53,217	648	Massachusetts	132,647	11,088
California	337,905	126,674	Boston	215,416	4,392
Fresno	143,553	1,135	Cambridge	173,273	3,077
Los Angeles	378,443	29,118	Springfield	35,086	295
Oakland	450,021	12,520	New Hampshire	43,445	893
Sacramento	202,940	4,844	Manchester	25,974	131
San Diego	355,565	10,612	New Jersey	122,145	13,920
San Francisco	718,264	12,369	Atlantic City	95,857	330
San Jose	612,881	11,279	Trenton	47,554	210
Connecticut	59,484	2,846	Newark	161,110	3,904
Hartford	13,061	200	Oregon	84,686	4,316
New Haven	70,266	723	Eugene	68,327	295
Florida	65,324	19,533	Portland	93,737	2,427
Fort Lauderdale	110,070	2,689	Rhode Island	109,475	1,477
Jacksonville	15,685	275	Providence	107,560	2,051
Miami	150,355	3,777	Vermont	25,201	275
Naples	247,149	1,248	Burlington	39,202	109
Orlando	61,503	1,593	Washington	100,237	8,738
Hawaii	382,589	5,406	Seattle	179,776	5,701
Honolulu	394,146	3,242	Spokane	22,800	134
			Tacoma	94,830	876
<b>Other Urban Areas with Growth Management Plans</b>					
Boulder	101,023	413	Minneapolis-St. Paul	14,848	685
Denver	38,796	1,264	Missoula	70,900	93
Ft. Collins	37,698	147	Madison, WI	9,578	67
Portland, ME	56,300	415	Milwaukee	7,551	143

Source: Author's calculations.

Note: The planning tax is a conservative estimate of the additional amount buyers of median-priced homes must pay because of growth-management planning. The total tax is a conservative estimate of the total additional amounts paid by homebuyers for houses purchased in 2006. A spreadsheet presenting calculations and results for every state and metropolitan area can be downloaded from [tinyurl.com/3bevle](http://tinyurl.com/3bevle).

**The cost  
of growth-  
management  
planning is often  
more than  
\$100,000  
per home.**

ferent parts of the San Francisco Bay Area, it ranges from \$450,000 to more than \$700,000. This is a huge burden to impose on homebuyers.

The insidious nature of growth management is that, by placing restrictions on new home construction, it affects the prices of all

homes in a region. For example, one source of the planning tax is impact fees that are intended to cover the capital costs of infrastructure such as roads, sewer, water, and schools. These fees are applied only to new homes but, because sellers of existing homes base the prices they ask on the cost of new homes, the

fees end up increasing the cost of all housing in a region. If the goal is to recover the capital cost that new low-density homes impose on urban service providers, the best solution is a service district, limited improvement district, or other financial program that allows developers or local governments to sell bonds that would be repaid by new homeowners and other property owners over a 20- to 30-year period. Monthly or annual payments, instead of a single up-front impact fee, would insure that growth pays for itself without influencing the general level of housing affordability.

Table 3 also presents estimates of the total planning tax paid by homebuyers in 2006. In the vast majority of cases, this planning tax is far more than the \$11,000 that *The Costs of Sprawl—2000* estimates low-density housing imposes on urban-service providers. Moreover, the planning tax applies to every owner-occupied home in a region, not just to new homes. The estimate of the total planning tax conservatively assumes that 5 percent of a region's housing stock is sold each year. In fact, in 2006, 5.9 percent of homes in the nation were sold.<sup>38</sup> Note, too, that the total tax numbers apply only to owner-occupied homes; if the planning tax were also calculated for rental housing and non-residential properties, the total tax would be significantly more.

Nationally, the total planning-tax paid by homebuyers in 2006 was close to \$250 billion. About half of this was in California. Most of the rest was in nine states with statewide growth-management laws: Arizona, Florida, Hawaii, Maryland, New Jersey, Oregon, Rhode Island, Vermont, and Washington. The remainder was in New England, New York City, and Washington, D.C., and in a number of other urban areas that have adopted regional growth-management plans with or without state growth-management laws.

The planning tax imposed on homebuyers is partly offset by windfall profits for sellers of existing homes. But existing homeowners who want to trade up to a larger or better home face the same obstacles as first-time homebuyers: thanks to regional plan-

ning, the new home they want to buy also costs much more than it should. Sellers of new homes, of course, do not earn windfall profits, because it is the increase in their costs that makes housing unaffordable. The existence of windfall profits also raises an equity issue, as homesellers tend to be wealthier than homebuyers.

In effect, growth-management planning can be interpreted as a cartel of existing homeowners who limit the supply of new homes in order to drive up the value of their own homes. This has been called the *homevoter hypothesis*.<sup>39</sup> While homevoting may be important in maintaining political support for growth management, in a previous paper this writer argued that it is only one of several factors behind growth-management planning.<sup>40</sup> An additional factor is municipal finance: cities object to developments outside their borders because they want to keep new tax revenues for themselves. As this paper has shown, when cities can gain control over development rates in rural areas, they respond by imposing growth-management rules.

## Housing Bubbles

Housing bubbles are one of the negative side effects of regional growth-management planning. The most recent bubble is often blamed on low interest rates and easy credit, but in fact housing prices bubbled mainly in regions where there were shortages of land for new housing or other planning-induced housing shortages. As economist Paul Krugman noted in 2005, prices rose most in what he called "the zoned zone," where land-use restrictions make "it hard to build new houses," while in the rest of the country prices rose not much faster than inflation.<sup>41</sup>

At least two economic studies have confirmed a relationship between growth-management planning and housing bubbles. A 2005 economic analysis of the housing market in Great Britain, which has practiced growth management since 1947, found that planning makes housing markets more

**When cities gain control over development rates in rural areas, they respond by imposing growth-management rules aimed at maximizing their tax revenues.**

volatile, that is, more susceptible to booms and busts. “By ignoring the role of supply in determining house prices,” the report says, “planners have created a system that has led not only to higher house prices but also to a highly volatile housing market.”<sup>42</sup>

A more recent study by Harvard economist Edward Glaeser also finds that land-use rules that restrict “housing supply lead to greater volatility in housing prices.” Glaeser found that, “if an area has a \$10,000 increase in housing prices during one period, relative to national and regional trends, that area will lose \$3,300 in housing value over the next five-year period.”<sup>43</sup>

Historically, U.S. housing prices have grown at about the rate of inflation.<sup>44</sup> Planning-induced housing shortages lead to bubbles because housing prices in regions with growth-management planning rise faster than normal. This attracts investors—sometimes derisively termed “speculators”—seeking capital gains. In extreme cases, this leads to well-documented frenzies, as when tiny or poorly built homes sell for unrealistically high prices to “flippers,” that is, to people who expect to quickly resell at even higher prices.<sup>45</sup> Eventually the bubble deflates, leading the present situation where homebuilders are forced to cut \$100,000 or more from the prices of their homes.<sup>46</sup>

In the 380 housing markets for which data are available, there is a strong correlation between the price-to-income ratios in 1999 and the increase in housing prices between 1999 and 2006.<sup>47</sup> In Atlanta, Dallas, and Houston, where housing was affordable in 1999, price-to-income ratios grew by only 13 to 24 percent. In California cities where housing was already very unaffordable in 1999, ratios grew by 80 to 140 percent.

The correlation between 1999 affordability and subsequent price increases is less than perfect partly because Florida and other states that had recently implemented growth-management laws still had affordable housing in 1999. But by 2006, it was quite unaffordable: price-to-income ratios in Florida grew by 55 to 150 percent, while ratios in most Georgia housing markets grew by only 20 to 30 percent.

The United States has experienced housing bubbles before. A bubble in the late 1970s saw California and Oregon housing prices peak in 1980, then fall by about 10 to 20 percent (after adjusting for inflation) over the next four years. A bubble in the late 1980s saw prices in California and the Northeast peak in 1990, then fall by 10 to 20 percent in the Northeast and 20 to 30 percent in California over the next six years.<sup>48</sup>

What is significant about the most recent housing bubble is that it affected so many more housing markets than previous bubbles. The biggest bubbles were in California and Florida, where price-to-income ratios typically doubled between 1999 and 2006. But nearly a third of the nation’s metropolitan areas, representing nearly 40 percent of the nation’s housing, saw price-to-income ratios rise by 50 percent or more. That includes markets in Arizona, California, Florida, Hawaii, Maryland, Oregon, Washington, the New England states, and the New York, Washington, and Philadelphia metropolitan areas.<sup>49</sup>

These bubbles and subsequent collapses are not good for the economy and certainly not good for people buying homes at artificially inflated prices. A significant share of the recent chaos in the lending industry and stock market can be credited to regional growth-management planners.

## Economic Growth

Planning-induced housing shortages affect more sectors of the economy than just housing. Retail, commercial, and industrial developers all need land, and restrictions on the amount of land available for their use will drive up their costs. Businesses in areas with expensive housing may also have to pay their employees more than businesses in other areas to compensate for the higher cost of living. These increased costs of doing business can deter employers from building or expanding in areas with growth-management planning.

There are few more dramatic examples of this than the San Jose urban area, which grew

**Planning-induced housing prices lead to bubbles when rising prices attract investors seeking capital gains as well as ordinary homebuyers.**

by an average of more than 42,000 people per year between 1950 and 1970. As the heart of the nation's booming high-tech industry, San Jose could have grown much faster than it has in the last three decades, but its growth was inhibited by a growth-management plan approved in 1974. During the 1970s and 1980s it grew by only 20,000 people per year. Growth contracted to 10,000 people per year in the 1990s and less than 8,000 people per year to date since 2000.

The imposition of growth-management plans in coastal California urban areas has pushed growth into California's interior. Since 2000, coastal California metropolitan areas have grown by an average of 3.5 percent, while interior metro areas have grown by an average of 15.5 percent. The data suggest that price-to-income ratios of 4 or more can significantly curtail growth unless that growth is the result of people and jobs fleeing even less affordable regions nearby.

Just as planning-induced land shortages can make housing markets more volatile, they can also make job markets volatile. Glaeser's study of land-use regulation found that "places with rapid price increases over one five-year period are more likely to have income and employment declines over the next five-year period."<sup>50</sup>

## Urban Sprawl

Urban planners say that the most important goal of growth-management planning is to curb urban sprawl. Urban sprawl—the pejorative term for low-density development—reflects the preferences of the vast majority of Americans to live in a single-family home with a yard.<sup>51</sup> The United States has a huge abundance of open space: less than 3 percent of the U.S. is considered urban (which the Census Bureau defines as "densely settled areas with a population of 2,500" or more<sup>52</sup>), and 95 percent of the nation is rural open space. Even New Jersey, the nation's most heavily developed state, is 65 percent rural open space.<sup>53</sup>

So the push for dense housing and hostility to low densities seems perplexing. As Urban Land Institute researcher Douglas Porter notes, there is a "gap between the daily mode of living desired by most Americans and the mode that most city planners . . . believe is most appropriate." While most Americans "want a house on a large lot and three cars in every garage," planners believe this leads to a urban development pattern "that is expensive in terms of public and private infrastructure costs, quality of life, and environmental damage." Porter's 1991 paper urged planners to use regional governments to impose their goals on reluctant voters.<sup>54</sup>

Whether curbing sprawl is a worthwhile goal or not, it is worth asking whether growth-management planning can achieve such a goal. University of Iowa planning professor Jerry Anthony compared changes in urban population densities in 11 states that had passed growth-management laws before 1997 with states that had no similar laws. Recognizing the growth-management efforts of LAFCos, he included California among the states with growth-management laws. Anthony found that "state growth management programs did not have a statistically significant effect in checking sprawl."<sup>55</sup>

In 2001, the Willamette Valley Livability Forum, a supporter of growth-management planning, published a report projecting—with and without such planning—the effects of development on Oregon's Willamette Valley, which covers one-seventh of the state but houses two-thirds of Oregon's people. Based on research by a local economics consulting firm, the report noted that 5.9 percent of the valley was urbanized in 1990. It projected that, under Oregon's strict land-use rules, that would increase to 6.6 percent by 2050. If, however, those rules were eliminated to "let private property rights and short-term market forces" determine land uses, by 2050 the total amount of urbanized land would cover 7.6 percent of the valley.<sup>56</sup> Table 3 shows that, to protect just 1 percent of the Willamette Valley from development, Oregon's land-use rules are costing valley

**In order to protect just 1 percent of Oregon's Willamette Valley from development, the state's land-use rules cost homebuyers \$70,000 to \$90,000 per home.**

**The key to keeping housing affordable is the availability of relatively unregulated vacant land outside city boundaries.**

(Eugene and Portland) homebuyers \$70,000 to \$90,000 per median-priced home.

Growth-management planning can profoundly change the character of the cities in which it is practiced. By making housing unaffordable, cities such as San Francisco, Portland, and Seattle have driven families with children to suburbs where they can afford a single-family home with a yard. In 2000, 26 percent of the nation's population was under the age of 18. But only 14.5 percent of San Franciscans, 15.6 percent of Seattleites, and 21.1 percent of Portlanders were under 18.<sup>57</sup> Although Portland's 2000 population was twice what it was in the 1920s, Portland schools educated fewer students in 2000 than in 1925.<sup>58</sup>

The result is that the central cities are inhabited largely by young singles and childless couples. These people may be more willing to live in higher densities and to walk or bicycle than older people or families with children, so planners believe that their plans are working to reduce driving and sprawl. But in fact all they are doing is to separate the population into those who are willing to live in denser areas and to move to the central cities, from those who prefer low densities, who move to the sometimes-distant suburbs.

## Conclusion

As it is usually practiced, regional growth-management planning imposes huge costs on homebuyers, renters, and businesses. Yet it provides negligible benefits: it does little to reduce sprawl (if that can even be considered a benefit), and its greatest social effect is to sort urban areas into central cities largely composed of young singles and childless couples and suburbs with high percentages of families with children.

The key to affordable housing is the availability of relatively unregulated vacant land for housing and other urban purposes. The effects of denying homebuilders access to such developable land appears to be an almost relentless upward push of housing prices. In 1979, price-to-income ratios in coastal California cities

were greater than 4. By 1989, they exceeded 5.0. Thanks to a major recession in the early 1990s, they were still between 5 and 6 by 1999, but today they are mostly greater than 8. Prices may be declining now, but—unless changes are made—states such as Arizona, Florida, and Oregon whose price-to-income ratios were 4 or more in 2006 can expect to have California's price-to-income ratios in a decade or two.

Remedies for unaffordable housing will require actions at the federal, state, and local levels.

- The federal government should revoke requirements that all urban areas must be represented by metropolitan planning organizations. Congress should also repeal the comprehensive, long-range planning requirements found in federal transportation and housing legislation.
- States with growth-management laws should repeal those laws and other states should avoid passing similar ones.
- Other state laws that give cities power to control the rate of development of rural areas, such as the California law creating local agency formation commissions, should also be repealed. Instead, states should insure that plenty of vacant land is available to meet each region's need for housing and other land uses.
- Local governments should resist efforts by MPOs and other regional agencies to impose region-wide planning on their urban areas.
- As far as possible, infrastructure should be paid for by developers or property owners through annual user fees and special service districts rather than through up-front impact fees or general taxation.

Urban planners, of course, may oppose these actions. Instead, they aspire to pass growth-management laws in every state and impose growth-management plans on every urban area. The predictable result will be increasingly unaffordable housing, declining homeownership rates, and a growing disparity

between the elite who own their own homes and a significant number of families who will never become homeowners.

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# Policy Analysis

No. 646

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## *How Urban Planners Caused the Housing Bubble*

by Randal O'Toole

### Executive Summary

Everyone agrees that the recent financial crisis started with the deflation of the housing bubble. But what caused the bubble? Answering this question is important both for identifying the best short-term policies and for fixing the credit crisis, as well as for developing long-term policies aimed at preventing another crisis in the future.

Some people blame the Federal Reserve for keeping interest rates low; some blame the Community Reinvestment Act for encouraging lenders to offer loans to marginal homebuyers; others blame Wall Street for failing to properly assess the risks of subprime mortgages. But all of these explanations apply equally nationwide, while a close look reveals that only some communities suffered from housing bubbles.

Between 2000 and the bubble's peak, inflation-adjusted housing prices in California and Florida more than doubled, and since the peak they have fallen by 20 to 30 percent. In contrast, housing prices in Georgia and Texas grew by only about 20 to 25 percent, and they haven't significantly declined.

In other words, California and Florida housing bubbled, but Georgia and Texas housing did not. This is hardly because people don't want to live in Georgia and Texas: since 2000, Atlanta, Dallas-Ft. Worth, and Houston have been the nation's fastest-growing urban areas, each growing by more than 120,000 people per year.

This suggests that local factors, not national policies, were a necessary condition for the housing bubbles where they took place. The most important factor that distinguishes states like California and Florida from states like Georgia and Texas is the amount of regulation imposed on landowners and developers, and in particular a regulatory system known as *growth management*.

In short, restrictive growth management was a necessary condition for the housing bubble. States that use some form of growth management should repeal laws that mandate or allow such planning, and other states and urban areas should avoid passing such laws or implementing such plans; otherwise, the next housing bubble could be even more devastating than this one.

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**As late as the fourth quarter of 2008, home prices remained stable in many parts of the country.**

## Misconceptions about the Housing Bubble

In 2005, both Alan Greenspan and Ben Bernanke argued that there was “no housing bubble” and that people need not fear that such a bubble would burst. Greenspan admitted there was “froth” in local housing markets but no national bubble. Bernanke argued that growing housing prices “largely reflected strong economic fundamentals” such as growth in jobs, incomes, and new household formation.<sup>1</sup>

How could they have gone so wrong? “Bubble deniers point to average prices for the country as a whole, which look worrisome but not totally crazy,” Princeton economist Paul Krugman wrote in a 2005 newspaper column. “When it comes to housing, however, the United States is really two countries, Flatland and the Zoned Zone.” Flatland, he said, had little land-use regulation and no bubble, while the Zoned Zone was heavily regulated and was “prone to housing bubbles.”<sup>2</sup>

Krugman’s choice of terms is unfortunate because most of “Flatland” is in fact zoned. What makes the Zoned Zone different is not zoning but *growth-management planning*, a broad term that includes such policies as urban-growth boundaries, greenbelts, annual limits on the number of building permits that can be issued, and a variety of other practices.

*Growth control*, which limits a city’s growth to a specific annual rate, is a form of growth-management planning that was popular in the 1970s. *Smart growth*, which discourages rural development and encourages higher-density development of already developed areas, is another form that is more popular today. No matter what the form, by interfering with markets for land and housing, growth-management planning almost inevitably drives up housing prices and is closely associated with housing bubbles.

Harvard professor Harvey Mansfield criticizes economists for failing to foresee the housing bubble.<sup>3</sup> But, in fact, many economists did see the bubble as it was growing and predicted that its collapse would lead to severe hardships.

For example, as early as 2003 *The Economist*

observed, “The stock-market bubble has been replaced by a property-price bubble,” and pointed out that “sooner or later it will burst.”<sup>4</sup> By 2005, it estimated that housing had become “the biggest bubble in history.” Because of the effects of the bubble on consumer spending, *The Economist* warned, the inevitable deflation would lead to serious problems. “The whole world economy is at risk,” the newspaper pointed out,<sup>5</sup> adding, “It is not going to be pretty.”<sup>6</sup> Although *The Economist* did not predict the complete collapse of credit markets, it was correct that the bubble’s deflation was not pretty.

After home-price deflation led to the credit crisis, it became “conventional wisdom that Alan Greenspan’s Federal Reserve was responsible for the housing crisis,” notes Hoover Institution economist David Henderson in a column in the *Wall Street Journal*.<sup>7</sup> Although Henderson disagreed with this view, several other economists writing in the same issue agree that by boosting demand for housing, the Federal Reserve Bank’s low interest rates caused the housing bubble. “The Fed owns this crisis,” charges Judy Shelton, the author of *Money Meltdown*.<sup>8</sup>

Other people blame the crisis on the Community Reinvestment Act and other federal efforts to extend homeownership to low-income families.<sup>9</sup> Those policies, along with unscrupulous lenders, fraudulent homebuyers, and greedy homebuilders—all of whom have also been blamed for the housing crisis—have two things in common. First, they focus on changes in the demand for housing. Second, they are all nationwide phenomena.

National changes in demand should have had about the same effect on home prices in Houston as in Los Angeles. But they did not. As this paper will show, just as prices rose much more dramatically in Krugman’s Zoned Zone than in Flatland, prices later fell steeply in most of the Zoned Zone but—except for states where home prices declined because of the collapse of the auto industry—prices hardly fell at all in Flatland. As late as the fourth quarter of 2008, home prices remained stable in many non-bubbling parts of the country. This suggests that the real source of the bub-

ble was limits on supply that exist in some parts of the country but not in others.

In response to the crisis, some have suggested that the federal government should buy surplus homes and tear them down or rent them to low-income families. This misreads the crisis, which is not due to a surplus of homes but to an artificial shortage created by land-use regulation. This shortage pushed up home prices to unsustainable levels, but that doesn't mean that there is no demand for housing at more reasonable prices.

Related to this are increased claims that this crisis signals the last hurrah for suburban single-family homes. "The American suburb as we know it is dying," proclaims *Time* magazine.<sup>10</sup> The *Atlantic Monthly* frets that suburbs will become "the next slums." Both articles quote a demographic study that claims that "by 2025 there will be a surplus of 22 million large-lot homes (on one-sixth of an acre or more) in the U.S."<sup>11</sup> Ironically, articles such as these promote an intensification of the kind of land-use regulation that created the housing bubbles.

## A Theory of the Housing Bubble

Bubbles have characterized recent economic history, as institutional and other major investors have sought high-return, low-risk investments. These investments have turned into speculative manias that eventually come crashing down. The last decade alone has seen the telecom bubble, the nearly simultaneous dot-com bubble, the housing bubble, and most recently, the oil bubble—all of which led the satirical newspaper, *The Onion*, to report, "Nation Demands New Bubble to Invest In."<sup>12</sup>

Of these, the housing bubble is the most significant. On one hand, consumer spending fed by people borrowing against the temporarily increased equity in their homes kept the world economy going after the high-tech and telecom bubbles burst in 2001. On the other hand, the eventual deflation of the housing bubble caused far more severe economic prob-

lems than the deflation of the telecom and high-tech bubbles would have caused if the housing bubble had not disguised them.

A *bubble* has been defined as "trade in high volumes at prices that are considerably at variance with intrinsic values."<sup>13</sup> Bubbles are essentially irrational, so they are difficult to describe with a rational economic model. However, the preliminaries to the housing bubble can be explained using simple supply-and-demand curves.

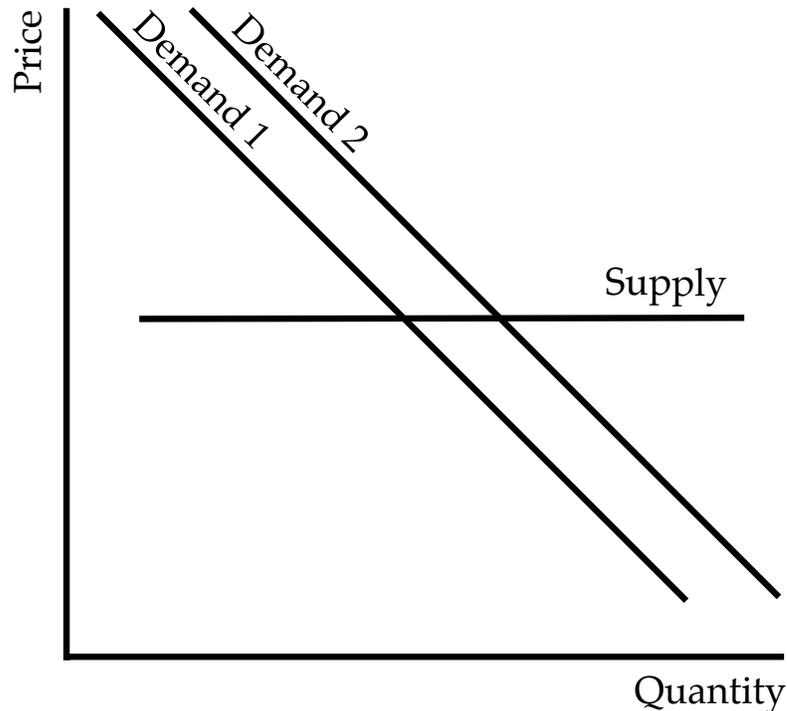
Charles Kindleberger's classic book *Manias, Panics, and Crashes* describes six stages of a typical bubble. First, a *displacement* or outside shock to the economy leads to a change in the value of some good. Second, new *credit instruments* are developed to allow investors to take advantage of that change. This leads to the third stage, a period of *euphoria*, in which investors come to believe that prices will never fall. This often results in a period of *fraud*, the fourth stage, in which increasing numbers of people try to take advantage of apparently ever-rising prices. Soon, however, prices do fall, and, in the fifth stage, the market *crashes*. In the sixth and final stage, government officials try to impose new regulation to prevent such bubbles from taking place in the future.<sup>14</sup> All of these stages are apparent in the recent housing bubble. The key point of this paper is that because growth controls did not allow heightened demand for housing to dissipate through new supply, the result was an immense price bubble in states housing nearly half of the nation's population.

Housing markets include both new and used housing. New housing accommodates population growth and replaces both worn-out older housing and housing in areas that are being converted to other uses. The price of used housing is set by the cost of new housing. If the price of new housing rises, sellers of existing homes will respond by adjusting their asking prices. Thus, to understand the price of housing, we must focus on the supply and demand curves for new housing.

The steepness of those curves—which economists call *elasticity*—describes the sensitivity of prices to changes in demand or supply. A flat or elastic supply curve, for example,

**Claims that the suburbs are dying are made to support the policies that created the housing bubbles in the first place.**

**Figure 1**  
**Elastic Housing Supply**



Note: When supply is perfectly elastic, changes in demand have no influence on price.

means that large changes in demand will lead to only small changes in price. But a steep or inelastic curve means small changes in demand can lead to large changes in price.

The demand for housing is inelastic: few Americans are willing to live without a home.<sup>15</sup> The vast majority of Americans, moreover, prefer a single-family home with a yard.<sup>16</sup> The same is true for Canadians and, likely, the people of most other nations.<sup>17</sup> While people are willing to live in multifamily housing, most see such housing as only temporary until they can afford a single-family home. This suggests that the demand for single-family housing may be even more inelastic than for housing in general. Inelastic demand curves mean that a small change in the supply of new homes can lead to large changes in price.

While demand for housing is inelastic, supply can be either elastic or inelastic. The

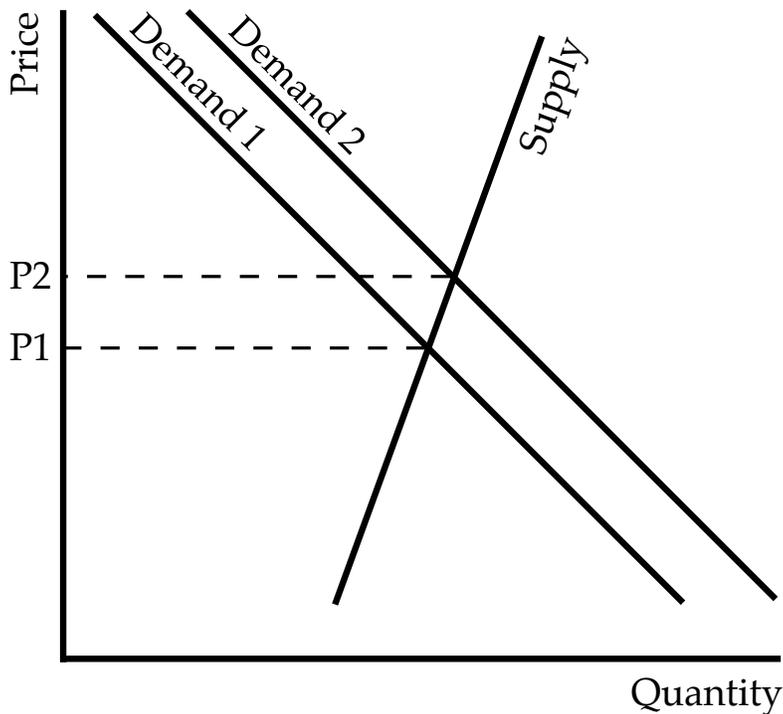
main determinants of the cost of new housing are land, materials, labor, and the time required to construct a house. Although realtors love to remind people that the supply of land is fixed, it is actually fixed at an extremely abundant level.

The 2000 census found that U.S. urban areas of more than 2,500 people house 79 percent of the population, yet they occupy less than 2.5 percent of the nation's land.<sup>18</sup> This means that, with rare exceptions, the value of land for housing at the urban fringe is influenced mainly by its value for other purposes, such as farming. Given that farmland is also abundant—the U.S. has nearly 800 million acres of private agricultural land, but farmers grow crops on less than 400 million of those acres—those alternate values tend to be low.<sup>19</sup>

Land can also be valuable for its proximity to certain activities such as jobs, schools, retail, and amenities such as parks. But the automo-

**The 2000 census found that urban areas housing 79 percent of the nation's people occupy less than 2.5 percent of the nation's land.**

**Figure 2**  
**Inelastic Housing Supply**



Note: When both supply and demand are inelastic, small changes in either result in large changes in price.

bile has greatly reduced the relative importance of such “agglomerative economies.” Jobs, housing, retail, and other activities are distributed through modern urban areas in a fine-grained pattern. For example, downtowns typically have only about 10 percent of the jobs in their urban areas, and suburban and other job centers typically have only 20 to 30 percent of the jobs.<sup>20</sup> This means that 60 to 70 percent of the jobs are finely distributed throughout the area.

As a result, the *monocentric* view of a city, in which people pay a premium to locate near the downtown area and housing prices steadily decline with distance from downtown, is obsolete. Under this view, housing is expensive in some urban areas because people are not willing to live far from the center, and so they drive up housing prices to live closer. In fact, few or no U.S. urban areas look like this.

Instead, housing prices vary more according to the quality of schools, proximity to parks or other amenities, and similar factors, meaning that there is no predictable rent gradient in any cross section of the region.

Thanks to low transportation costs, construction supplies cost about the same throughout the United States. Labor costs vary somewhat, but one of the reasons for such variation is the difference in housing costs.

The last key factor in housing prices is time—specifically, the actual time it takes to construct a home and the time it takes to get permits for construction. Thanks to assembly-line methods developed during and after World War II, homes can be built in a few months. However, permit times vary anywhere from zero (in a few Nevada counties that don’t even require building permits) to many years, and—in the case of some large projects—decades.

**Downtowns today typically have only about 10 percent of a region’s jobs.**

**Houston's minimal government regulation allows homebuilders to provide for 125,000 new residents a year while keeping the price of a 2,200-square-foot home well under \$200,000.**

## A Normal Housing Market

In a recent attempt to prop up sales, the National Association of Realtors produced a television ad claiming that “on average, home values nearly double every 10 years,” which is a growth rate of about 7 percent per year.<sup>21</sup> This is true only when areas with restrictive land-use regulations are included in the average.

Prior to 1970, median home prices in the vast majority of the United States were 1.5 to 2.5 times median family incomes.<sup>22</sup> The main exception was Hawaii, which, not coincidentally, had passed the nation's first growth-management law in 1961.<sup>23</sup> Home-value to income ratios remain in that range today in most places that do not have growth-management planning. In other words, in the absence of government regulation, median housing prices average about two times median family incomes.

Without supply restrictions, housing prices grow only if median family incomes grow. Even then, most of the growth in median housing prices is due to people building larger or higher-quality homes, thus increasing the value of the median home. The actual value of any given home will not grow much faster than inflation.

In a normal housing market, then, home values keep up with inflation and median home values keep up with median family incomes. Markets become abnormal when there is some limit on the supply of new homes—and most such limits result from government regulation. The National Association of Realtors' claim may be correct when regulated housing markets are averaged with unregulated ones, but it is incorrect if it is applied to unregulated markets alone.

## The Extremes: Houston vs. San Francisco

Houston is an example of a place where, with minimal government regulation, the supply curve for housing is almost perfectly elastic. Houston and surrounding areas have

no zoning, so developers face minimal regulation when building on vacant land. Once built, most developers add deed restrictions to their properties in order to enhance their value for buyers who want assurance that the neighborhood will maintain a positive character. But these deed restrictions do not impede further growth, as there is plenty of land in the region without such restrictions.<sup>24</sup>

In the suburbs of Houston, developers often assemble parcels of 5,000 to 10,000 acres, subdivide them into lots for houses, apartments, shops, offices, schools, parks, and other uses, and then sell the lots to builders. The developers provide the roads, water, sewer, and other infrastructure using *municipal utility districts*, which allow homebuyers to repay their share of the costs over 30 years. At any given moment, hundreds of thousands of home sites might be available, allowing builders to quickly respond to changing demand by building both on speculation and for custom buyers.

Between 2000 and 2008, the Houston metropolitan area grew by nearly 125,000 people per year. This is 10 times faster than population growth in 85 percent of American metropolitan areas.<sup>25</sup> Yet brand-new homes are available in Houston-area developments for less than \$120,000, and four-bedroom, two-and-a-half bath homes on a quarter-acre lot average under \$160,000.<sup>26</sup> When supply is this elastic, the inelasticity of demand is irrelevant.

In contrast, land-use regulations steepen the supply curve, making supply as well as demand inelastic. While the exact nature of such regulations varies from state to state, typically they involve the use of urban-growth boundaries outside of which development is limited to homes on lots as large as 80 acres; a lengthy and uncertain permitting process; high impact fees; and frequent passage of new regulations that make subdivision and construction increasingly costly and difficult.

The eight counties in the San Francisco Bay Area, for example, have collectively drawn urban-growth boundaries that exclude 63 percent of the region from development. Regional and local park districts have purchased more

than half of the land inside the boundaries for open space purposes. Virtually all of the remaining 17 percent has been urbanized, making it nearly impossible for developers to assemble more than a few small parcels of land for new housing or other purposes.<sup>27</sup>

Urban-growth boundaries and greenbelts not only drive up the cost of new homes, they make each additional new housing unit more expensive than the last. In other words, they steepen the supply curve.

Once growth boundaries are in place, cities no longer need to fear that developers will simply build somewhere else. This gives the cities *carte blanche* to pass increasingly restrictive rules on new construction. In places like Houston, such rules would drive developers to unregulated land in the suburbs. In the San Francisco Bay Area, the nearest relatively (with emphasis on “relatively”) unregulated land is in the Central Valley, 60 to 80 miles away.

An onerous permitting process can significantly delay developments both large and small. Scott Adams, the creator of the Dilbert comic strip, reports that it took him more than four years to gain approval to build one home in the San Francisco Bay Area.<sup>28</sup>

Approval of larger developments can take even longer and is highly uncertain. When San Jose drew its urban-growth boundary in 1974, it set aside a 7,000-acre area known as Coyote Valley as an “urban reserve” that supposedly would be brought into the boundary when needed. Nearly 30 years later, after inflation-adjusted housing prices had more than quadrupled, the city finally offered developers an opportunity to propose a plan for building in Coyote Valley. After spending \$17 million and five years on planning, however, developers announced in 2008 that they were giving up because there was “simply too much uncertainty surrounding the plan and the market to continue as is.” Developers doubted the city would have approved the plan, and even if approval were given, environmental groups were likely to delay development even further through legal challenges.<sup>29</sup>

A lengthy permitting process makes it impossible for developers and homebuilders

to quickly respond to changes in demand. California developers responding to the increase in housing demand in 2000 were unlikely to have increased the amount of product they would have brought to market before the prices collapsed in 2006. Empty homes in states with growth-management planning are symptoms of planning delays, not of any actual housing surplus.

Legal challenges can add to both delays and uncertainties in home construction. Growth-management planners believe almost anyone should have the right to challenge development of private land on the grounds that property is really a “collective institution,” says Eric Freyfogle in his book, *The Land We Share*. “When property rights trump conservation laws, they curtail the positive liberties of the majority.”<sup>30</sup> In other words, if the majority of people decide that your land should be preserved as their “scenic viewshed,” you can effectively lose the right to use it yourself.

In Oregon, for example, the courts grant standing to anyone trying to stop a development as long as they say they have some interest, however slight, in the property. In one case, a challenger was granted standing because she “pass[ed] by the property regularly” (it was on a major highway) and used nearby areas “for passive recreation, including the viewing of wildfowl.”<sup>31</sup>

These challenges have a major effect on the type of housing built in a region. Homeowners are more likely to object to new homes that cost less than their own homes, which are perceived as “bringing down the neighborhood.” They also tend to oppose higher-density developments because of the potential effects on traffic and other issues. At lower densities, homes must cost more to cover the costs of land and permitting.

For example, a developer once proposed to build 2,200 homes on 685 acres in Oakland, California. After eight years, the developer finally received a permit to build 150 homes, each of which ended up selling for six times as much as the homes in the original plans.<sup>32</sup>

Regions that use growth management are also more likely to charge stiff developer fees to

**Oregon courts grant standing to anyone who wants to challenge a proposed development, even if their only interest in the property is for birdwatching.**

cover infrastructure costs. Whereas Houston developers allow homebuyers to pay off infrastructure costs over 30 years, impact fees or development charges require up-front payments often totaling tens of thousands of dollars. The difference is crucial for housing affordability: since development charges increase the cost of new housing, sellers of existing homes can get a windfall by raising the price of their houses by an amount equal to those charges, thus reducing the general level of housing affordability.

Increasing land and housing costs make other things more expensive as well. When housing is more expensive, for example, businesses must pay their employees more so that workers can afford to live in the region.

A 2002 study broke down the difference in the costs of a new home in San Jose, which has had an urban-growth boundary since 1974, and Dallas, which has zoning but whose suburbs remain, like Houston's, almost completely unregulated. Some of the key findings were as follows:

- The biggest difference was in land costs: A 7,000-square-foot lot in Dallas cost only \$29,000, while a 2,400-square-foot lot in San Jose cost \$232,000.
- San Jose's lengthy permitting process (and the high risk that a permit will never be issued) added \$100,000 to the cost of a home in San Jose, while permitting cost less than \$10,000 per home in Dallas.
- To help pay for roads, schools, and other services, San Jose charged impact fees of \$29,000 per new residence, whereas Dallas charged only \$5,000.
- Due mainly to high housing prices for workers, San Jose construction labor costs are higher: \$143,000 for a three-bedroom house compared with \$100,000 in Dallas.<sup>33</sup>

When planners make housing unaffordable, their first response is to impose "affordability mandates" on builders. Typically, such regulations require builders to sell 15 to 20 percent of their homes below cost to low-

income buyers. Far from making housing more affordable, such mandates make it less affordable as builders build fewer homes and pass the costs on to the buyers of the other 80 to 85 percent of homes. This in turn raises the general price of housing in the region. One econometric analysis found that such affordability mandates increased housing prices by 20 percent.<sup>34</sup>

Land-use regulation can affect prices in other ways as well. A wide range of homebuilders compete for business in relatively unregulated markets, ranging from small companies that produce only a few homes each year, to medium-sized companies that produce a few hundred homes per year, to giant national companies that build thousands of homes in many different states. Excessive regulation tends to put the small companies out of business and discourage the national companies as well. The resulting loss of competition helps keep home prices high. Portland, Oregon's, "urban-growth boundary has really been our friend," says one mid-sized Portland homebuilder. "It has kept the major builders out of the market."<sup>35</sup>

Given that both demand and supply in regulated regions are inelastic, small changes in either one can result in large changes in price. If lower interest rates increase demand for housing, Houston-area homebuilders respond by building more homes; San Francisco-area builders respond by filing more applications, which may wait several years for approval. If government purchase of a large block of land for a park or open space restricts supply, Houston-area builders can simply go somewhere else nearby; in the San Francisco area, the nearest alternative building location is more than 50 miles away.

Notice that inelastic supply not only makes housing prices rapidly increase with small increases in demand; it also makes housing prices rapidly fall with small decreases in demand. This is exacerbated by lengthy permitting periods that can put homebuilders out of phase with the market. Thus, land-use restrictions create conditions ripe for housing bubbles.

**When planners make housing unaffordable, their first response is to require developers to sell some of their homes to low-income families.**

Supply and demand charts only go so far in explaining bubbles. The recent bubble was probably exacerbated as much by money fleeing the post-dot-com bubble stock market than by loose credit. Investors looking for safe places to put their money quickly noted that housing prices were increasing at double-digit rates in California, Florida, and other places with growth management policies. At this point, home sales were driven by speculation as much as by the need for shelter.

For example, because of the dot-com crash, San Jose lost 17 percent of its jobs between 2001 and 2004. In the same period, office vacancy rates increased from 3 to 30 percent.<sup>36</sup> Yet, between the beginning of 2001 and the end of 2004, home prices increased by more than 20 percent.

This rise in prices in the face of declining demand can be attributed to speculation—that is, people buying homes as sources of income rather than for shelter. Even those who are buying for shelter will pay more for a house than its fundamental value (as measured by rents) if they believe, as the National Association of Realtors claims, that it is a safe investment. So the sharp rises in price caused by growth management turn into sharper rises caused by people seeing housing as an investment.

Houston and the San Francisco Bay Area are at the extremes of a continuum between almost no regulation and highly intrusive land-use regulation. Within that continuum, there appear to be five ways in which growth management can influence housing prices:

First, as of 2000, when housing prices were beginning to bubble, 12 states had passed growth-management or smart-growth laws, including Arizona, California, Connecticut, Florida, Hawaii, Maryland, New Jersey, Oregon, Rhode Island, Tennessee, Vermont, and Washington.<sup>37</sup> Those laws generally require all municipalities to write and follow growth-management plans. In a few cases, the plans are written by the state itself.

Second, most New England states have largely abandoned the county level of government. This effectively gives cities growth-

management authority over the countryside around them.

Third, Nevada is a unique case where nearly all of the land in the state is owned by the federal government. The rapid growth of Las Vegas and Reno have been enabled by federal land sales, but concerns over environmental issues slowed such sales after 2000 and led to rising prices. Moreover, under the Southern Nevada Public Land Management Act of 1998, most of the revenue from land sales in Clark County (Las Vegas) is dedicated to buying open space and other amenities.<sup>38</sup> Since then, nearly half the revenues from land sales have been used to buy parklands, effectively requiring developers to buy two acres from the federal government to net one more acre of developable land.<sup>39</sup> In effect, Nevada growth management is regulated at the federal level.

Fourth, some counties or urban areas implemented growth-management plans without state mandates. Prominent examples include Denver-Boulder; Minneapolis-St. Paul; Missoula, Montana; and Charleston, South Carolina. This can produce local bubbles that are sometimes obscured when examining data at the state level.

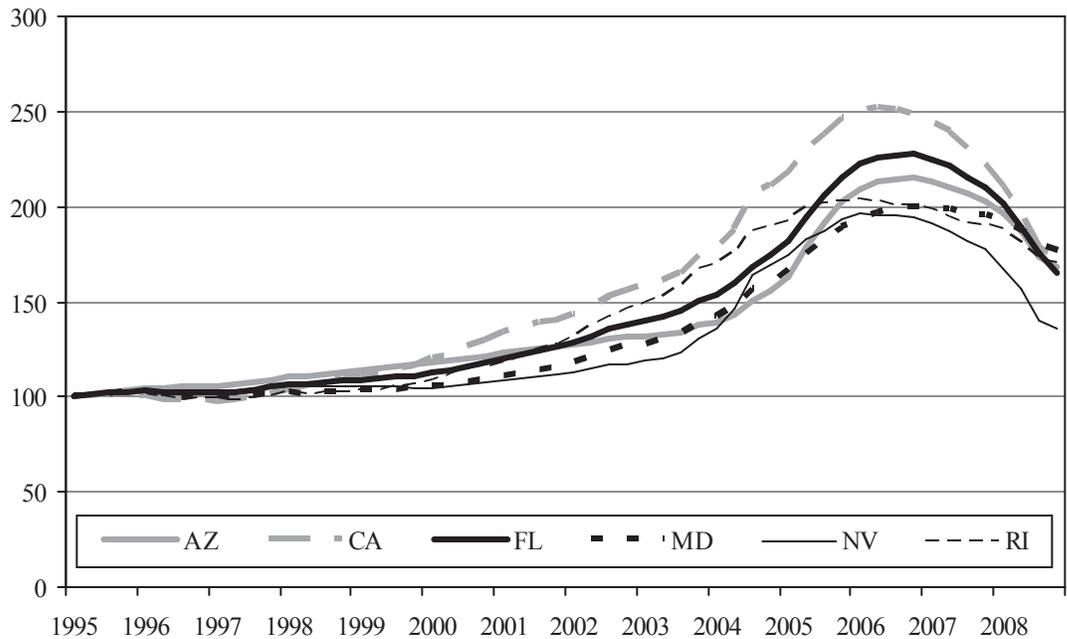
Fifth, and finally, some major urban areas may not have coordinated growth-management plans, yet they are hemmed in by state or local areas that do have such plans. Washington, DC, has no growth-management plan, but Maryland has a statewide growth-management law and selected counties in northern Virginia have also begun to practice growth management. New York has no state growth-management law, and prices in upstate New York did not bubble. But New York City prices bubbled, partly because it is hemmed in by Connecticut and New Jersey. Table 1 shows which form of growth management, if any, affects housing in each state.

## State Housing Bubbles

A careful examination of home price data for the 50 states and 384 metropolitan areas reveals strong correlations between growth-

**A 1998 federal law dedicates half the revenues from federal land sales in southern Nevada to land preservation, so developers have to buy two acres to net one developable acre.**

**Figure 3  
State Housing Bubbles**



Source: Federal Housing Finance Agency, fourth quarter 2008 data for individual states, [tinyurl.com/cb72o7](http://tinyurl.com/cb72o7).  
 Note: Price indices for the states with the biggest housing bubbles, with home prices in the first quarter of 1995 set to 100.

management planning and housing bubbles. The home price indices used in this and other figures are published by the Federal Housing Finance Agency (formerly the Office of Federal Housing Enterprise Oversight) and are based on the Case-Schiller method of comparing changes in prices of same-home sales over time.<sup>40</sup>

On a state level, the biggest housing bubbles were in six states. Five of the states—Arizona, California, Florida, Maryland, and Rhode Island—have growth-management laws, while the sixth state, Nevada (Figure 3), does not.<sup>41</sup> In all of these states, inflation-adjusted prices rose by 80 to 125 percent after 2000 and dropped by 10 to 30 percent after their peak.<sup>42</sup> Even though several of these states are located at opposite corners of the country, the price indices are very similar.

Prices in all but one of the other states with growth-management laws, including the New England states, also increased by 50 to 100 percent after 2000 and have declined since

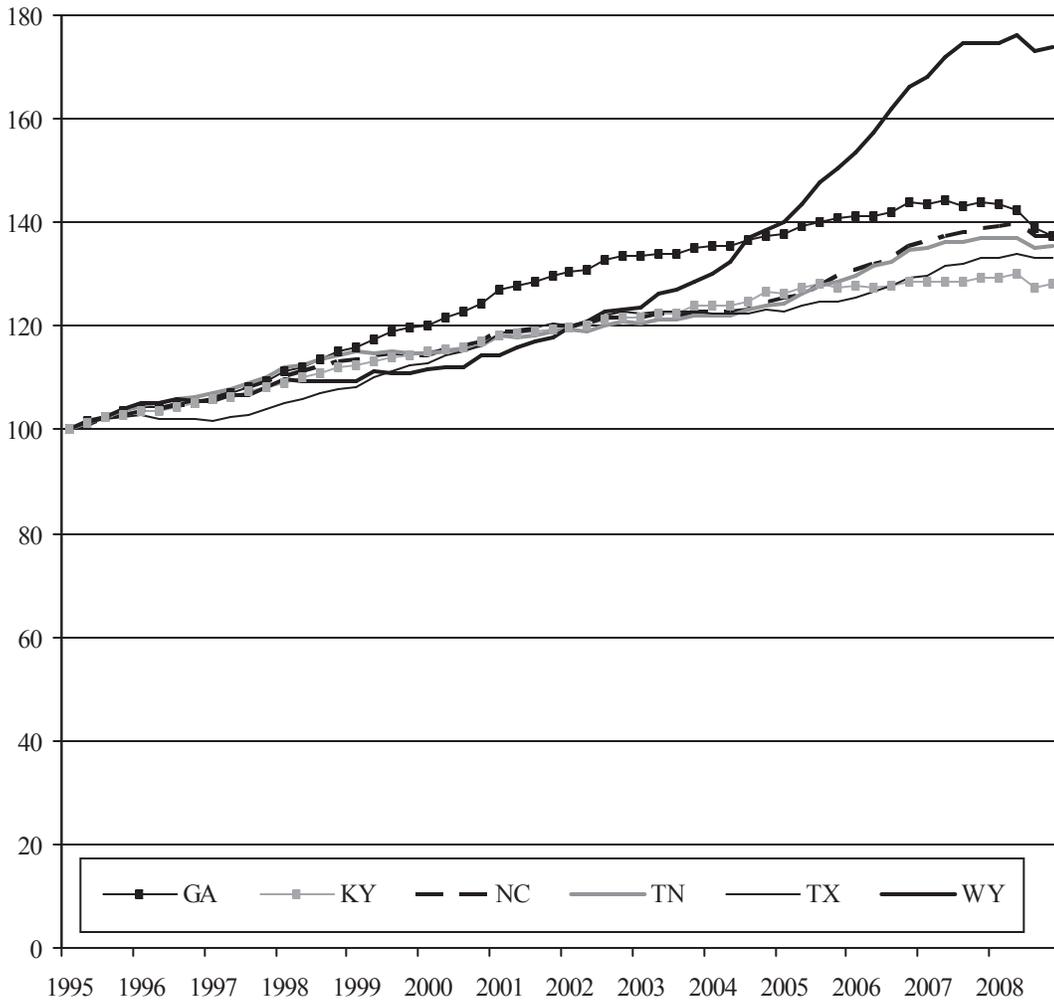
2006, in most cases by 5 to 15 percent. The exception is Tennessee, whose price trends are nearly identical to those in Georgia and Texas (Figure 4). Tennessee housing did not bubble because its law was passed in 1998 and the urban-growth boundaries drawn by the cities were so large that they did not immediately constrain homebuilders.

In contrast, Figure 4 shows housing prices in Tennessee and several fast-growing states with no growth-management laws. Notice that the price indices appear very similar to one another but are very different from those in Figure 3.

Wyoming stands out as a state in which prices grew rapidly after 2004 and have not significantly declined. This is because the state’s economy is closely tied to fossil fuel extraction, and home prices began to grow rapidly when oil prices rose in 2004. Apparently, newcomers didn’t trust oil prices to remain high for long enough to justify building new homes. Cyclical housing prices are

**Housing prices bubbled in 16 states, virtually all of which have some form of growth management.**

**Figure 4**  
**States without Bubbles**



Source: Federal Housing Finance Agency, fourth quarter 2008 data for individual states, [tinyurl.com/cb72o7](http://tinyurl.com/cb72o7).  
 Note: Price indices for states with no bubbles. Wyoming prices were boosted after 2004 because of increased oil prices. The short-term nature of such oil booms prevented newcomers from building new homes.

typical of energy-related boom-bust economies, and it is just a coincidence that this boom vaguely paralleled housing bubbles elsewhere.

Altogether, housing prices bubbled in 16 states, meaning inflation-adjusted prices grew by at least 45 percent after the beginning of 2000 and then fell by at least 5 percent after peaking (see Table 1). These 16 states housed 45 percent of the population in 2008.<sup>43</sup> Virtually all of these states have some

form of growth management, though in some cases, such as Minnesota, it is practiced only by major urban areas in the state.

Housing prices did not bubble—meaning that prices grew by less than 45 percent after 2000—in 29 states housing nearly 54 percent of the nation. Other than Tennessee, none of these states have statewide growth management, but a few, such as Colorado and Wisconsin, contain urban areas that have written growth-management plans. The only no-

**Prices did not bubble in 29 states, only one of which has a state growth-management law.**

**Table 1**  
**State Housing Bubbles and Land-Use Regulation**

State	Price Gain	Price Decline	Bubble?	Regulation
Dist. of Columbia	145.8%	-9.3%	Yes	HI
California	124.3%	-31.2%	Yes	GM
Florida	107.7%	-27.4%	Yes	GM
Hawaii	96.2%	-8.5%	Yes	GM
Rhode Island	96.0%	-16.1%	Yes	GM
Maryland	93.8%	-11.6%	Yes	GM
Arizona	87.1%	-21.6%	Yes	GM
Nevada	86.7%	-30.8%	Yes	FL
New Jersey	83.7%	-10.0%	Yes	GM
Virginia	77.7%	-8.4%	Yes	UA
New York	72.1%	-7.7%	Yes	HI
New Hampshire	70.8%	-11.4%	Yes	NE
Massachusetts	70.5%	-14.1%	Yes	NE
Delaware	64.8%	-7.3%	Yes	HI
Vermont	61.9%	-2.5%	Ambiguous	GM
Maine	60.9%	-4.4%	Ambiguous	GM
Washington	59.2%	-5.7%	Yes	GM
Wyoming	58.4%	-1.3%	Ambiguous	NG
Connecticut	58.2%	-8.6%	Yes	NE
Oregon	55.5%	-6.7%	Yes	GM
Montana	54.4%	-1.7%	Ambiguous	UA
Minnesota	49.3%	-10.2%	Yes	UA
Idaho	45.5%	-3.8%	Ambiguous	UA
Pennsylvania	44.1%	-3.0%	No	UA
New Mexico	39.0%	-3.9%	No	UA
Alaska	38.6%	-3.6%	No	NG
Illinois	35.1%	-5.8%	No	UA
Utah	32.9%	-5.0%	No	UA
North Dakota	30.6%	0.0%	No	NG
Louisiana	30.5%	-1.8%	No	NG
Wisconsin	27.0%	-3.8%	No	UA
Colorado	26.1%	-3.3%	No	UA
South Carolina	25.9%	-2.0%	No	NG
South Dakota	24.8%	0.0%	No	NG
Missouri	24.6%	-3.1%	No	NG
Georgia	22.7%	-4.8%	No	NG
West Virginia	22.1%	-3.2%	No	NG
North Carolina	22.1%	-1.4%	No	NG
Alabama	21.8%	-0.8%	No	NG
Texas	21.5%	-0.4%	No	NG
Arkansas	20.4%	-2.3%	No	NG
Oklahoma	20.3%	-1.8%	No	NG
Mississippi	20.2%	-2.0%	No	NG
Tennessee	19.4%	-1.3%	No	GM

Table 1 *Continued*

State	Price Gain	Price Decline	Bubble?	Regulation
Michigan	15.7%	-19.4%	No	NG
Kansas	15.4%	-2.2%	No	NG
Kentucky	14.6%	-1.3%	No	NG
Iowa	13.2%	-1.7%	No	NG
Nebraska	9.7%	-4.4%	No	NG
Ohio	9.0%	-9.4%	No	NG
Indiana	6.5%	-4.8%	No	NG

Notes: States are listed in descending order of price gain, that is, the increase in home prices from the first quarter of 2000 to the peak; price decline is the decrease in prices from the peak to the second quarter of 2008. States that gained less than 75 percent are classified “no”; the remaining states are “ambiguous.” Regulatory status is: FL=state dominated by federal land; GM=mandatory state growth-management law; HI=urban areas hemmed in by other states with growth management; NE=New England (weak county governments); NG=no growth management; UA=selected urban areas practice growth management (including Denver and Boulder, CO; Boise, ID; Chicago, IL; Minneapolis–St. Paul, MN; Missoula and Whitefish, MT; Albuquerque and Santa Fe, NM; Philadelphia, PA; Charleston, SC; Salt Lake City, UT; northern Virginia; and Madison and Milwaukee, WI).

bubble states with significant price declines are Michigan and Ohio, and those declines are due to contractions in manufacturing, not a housing bubble.

The remaining five states, whose prices rose by more than 45 percent but shrank by less than 5 percent, are ambiguous. These states house less than 2 percent of the population and include one with a growth-management law (Vermont), one with no growth management (Wyoming), and three with controls in a few urban areas (Idaho, Maine, and Montana).<sup>44</sup>

There is a strong correlation between foreclosure rates and growth-management-induced housing bubbles. As of January 2009, one out of every 173 homes in California was in foreclosure. The rate in Arizona was 1 in 182; Florida was 1 in 214; Nevada was 1 in 76; and Oregon was 1 in 357—all of which are worse than Michigan (1 in 400), despite the latter having the nation’s highest unemployment rate. By comparison, barely 1 in 1,000 Texas homes was in foreclosure. The rate in Georgia was 1 in 400, North Carolina was 1 in 1,700, and Kentucky was 1 in 2,800. The correlation is not perfect, but the hardest-hit states all have some form of growth-management planning.<sup>45</sup>

## Metropolitan Area Housing Bubbles

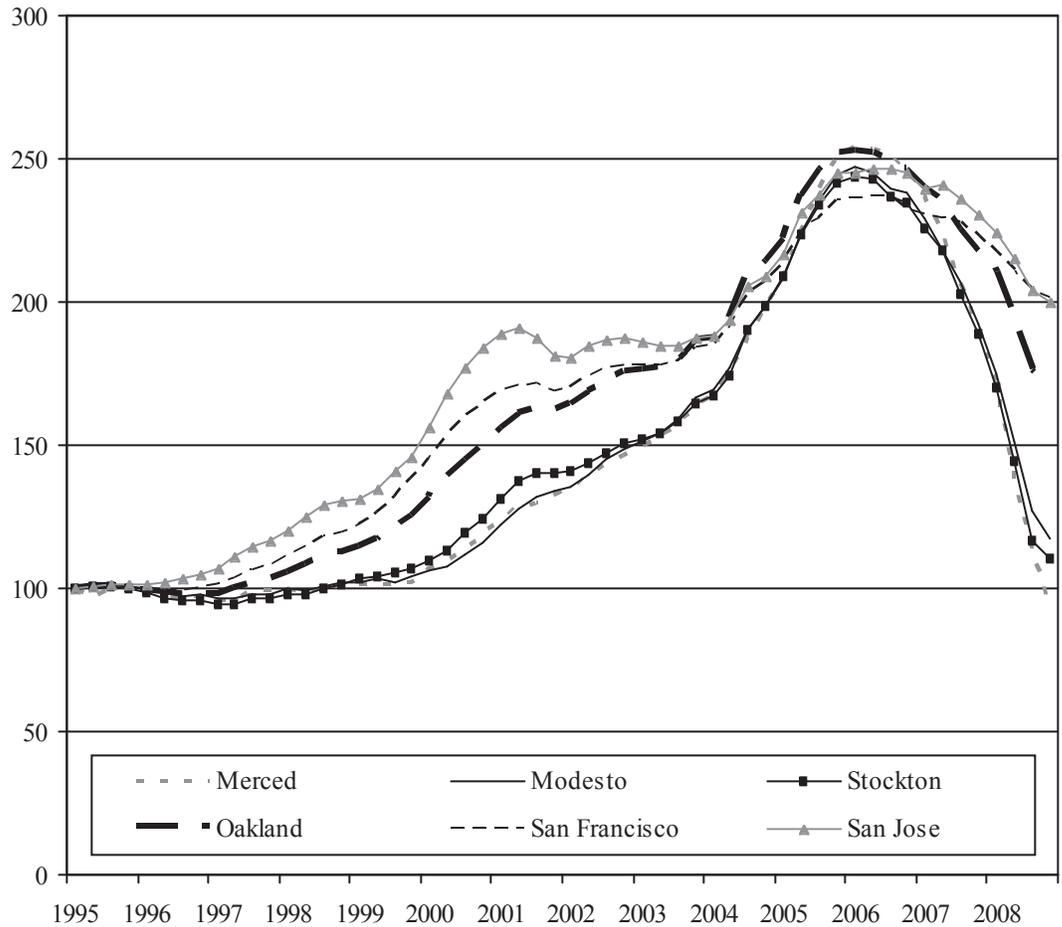
Figure 5 shows home price trends in the San Francisco Bay area and the Merced, Modesto, and Stockton metropolitan areas in central California. The latter areas enjoyed some of the biggest price increases after 2000 and suffered the largest price declines since the top of the housing bubble.<sup>46</sup>

In 1963, the California legislature passed a law effectively (though unintentionally) authorizing cities and counties to do growth-management planning.<sup>47</sup> The counties in the San Francisco Bay Area used this law to impose urban-growth boundaries in the mid 1970s. This made Bay Area housing some of the most expensive in the nation, and by the 1990s, increasing numbers of Bay Area workers were buying homes in relatively affordable central California, some 50 to 80 miles away.

Central California counties were less prone to adopt strict growth-management plans. But in 2000, the California legislature amended the law to mandate growth-management planning by all cities and counties. This new mandate, combined with the overflow from the Bay Area, caused central

**There is a strong correlation between foreclosure rates and growth-management-induced housing bubbles.**

**Figure 5  
Central California and Bay Area Housing Bubbles**



Source: Federal Housing Finance Agency, fourth quarter 2008 data for metropolitan statistical areas, tinyurl.com/dkr3gg.

Note: Price indices for Merced, Modesto, and Stockton.

**Between 2000 and 2008, the Atlanta, Dallas-Ft. Worth, and Houston metro populations each grew by more than 125,000 per year without experiencing housing bubbles.**

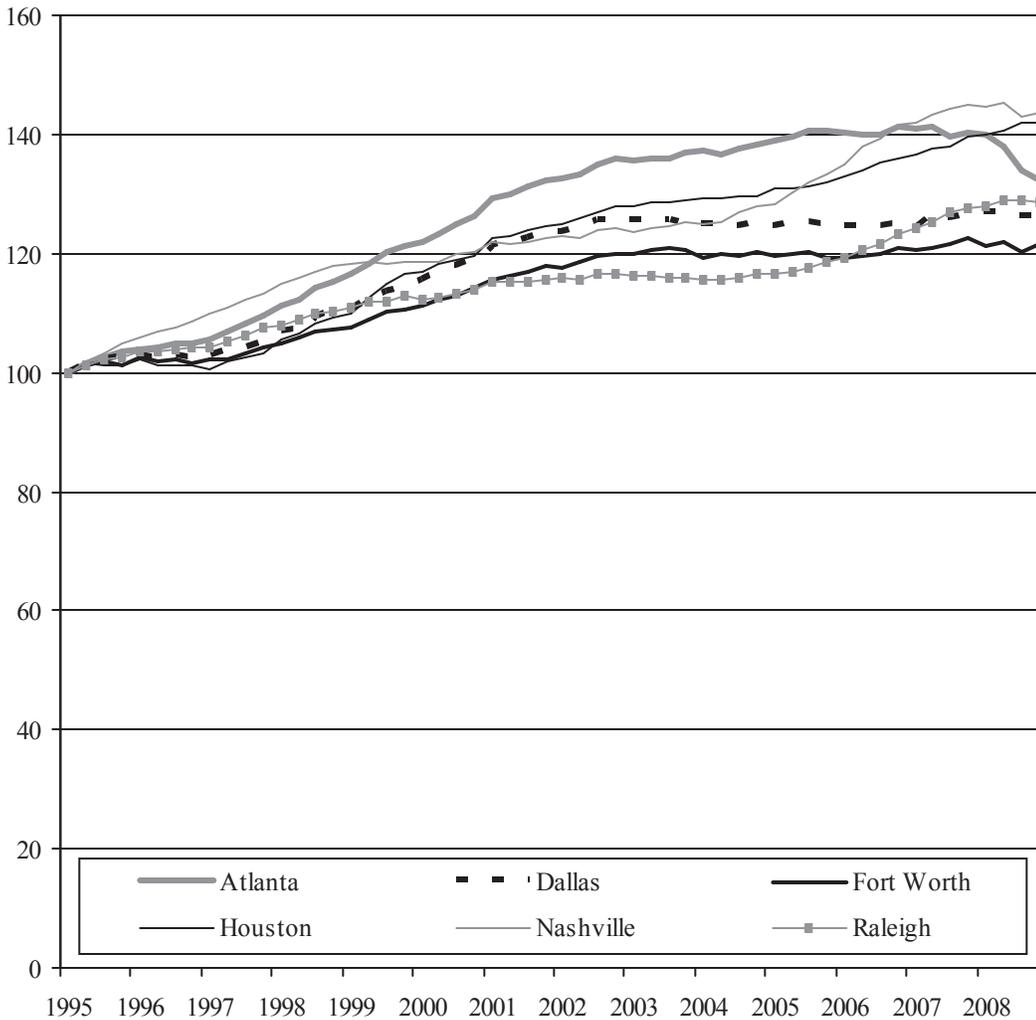
California home prices to bubble with special vigor, with prices rising during the boom and falling during the bust by more, on a percentage basis, than anywhere else in the country.

Although prices certainly bubbled in the San Francisco Bay Area, the bubble was not as severe. This illustrates a “first-in, last-out” phenomenon: since housing in the Central Valley, with its 80-mile-one-way commutes to jobs in San Francisco and San Jose, was less desirable to begin with, it experienced greater price declines than in the cities where the best jobs were located.

In contrast, Figure 6 tracks housing prices in the Atlanta, Dallas, Ft. Worth, Houston, Nashville, and Raleigh metropolitan areas. Although a very slight increase in price growth can be discerned in late 1997, prices did not significantly bubble upwards, nor has there been a significant decline in prices in recent years (although Atlanta prices fell by 0.7 percent in the second quarter of 2008).

The lack of a housing bubble in those metro areas is not because they are unpopular places to live. In fact, between 2000 and 2008, the Atlanta, Dallas-Ft. Worth, and Houston metro area populations each grew

**Figure 6**  
**Metropolitan Areas with No Bubbles**



Source: Federal Housing Finance Agency, fourth quarter 2008 data for metropolitan statistical areas, [tinyurl.com/dkr3gg](http://tinyurl.com/dkr3gg).

Note: Price indices for Atlanta, Dallas, Ft. Worth, and Houston.

by more than 120,000 people per year. Along with Nashville and Raleigh, these regions are all growing faster than 2 percent per year. By comparison, the San Francisco Bay area (the combined Oakland, San Francisco, and San Jose metro areas) grew by less than 20,000 people (0.4 percent) per year and central California (the combined Merced, Modesto, and Stockton metro areas) grew by less than 30,000 people (1.9 percent) per year.<sup>48</sup>

Atlanta, Dallas-Ft. Worth, and Houston were just as influenced by low interest rates,

predatory lenders, and other changes in the credit market as Merced, Modesto, and Stockton. It may be that changing credit rules are responsible for the slight increase in the growth of housing prices after 1997. The trend lines in Figures 4 and 6 are likely what would have happened all over the country were it not for governmental restraints on new home construction.

Almost all other housing bubbles were in urban areas hemmed in by states with growth-management laws. New York State has no

**The trend lines in Figures 4 and 6 are likely what would have happened throughout the country were it not for governmental restraints on new home construction.**

**French economist Vincent Benard says that land-use regulations “appeared to be, by far, the main factor explaining” the housing bubble in France.**

such law, and most of its urban areas did not experience bubbles. But New York City and its immediate suburbs (Poughkeepsie, Nassau-Suffolk) did, as their expansion is partly controlled by Connecticut and New Jersey. Similarly, Washington, DC, is bordered by Maryland, which has a state growth-management law, and Virginia, whose northern counties have imposed large-lot zoning to prevent urban expansion into rural areas.

Bubbles—prices growing more than 45 percent and then declining more than 5 percent—took place in 115, or 30 percent, of the nation’s 384 metro areas. Those areas house 46 percent of the metropolitan population.<sup>49</sup> All but a handful of these were in states that were subject to some form of growth management. The few that were not, such as Myrtle Beach, South Carolina, and Wilmington, North Carolina, may have had some local growth-management programs.<sup>50</sup>

No-bubble metro areas numbered 245 and include 50 percent of metro area residents. Only a handful of these, such as Salem and Corvallis, Oregon, and Longview, Washington, were in states that had some form of growth management. Most regions that saw prices decline by more than 10 percent are in Michigan, and this is due to the auto industries’ troubles, not to a housing bubble.

The remaining 24 urban areas are in the ambiguous category and include a mixture of areas with and without growth management. Prices in growth-managed Charleston, South Carolina, and Missoula, Montana, for example, increased more than 50 percent but only declined by a little more than 4 percent. Larger declines are likely in those areas before the market bottoms out. On the other hand, prices in unregulated Casper, Wyoming, and Midland, Texas, grew by around 70 percent and have hardly declined. Those cities’ economies are based on fossil fuel production, which stepped up after 2004 with the increase in oil prices.

In short, there is a very close correlation between regions with growth-management planning and regions that have seen a major housing bubble. Without growth management, prices in a few parts of the country,

such as Casper and Midland, would have grown because of local factors; and prices in other parts, such as Michigan, would have declined because of local factors.

In most of the country, however, prices without growth management would have looked like those in Figures 4 or 6. There might have been some subprime mortgage defaults—particularly in Michigan—but there would have been no major housing bubbles, no credit crisis, no need for a bank bailout, and no worldwide recession.

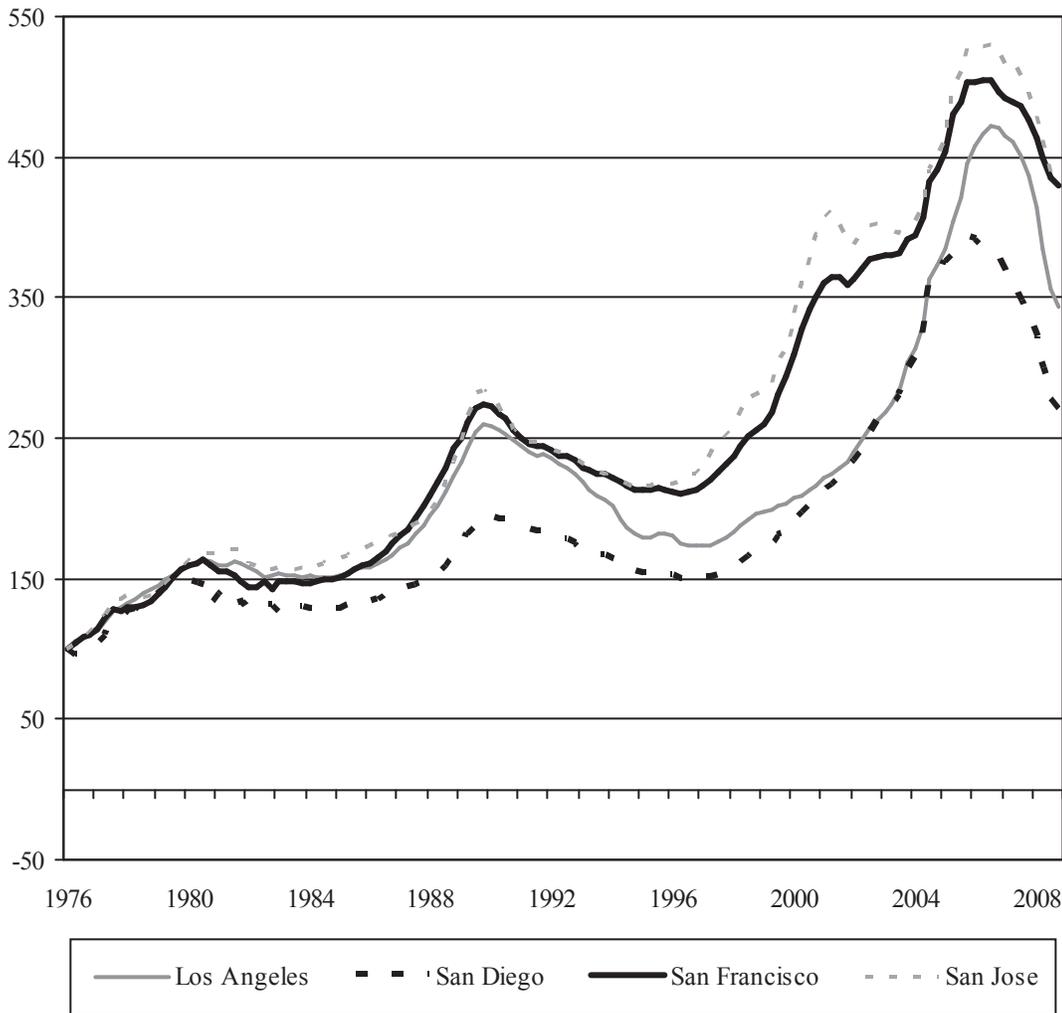
## **Housing Bubbles in Other Countries**

The United States is not the only country whose planners use growth-management tools, and it is not the only country to have a housing bubble. “Two thirds (by economic weight) of the world . . . has a potential housing bubble,” observed *The Economist* in 2004.<sup>51</sup> Great Britain has used growth management since 1947, and it underwent a severe housing bubble. Much of continental Europe, Australia, and New Zealand have similar land-use policies and also have had housing bubbles.

Vincent Benard, of l’Institut Hayek, observes that French land-use authorities write plans every 10 to 15 years. If there is a surge in demand between the rewrites, the plans may fail to have enough land available to accommodate new development. A six-year permitting process further contributes to long lags between new demand and the time homebuilders can meet that demand. As a result, land-use regulations “appeared to be, by far, the main factor explaining” the French housing bubble.<sup>52</sup>

Canada, like the United States, does not have a national land-use policy. But some urban areas, notably Vancouver and Toronto, practice growth management. These two regions have the most expensive housing in the nation, with a typical home in Vancouver costing four times as much as a similar home in Ottawa, the nation’s capital, and five times as much as a similar home in Montreal.<sup>53</sup>

**Figure 7  
California Housing Bubbles**



Source: Federal Housing Finance Agency, fourth quarter 2008 data for metropolitan statistical areas, [tinyurl.com/dkr3gg](http://tinyurl.com/dkr3gg).

Vancouver home prices peaked in 2007 and declined by 10 percent in 2008.<sup>54</sup>

In a recent survey of 227 housing markets around the world, former governor of the New Zealand Reserve Bank Donald Brash observes that “the affordability of housing is overwhelmingly a function of just one thing, the extent to which governments place artificial restrictions on the supply of residential land.”<sup>55</sup> Using the same data, Wendell Cox shows that “one of the most important factors” in the mortgage meltdown around the world has

been “the role of excessive land-use regulations in exacerbating the extent of losses.”<sup>56</sup>

### Housing Bubbles in the Past

Growth management was a necessary condition for most or all of the housing bubbles American communities have seen in the last decade. Beyond that, growth management was part of several housing bubbles well before 2000. Those bubbles took place before the

**“The affordability of housing,” says former New Zealand central banker, “is a function of the extent to which governments place artificial restrictions on the supply of residential land.”**

**Land-use restrictions not only make housing unaffordable, they make prices more volatile.**

loosening of credit that many claim caused the recent bubble. The difference between earlier bubbles and the recent one is that fewer states were practicing growth management in earlier decades, and so a much smaller share of American housing suffered from such bubbles.

Figure 7 shows two earlier bubbles in the Los Angeles, San Diego, San Jose, and San Francisco metropolitan areas. The first was when prices grew in the late 1970s in response to the original imposition of urban-growth boundaries. Prices fell in the early 1980s. Then prices bubbled again, peaking in 1990 and crashing again through 1995. Silicon Valley suffered a small bubble that peaked in 2001, but this was really just a part of the most recent bubble.

Again, there is a close correlation between bubbles and growth management. The bubble that peaked in 1980 took place in California, Hawaii, Oregon, and Vermont—the only states that were practicing growth management in the 1970s. By the 1980s, several New England states and a few urban areas, including Seattle, began practicing growth management, and they joined in the bubble that peaked in 1990. Few, if any, states or urban areas that were not practicing growth management had housing bubbles before 2000.

Foreign countries that practice growth management have also had previous bubbles. Norway, Sweden, and Finland had property bubbles that peaked in 1990 and were severe enough to send virtually all of the nations' banks into bankruptcy.<sup>57</sup> Japanese policies aimed at preventing the development of rural land included 150 percent capital gains taxes on short-term property gains.<sup>58</sup> The resulting property bubble and inevitable collapse led to a decade-long recession.

Several studies have tied volatility to land-use regulation. A 2005 economic analysis of the housing market in Great Britain, which has practiced growth management since 1947, found that planning makes housing markets more volatile. "By ignoring the role of supply in determining house prices," the report says, "planners have created a system that has led not only to higher house prices but also to a highly volatile housing market."<sup>59</sup>

Economists Edward Glaeser and Joseph Gyourko have found similar results in the United States. Land-use rules that restrict "housing supply lead to greater volatility in housing prices," they say, adding that, "if an area has a \$10,000 increase in housing prices during one period, relative to national and regional trends, that area will lose \$3,300 in housing value over the next five-year period."<sup>60</sup> Both the Great Britain and the Glaeser-Gyourko studies were based on data preceding the current housing bubble.

## Responding to Unaffordability

Because prices do not decline as much in crashes as they increase in booms, successive bubbles can make housing grotesquely unaffordable. In 1969, the nation's least-affordable metropolitan area, with a median-home-value-to-median-family-income ratio of 3.2, was Honolulu, mainly because of Hawaii's 1961 growth-management law. As previously noted, most other metropolitan areas had ratios of 1.5 to 2.5.

By 1979, after Oregon and California had implemented growth management plans, the Honolulu value-to-income ratio was 5.5, at which point it became virtually impossible for a median family to get a mortgage on a median home given the terms typical of the day. In much of California, 1979 value-to-income ratios were between 4 and 5, while they had reached 3.2 (Honolulu's 1969 ratio) in some Oregon communities.

Despite the decline in real California and Hawaii home prices in the early 1980s, the late-1980s bubble pushed California value-to-income ratios to as high as 6.7 in San Francisco (compared with 6.2 in Honolulu) and well above 4 in much of the rest of California. This bubble also pushed prices in Boston, New York, and nearby metro areas above 4. Oregon, which suffered a greater recession in the early 1980s than most states, did not have a late-1980s bubble.

Prices in California, Hawaii, and the Northeast crashed in the early 1990s, but by 1999

value-to-income ratios had recovered and were poised for another leap. By 2006, price-to-income ratios throughout California and Hawaii ranged from 5 to as high as 11.5. In response to growth-management plans written in the mid- to late-1990s, value-to-income ratios in Arizona, Florida, Maryland, and Washington ranged from 3 to 5.5.

The pattern is clear: each successive bubble pushes value-to-income ratios further away from the natural ratio of about 2.0. Even at the bottom of the cycle in 1995, many California value-to-income ratios were well above 5, meaning that housing was still unaffordable despite the crash of the early 1990s.

Much media attention has focused on the Community Reinvestment Act of 1977 and its role in encouraging banks to make risky loans to low-income families. Just as important is how the Department of Housing and Urban Development responded to the growing housing affordability crisis by encouraging banks to loosen their criteria for making loans to *moderate-income* families that were priced out of housing markets by growth-management planning.

In 1992, Congress gave the Department of Housing and Urban Development the responsibility for regulating Fannie Mae and Freddie Mac (collectively known as government-sponsored enterprises, or GSEs) to ensure that they did not engage in risky behavior. But this conflicted with HUD's primary mission, which "is to increase homeownership, support community development, and increase access to affordable housing free from discrimination."<sup>61</sup>

As successive HUD secretaries became aware of housing affordability problems in California and other parts of the country, they used their regulatory authority to order the GSEs to buy more loans from "low- and moderate-income families." Specifically, in 1995, Secretary Henry Cisneros ordered that at least 42 percent of the mortgages purchased by the GSEs had to be from low- and moderate-income families. In 2000, Secretary Andrew Cuomo increased this to 50 percent.<sup>62</sup> In 2004, Secretary Alphonso Jackson increased it yet again to 58 percent.<sup>63</sup>

One response to these rules was an increase in Fannie Mae and Freddie Mac purchases of subprime loans, meaning loans made to people with poor credit histories. But another response was to relax the loan criteria for prime loans, that is, loans to people with excellent credit histories who nonetheless had a hard time buying houses in unaffordable states like California. Before 1995, Fannie Mae and Freddie Mac would normally buy only 15- to 30-year mortgages with at least 10 percent down and monthly payments (plus insurance and property taxes) that were no more than about 33 percent of the homebuyer's income.

When brand-new starter homes cost \$110,000, as they do in Houston, a 10 percent down payment is not a formidable obstacle. When starter homes cost closer to \$400,000, as they did in the San Francisco Bay Area in the late-1990s, the obstacle is much greater. Value-to-income ratios of 5 and above require 40- to 50-year payment periods and/or mortgages that cost more than 33 percent of a family's income.

The result was that mortgage companies greatly reduced the criteria required to get loans. They no longer required 10 percent down payments. People could get loans for 40 and even 50 years. And borrowers could dedicate well over half their incomes to their mortgages. These changes allowed people to buy homes that were five or six times their incomes, but they also increased the risks of defaults even among supposedly prime borrowers.

Such regulatory actions would not have been necessary if growth management had not made a substantial portion of American housing unaffordable. While urban planners had nothing to do with credit default swaps or other derivatives, they are directly responsible for unaffordable housing and indirectly responsible for the government's loosening of credit standards in response to that unaffordability.

## Should Government Stabilize Home Prices?

When financial markets melted down in October 2008, several economists argued that

**By eliminating the requirement that homebuyers make at least a 10 percent down payment, Fannie Mae and Freddie Mac increased the risk of defaults.**

**Though some people want to stabilize housing prices, the reality is that housing remains much too expensive in virtually all of the bubble markets.**

the solution was to “stabilize home prices.”<sup>64</sup> In February 2009, President Obama announced a plan that aimed to “shore up housing prices” and “arrest this downward spiral.”<sup>65</sup> When potential homeowners refuse to buy homes until the market bottoms out, it is easy to see why some people might think that the problem with the nation’s housing markets is falling prices.

Yet the reality is that—in terms of median-home-price-to-median-income ratios—housing remains much too expensive in virtually all of the bubble markets. Such expensive housing puts hardships on consumers, and as Portland economist Randall Pozdena notes, those hardships fall hardest on poor, minority, and working-class families.<sup>66</sup> The benefits gained by homesellers who earn windfall profits because of artificial housing shortages are unfair because existing homeowners tend to be wealthier than first-time home buyers. Moreover, those benefits do not entirely offset the costs, some of which, such as the cost of an onerous permitting process, are simply deadweight losses to society.

Furthermore, housing is only one symptom of the problems created by growth-management policies. Such policies impose the same sorts of hardships on businesses that need land and structures for offices, factories, stores, and other purposes.

Glaeser and Gyourko agree that an effort to stabilize housing prices is a bad idea. They point out that most of the tools government would use to support housing prices, such as

reduced interest rates or more favorable loans, would be extremely costly yet have only marginal and uncertain effects on housing. “This is a bad combination,” they dryly observe.<sup>67</sup>

The biggest reason to oppose price stabilization is that it contradicts other government policies. “Housing affordability has long been a stated goal of the federal government,” Glaeser and Gyourko point out. “Why should it now try to make it more difficult for people to buy, or rent, a home by supporting prices?”<sup>68</sup> The real problem, they add, “is not the price decline but the previous price explosion.”<sup>69</sup>

Of course, the reason housing prices are high in most areas that suffered housing bubbles is because of explicit government policies aimed at discouraging construction of new single-family homes. Rightly or wrongly, high housing prices serve this agenda, so government efforts to promote homeownership are undermined by other government efforts to discourage it.

As an alternative, “home prices must get back to pre-bubble levels,” suggests Harvard economist Martin Feldstein. But, he adds, “Congress should enact policies to reduce defaults that could drive prices down much further.”<sup>70</sup> Yet such policies carry the same perils as efforts to stabilize prices—especially since pre-bubble prices in several states and urban areas were already well above normal value-to-income ratios.

Table 2 shows value-to-income ratios by state in 1999, when the bubble was in an incip-

**Table 2  
Median Home Value to Median Family Income Ratios**

State	1999	2006	2008
Alabama	1.8	2.1	2.2
Alaska	2.3	3.1	3.2
Arizona	2.3	4.4	3.4
Arkansas	1.7	2.1	2.1
California	3.8	8.3	5.5
Colorado	2.9	3.7	3.5
Connecticut	2.5	3.7	3.5
Delaware	2.2	3.5	3.5
Dist. of Columbia	3.3	7.3	6.3

**Table 2 Continued**

State	1999	2006	2008
Florida	2.0	4.2	3.0
Georgia	2.0	2.5	2.4
Hawaii	4.4	8.7	7.8
Idaho	2.3	4.2	4.2
Illinois	1.8	2.2	2.2
Indiana	1.7	1.8	1.8
Iowa	2.3	2.4	2.4
Kansas	1.6	1.9	1.9
Kentucky	1.9	2.2	2.2
Louisiana	1.9	2.4	2.4
Maine	2.1	3.2	3.2
Maryland	2.3	4.3	3.7
Massachusetts	3.0	4.8	4.1
Michigan	2.1	2.4	2.1
Minnesota	2.1	3.1	2.7
Mississippi	1.7	2.2	2.1
Missouri	1.9	2.3	2.3
Montana	2.4	3.4	3.4
Nebraska	1.8	1.9	1.9
Nevada	2.6	5.0	3.3
New Hampshire	2.2	3.6	3.1
New Jersey	2.6	4.5	4.1
New Mexico	2.4	3.3	3.2
New York	2.9	4.9	4.3
North Carolina	2.1	2.5	2.6
North Dakota	1.6	1.8	1.9
Ohio	2.0	2.2	2.1
Oklahoma	1.7	1.9	2.0
Oregon	3.0	4.4	4.5
Pennsylvania	1.9	2.7	2.7
Rhode Island	2.5	4.7	3.8
South Carolina	1.9	2.3	2.4
South Dakota	1.7	2.0	2.1
Tennessee	2.0	2.4	2.5
Texas	1.7	2.0	2.1
Utah	2.8	3.6	3.8
Vermont	2.3	3.4	3.5
Virginia	2.2	3.8	3.4
Washington	3.0	4.6	4.4
West Virginia	1.8	2.0	2.1
Wisconsin	2.1	2.7	2.6
Wyoming	2.0	2.7	3.0

Source: 1999 home values and family incomes from the 2000 census. Median incomes for 2006 and 2008 from "Income Limits," Department of Housing and Urban Development, 2006 and 2008, [tinyurl.com/c7rjvp](http://tinyurl.com/c7rjvp). Home values for 2006 and 2008 were calculated from 1999 census values using home price indices from the Federal Housing Finance Agency, [tinyurl.com/cydm8h](http://tinyurl.com/cydm8h).

**Housing bubbles are due solely to supply problems, not to changes in housing demand.**

ient stage; 2006, when it reached its peak in many places; and the last quarter of 2008. In 1999, only 4 states had average value-to-income ratios of three or more, and only 1 state was greater than four. By 2006, home values in 24 states were three times incomes and 13 states were greater than four. As of the last quarter of 2008, values in 24 states were still at least three times median incomes and eight states were greater than four. So prices still have to fall to get back to 1999 levels of affordability, and in a few states they should fall even further to value-to-income ratios lower than three.

Planners argue that growth management helps preserve open space and reduces the amount of driving people need to do. Yet the share of U.S. land that would be protected from urbanization through denser housing is miniscule—probably less than 1 percent—and the effects of density on driving are also small.

The negative effects of growth management—on housing prices, on the costs of doing business, on congestion, and on personal liberty—are far greater than the benefits, most of which can be achieved in other ways at a far lower cost. Rather than prop up housing prices, then, the current recession is an excellent time to start the discussion of how housing prices in areas with growth management can be returned to normal, affordable levels.

### **Planners' Response**

Many urban planners steadfastly deny that their growth-management policies make housing more expensive. Instead, they claim that higher-priced housing is solely due to increased demand resulting from the quality-of-life improvements resulting from their policies. As Paul Danish, the city council member whose plans made Boulder, Colorado, housing less affordable than 90 percent of the other urban areas in the United States, says, Boulder housing prices are high solely because it is “a really desirable place to live,” while anywhere else with lower prices is “a really awful place to live.”<sup>71</sup>

In reality, housing bubbles are solely due to supply problems. When the supply of new homes is elastic, an increase in demand should not result in a significant increase in price. There are several reasons why supply may be inelastic, but most of them relate to land-use regulation or other government policies that keep land unavailable for housing. Preventing future housing bubbles and the economic instability they cause will require dismantling those growth-management policies.

Ironically, many planning advocates are using declining home prices as an argument in favor of more growth-management planning. They observe that most of the households in the high-density housing projects favored by smart-growth plans have no children, and that an increasing share of American households is childless. They therefore reason that the share of households that want single-family homes is about to decline drastically, and the recent drop in housing prices is a symptom of that decline.

A prime example is Arthur Nelson, an urban planning professor at the University of Utah, whose projection of 22 million “surplus” suburban homes by 2025 was cited in *Time* and *Atlantic Monthly*. That projection is based on a table in a paper by Nelson titled “Summary of Housing Preference Survey Results.” The table says that 38 percent of Americans prefer multi-family housing, 37 percent prefer homes on small (less than one-sixth acre) lots, and 25 percent prefer homes on large lots. A note to the table says it “is based on interpretations of surveys by Myers and Gearin (2001).”<sup>72</sup>

However, Myers and Gearin’s paper, which reviews surveys of housing preferences, hardly supports Nelson’s table. “Americans overwhelmingly prefer a single-family home on a large lot,” concludes one survey they cite. Others found that “83 percent of respondents in the 1999 National Association of Home Builders Smart Growth Survey prefer a single-family detached home in the suburbs”; “74 percent of respondents in the 1998 Vermonters Attitudes on Sprawl Survey preferred a home in an outlying area with a larger lot”; and “73 percent of the 1995 American Lives New

Urbanism Study respondents prefer suburban developments with large lots.”<sup>73</sup>

Indeed, the main point of Myers and Gearin’s article is not that most Americans want to live on small lots or in multifamily homes, but only that there is a contingent of Americans who do prefer such housing. “Some housing consumers actually prefer higher density,” they report.<sup>74</sup> They also speculate that people are more likely to join that group as they get older. However, their evidence for this is sketchy: surveys showing that older people are “receptive to decreased auto dependence.”<sup>75</sup> Being “receptive” is far from choosing to live in higher densities; the same Vermont survey that reported 74 percent of people want to live on a large lot found that 48 percent want to be within walking distance of stores and services.<sup>76</sup> These two preferences are incompatible, and most Americans have picked the large lot over walking distance to stores.

The information used by Nelson “may not be terribly reliable,” comments Emil Malizia, a planning professor at the University of North Carolina. “The samples are self-selected” he says, “the responses may be heavily influenced by the data collection method,” and “people often do not behave in ways that are consistent with the preferences or opinions they express.”<sup>77</sup>

So the claim that the nation will soon have a huge surplus of large-lot homes is based on, at best, a misinterpretation of the data. Nelson uses this misinterpretation to urge planners to design a new “template” for future development and redevelopment that focuses on higher densities and mixed-use developments.<sup>78</sup> In short, Nelson promotes his erroneous data to justify growth-management policies that will increase the scarcity of single-family homes despite the reality that these are the homes most Americans prefer.

## The Next Housing Bubble

The prime cause of the housing bubble that generated the recent financial crisis was over-regulation of land that created artificial short-

ages of housing. Over the last decade, housing prices have bubbled in almost every state and region that has attempted to regulate growth, while very few areas that haven’t practiced growth management have seen housing prices rise and crash. Prices have also bubbled in other countries with managed growth policies, as well as in past decades in the few states that attempted to manage growth before 1990.

Understanding that growth management caused the housing bubble that led to the recent economic crisis provides little help in solving the crisis. But it can help in preventing future housing bubbles and economic crises.

As previously noted, Tennessee passed a growth-management law in 1998 but did not experience a housing bubble. In the next economic boom, however, Tennessee is likely to join the bubble club. So will any other states that are persuaded by local chapters of the American Planning Association to pass similar laws. The APA has written “model statutes” for such planning as well as a guidebook to help planners generate “grassroots support” for laws that give them more power to manage growth.<sup>79</sup>

On top of this, the California legislature recently passed a bill mandating even stricter growth management on the unproven (and unlikely) premise that ever-denser housing will reduce greenhouse gas emissions.<sup>80</sup> This bill is regarded as a model for other states and some in Congress have proposed to incorporate some of its concepts into federal law.

If present trends continue, then, the next housing bubble is likely to affect an even greater percentage of American housing. It is also likely to push value-to-income ratios even higher, with ratios reaching 14 or 15 in the San Francisco Bay Area, 10 in much of the rest of California, and 6 or more in Florida and other states that experienced their first bubble in the last decade.

If problems with derivatives are fixed, the next housing bubble might not cause an international financial meltdown. Yet, as Edward Chancellor observes in *Devil Take the Hindmost*, “speculation demands continuing govern-

**Despite the relationship between growth management and housing bubbles, the American Planning Association is urging more states to pass such laws.**

**While low-cost housing markets maintain a diversity of incomes, lower- and middle-income people are migrating away from high-cost markets.**

ment restrictions, but inevitably it will break any chains and run amok.”<sup>81</sup> Even if the next bubble does not cause an international crisis, it will impose severe hardships on homebuyers, turn ordinarily stable regions into boom-bust economies, increase the costs to businesses, and greatly restrict personal choice and freedom.

It will also greatly transform urban areas, and not for the better. As Joel Kotkin has documented, while low-cost housing markets maintain a diversity of incomes, lower- and middle-income people are migrating away from San Francisco and other high-cost markets.<sup>82</sup> This is turning these places, says one demographer, into “Disneylands for yuppies.”<sup>83</sup> Some could argue that this helps to create a diverse array of communities, but the alternative view (as expressed by Glaeser) is that it makes the affected regions “less diverse” and turns them into “boutique cities catering only to a small, highly educated elite.”<sup>84</sup>

## Conclusions

Housing bubbles triggered the financial meltdown of 2008. Those bubbles did not result from low interest rates, changes in mortgage requirements, or other factors influencing demand. Instead, a necessary condition for their formation was supply shortages, most of which resulted from urban planners engaged in what they considered to be state-of-the-art growth-management planning. The United States is fortunate that they were able to practice these policies in only about 16 states, else the costs of the financial crisis would be even greater.

The best thing the government can do is allow home prices to fall to market levels. To do this, states and urban areas with growth-management laws and plans should repeal those laws and dismantle the programs that made housing expensive in the first place. This will obviously be easier to do in states like Florida, where value-to-income ratios have returned to affordable levels, than in California, where housing remains unafford-

able. But repealing California’s grotesque planning laws will probably help kick-start its economy, which in many respects is in even worse shape than Michigan’s.

States and regions that have been considering growth-management laws and plans should firmly reject them. Both Congress and the states should reject proposals to impose California-style policies aimed at creating more compact cities, supposedly to reduce driving and greenhouse gas emissions. The costs of such policies will be extremely high and their beneficial effects will be negligible.

Bubbles and credit crises happen too often as it is. Governments should not increase their frequencies and depths by creating artificial housing and real estate shortages.

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# Policy Analysis

No. 615

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Routing

## *Does Rail Transit Save Energy or Reduce Greenhouse Gas Emissions?*

by Randal O'Toole

### Executive Summary

Far from protecting the environment, most rail transit lines use more energy per passenger mile, and many generate more greenhouse gases, than the average passenger automobile. Rail transit provides no guarantee that a city will save energy or meet greenhouse gas targets.

While most rail transit uses less energy than buses, rail transit does not operate in a vacuum: transit agencies supplement it with extensive feeder bus operations. Those feeder buses tend to have low ridership, so they have high energy costs and greenhouse gas emissions per passenger mile. The result is that, when new rail transit lines open, the transit systems as a whole can end up consuming more energy, per passenger mile, than they did before.

Even where rail transit operations save a little energy, the construction of rail transit lines consumes huge amounts of energy and emits large volumes of greenhouse gases. In most cases, many decades of energy savings would be needed to repay the energy cost of construction.

Rail transit attempts to improve the environment by changing people's behavior so that they drive less. Such behavioral efforts have been far less successful than technical solutions to toxic air pollution and other environmental problems associated with automobiles.

Similarly, technical alternatives to rail transit can do far more to reduce energy use and CO<sub>2</sub> outputs than rail transit, at a far lower cost. Such alternatives include the following:

- Powering buses with hybrid-electric motors, biofuels, and—where it comes from nonfossil fuel sources—electricity;
- Concentrating bus service on heavily used routes and using smaller buses during off-peak periods and in areas with low demand for transit service;
- Building new roads, using variable toll systems, and coordinating traffic signals to relieve the highway congestion that wastes nearly 3 billion gallons of fuel each year;
- Encouraging people to purchase more fuel-efficient cars. Getting 1 percent of commuters to switch to hybrid-electric cars will cost less and do more to save energy than getting 1 percent to switch to public transit.

If oil is truly scarce, rising prices will lead people to buy more fuel-efficient cars. But states and locales that want to save even more energy and reduce greenhouse gas emissions will find the above alternatives far superior to rail transit.

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**Twentieth-century streetcar companies knew what many American cities have forgotten today: buses cost less, can run on faster schedules, and are more flexible than rail service.**

## Introduction

Once upon a time, so the story goes, evil automobile and oil companies bought up the nation's efficient streetcar lines and dismantled the trolley systems that commuters loved in order to force people to buy cars and gasoline instead.<sup>1</sup> The moral of this oft-repeated fairy tale is that we should unshackle ourselves from slavery to auto dependency and petrodominance by building modern light rail, streetcar, and other rail transit lines.

The truth is that the streetcar conspiracy is a complete myth that has been frequently debunked by academic researchers.<sup>2</sup> In 1933, General Motors and two oil companies did purchase National City Lines, which owned a number of transit companies, in order to sell their buses and diesel fuel, not to dismantle transit systems. In 1949, General Motors was convicted of conspiring to monopolize the bus market through its investments in transit companies, so it divested itself of National City.

In 1910, streetcars served 750 American cities. By 1966, all but six of these streetcar systems had been dismantled and replaced by buses.<sup>3</sup> General Motors and the oil companies had an interest in fewer than 25 streetcar companies at the time they converted to buses. In many cases, National City purchased the companies in the same year they stopped running streetcars, suggesting the decision had been made before National City made its investment.<sup>4</sup>

In short, the General Motors "conspiracy" was involved in less than 5 percent of the conversions from streetcars to buses. The other 95 percent knew something that many cities today have forgotten: bus service costs less to start, operate, and maintain; can run on schedules that are as fast or faster than light rail; and is more flexible than rail service.

Rail advocates have used the streetcar-conspiracy myth and other myths as a part of their campaign to persuade cities to build new rail transit lines. This effort has been remarkably successful: in the last 15 years alone, American cities have spent \$100 billion on new rail transit lines.<sup>5</sup>

Since 1980, 15 U.S. urban areas that were once served exclusively by bus transit have opened new light-rail lines. Light-rail lines are also under construction in at least two other regions, and in the planning stages in several more; and several other regions have opened or are planning commuter-rail lines that use existing tracks.

Rail advocates claimed that rail transit would cost little to build and operate, attract people out of their automobiles, relieve congestion, and restore inner cities. Although most transit agencies that built these lines claim they are successful, an objective look at the evidence reveals that these benefits are just as mythical as the streetcar conspiracy.

- A recent review of rail projects found that the average cost was 40 percent higher than the estimates made when the decision was made to build it.<sup>6</sup>
- The Government Accountability Office notes that bus rapid transit can cost as little as 2 percent as much to start, cost less to operate, and provide faster service than light rail.<sup>7</sup>
- A comparison of the cost of rail transit systems with the benefits provided by those systems found that, "with the single exception of BART in the San Francisco Bay area, every U.S. [rail] transit system actually reduces social welfare."<sup>8</sup>
- The cost of rail transit is so high that many transit agencies have been forced to raise fares and/or cut back on bus service, leading to actual losses in transit ridership in such regions as Baltimore, Los Angeles, and San Jose.<sup>9</sup>
- Even in regions where transit ridership has increased, those increases rarely keep up with increases in driving; so in almost every new rail region, transit carried a smaller share of passenger travel after rail service opened than before rail construction began.
- The American Public Transportation Association brags that ridership on light-rail transit is growing faster than any other form of transit.<sup>10</sup> But this is only because agencies are offering so much more

light-rail service. The average number of trips taken per light-rail vehicle mile declined from 7.3 in 1995 to 5.2 in 2005, indicating that light rail is suffering from a serious case of diminishing returns.

- Although Denver, Portland, San Jose, and other cities often claim that light rail stimulated economic development, such developments are almost always supported by large tax subsidies.<sup>11</sup> At best, the developments that result from rail transit are a zero-sum game, that is, they merely transfer developments that would have taken place anyway from one part of an urban area to another.<sup>12</sup>

One by one, all the original justifications for building rail transit have been discredited by the evidence. In response, rail advocates and transit agencies offer two new reasons for building rail lines: energy and global warming. Rail transit, they say, uses less energy and emits less greenhouse gases per passenger mile than buses, autos, or other forms of transportation. Cities that want to prepare for an age of scarce oil or limits on greenhouse gases, they argue, should build more rail lines.

Many people accept these statements without question. A recent National Public Radio story argued that “part of the solution (to global warming) is light rail.”<sup>13</sup> Portland, Oregon, has been named the nation’s “greenest city” mainly on the strength of the supposed reduction in greenhouse gases emitted by its light-rail lines.<sup>14</sup>

Is this a valid argument? Assuming we are running out of oil and/or that anthropogenic global warming is a real problem, is light rail, or any form of rail transit, an appropriate response? To answer this question, we can look at the effects of existing and new rail transit lines on energy consumption and greenhouse gas emissions in the cities that have built and maintained those lines.

## Data Sources

Data needed to calculate the energy efficiency and greenhouse gas emissions of rail

transit are available from a variety of federal agencies:

- The U.S. Department of Transportation’s *National Transit Database* shows fuel consumption by mode for most public transit operations.<sup>15</sup>
- The U.S. Department of Energy’s *Transportation Energy Data Book* provides factors for converting gasoline, diesel, kilowatt-hours, and other fuels into British Thermal Units.<sup>16</sup>
- The Energy Information Administration provides coefficients for estimating carbon dioxide (CO<sub>2</sub>) emissions by energy source.<sup>17</sup> It also provides data on the mix of energy sources used to produce electricity in each state.<sup>18</sup>
- For comparison, information about auto energy efficiency is available in the *Transportation Energy Data Book*.<sup>19</sup> Information about specific brands of autos is available from the Environmental Protection Agency’s new measure of fuel economy for 2008 automobiles.<sup>20</sup>

These data can be used to calculate energy use and emissions for most of the transit systems in the United States. However, there are a few limits. The *National Transit Database* only includes fuel numbers for transit lines that are directly operated by transit agencies. Agencies that contract out their operations to private companies such as Laidlaw or First Transit do not report the fuel those companies use. This means there are no results for many of the new commuter rail lines, including those in Dallas, Ft. Lauderdale, Los Angeles, San Diego, San Jose, Seattle, and the Washington, D.C., area.

Still, data are available for almost every heavy-rail system, most light-rail systems, and several commuter-rail systems, not to mention hundreds of bus systems and the handful of trolley buses, ferry systems, and other forms of transit that still operate. For each of these systems we can calculate BTUs and pounds of CO<sub>2</sub> emissions per passenger mile.

Calculations of CO<sub>2</sub> emissions by electrically powered transit are complicated by the fact that

**Now that all the original justifications for building rail transit have been discredited by the evidence, rail advocates offer two new reasons: energy and global warming.**

**On average,  
light rail uses as  
much energy per  
passenger mile  
as passenger  
automobiles.**

different sources of electricity are used in different regions of the country. Three-fourths of the electricity used in Washington state comes from hydroelectric dams, while all of the electricity used in Washington, D.C., comes from burning oil. The Energy Information Administration publishes an annual report showing the sources of electrical power by state.<sup>21</sup>

As used in this paper, *automobile* denotes four-wheeled passenger-carrying vehicles including *passenger cars* and *light trucks*. Light trucks, in turn, include pickups, sport utility vehicles, and vans.

*Light rail* includes self-powered rail transit cars that sometimes operate in their own exclusive rights of way and sometimes run in streets. *Heavy rail*, also known as subways or elevateds, always run in exclusive rights of way. *Commuter rail* usually consists of a locomotive pulling unpowered passenger cars on tracks that are often shared with freight trains. These tracks may cross streets at grade but usually do not operate in streets.

A number of rail lines that the *National Transit Database* classifies as light rail are actually *streetcars*, which tend to be smaller vehicles than light-rail cars, run on shorter routes, and run almost exclusively in streets. *Automated guideways*, sometimes called *people movers*, are self-powered vehicles that run without drivers, usually elevated above street level. *Motor buses* are powered by internal combustion engines whereas *trolley buses* are powered by electricity.

## Modal Averages

Table 1 shows the average number of BTUs and pounds of CO<sub>2</sub> per passenger mile for various modes of transit and types of automobiles. Ferries and automated guideways are far worse, on both counts, than any other form of passenger travel. Motor buses and light trucks are comparable to one another, while light rail uses the same energy as passenger cars but emits less CO<sub>2</sub>.

**Table 1**  
**Modal Energy Consumption and CO<sub>2</sub> Emissions per Passenger Mile**

	BTUs	Pounds CO <sub>2</sub>
Ferry Boats	10,744	1.73
Automated Guideways	10,661	1.36
Light Trucks	4,423	0.69
Motor Buses	4,365	0.71
Trolley Buses	3,923	0.28
All Automobiles	3,885	0.61
Light Rail	3,465	0.36
Passenger Cars	3,445	0.54
All Transit	3,444	0.47
Heavy Rail	2,600	0.25
Commuter Rail	2,558	0.29
Toyota Prius	1,659	0.26

Source: Calculations based on data in Federal Transit Administration, "Energy Consumption," *2006 Provisional National Transit Database* (Washington: U.S. Department of Transportation, 2007), [tinyurl.com/3cdn6k](http://tinyurl.com/3cdn6k); Stacy C. Davis and Susan W. Diegel, *Transportation Energy Data Book: Edition 26* (Oak Ridge, TN: U.S. Department of Energy, 2007), pp. B-4, B-6, Table 2.13; Energy Information Administration, "Fuel and Energy Emission Coefficients," (Washington: Department of Energy), [tinyurl.com/smdrm](http://tinyurl.com/smdrm); Energy Information Administration, *State Electricity Profiles 2006* (Washington: Department of Energy, 2007), Table 5; Environmental Protection Agency, *Model Year 2008 Fuel Economy Guide* (Washington: EPA, 2007), [tinyurl.com/25y3ce](http://tinyurl.com/25y3ce).

**Table 2**  
**Household Size and Average Auto Occupancy**

	Household Size	Occupancy
1969	3.27	1.90
1977	2.86	1.90
1983	2.73	1.75
1990	2.63	1.64
1995	2.65	1.59
2001	2.58	1.63

Source: Census Bureau, “Average Population by Household and Family: 1940 to Present” (Washington, 2004), [tinyurl.com/2hpgbx](http://tinyurl.com/2hpgbx); and Pat S. Hu, *Summary of Travel Trends: 2001 National Household Travel Survey* (Washington, US DOT, 2004), table 15.

The Toyota Prius, the most fuel-efficient auto sold in the United States, is also shown as an example of the potential for energy-efficient autos.<sup>22</sup> The Prius uses less energy than other forms of travel, but generates about the same CO<sub>2</sub> as heavy rail and commuter rail.

Emissions from electrically powered transit depend on local sources of electricity. Massachusetts and Ohio, for example, rely heavily on fossil fuels for electrical power, so trolley buses in those states emit more greenhouse gases than diesel buses. But Washington and California rely more heavily on hydroelectric power, so trolley buses in those states emit less greenhouse gases than diesel buses.

All of these numbers are very sensitive to load factors. Because the vehicles themselves tend to weigh far more than the passengers being carried, doubling the number of people on board any vehicle will cut the energy consumption and emissions per passenger almost in half. Using estimates from the *2001 National Household Travel Survey*, Table 1 assumes that passenger autos carry an average of 1.57 people, while light trucks carry an average of 1.73 people.<sup>23</sup> Transit loads are from the *National Transit Database* (passenger miles divided by vehicle revenue miles).<sup>24</sup>

One obvious way to reduce energy consumption and emissions is to increase vehicle occupancies. Increasing auto occupancies is easier said than done, however. As Table 2 shows, average auto occupancies roughly

equal average household size minus one. Efforts to increase occupancies with carpool lanes have mostly failed. Indeed, most carpools are really “fampools,” that is, family members traveling together to work or other destinations.

Transit loads are easier to manipulate by directing transit service to areas where demand is high and avoiding or providing smaller vehicles in areas where demand is low. Most transit agencies fail to do this for political reasons. Since transit agencies rely heavily on tax dollars, they try to provide at least some service to all taxpayers in a region. Because a large share of their capital costs is funded by federal grants, they also tend to buy buses that are larger than they really need. The result is that they often run buses that are nearly empty.

## Modal Trends

Not only are passenger autos competitive (at least in terms of energy efficiency) with public transit, autos are becoming more energy efficient each year, whereas transit’s efficiency is stagnant or declining. The energy efficiency of passenger cars per vehicle mile has grown by an average of 1.5 percent per year, and when fuel prices have been high, it has grown by as much as 3.0 percent per year. Since auto occupancies have been declining, efficiencies per passenger mile have only grown at an average

**Automobiles are becoming more energy efficient each year, whereas transit’s efficiency is stagnant or declining.**

**Automobiles will continue to become more energy efficient by 2 percent per year, which means that new rail transit lines must be more efficient than future autos to achieve any savings at all.**

of 0.9 percent per year; but they have grown as fast as 2.5 percent per year when fuel prices were highest.<sup>25</sup>

The fuel efficiencies of light trucks have grown faster than cars, partly because light truck occupancies have increased. In 1970, the vast majority of light trucks were pickups. Today, most are vans or sport utility vehicles, which tend to have much higher occupancies than pickups.<sup>26</sup>

These trends will be accelerated by the Energy Independence and Security Act of 2007, which requires that corporate average fuel economy (CAFE) increases from 27.5 miles per gallon today to 35 miles per gallon by 2020. The law also requires that production of biofuels (which produce only one-third the net greenhouse gas emissions of fossil fuels) increase from 4 billion gallons today to 36 billion by 2022.<sup>27</sup>

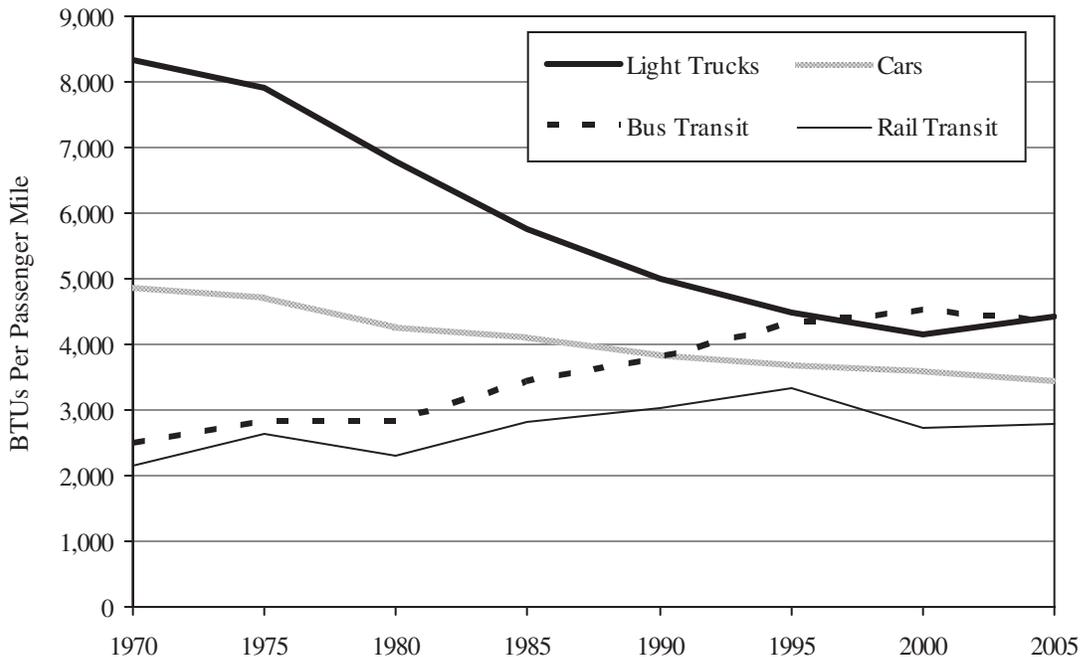
The net effect of this law will be to increase fuel economies by close to 2 percent per year. By 2020, the average automobile on the road will consume little more than 3,000 BTUs per

passenger mile. By 2035, even if new-car efficiencies do not improve after 2020, the average auto will consume just 2,500 BTUs per passenger mile.<sup>28</sup>

Projections of the energy efficiency of rail transit must take into account the growing energy efficiency of automobiles. A proposed light-rail line that promises to save energy not only needs to be more efficient than today's autos, it must be more efficient than future autos. Since rail lines typically take 10 years to plan and construct, and have an operational life (before they need reconstruction and rehabilitation) of 30 to 40 years, they would have to be more efficient than the average auto 25 to 30 years from now to achieve any savings at all.

Suppose a light-rail line is projected to open in 2015 and operate until 2055. If the average auto consumed 3,885 BTUs per passenger mile in 2005, and auto energy efficiency is growing at 2.7 percent per year, then when the rail line opens, autos will be using less than 3,400 BTUs per passenger mile. At the light-rail line's mid-life in 2035, autos will

**Figure 1  
Energy Intensity of Passenger Transport**



Source: Davis and Diegel, *Transportation Energy Data Book*, Tables 2.13 and 2.14.

consume only 2,500 BTUs per passenger mile. Since only one light-rail line operating today consumes significantly less than that, new light-rail lines are not likely to achieve any savings.

Production of carbon dioxide (CO<sub>2</sub>) by petroleum-fueled motor vehicles is almost exactly proportional to their energy efficiency. CO<sub>2</sub> emissions from motor vehicles can be reduced, however, by using biofuels, which offset the CO<sub>2</sub> emissions by obtaining energy from plants taking carbon out of the atmosphere. The biofuel requirement in the 2007 Energy Act means that greenhouse gas emissions per passenger mile will decline even faster than fuel consumption.

In contrast to autos, fuel economies for bus transit have declined in almost every five-year period since 1970. This is partly because transit agencies have purchased larger vehicles and increasingly supplied them with air conditioning and other energy-intensive features, and partly because the number of people riding the average bus has declined. In 1982 (the earliest year for which data are available), the average number of bus occupants (passenger miles divided by vehicle revenue miles) was 13.8; by 2006, it was only 10.7.<sup>29</sup>

Rail transit's energy intensity has been flat or trending upwards.<sup>30</sup> But the New York urban area heavily skews rail numbers. New York provided more than 65 percent of rail transit passenger miles in 1980 and even today accounts for 55 percent of rail passenger miles.<sup>31</sup> New York rail ridership dropped dramatically in the 1980s, bottoming out in 1993. Since then, it has recovered. The trend for rail in Figure 1 largely reflects what happened in New York and says little about the energy efficiency of rail transit in other regions.

In general, the trends for CO<sub>2</sub> emissions for bus and rail transit probably roughly follow the trends for energy efficiency. Detailed calculations are complicated because so many different fuels are used to power these modes, and data are not available before 1982. Most buses rely on diesel fuel, but many use gasoline, some use compressed natural gas or other fuels, and a few (separately classified as

“trolley buses”) are electric. Some rail transit is diesel powered, but most rail transit is electrically powered. The sources of that electricity include some greenhouse gas emitters, such as coal and oil, and some non-emitters, such as nuclear and hydro.

## Urban Area Modal Data

Table 3 lists the energy efficiency and CO<sub>2</sub> emissions for most of the nation's light-rail, heavy-rail, and commuter-rail lines in 2006. Also listed are streetcars, ferryboats, and trolley buses, each of which is being considered by some cities. For good measure, the table also includes automated guideways and cable cars, even though these are not being seriously considered by any major cities.

**Commuter rail.** Two commuter-rail systems—New Jersey Transit and the Northern Indiana Commuter District—are the only transit systems that use less energy per passenger mile than a Toyota Prius. All other commuter-rail lines, except for the SEPTA system in Philadelphia, use less energy than the average passenger auto.

The commuter-rail systems shown in Table 3 are electrically powered, while most of the commuter-rail systems for which there are no data are diesel-powered. So the missing systems may produce more greenhouse gases per passenger mile than the systems shown in the table.

**Heavy rail.** As Figure 2 shows, most heavy-rail systems are less energy efficient than an average passenger car, and none are more energy efficient than a Toyota Prius. As Table 3 shows, two of them—New York subways and San Francisco BART—emit less CO<sub>2</sub> than a Prius, but several emit more CO<sub>2</sub> than the average passenger car.

**Light rail.** Most light-rail systems use as much or more energy per passenger mile as the average passenger car, several are worse than the average light truck, and none is as efficient as a Prius (see Figure 3). Three emit less greenhouse gases than a Prius, but several emit more greenhouse gases than light trucks (see Table 3).

**Most light- and heavy-rail lines are less energy efficient than the average passenger car, and none are as efficient as a Prius.**

**Table 3**  
**Transit Line Energy Consumption and CO<sub>2</sub> Emissions per Passenger Mile**

Urban Area	BTUs	Pounds CO <sub>2</sub>
<i>Commuter Rail</i>		
Chicago (NW IN)	1,587	0.33
Newark (NJT)	1,599	0.19
Boston	2,209	0.36
New York (LIRR)	2,681	0.24
Chicago (RTA)	2,693	0.40
New York (Metro-North)	3,155	0.28
Philadelphia	4,168	0.53
<i>Heavy Rail</i>		
Atlanta	1,983	0.29
New York (MTA)	2,149	0.16
San Francisco (BART)	2,299	0.14
New York (PATH)	2,953	0.20
Washington	3,084	0.62
Chicago	3,597	0.37
Boston	3,631	0.44
Baltimore	3,736	0.50
Philadelphia (SEPTA)	3,745	0.48
Los Angeles	4,233	0.26
Philadelphia (PATH)	5,077	0.35
Cleveland	5,494	1.02
Miami	6,756	0.89
Staten Island	8,039	0.60
<i>Light Rail</i>		
San Diego	2,102	0.13
Boston	2,473	0.30
Portland	2,482	0.08
Minneapolis	2,498	0.35
St. Louis	2,613	0.48
Salt Lake City	2,830	0.56
Houston	2,849	0.39
Los Angeles	2,884	0.18
Denver	4,400	0.78
Dallas	4,466	0.60
San Francisco	4,509	0.27
Newark	4,564	0.31
Sacramento	4,821	0.29
Philadelphia	5,459	0.69
Cleveland	5,585	1.03
Buffalo	5,774	0.43
San Jose	6,174	0.38
Baltimore	8,128	1.09
Pittsburgh	9,265	1.18

Urban Area	BTUs	Pounds CO <sub>2</sub>
<i>Streetcars/Vintage Trolleys</i>		
New Orleans	3,540	0.40
Tacoma	4,396	0.09
Charlotte	5,438	0.71
Tampa	7,941	1.04
Little Rock	12,948	1.54
Memphis	17,521	2.42
Kenosha	32,910	4.94
Galveston	34,325	5.58
<i>Trolley Bus</i>		
San Francisco	3,341	0.21
Seattle	3,912	0.08
Dayton	6,377	1.12
Boston	7,589	0.88
<i>Ferry Boat</i>		
New York	4,457	0.72
San Francisco	10,173	1.65
Portland	11,464	1.86
Seattle	13,118	2.13
Savannah	38,864	6.31
San Juan	60,582	9.84
New Orleans	71,784	11.66
<i>Automated Guideway</i>		
Miami	7,649	1.00
Detroit	15,058	2.11
Jacksonville	54,054	7.09
<i>Cable Car</i>		
San Francisco	4,629	0.28

Source: Calculations based on data from Federal Transit Administration, "Energy Consumption," *2006 Provisional National Transit Database* (Washington: U.S. Department of Transportation, 2007), [tinyurl.com/3cdn6k](http://tinyurl.com/3cdn6k); Stacy C. Davis and Susan W. Diegel, *Transportation Energy Data Book: Edition 26* (Oak Ridge, TN: U.S. Department of Energy, 2007), pp. B-4, B-6; Energy Information Administration, "Fuel and Energy Emission Coefficients," (Washington: Department of Energy), [tinyurl.com/smdrm](http://tinyurl.com/smdrm); Energy Information Administration, *State Electricity Profiles 2006* (Washington: Department of Energy, 2007), table 5.

Note: Salt Lake City data adjusted for ridership overcounts revealed by local transit agency.

**Streetcars.** Streetcars and vintage trolleys consume lots of energy and, for the most part, emit lots of greenhouse gases per passenger mile. The poor performance of these systems results from low passenger loads, as many carry average loads of just two to six riders.

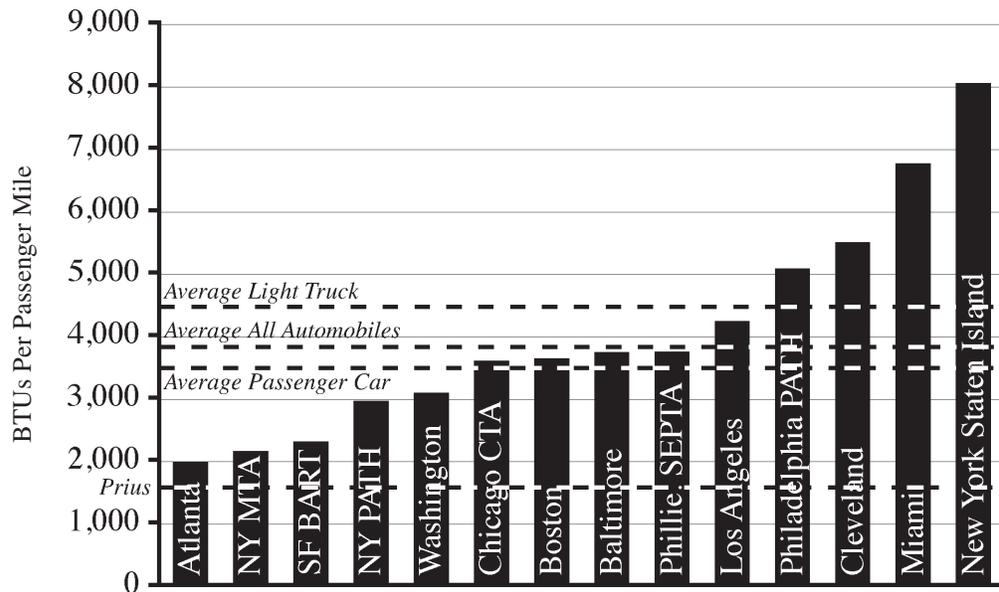
**Trolley Buses.** Trolley buses in Seattle and San Francisco use somewhat less energy than buses, probably because they are concentrat-

ed in the inner cities while most bus lines serve many suburban areas. In regions where much if not most electricity comes from hydro or other non-fossil-fuel sources, trolley buses can reduce greenhouse gas emissions, but otherwise they are not effective.

**Ferryboats.** If saving energy and reducing greenhouse gases are the goals, ferryboats are a very poor choice of transit.

**Streetcars and ferryboats tend to use the most energy and generate the most greenhouse gases per passenger mile of any form of transit.**

**Figure 2  
Heavy-Rail Energy Consumption**



Source: Calculations based on data in Federal Transit Administration, “Energy Consumption,” *2006 Provisional National Transit Database* (Washington: U.S. Department of Transportation, 2007), [tinyurl.com/3cdn6k](http://tinyurl.com/3cdn6k); Stacy C. Davis and Susan W. Diegel, *Transportation Energy Data Book: Edition 26* (Oak Ridge, TN: U.S. Department of Energy, 2007), pp. B-4, B-6, Table 2.13; Energy Information Administration, “Fuel and Energy Emission Coefficients,” (Washington: Department of Energy), [tinyurl.com/smdrm](http://tinyurl.com/smdrm); Energy Information Administration, *State Electricity Profiles 2006* (Washington: Department of Energy, 2007), table 5; Environmental Protection Agency, *Model Year 2008 Fuel Economy Guide* (Washington: EPA, 2007), [tinyurl.com/25y3ce](http://tinyurl.com/25y3ce).

**Rail systems do poorly partly because rail cars weigh around 60 percent more, per passenger, than buses.**

**Automated Guideways.** The “people movers” in Florida and Detroit have mostly been disappointments. One in Tampa was even torn out because ridership was so low. Not surprisingly, they require large amounts of energy per passenger mile.

**Cable Cars.** The San Francisco cable cars use a lot of energy. But California gets nearly half its electricity from renewable sources that emit little or no CO<sub>2</sub>, so they are relatively greenhouse friendly.

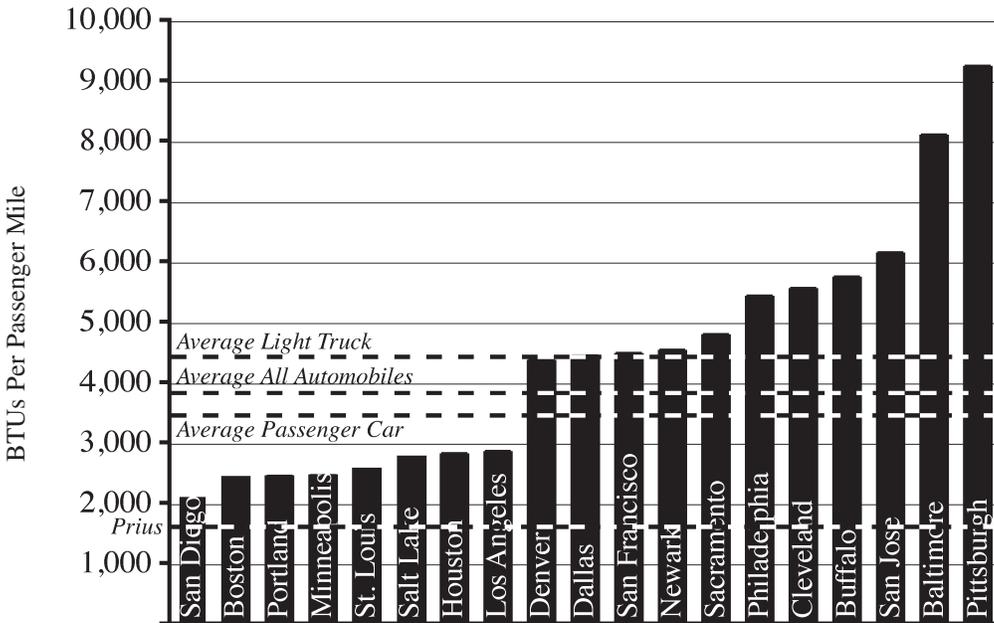
National Transit Database numbers for Salt Lake City indicate that it has an extraordinarily efficient light-rail line, equal in energy performance to the San Diego line. However, the Utah Transit Authority recently revealed that it has systematically overestimated light-rail ridership by 20 percent or more for several years. The agency installed automated passenger counters in all its rail vehicles, whereas previously it had relied on a sampling system. The

new counters reveal light rail carries about 22 percent fewer riders than the transit authority had previously reported.<sup>32</sup> The numbers in Table 3 have been adjusted to account for this overcount.

Only a handful of rail systems are more environmentally friendly than a Toyota Prius, and most use more energy per passenger mile than the average automobile. Steel wheels on steel rails require far less friction to turn than rubber tires on pavement. So why do rail systems have such mediocre performances?

One reason is that, for the safety and comfort of passengers, rail cars tend to be heavier per passenger than buses. A typical light-rail car, for example, weighs about 100,000 pounds compared with 27,000 pounds for a typical bus. Light-rail loads and capacities are around two-and-one-half times those of buses, so light-rail cars weigh around 60 percent more per passenger.<sup>33</sup>

**Figure 3  
Light-Rail Energy Consumption**



Source: Calculations based on data in Federal Transit Administration, “Energy Consumption,” 2006 Provisional National Transit Database (Washington: U.S. Department of Transportation, 2007), [tinyurl.com/3cdn6k](http://tinyurl.com/3cdn6k); Stacy C. Davis and Susan W. Diegel, Transportation Energy Data Book: Edition 26 (Oak Ridge, TN: U.S. Department of Energy, 2007), pp. B-4, B-6, Table 2.13; Energy Information Administration, “Fuel and Energy Emission Coefficients,” (Washington: Department of Energy), [tinyurl.com/smdrm](http://tinyurl.com/smdrm); Energy Information Administration, State Electricity Profiles 2006 (Washington: Department of Energy, 2007), table 5; Environmental Protection Agency, Model Year 2008 Fuel Economy Guide (Washington: EPA, 2007), [tinyurl.com/25y3ce](http://tinyurl.com/25y3ce).

A second problem is that electrically powered systems suffer significant losses in generation and transmission. A kilowatt-hour provides users with about 3,400 BTUs of energy. But the electricity producer must use more than 10,300 BTUs to deliver that kilowatt-hour to the user.<sup>34</sup> Trolley buses in Boston, Dayton, and Seattle, for example, consume more energy per passenger mile than diesel buses in those same cities even though the trolley buses carry the same or greater loads.<sup>35</sup>

A third problem is that rail lines cost a lot to build, so they are largely limited to major corridor routes. To justify the large investment, transit agencies operate light- and heavy-rail lines at greater frequencies than buses. Where buses can run frequent service in busy corridors and then diverge into various neighborhoods at the ends of the corridors, trains are confined to the rails. The result is that the train cars are substantially

empty at the ends of their corridors and during much of the day.

All of these factors counteract rail’s inherent efficiency advantage. The result is that rails are energy efficient only in extremely high-use corridors, and electrically powered rail lines are greenhouse friendly only in regions that use alternatives to fossil fuels to generate half or more of their electricity.

Even rail lines that use significantly less energy than autos will not save much energy unless they attract a significant number of people who would otherwise drive their cars. Table 4 shows that no region with rail transit has been able to persuade more than 0.5 percent of travelers to switch from cars to transit in the past 20 years. Transit’s share of travel has actually declined since rail service began (or since 1985 for regions that had rail service before 1985) in 14 out of 25 regions with rail transit.

**Electrically powered transit loses two-thirds of its energy in electrical generation and transmission.**

**Table 4**  
**Transit's Share of Motorized Passenger Travel (percent)**

	1985	1990	1995	2000	2005	Rail Began
Atlanta	1.9	1.8	1.3	1.4	1.1	1979
Baltimore	1.9	1.8	1.5	1.6	1.4	1983
Boston	2.6	2.8	3.0	3.4	3.1	1888
Buffalo	1.2	0.9	0.8	0.7	0.6	1986
Chicago	5.7	4.8	3.6	3.7	3.7	1892
Cleveland	2.3	1.5	1.2	1.3	1.3	1884
Dallas–Ft. Worth	0.8	0.6	0.5	0.6	0.6	1996
Denver	1.4	1.3	1.2	1.3	1.4	1994
Houston	1.0	1.0	1.0	1.0	1.0	2004
Los Angeles	1.9	1.4	1.3	1.4	1.8	1988
Miami–Ft. Lauderdale	1.2	1.1	1.1	1.0	1.0	1984
Minneapolis–St. Paul	1.4	1.1	0.8	1.0	1.0	2004
New Orleans	3.1	2.9	2.4	1.9	1.4	1892
New York	12.7	10.4	9.9	10.4	9.6	1905
Philadelphia	3.4	3.3	2.5	2.6	2.5	1890
Pittsburgh	2.2	2.1	1.5	1.5	1.3	1890
Portland	2.1	1.8	2.0	2.1	2.2	1986
Sacramento	0.9	0.7	0.7	0.9	0.7	1987
Salt Lake City	1.1	1.7	1.1	1.0	1.2	1999
San Diego	1.1	1.2	1.0	1.4	1.1	1981
San Francisco–Oakland	5.3	4.3	3.9	4.2	4.1	1972
San Jose	0.9	1.0	0.9	1.1	0.9	1988
Seattle	1.8	1.5	1.4	1.6	1.9	2000
St. Louis	1.0	0.7	0.6	0.8	0.7	1994
Washington	3.9	4.4	3.9	4.0	4.0	1976

Sources: Transit passenger miles from Federal Transportation Administration, *National Transit Database*, compared with motor vehicle miles (multiplied by 1.6 to get passenger miles) from Federal Highway Administration, *Highway Statistics* (years indicated in table).

**Rather than attract people out of their cars, transit's share of commuting has declined in 20 out of 25 rail regions.**

The same tale of woe is told by commuting data (see Table 5). Twenty out of 25 rail regions saw a decline in transit's market share of commuters since they began rail service (or 1970, in the case of regions that have had rail service since before 1970). Among the few that increased, Seattle's increase was the greatest, with transit's share rising from 7.1 percent in 1990 to 8.1 percent in 2006. Very little of that increase, however, was due to the region's trivial rail transit projects, which carried less than 2 percent of the region's transit trips in 2006.

Transit's loss of market share in most rail cities is not just a case of bad luck. Rail tran-

sit agencies must go heavily in debt to cover the high cost of building rail transit lines, and once that debt is paid off they have to go in debt again to reconstruct and rehabilitate worn out rail lines. To keep its rail system running, for example, Boston has incurred a \$5 billion debt and must dedicate one-third of its operating budget just to pay the interest on that debt.<sup>36</sup>

Such indebtedness—which is not needed to operate a bus system—leaves transit riders vulnerable to economic downturns that reduce the tax revenues transit agencies rely on to both repay their debts and operate their sys-

**Table 5**  
**Transit's Share of Commuting (percent)**

	1970	1980	1990	2000	2006	Rail Began
Atlanta	10.4	9.1	5.9	4.1	4.4	1979
Baltimore	16.9	12.3	9.3	7.4	8.1	1983
Boston	18.2	13.5	12.7	12.5	12.3	1888
Buffalo	12.3	16.4	5.5	4.0	4.9	1986
Chicago	24.4	18.7	15.8	12.6	12.2	1892
Cleveland	14.0	11.5	6.8	5.0	4.6	1884
Dallas–Ft. Worth	5.7	4.0	2.7	2.2	2.1	1996
Denver-Boulder	4.6	6.6	4.8	5.1	5.3	1994
Houston	6.0	3.5	4.5	3.8	3.2	2004
Los Angeles	4.8	5.9	5.6	6.0	6.3	1988
Miami–Ft. Lauderdale	6.2	4.3	3.7	3.3	4.0	1984
Minneapolis–St. Paul	9.5	10.0	6.2	5.5	5.1	2004
New Orleans	21.5	11.5	8.3	7.1	2.9	1892
New York	39.0	30.7	29.3	28.9	30.8	1905
Philadelphia	23.0	15.1	12.4	10.1	9.8	1890
Pittsburgh	17.7	13.8	10.2	8.1	8.0	1890
Portland	7.0	9.8	6.7	7.7	7.6	1986
Sacramento	2.7	4.1	2.8	2.9	2.9	1987
Salt Lake City	2.3	5.5	3.5	3.6	4.2	1999
San Diego	4.8	3.5	3.5	3.6	3.3	1981
San Francisco–Oakland	16.0	16.8	14.5	14.3	13.1	1972
San Jose	2.4	3.1	3.1	3.6	3.6	1988
Seattle	6.6	9.1	7.1	7.9	8.1	2000
St. Louis	9.2	6.9	3.5	2.9	3.1	1994
Washington	17.6	16.7	15.6	13.7	16.9	1976

Sources: Census Bureau, *Decennial Census, 1970 through 2000*, and *American Community Survey for 2006* (Washington: Census Bureau).

tems. When tax revenues decline, debt holders will not accept lower payments, so transit agencies must make much larger cuts to their transit systems than if they had no debt.

San Jose, for example, went into debt building new light-rail lines in the 1990s. When the 2001 recession hit, it was forced to cut transit service by nearly 20 percent and lost more than a third of its transit riders.<sup>37</sup>

So, even though some systems report that their rail lines generate less greenhouse gases than automobiles, they are not saving energy if they are losing market share to the auto. At best, agencies might brag that rail transit saves energy by carrying people who would otherwise ride

an energy-intensive and CO<sub>2</sub>-emitting bus. But, as the next section will show, new rail transit lines do not reduce energy use by buses.

## Urban Transit Network Data

Table 6 lists the average energy efficiency and CO<sub>2</sub> outputs for all transit agencies for which data are available in 50 major urban areas in the country. A few regions are not listed because most or all of their transit systems are contracted out and so representative data are not available.

**Unlike bus transit, the high cost of rail transit forces transit agencies into debt that leaves them especially vulnerable to recessions.**

**Table 6**  
**Urban Area Transit Energy Consumption and CO<sub>2</sub> Emissions per Passenger Mile**

Urban Area	BTUs	Pounds CO <sub>2</sub>	Urban Area	BTUs	Pounds CO <sub>2</sub>
New York	2,639	0.29	Columbus	4,643	0.50
Atlanta	2,865	0.45	Cleveland	4,703	0.79
San Francisco–Oakland	3,003	0.30	Austin	4,985	0.80
Portland	3,008	0.36	Miami–Ft. Lauderdale	5,037	0.76
Boston	3,201	0.45	Indianapolis	5,059	0.82
Chicago	3,357	0.46	Tampa–St. Petersburg	5,218	0.84
Minneapolis–St. Paul	3,722	0.56	San Antonio	5,351	0.84
Houston	3,528	0.57	Pittsburgh	5,357	0.82
Denver	3,596	0.59	Dallas–Ft. Worth	5,414	0.85
Washington	3,646	0.63	Memphis	5,502	0.87
Orlando	3,670	0.59	Louisville	5,521	0.89
Hartford	3,670	0.59	San Jose	5,549	0.74
Los Angeles	3,674	0.56	Buffalo	5,602	0.81
Salt Lake City	3,837	0.66	Sacramento	5,613	0.69
San Diego	3,893	0.54	Seattle	5,805	0.91
Cincinnati	3,938	0.48	Kansas City	6,106	0.97
Detroit	3,998	0.64	Riverside–San Bern.	6,121	1.11
Providence	4,076	0.66	Richmond	6,193	1.00
Norfolk	4,133	0.66	Tucson	6,275	1.00
Philadelphia	4,305	0.57	Jacksonville	6,278	1.00
St. Louis	4,345	0.74	Dayton	6,379	1.05
Charlotte	4,488	0.72	Oklahoma City	6,626	1.07
Baltimore	4,497	0.67	Norwalk	7,243	1.17
Milwaukee	4,572	0.74	New Orleans	8,674	1.40
Nashville	4,596	0.74			

Source: Calculations based on data from Federal Transit Administration, “Energy Consumption,” *2006 Provisional National Transit Database* (Washington: U.S. Department of Transportation, 2007), [tinyurl.com/3cdn6k](http://tinyurl.com/3cdn6k); Stacy C. Davis and Susan W. Diegel, *Transportation Energy Data Book: Edition 26* (Oak Ridge, TN: U.S. Department of Energy, 2007), pp. B-4, B-6; Energy Information Administration, “Fuel and Energy Emission Coefficients,” (Washington: Department of Energy), [tinyurl.com/smdrm](http://tinyurl.com/smdrm); Energy Information Administration, *State Electricity Profiles 2006* (Washington: Department of Energy, 2007), table 5.

**Transit systems in Baltimore, Dallas, Miami, San Jose, and Sacramento are less environmentally friendly than SUVs.**

The most energy-efficient transit network is in New York City. New York’s transit network is efficient not just because it has rail transit, but because its buses average 60 percent greater loads than the rest of the country (more than 17 passengers versus fewer than 11).

Other than the top six or seven systems, U.S. transit networks use as much or more energy and emit as much or more CO<sub>2</sub> per passenger mile as the average passenger car. Many regions with rail transit, including Baltimore,

Dallas, Miami, San Jose, and Sacramento, are less environmentally friendly than light trucks.

One reason why many rail regions do so poorly is that new rail lines cannibalize bus systems by taking their most popular—and therefore most energy-efficient—routes. Moreover, after opening a new rail line, transit agencies typically offer their customers more bus service, not less, as corridor bus routes are turned into feeder buses for the rail corridor. Since many people who have access to autos will drive to the rail stations, those feeder bus-

es tend to operate with much smaller average loads than the corridor buses they replaced.

Many regions that build new rail transit lines end up using more fuel on buses carrying smaller average loads than before they built those lines. For example, in 1991, before St. Louis built its first light-rail line, St. Louis buses averaged more than 10 riders and consumed 4,600 BTUs per passenger mile. In 1995, after opening the light-rail line, average bus loads declined to fewer than 7 riders and energy consumption increased to 5,300 BTUs per passenger mile. CO<sub>2</sub> emissions also climbed from 0.75 pounds to 0.88 pounds per passenger mile.<sup>38</sup>

Other cities experienced similar declines in energy efficiencies after opening light-rail lines. Sacramento's bus loads, for example, declined from around 14 before the region's first light-rail line opened to under 10 afterwards. Overall energy consumption thus increased from around 3,000 to 4,300 BTUs per passenger mile while CO<sub>2</sub> emissions increased from 0.48 pounds to 0.58 pounds per passenger mile.<sup>39</sup> By 2004, Sacramento had opened a new light-rail line, but bus loads fell below 8 while overall energy consumption and CO<sub>2</sub> emissions grew to nearly 4,600 BTUs and 0.64 pounds per passenger mile.<sup>40</sup>

Similarly, Houston's light-rail line boosted energy consumption and CO<sub>2</sub> emissions per passenger mile by 8 to 10 percent.<sup>41</sup> Portland's eastside light-rail line, which opened in 1986, increased energy use and CO<sub>2</sub> production by 5 to 13 percent per passenger mile.<sup>42</sup> Its westside line, opened in 1998, increased energy use and CO<sub>2</sub> production by 7 to 11 percent per passenger mile.<sup>43</sup>

Not every transit system suffers a decline in energy efficiency after opening a rail line. Before opening the Hiawatha light-rail line in 2004, the Twin Cities' transit system used about 4,000 BTUs and emitted about 0.65 pounds of CO<sub>2</sub> per passenger mile. The light rail improved the 2006 systemwide average to 3,722 BTUs and 0.56 pounds of CO<sub>2</sub> per passenger mile.<sup>44</sup> But as the next section suggests, this small savings probably does not make up for the huge energy and CO<sub>2</sub> cost of building the line.

## Construction

Even if a new rail line could save energy or reduce greenhouse gases compared with buses or autos, the energy costs and CO<sub>2</sub> emissions from constructing rail lines are huge and may never be recovered by the savings. Rail transit requires significant amounts of steel and concrete, for example, the production of both of which is energy intensive and emits large volumes of CO<sub>2</sub>.

The environmental impact statement for Portland's North Interstate light rail estimated that the line would save about 23 billion BTUs per year but that construction would cost 3.9 trillion BTUs.<sup>45</sup> Thus, it would take 172 years for the savings to repay the construction cost. In fact, long before 172 years, automobiles are likely to be so energy efficient that light rail will offer no savings at all.

Similarly, the North Link light-rail line in Seattle is estimated to save about 346 billion BTUs of energy in 2015, declining to 200 billion in 2030.<sup>46</sup> Construction is estimated to require 17.4 trillion BTUs.<sup>47</sup> If the savings remains constant at 200 billion BTUs after 2030, the savings will not repay the cost until 2095. The Federal Transit Administration says that it is satisfied with this savings, because "the light rail project is expected to have about a 100 year life."<sup>48</sup>

In reality, rail projects have an expected lifespan of only about 30 to 40 years, after which most of the rail line must be substantially rebuilt or replaced. Washington's Metrorail needs \$12.2 billion to reconstruct and rehabilitate its rail system over the next decade, none of which is funded—and the oldest parts of the system are about 30 years old.<sup>49</sup> The San Francisco Bay Area Rapid Transit District, which is slightly older than Washington's Metrorail, needs \$11 billion for rehabilitation, only half of which is funded.<sup>50</sup> No matter where the money comes from, such reconstruction will require lots of energy and emit lots of CO<sub>2</sub>, all of which must be counted against any operational savings that the systems claim to provide.

These examples show that any claims that rail transit will reduce energy consumption

**Even if rail operations did save energy, it could take hundreds of years for that savings to repay the energy cost of constructing rail transit.**

**Behavioral solutions to toxic air pollution have failed miserably, so it is no surprise that behavioral solutions to greenhouse gases are also failing.**

must be met with skepticism unless they are accompanied by evidence that the operational savings will quickly repay the construction cost. Transit agencies are often reluctant to provide that evidence even when they are required to do so by law. In the environmental impact statement for Dallas' Southeast Corridor light-rail line, the chapter on environmental consequences, for example, never once mentions the words "energy," "greenhouse," or "carbon dioxide," much less estimates the energy or CO<sub>2</sub> costs of constructing the line.<sup>51</sup>

Highway construction also uses energy and emits CO<sub>2</sub>, but each mile of urban highway typically carries far more passenger miles and freight ton miles of travel than a mile of rail transit line. In 2005, for example, the average mile of U.S. light-rail line moved only 15 percent as many passenger miles as the average lane mile of urban freeway in rail regions.<sup>52</sup> Highways also move millions of tons of freight that can share the cost of construction. This means the energy and CO<sub>2</sub> costs of highway construction, per passenger mile or ton mile, are far lower than for rail transit construction.

## Alternatives to Rail Transit

Since the 1960s, when Americans became alarmed about toxic air pollution, we have used two very different techniques to reduce the pollution generated by automobiles. First, we applied *technical solutions*, such as increasing traffic speeds (because cars pollute more at slower speeds) and reducing tailpipe emissions. Second, we tried *behavioral solutions* aimed at getting people to drive less.

Technical solutions have been fantastically successful. Americans drive four times as many miles as they did four decades ago, yet total automotive air pollution has been reduced by more than 50 percent.<sup>53</sup> New cars on the road typically pollute less than 5 percent as much as cars made in 1970, and some pollute less than 1 percent as much. Because new cars are getting cleaner every year, the air pollution problem is rapidly disappearing.<sup>54</sup>

In contrast, the behavioral solutions have failed miserably. Per capita driving in urban areas has more than doubled since the 1970s, and no city has managed to reduce per capita driving by even 1 percent except for short periods of time when gas prices were high. Americans respond to high fuel prices with a short-term reduction in driving, but their long-term response is to buy more fuel-efficient cars and then continue to drive more each year.

Despite the failure of behavioral solutions in the past, history is repeating itself today with cities planning rail transit lines, high-density housing projects, mixed-use developments, and other techniques aimed at changing people's travel behavior in order to reduce energy use and greenhouse gas emissions. Once again, the reality is that technical solutions cost less and do more to address these issues, while there is little evidence that the behavioral solutions will have any measurable effect at all.

Construction of new rail lines, or reconstruction of existing ones, is very expensive in dollars, energy, and greenhouse gas emissions; yet the most successful lines have attracted only a tiny percentage of motorists out of their automobiles. Even the best rail transit lines provide only small energy and greenhouse benefits relative to the most efficient automobiles. And most rail transit lines in the United States actually consume more energy per passenger mile than the average passenger car.

Rail transit may use less energy, per passenger mile, than buses. But the introduction of rail transit rarely leads to a reduction in bus operations. Instead, buses that once followed the rail corridors are converted to feeder bus routes. So the incremental effect of rail transit on a transit system's overall energy use can often be to increase consumption per passenger mile.

Transit officials and other urban leaders who have a genuine desire to reduce energy usage and greenhouse gas emissions from their regions should consider alternatives that are far more cost effective at achieving these goals than building rail transit. Four

potential alternatives are these:

- Promoting alternative transit fuels and technologies;
- Increasing average bus loads;
- Reducing fuels wasted on highways and streets; and
- Improving automotive efficiencies.

## Alternative Transit Fuels and Technologies

Transit agencies wishing to reduce greenhouse gas emissions have two options, neither of which involves building rail transit. First, they can use alternative fuel sources and technologies. Second, they can improve their loadings by increasing the average number of people using each transit vehicle or reducing vehicle sizes.

Minneapolis–St. Paul is one of the few regions where a new light-rail line saved energy. In addition to building this line, the region has also reduced greenhouse gas emissions by purchasing hybrid-electric buses and converting to biodiesel fuel for its buses. Hybrid-electric buses are 22 percent more fuel-efficient than regular buses. Biodiesel's net CO<sub>2</sub> emissions are two-thirds less than petroleum-based diesel fuel. In 2006, Minneapolis–St. Paul used a fuel mixture of 10 percent biodiesel and plans to increase this to 20 percent in 2008.<sup>55</sup>

Hybrid buses cost more than regular buses, and biodiesel costs more than regular diesel. But they are far more cost-effective at reducing greenhouse gas emissions than building light rail. Minneapolis–St. Paul spent \$715 million building its light-rail line.<sup>56</sup> Amortized at 7 percent over 40 years, this is equal to a \$53 million annual payment. The transit agency estimates that the light rail saves it \$18 million per year in operating costs, so the net cost is \$35 million per year.<sup>57</sup> Operating the light rail instead of carrying the same passengers on buses saved about 16 million pounds of CO<sub>2</sub>, at a cost of more than \$2.20 per pound.

In contrast, Minneapolis–St. Paul is purchasing 172 hybrid-electric buses, each costing

\$200,000 more than a regular bus. Amortizing this cost over 10 years results in an annual cost of about \$28,000. The transit agency estimates that each bus will save nearly 2,000 gallons of fuel per year, which would otherwise have generated nearly 44,000 pounds of CO<sub>2</sub>.<sup>58</sup> This represents a cost of about 60 cents per pound. Hybrid-electric buses are thus 3.5 times more cost-effective at reducing greenhouse gases than light rail. The Minneapolis–St. Paul experience indicates that, even where light-rail operation saved greenhouse gas emissions (not counting construction costs), other methods of reducing CO<sub>2</sub> are far more cost effective (see Figure 4).

Biodiesel is even more cost effective. Converting from petroleum diesel to a 20-percent biodiesel mixture saves Minneapolis–St. Paul about 22 million pounds of CO<sub>2</sub> per year.<sup>59</sup> The 20-percent biodiesel mixture costs about 20 cents more per gallon and yields about 2 percent less BTUs per gallon than pure petroleum diesel, for a total net cost of less than \$2 million per year.<sup>60</sup> Biodiesel thus costs less than 10 cents per pound of CO<sub>2</sub> saved, making it more than 25 times as cost-effective at reducing greenhouse gases as light rail.

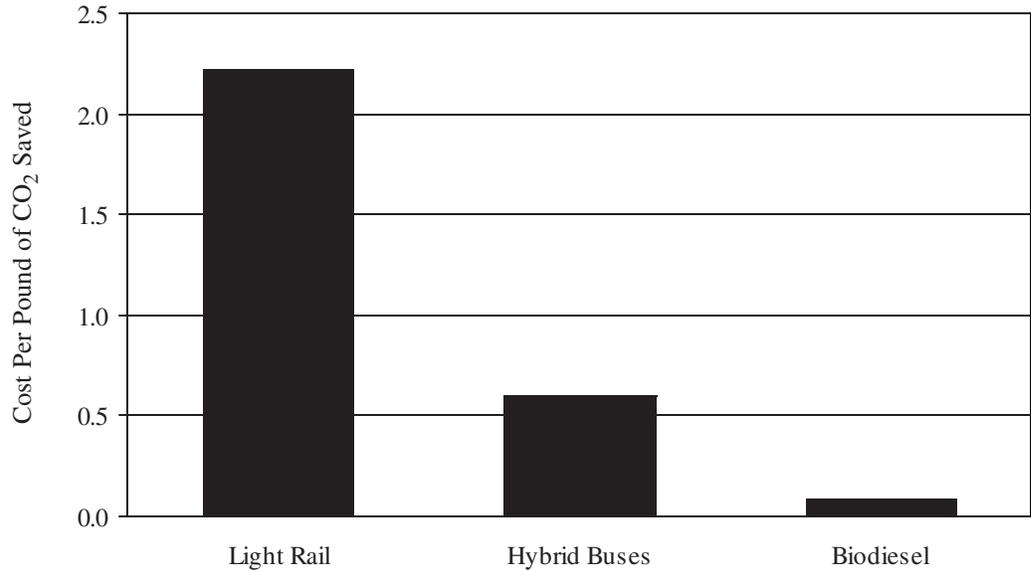
## Increasing Transit Loads

Transit agencies can also save energy by increasing load factors—that is, the percentage of seats and standing room on transit vehicles used in the course of a day. The average transit bus has 39 seats and room for 20 more people standing, yet it carries on average fewer than 11 people. As Figure 5 shows, some transit agencies average more than 20 passengers per bus and consume far less energy per passenger mile.

Regions that rely heavily on non-fossil-fuel sources of electricity have a third option for reducing CO<sub>2</sub>: electric trolley buses. While trolley buses are not as energy-efficient as diesel buses, they can be greenhouse friendly. Seattle's trolley buses, for example, produce just one-seventh as much CO<sub>2</sub> per passenger mile as Seattle's diesel buses.<sup>61</sup> Installing and maintain-

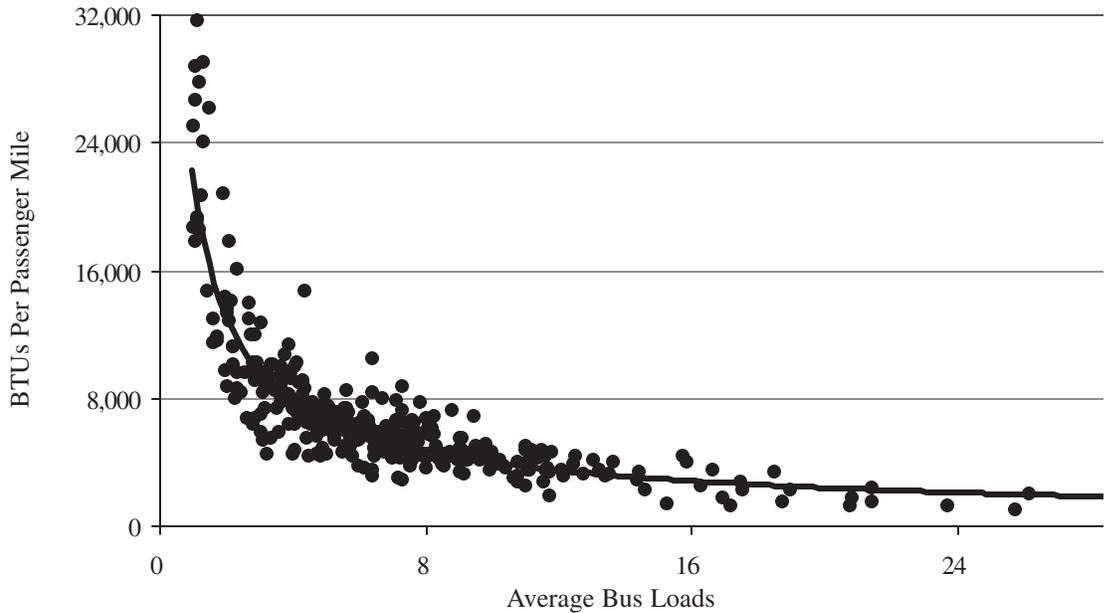
**Hybrid buses and biofuels can reduce one pound of greenhouse gas emissions at a small fraction of the cost of light rail.**

**Figure 4**  
**Alternative Greenhouse Gas Strategies**



Source: Calculations based on data in Peter Bell, "Message from the Council Chair" (St. Paul, MN: Metropolitan Council, 2007), [tinyurl.com/2nlxur](http://tinyurl.com/2nlxur); Dantata, Touran, and Schneck, "Trends in U.S. Rail Transit Project Cost Overrun," Table 3; Federal Transit Administration, "Operating Expenses," *2006 Provisional National Transit Database*; Jim Foti, "Hybrid Buses Thunder Down Nicollet Mall—Quietly," *Minneapolis Star-Tribune*, November 15, 2007, [tinyurl.com/2c33mj](http://tinyurl.com/2c33mj); Federal Transit Administration, "Fuel Consumption," *2006 Provisional National Transit Database*; and Davis and Diegel, *Transportation Energy Data Book*, Table A.3.

**Figure 5**  
**Energy Efficiency of Bus Transit**



Source: Federal Transit Administration, "Energy Consumption," *2006 Provisional National Transit Database* (Washington: U.S. Department of Transportation, 2007), [tinyurl.com/3cdn6k](http://tinyurl.com/3cdn6k).

ing trolley wires is costly, though nowhere near as costly as building rail transit lines.

One way to increase passenger loads is to focus bus service in areas where ridership is highest. Such a market orientation is foreign to transit agencies that are politically pressured to provide service to all taxpaying neighborhoods, even if those neighborhoods offer few riders.

Still, some bus operations are remarkably energy efficient. Several commuter bus lines in the New York metropolitan area consume less than 2,000 BTUs per passenger mile by focusing their services on routes and times that serve large numbers of passengers. Golden Gate Transit in San Francisco–Marin County as well as transit systems in such varied cities as Cumberland, Maryland; Rome, Georgia; Brownsville, Texas; and Santa Barbara, California; all consume less than 3,000 BTUs per passenger mile.

Transit agencies that focus on corridor or commuter routes can save energy while serving suburban neighborhoods or off-peak times by using smaller buses. Transit agencies typically buy buses large enough to meet peak-hour demand and then operate those buses throughout the day. Moreover, federal funding for transit capital purchases gives agencies incentives to buy buses that are larger than they really need even during peak hours. In any case, buying two separate fleets of buses—one for corridors and peak periods and one for suburban routes and off-peak periods—would do more to reduce energy use and CO<sub>2</sub> emissions than building rail transit.

Portland’s TriMet transit agency, for example, has a fleet of 545 buses in fixed-route service, 90 percent of which have 39 seats or more. TriMet could supplement these buses with 500 15- to 25-passenger buses costing \$50,000 to \$75,000 each.<sup>62</sup> This would total \$25–37 million—about the cost of one mile of light-rail line. Amortized over 10 years, this is about \$5 million per year.

The smaller buses consume only about 40 percent as much fuel and emit 40 percent as much CO<sub>2</sub> as full-sized buses. TriMet buses produced 129 million pounds of CO<sub>2</sub> in

2006, so operating smaller buses for even one-third of vehicle-hours of service would save 25 million pounds of CO<sub>2</sub>. Savings on fuel would offset at least \$1 million of the \$5 million amortized cost of buying these buses. Thus, the reductions in CO<sub>2</sub> levels would cost only about 16 cents per pound.

## Saving Energy on Highways and Streets

The Texas Transportation Institute estimates that more than 2.9 billion gallons of fuel are wasted in congested traffic each year.<sup>63</sup> Relieving the congestion by fixing bottlenecks, using congestion tolls, and adding new capacity will do far more to reduce energy than rail transit can. Moreover, new highways largely pay for themselves, especially if tolls are used, while rail transit requires huge subsidies.

Some people fear that relieving congestion will simply induce more driving, and the energy costs of that driving will cancel out the savings from congestion relief. The induced-demand story is as much a myth as the claim that General Motors shut down streetcar systems in order to force people to buy cars.

Not building roads out of fear of induced demand is “wrongheaded,” says University of California planning professor Robert Cervero. “The problems people associate with roads—for example, congestion and air pollution—are not the fault of the road investments,” he adds. They result “from the *use* and *mispricing* of roads.”<sup>64</sup>

Historically, gasoline taxes and other highway user fees have paid nearly 90 percent of all the costs of building, maintaining, and policing American roads and streets.<sup>65</sup> (In contrast, transit fares cover only about 40 percent of transit operating costs and none of transit capital costs.) The problem with gas taxes as a user fee, however, is that they do not signal users about the costs of the services they are consuming. Building a system that can meet peak-period demand costs more, yet peak-period users pay about the same user fee as off-peak users.

**Relieving traffic congestion by fixing bottlenecks, using congestion tolls, and coordinating traffic signals will do far more to save energy than rail transit.**

**There may be reasons to build rail transit, but saving energy and reducing greenhouse gas emissions are not among them.**

The solution is to charge tolls for new highway capacity, and vary the tolls by the amount of traffic so that new highway lanes never become congested. Existing high-occupancy vehicle lanes, which often have surplus capacity, can also be converted to high-occupancy toll (HOT) lanes, as has been successfully done in Denver.<sup>66</sup> Toll revenues will cover the costs of new roads, but higher tolls during peak periods will reduce the need for more roads.

So far, tolls have been applied only to limited-access highways. But traffic engineers can do much to reduce CO<sub>2</sub> emissions on unlimited access roads by improving traffic signal coordination.

San Jose coordinated 223 traffic signals on the city's most-congested streets at a cost of about \$500,000. Engineers estimate that this saves 471,000 gallons of gasoline each year, which translates to a 9.2-million pound reduction in CO<sub>2</sub> emissions.<sup>67</sup> That works out to a cost of just 5.4 cents per pound. Not only were greenhouse gases reduced, but motorists saved time, safety improved, and toxic air pollution was reduced as well.

According to the Federal Highway Administration, three out of four traffic signals in the nation are obsolete and poorly coordinated with other signals.<sup>68</sup> The National Transportation Operations Coalition says that deficiencies in signal coordination "are remarkably similar across the country and across jurisdictions."<sup>69</sup> Cities that have not budgeted the funds to improve traffic signal coordination have no business spending hundreds of millions of dollars building light-rail lines in the forlorn hope that rail transit will reduce CO<sub>2</sub> emissions.

## **Improving Automobile Efficiencies**

The Energy Independence and Security Act of 2007 requires that the average new car sold in 2020 get 35 miles per gallon. Yet even under this law, the average car on the road in 2020 will get only about 25 miles per gallon. Cities

that want to accelerate this process are likely to find that giving people incentives to buy fuel-efficient cars will be a more cost-effective way of reducing energy consumption and greenhouse gas emissions than building rail transit.

Since 1992 American cities have invested some \$100 billion in urban rail transit.<sup>70</sup> Yet no rail system in the country has managed to increase transit's share of urban travel by even 1 percent.<sup>71</sup> Between 1990 and 2005, the only rail region that managed to increase transit's share of commuting by more than 1 percent was New York, and it did so mainly by lowering transit fares. Meanwhile, transit actually lost a share of passenger travel and commuters in most rail regions.<sup>72</sup> Thus, rail transit promises, at best, tiny gains for huge investments.

Considering rail transit's poor track record, persuading 1 percent of auto owners to purchase a car that gets 30 to 40 miles per gallon or better the next time they buy a car will do more to reduce energy consumption and CO<sub>2</sub> emissions than building rail transit. Only minimal incentives might be needed to achieve this, making such incentives far more cost effective than building rail transit.

## **Conclusion**

There may be places in the world where rail transit works. There may be reasons to build it somewhere in the United States. But saving energy and reducing greenhouse gas emissions are not among those reasons. Regions and states that want to be green should find cost-effective alternatives such as the ones described here.

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# Policy Analysis

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## *The Myth of the Compact City Why Compact Development Is Not the Way to Reduce Carbon Dioxide Emissions*

by Randal O'Toole

### Executive Summary

Proponents of compact development argue that rebuilding American urban areas to higher densities is vital for reducing greenhouse gas emissions. Compact city policies call for reducing driving by housing a higher percentage of people in multi-family and mixed-use developments, reducing the average lot sizes of single-family homes, redesigning streets and neighborhoods to be more pedestrian friendly, concentrating jobs in selected areas, and spending more on mass transit and less on highways.

The Obama administration has endorsed these policies. Secretary of Transportation Ray LaHood and Secretary of Housing and Urban Development Shaun Donovan have agreed to require metropolitan areas to adopt compact-development policies or risk losing federal transportation and housing funds. LaHood has admitted that the goal of this program is to “coerce people out of their cars.”

As such, compact-development policies repre-

sent a huge intrusion on private property rights, personal freedom, and mobility. They are also fraught with risks. Urban planners and economists are far from unanimous about whether such policies will reduce greenhouse gas emissions. Some even raise the possibility that compact city policies could increase emissions by increasing roadway congestion.

Such reductions are insignificant compared with the huge costs that compact development would impose on the nation. These costs include reduced worker productivity, less affordable housing, increased traffic congestion, higher taxes or reduced urban services, and higher consumer costs. Those who believe we must reduce carbon emissions should reject compact development as expensive, risky, and distracting from tools, such as carbon taxes, that can have greater, more immediate, and more easily monitored effects on greenhouse gas emissions.

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**Compact development policies, admits Transportation Secretary Ray LaHood, are designed “to coerce people out of their cars.”**

## Introduction

The Obama administration has endorsed proposals to direct metropolitan areas to become more “compact” in order to reduce greenhouse gas emissions. Such a compact-development policy calls for increasing urban population densities, housing more people in multi-family and mixed-use developments, investing more in mass transit and less in infrastructure for personal transportation, and concentrating jobs in selected areas.

The major premises behind this policy are that people living in compact cities drive less, and that the United States cannot meet targets for reducing greenhouse gas emissions without reducing the growth of driving. The “transportation sector cannot do its fair share to meet this [greenhouse gas reduction] target through vehicle and fuel technology alone,” says *Growing Cooler*, a 2008 report from the Urban Land Institute. This is because, the report explains, the predicted growth in driving is greater than predicted reductions in emissions from more efficient cars and alternative fuels.<sup>1</sup>

To reduce driving, *Growing Cooler* advocated the use of “compact development” combined with “expanded transportation alternatives.” Compact development, says *Growing Cooler*, means “higher average ‘blended’ densities” along with “a mix of land uses, development of strong population and employment centers, interconnection of streets, and the design of structures and spaces at a human scale.”<sup>2</sup>

One month after publication of *Growing Cooler*, the Brookings Institute released *Shrinking the Carbon Footprint of Metropolitan America*. The report urged the federal government to use its housing and transportation programs to encourage or require metropolitan areas “to expand transit and compact development.”<sup>3</sup>

In 2009, the Urban Land Institute and several other groups published *Moving Cooler*, a sequel to *Growing Cooler*. The report claimed that “smart growth”—a combination of compact development and “improved travel op-

tions”—could reduce 2050 greenhouse gas emissions by 9 to 15 percent.<sup>4</sup>

Another 2009 report from the Center for Clean Air Policy promoted “greenhouse gas reductions through smart growth and improved transportation choices” and proposed that cap-and-trade revenues be invested in such programs. The report went further and argued that such changes would be “cost-effective” and even “profitable.”<sup>5</sup>

Most recently, a report from the Transportation Research Board, *Driving and the Built Environment*, concluded that doubling the density of most new development and making other land-use changes such as concentrating jobs, mixed-use developments, and significant transit improvements, could reduce miles of driving and auto-related carbon dioxide emissions by up to 11 percent.<sup>6</sup>

Coming at a time when Congress is debating both climate policy and transportation reauthorization, these reports are clearly aimed at promoting a national smart-growth policy that would dictate land uses and transportation spending for the next several decades. The reports have clearly influenced the Obama administration, which has endorsed the goal of reducing driving through compact-city policies. The secretaries of transportation and housing and urban development have signed an agreement to require metropolitan areas to adopt compact development policies.<sup>7</sup> Secretary of Transportation Ray LaHood has admitted that these policies are designed to “coerce people out of their cars.”<sup>8</sup>

Yet the reports supporting compact cities contain major flaws. First, they typically overstate the effects of compact development on greenhouse gas emissions. Second, they ignore or vastly underestimate the costs of compact development, alternative forms of transportation, and restrictions on personal mobility. Further, they ignore or underestimate the risks that compact development will not produce the intended effects or that unintended consequences will prove far more costly than any benefits that result.

The reports’ failure to accurately assess benefits and costs obscures the fact that com-

compact city policies are extremely expensive, yet they will likely yield negligible (and possibly negative) environmental benefits. Given limited resources, if other means of reducing greenhouse gases are more cost efficient, then promoting or requiring compact development will make it more difficult to achieve emission reduction targets.

## History of Compact City Planning

For more than 75 years, architects and urban planners have proposed compact development as an alternative to low-density suburbs, which they derisively term “sprawl.” In addition to higher-density housing, most compact city proposals also include plans to make neighborhoods more pedestrian-friendly and include investments in mass transit and other alternatives to auto driving. Together, compact development and alternative transportation projects are sometimes called “smart growth.”

Although the term smart growth was not applied to these policies until 1996, the desire on the part of urban planners and some environmentalists for higher urban densities long predates that year or any concerns about global climate change. Criticism of low-density suburbs dates back at least to the 1930s.<sup>9</sup> First in Europe and later in the United States, those critics have sought to use the power of government to herd large segments of the population into high-density cities and to prevent owners of rural land from developing their property for residential uses.

One of the first to promote such policies was Le Corbusier, a Swiss-French architect who promoted the reconstruction of cities into vast regions of high-rise apartments that he called “Radiant Cities.” His ideas so heavily influenced urban planners throughout the world in the 1940s and 1950s that planning historian Peter Hall calls Corbusier “the Rasputin of this tale,” both because Radiant Cities turned out to be unlivable and because of his authoritarian approach to planning, “the

evil consequences of which are ever with us.”<sup>10</sup>

In 1947, the British Parliament passed the Town and Country Planning Act, which could be described as the first modern compact-city law. This law set aside vast regions of rural land as greenbelts and mandated the construction of high-density, high-rise housing within existing cities along Radiant City lines.

Unlike the United States, which built public housing only for the poor, the British government built these apartments for working-class and middle-class families. Many of the buildings proved to be so unlivable, observes Hall, that “the remarkable fact was how long it took for anyone to see that it was wrong.”<sup>11</sup> By the late 1960s, few people were willing to live in such apartments even at heavily subsidized rents, and so by 1970, says Hall, “the great Corbusian rebuild was over.”<sup>12</sup>

The United States built its Radiant City housing exclusively for low-income families, but had the same experience. The housing projects became so plagued by crime and vandalism that most have been demolished.<sup>13</sup>

One of the leading critics of the standard urban renewal practices of the 1950s—clearing “slums” and replacing them with high-rise housing—was Jane Jacobs, author of *The Death and Life of Great American Cities*. Jacobs lived in a mid-rise, mixed-use, inner-city neighborhood that was slated for urban renewal, and she sought to prove that her neighborhood was “lively,” and not a blighted slum that needed to be replaced.<sup>14</sup>

Urban planners learned a lesson from *The Death and Life*, but it was the wrong one. Instead of realizing that cities are too complicated to be centrally planned, they concluded that central planners should promote Jacobs’s mid-rise neighborhoods instead of Corbusier’s high-rise apartments.

This transition is apparent in a 1973 book, *Compact City*. “The problems of urban development,” write authors George Dantzig and Thomas Saaty, “are too crucial to the future to be left to real-estate developers”—in other words, private landowners who meet market demand by building low-density sub-

**Compact development proposals date back at least to the 1930s and the British Parliament passed the first compact-development law in 1947.**

urbs. Central planners should insist on higher-density development.<sup>15</sup>

The book's main proposals were "in some respects based on Radiant City lines" (which reveals how slow planners are to learn from their mistakes). As an alternative, however, the authors' proposed that density could be achieved using Jacobs's "lively neighborhoods."<sup>16</sup> Either way, the authors call for a top-down planning approach that would give property owners and homebuyers little choice but to accept the dictates of the supposedly omniscient planners.

In the 1980s, a number of architects proposed to build Jacobs's lively neighborhoods from scratch. On the East Coast, Andres Duany suggested that such "neotraditional" neighborhoods would have a stronger sense of community than traditional low-density suburbs.<sup>17</sup> On the West Coast, Peter Calthorpe claimed that pedestrian-oriented "urban villages" would be less "dependent" on the automobile.<sup>18</sup> These ideas soon became known as "New Urbanism."

New Urbanists, however, soon ran into a brick wall of market reality: surveys and actual buying habits have repeatedly shown that the vast majority of Americans aspire to live in a single-family home with a large yard.<sup>19</sup> While New Urbanists accepted some single-family homes, they wanted to increase the percentage of people living in multi-family housing and build single-family homes on tiny lots. There is a small market for high-density, mixed-use neighborhoods, but in many cities that market is easily met by existing older neighborhoods.

As a result, many early New Urban developments were financial failures. After the first developer of Calthorpe's Laguna West, near Sacramento, went bankrupt, a later developer reconfigured and completed it as a traditional suburb. Calthorpe soon went into the business of helping cities write codes mandating New Urban development. Such mandates came to be known as "smart growth," a term that became popular partly because advocates often construe anyone who supports property rights and freedom of choice as promoting "dumb growth."<sup>20</sup>

## The Solution in Search of a Problem

Throughout most of this history, compact development was a solution in search of a problem. Early advocates claimed that denser development was needed to preserve farmlands. Yet the United States has a billion acres of agricultural lands, less than 40 percent of which are actually used for growing crops, while the nation's urban areas occupy only about 100 million acres.<sup>21</sup> So, compact development for the purpose of farm preservation made little sense.

In the 1970s, advocates of compact development argued that it would reduce air pollution and save energy because people living in compact cities would drive less. Yet it proved to be far easier to simply build cleaner, more fuel-efficient cars than to completely rebuild American cities.

Between 1970 and 2007, for example, urban driving increased by 250 percent, but auto-related air pollution declined by more than two-thirds.<sup>22</sup> Meanwhile, Americans responded to higher gas prices in the 1970s and early 1980s by buying cars in the 1990s that were an average of 40 percent more fuel efficient than those available in the early 1970s.<sup>23</sup> In 1991, for example, Americans drove 41 percent more miles than in 1978, while using only 3 percent more fuel.<sup>24</sup> After gas prices fell, Americans bought larger cars, but technological improvements produced a continuing increase of ton-miles-per-gallon.<sup>25</sup> This shows that considerable progress can be made in improving fuel economy without reducing mobility.

Another early argument for regulating sprawl was that the cost of providing infrastructure to low-density communities was significantly greater than in higher-density areas.<sup>26</sup> The most detailed study of this question concluded that low-density suburban development imposes about \$11,000 per residence more in urban-service costs on communities than more compact development.<sup>27</sup> Some have questioned this number.<sup>28</sup> But even if valid, most homebuyers would gladly

**After the developer of a New Urban project designed by Peter Calthorpe went bankrupt, Calthorpe went into the business of helping cities writing codes mandating New Urban development.**

add \$11,000 to the cost of a \$150,000 home in order to have a good-sized yard and not share a wall with next-door neighbors.

In the 1980s and 1990s, some New Urban advocates argued that denser neighborhoods had a stronger sense of community. Studies have found, however, that suburbs actually have more social interactions than denser cities.<sup>29</sup> Even the data in Robert Putnam's *Bowling Alone*, which promoted the notion that Americans were losing their sense of community, showed that suburbanites had higher social participation rates than residents of dense cities.<sup>30</sup>

In the early 2000s, compact-city supporters jumped on the obesity issue by claiming that suburbs make people fat. In fact, even studies prepared by smart-growth supporters found that the differences in obesity rates between low- and high-density areas were trivial. One study found, for example, that about 2 percent more people in low-density Atlanta are obese than in high-density San Francisco.<sup>31</sup> More careful studies have found “no evidence that urban sprawl causes obesity.” In fact, these studies say, compact-city advocates confused cause and effect: “individuals who are more likely to be obese choose to live in more sprawling neighborhoods.”<sup>32</sup>

If all these reasons for supporting compact cities are wrong, then why is the idea so persistent? The answer, at least in part, says Peter Hall, is that it is a class conflict. Ironically, Hall observes, before 1920 the main goal of urban planners was to move working-class people from high-density inner-city tenements to low-density suburbs. No one complained about urban sprawl when low-density suburbs were occupied solely by the upper and middle classes. But when working-class families started moving to the suburbs—more due to Henry Ford's mass-produced automobiles than to anything urban planners did—conflicts between upper- and lower-class tastes led to a backlash.<sup>33</sup> While often giving lip service to the idea of mixed-income communities, the elites decided to promote policies that made single-family housing unaffordable to all but the wealthy.

Now compact-city advocates have hitched their wagon to the climate-change debate. However, instead of advocating the most efficient (and thus resource-conservative) ways of reducing greenhouse gas emissions, these advocates have co-opted climate concerns to justify their preferences for urban planning. Consider:

- The lead author of *Growing Cooler*, Reid Ewing, was also the lead author of the study (which he brags is “the most widely reported planning study ever”) that erroneously claimed suburbs make people obese.<sup>34</sup>
- *Growing Cooler* co-author Keith Bartholomew was staff attorney for 1000 Friends of Oregon in 1989, where he directed the Land Use-Transportation-Air Quality project that developed much of the modern conception of compact development.<sup>35</sup> Another co-author, Don Chen, is a former staff member of the Surface Transportation Policy Project, which has sought to reduce driving since its creation in 1990.
- Many of the organizations behind the *Moving Cooler* report, including the American Public Transportation Association, Environmental Defense Fund, Natural Resources Defense Council, and Environmental Protection Agency, have promoted compact cities for at least 15 years.
- Several people listed on the Center for Clean Air Policy report as having provided “assistance” to the authors have also promoted compact cities.

Some, though certainly not all, of the members of the Transportation Research Board committee that oversaw that organization's report have also long been compact-city advocates.

In other words, these reports have been written or influenced by people who supported compact development long before climate change became a major issue. Now they are using climate change to justify imposing their preferred form of urban planning on major U.S. metropolitan areas.

**No one complained about sprawl when suburbs were occupied solely by upper and middle classes. It was only when working-class families moved to the suburbs that critics proposed to force them into compact developments.**

**If the United States decides to reduce greenhouse gas emissions, other policies are far more cost-efficient than compact development.**

Rebuilding American cities to more compact standards would certainly qualify as a megaproject. Bent Flyvbjerg, a Danish planner who has studied numerous megaprojects, observes that megaproject advocates are often guilty of *optimism bias*, in which they overestimate benefits and underestimate costs, and *strategic misrepresentation*, in which they skew data to make their project look more favorable than it really is.<sup>36</sup>

For example, *Growing Cooler* optimistically estimated that building 60 percent of new urban development to compact standards would reduce 2030 carbon dioxide emissions by 79 million tons.<sup>37</sup> Somewhat more realistically, *Moving Cooler* estimated that building 64 percent of new urban development to compact standards would reduce 2030 carbon dioxide emissions by only 22 million tons, indicating that *Growing Cooler* overestimated the effects of compact development by nearly four times.<sup>38</sup> In its own example of optimism bias, however, *Moving Cooler* projects that the cost of building up to 90 percent of all new urban development in the U.S. to compact standards would be only \$1.5 billion.<sup>39</sup>

Policy advocates who couch their ideas in language that disguises the weaknesses of their proposals are guilty of strategic misrepresentation. For example, *Growing Cooler's* repeated statement that transportation accounts for one-third of greenhouse gas emissions (modified to 28 percent in *Moving Cooler*) obscures the fact that urban driving of personal vehicles—the form of transportation advocates seek to reduce through compact development—accounts for less than 13 percent of emissions, while the other 20 percent comes from freight, mass transportation, and intercity travel.<sup>40</sup>

A careful reading of the various compact-city reports reveal numerous other optimism biases and strategic misrepresentations that overestimate the benefits and underestimate the costs of these proposals. Correcting these biases and misrepresentations reveals that compact development would be a wasteful and inefficient way of achieving greenhouse gas reductions.

## Compact Cities and Greenhouse Gases

All of the reports discussed in this paper take it for granted that the United States must reduce carbon dioxide emissions by as much as 80 percent from 1990 levels—which would mean 83 percent from 2007 levels. Though many climatologists dispute this goal, such disputes are beyond the scope of this paper.<sup>41</sup>

Instead, the point of this paper is that *if the United States decides to reduce greenhouse gas emissions, there are more cost-efficient policies to achieve this goal than compact development*. Given that resources are limited, any project that reduces greenhouse gas emissions in a non-cost-effective manner will simply make it more difficult to meet emission reduction targets.

According to a McKinsey and Company report, the United States can meet emission reduction targets by investing in projects that cost less than \$50 per ton of carbon-dioxide-equivalent emissions. Close to half of the reductions, the company found, would actually have a negative cost: though they may require up-front investments, they would save money in the long run by reducing energy costs. These projects would include designing cars and light trucks that are lighter-weight and have less wind and rolling resistance.<sup>42</sup>

In contrast to McKinsey's rigorous analysis of cost-effectiveness, none of the reports advocating compact development show that such policies would be cost-effective, and most do not even mention cost-effectiveness. In fact, to the extent that compact development can reduce greenhouse gas emissions at all, it would do so only at a cost far greater than \$50 per ton. This means it should be among the last policies to be adopted in response to climate concerns.

### Growing Cooler

*Growing Cooler* insists that reductions in the growth of driving are needed so that transportation will contribute its "fair share" of greenhouse gas reductions.<sup>43</sup> But what is fair? The report implies that, since transportation

accounts for a third of emissions, it should provide a third of total emission reductions. This ignores the fact that emissions reductions can be achieved in other sectors much more cheaply and easily, which would be far more efficient for society. For example, the McKinsey study found that more than half of the cost-effective opportunities for emission reductions are in the electricity sector, while transportation offers only 15 percent of such opportunities.<sup>44</sup> Unless advocates of compact development can prove that their policies would cost less than \$50 per ton, proposals to reduce driving to meet emission-reduction targets are almost certain to be cost-ineffective.

Even among transportation investments, *Growing Cooler* provides no evidence that compact development is a cost-effective solution to greenhouse gas emissions. Instead, it relies on a weak metaphor of a three-legged stool, the legs being more fuel-efficient cars, alternative fuels, and reduced driving. The first two “legs” alone will not meet emission-reduction targets, says the report, so we must reduce driving.<sup>45</sup>

The only evidence the report offers that the first two legs are insufficient is based on the corporate average fuel economy (CAFE) standard in the Energy Independence and Security Act of 2007, which called for increasing the average fuel economy of cars to 35 miles per gallon by 2020. The report also accounts for a federal requirement that alternative fuel use be increased so as to reduce carbon dioxide emissions by about 10 percent. The report shows that the emission reductions from these two standards will be offset by increases in driving. This leads to the conclusion that driving must be reduced.<sup>46</sup>

In effect, the report assumes that no further increases in fuel efficiencies or alternative fuels are possible beyond those in the 2007 law. That assumption has already been proven obsolete, because in 2009 auto manufacturers accepted an even tighter CAFE standard of 35.5 mpg by 2016. The report further assumes that auto manufacturers will make no additional improvements in fuel efficiency or alternative-fueled autos after 2020. *Growing Cooler*

tracks emissions through 2050, yet it effectively assumes technology will freeze after 2020, barely a quarter of the way through the time-horizon of the report. Accepting that this is unlikely greatly shrinks the imperative to reduce driving.

Data buried in the back of *Growing Cooler* suggest that, to the extent that reductions in driving can contribute at all to greenhouse gas reductions, only a small share of that contribution will come from compact development. The report evaluates four policies that together, it concludes, could reduce driving by 38 percent. Of those policies, the two *smallest* reductions in driving come from increased investments in transit, which would reduce driving by only 4.6 percent, and increased population densities, which would reduce driving by 7.7 percent.

The greatest reduction in driving comes from an assumption that fuel prices will rise at rates that are significantly faster than historical levels (possibly through higher fuel taxes), which would reduce driving by 14.4 percent. This is closely followed by a policy of reducing investments in new highways, which would increase the growth in congestion and reduce driving by 11.4 percent.<sup>47</sup>

In other words, two-thirds of the projected reductions in driving come from making driving more expensive, not from land-use changes or investments in alternatives to driving. This reveals that compact-city policies are far less effective than its proponents imply, and that the compact-city agenda is far more coercive—relying more on punitive pricing measures than changes to the built environment—than its proponents admit.

In an effort to show that its policies are not necessarily coercive, *Growing Cooler* argues that increasing numbers of Americans want to live in more compact cities. The report relies heavily on the projections of an urban planning professor named Arthur Nelson, who claims that by 2025 the United States will have a surplus of single-family homes on large lots and all new construction will have to be multi-family housing or single-family homes on small lots.<sup>48</sup>

**Most of the reductions in driving in *Growing Cooler* come from policies that make driving more expensive, not from compact development.**

**Those who believe we should reduce carbon emissions should reject compact development as expensive, risky, and likely to distract attention from more cost-effective emission-reduction programs.**

However, Nelson himself is guilty of optimism bias. He claims that only 25 percent of Americans want to live in single-family homes on large lots, while 37 percent want small lots (less than one-sixth of an acre) and 38 percent prefer multi-family housing. These numbers, he says, are “based on interpretations of surveys” reported by urban planners Dowell Myers and Elizabeth Gearin.<sup>49</sup> Yet the Myers-Gearin paper completely contradicts Nelson’s “interpretation,” citing survey after survey finding that 75 to 85 percent of Americans aspire to live in single-family homes with a yard.<sup>50</sup>

If compact-city advocates truly believed in Nelson’s numbers, they would not need to use regulation to increase densities of American cities. Builders responding to market demand alone would make cities denser. But in fact, achieving *Growing Cooler’s* compact-city goals will require a degree of coercion from the federal government that is unprecedented in American history: limits on rural land development, mandated changes to existing residential areas, and huge taxpayer-supported subsidies to entice people to live in higher-density complexes.

### **Shrinking the Carbon Footprint**

The Brookings Institution report is the only one considered in this paper that deals with greenhouse gas emissions from sources other than transportation. Not only will compact cities reduce driving, says the report, but they will also reduce the energy consumption and greenhouse gas emissions from housing and other buildings.

Buildings, the report points out, account for even more carbon emissions than transportation—39 percent vs. 33 percent.<sup>51</sup> The report advocates compact development to reduce these costs through “smaller homes and shared walls in multi-unit dwellings.”<sup>52</sup>

As with *Growing Cooler’s* demand that we reduce driving, the Brookings report fails to show that compact development is a cost-effective way of saving energy or reducing greenhouse gases from residential or other buildings. According to the Department of

Energy, single-family homes actually consume less energy per square foot than multi-family homes. Despite their shared walls, two- to four-unit multi-family homes use 25 percent more energy per square foot, while residences with five or more units use 8 percent more, than single-family detached homes.<sup>53</sup>

This means the Brookings study is really proposing to save energy by forcing Americans to drastically reduce the size of their living spaces. Yet it is likely that technological improvements—better insulation, designs that take better advantage of solar heating opportunities, and so forth—could achieve far more energy savings at a lower cost without requiring dramatic changes in lifestyles. Just as compact-city advocates consider technological solutions that make driving more energy-efficient to be inadequate, the Brookings report implicitly considers technological solutions that make single-family housing more energy-efficient to be insufficient.

### **Cost-Effective GHG Reductions**

The Center for Clean Air Policy report shares a co-author, Steve Winkelman, with *Growing Cooler*—along with many of the latter report’s arguments. But it also claims to prove that compact development is a cost-effective means of reducing greenhouse gases. In fact, the report claims that reducing per capita driving by 10 percent “can be achieved profitably, when factoring in avoided infrastructure costs, consumer savings and projected tax revenue growth.”<sup>54</sup>

Typically, the report offers almost no real-world data to support this conclusion. Instead, it relies on the projections of urban planners in Atlanta, Portland, Sacramento, and elsewhere for how their policies will affect energy consumption and other behaviors. Though it calls these “case studies,” the report’s arguments suffer from optimism bias and strategic misrepresentations.<sup>55</sup>

For example, CCAP reports that Sacramento’s “smart-growth plan is projected to reduce emissions [at] a net economic benefit of \$198 per ton carbon dioxide.” Yet Sacramento has been using smart-growth plans requiring com-

pact development and investments in transit for decades, but the environmental gains from these efforts seem to be minimal. The region's 2006 plan openly admitted that its smart-growth plans imposed "during the past 25 years have not worked out." Despite building light rail, the share of transit riders who "have access to an automobile [and] can otherwise choose to drive" is decreasing. Despite efforts to promote compact development, both jobs and residences continued to decentralize. Despite the region's failure to build new roads to accommodate growth, "lack of road building and the resulting congestion have not encouraged many people to take transit instead of driving."<sup>56</sup> Despite the failure of past plans, Sacramento adopted a plan that continued these failed policies and projected benefits that were based more on hope than experience.

The CCAP report breathlessly notes "that \$73 million invested in the Portland Streetcar helped attract \$2.3 billion in private investment within two blocks of the line."<sup>57</sup> What it does not say is that, at the same time that it built the streetcar line, Portland spent more than \$665 million subsidizing new developments along the line, including building parking garages for retailers, subsidizing an aerial tram, parks, and parking garages for a development near the Oregon Health Sciences University, and providing 10 years of property-tax waivers to many residences that were built along the streetcar line.<sup>58</sup>

Except for the property-tax waivers, most of these subsidies came from tax-increment financing, which effectively transfers tax revenues from schools, fire, police, and other essential services to property developers. Far from being "profitable," as CCAP claims, such transfers give residents a choice between declining urban services and higher taxes to replace the funds lost to schools and other urban services.

CCAP claims that the Atlanta development Atlantic Station will reduce greenhouse gas emissions "at a net cost savings, because municipal tax revenues from the project will be greater than what is required to pay back the initial project loan."<sup>59</sup> As in the case of Port-

land, the "initial project loan" is a \$75 million tax-increment financed subsidy to the developers.<sup>60</sup> What CCAP does not reveal is that the tax revenues required to repay this subsidy would otherwise go to schools and other essential urban services for Atlantic Station.

The problem with relying on projections rather than reality is that the projections are often made by planners who themselves suffer from optimism bias and strategic misrepresentation. For example, planners typically portray tax-increment financing as a way of "self-financing" economic development. Yet the new development requires the same urban services as existing development, but the taxes that would have gone to those services are transferred to the developers instead.

In most cases, subsidies to economic development are, at best, a zero-sum game: if planners subsidize it to take place in a dense section of a city, it will not take place somewhere else. So planners cannot claim the benefits of that development as a net gain for the city or region; in fact, the tax subsidy is a net loss. At worst, such subsidies are a negative-sum game: by increasing taxes or reducing urban services, they discourage employers from moving to or remaining in the region. As a study in Illinois found, communities that use tax-increment financing actually "grow more slowly than those that do not."<sup>61</sup>

In Sacramento and Portland, at least, tax increases ordinarily require voter approval. But tax-increment financing is exempt from this requirement. Far from being profitable, cities that use tax-increment financing to support compact development are effectively stealing from schoolchildren, firefighters, and other recipients and providers of urban services—and, in turn, stealing from the taxpayers who agreed to fund those services.

### **Moving Cooler**

While *Moving Cooler* is in many ways a sequel to *Growing Cooler*, it maintains a patina of greater objectivity because it was written by a consulting firm, Cambridge Systematics, rather than by employees of organizations that have supported compact development for two

**CCAP's claims that compact development is "cost effective" are based on projects in which cities effectively steal money from schools, fire, and police to subsidize developers.**

decades. Yet *Moving Cooler* relies on many of the same sources as *Growing Cooler*, and background documents specifically cite *Growing Cooler* as the source of many of the new report's assumptions.

For example, *Moving Cooler* uses Arthur Nelson's projections, "as cited in *Growing Cooler*," of the future demand for various types of housing.<sup>62</sup> It based its estimate of the reductions in driving due to "pedestrian-friendly environments" on a paper by Ewing (a *Growing Cooler* co-author) and Cervero, "also cited in *Growing Cooler*."<sup>63</sup>

Cambridge Systematics also relied on a paper by the Center for Clean Air Policy for nearly all of its numbers relating to high-speed rail.<sup>64</sup> This paper contained many examples of optimism bias and strategic misrepresentation. For example, the paper assumed that high-speed trains would operate 70 percent full.<sup>65</sup> Yet Amtrak trains in 2008—a banner year for passenger trains due to high gas prices—were only 52 percent full.<sup>66</sup>

Unlike most of the other reports considered here, *Moving Cooler* compares compact development with other ways of reducing vehicle-related greenhouse gas emissions, including parking and highway pricing, carbon taxes, ride-sharing and similar commuting strategies, intelligent transportation systems, and highway capacity expansions.<sup>67</sup> Though the report estimates the costs and emission reductions from "expanded," "aggressive," and "maximum" levels of each strategy, it does not take the next step of calculating the cost per ton of abatements.

Those costs range from pennies to \$5,900 per ton. Of 47 strategies considered, only 21 are estimated to cost \$50 per ton or less, and in some cases the cost is less than \$50 at only some levels of implementation. For example, "expanded incident management" costs \$37 per ton, but "maximum incident management" costs \$161 per ton.<sup>68</sup>

Even though the report provides readers with enough data to calculate costs per ton, many of the cost and benefit estimates are questionable. For example, maximum expansions of transit service are estimated to pro-

duce 1.5 billion metric tons of greenhouse gas reductions. This seems questionable considering that transit produces about the same amount of greenhouse gases per passenger mile as automobiles.<sup>69</sup>

To reach this conclusion, Cambridge Systematics assumed that new technologies would reduce greenhouse gas emissions per passenger mile from buses by 26 percent and from rail transit by 50 percent or more, even if passenger loadings remain about the same as they are today.<sup>70</sup> This is extremely unlikely, particularly for rail transit. America's automobile fleet turns over every 18 years, so by 2050 we will have two completely new generations of automobiles on the roads, many of which will be lighter and have less wind- and rolling-resistance than today's cars. But rail transit fleets turn over only once every 30 to 40 years, and there is little reason to think that future vehicles will be significantly more fuel-efficient than the ones on the rails today.<sup>71</sup>

Moreover, both bus and rail transit vehicles are significantly less fuel efficient, per passenger mile, today than they were in 1980.<sup>72</sup> This is mainly due to a decline in passenger loadings that has resulted from expansions of service into areas that make little use of transit. Cambridge Systematics' assumption that a huge expansion of transit service will not reduce average passenger loads is likely to be optimistic.

The one way in which transit expansions could significantly reduce greenhouse gas emissions is if the transit were powered by non-fossil-fuel sources of electricity. But it would be more cost-effective to dedicate such electricity to electric cars and plug-in hybrids, which can be recharged overnight when electricity demand is low, and allow daytime use of that electricity for other purposes.

Even with Cambridge Systematics' generous assumptions regarding improvements in transit efficiencies, the cost of the maximum transit expansions is more than \$2,000 per ton, while the cost of lesser expansions exceeds \$1,700 per ton. This is far more than can be considered cost-effective under the McKinsey report's guideline of \$50 per ton.

**It is more cost-effective to dedicate renewable energy to electric cars and plug-in hybrids, which can be recharged overnight when electricity demand is low, then to use it for transit in day times, when demand is high.**

According to *Moving Cooler*, compact-development strategies are very cost-effective, ranging from \$1 to \$9 per ton. But the costs projected by Cambridge Systematics are extremely low. It claims that compact development nationwide would cost the same \$1.5 billion under the expanded (43 percent of new development is compact), aggressive (64 percent), and maximum (90 percent) levels of deployment of compact city policies.<sup>73</sup> At apparently no extra cost, the maximum level is projected to reduce greenhouse gas emissions by more than 9 times the expanded level.

This report will show that compact development will cost far more than \$1.5 billion. But even under the maximum level, Cambridge Systematics estimates that compact development will reduce greenhouse gas emissions by just 38 million tons in 2030, or about a half a percent of current U.S. emissions. By 2050 this would increase to 73 tons, or about 1.3 percent of current emissions.<sup>74</sup>

### Driving and the Built Environment

The Transportation Research Board report, *Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and Carbon Dioxide Emissions*, has an even stronger claim to objectivity than *Moving Cooler*. The report was written under the supervision of a 12-member committee that included a mix of planners and transportation engineers. Some members of the committee—most notably Dianne Brake of PlanSmart NJ, Andrew Cotugno of Metro (Portland’s metropolitan planning organization), and Rolf Pendall of the Cornell University City and Regional Planning Department—have been unabashed supporters of compact development, but others have been more skeptical.

“Evidence from the literature,” says the report, indicates “doubling density is associated with about 5 percent less VMT [vehicle miles traveled] on average.” When “other land-use factors” such as mixed uses and pedestrian-friendly design are taken into account, “reports find that VMT is lower by an average of 3 to 20 percent.”<sup>75</sup>

The report compares a base case (no action)

with two scenarios: one in which 25 percent of all future urban development is built to twice the existing urban densities and one in which 75 percent is built to twice the current densities. The report arbitrarily assumed that residents of compact developments would drive 12 percent less than average under the 25-percent scenario and 25 percent less than average under the 75-percent scenario.<sup>76</sup> This is particularly optimistic considering that the report’s own literature review found driving reductions of just 3 to 20 percent.

Based on these assumptions, the report projects that total miles of driving would be 1 percent less than the base case under the 25-percent scenario, and up to 11 percent less under the 75-percent scenario. The report adds that “the committee disagreed about whether the changes in development patterns and public policies necessary to achieve the high end of these findings are plausible.”<sup>77</sup>

In preparing this report, the committee commissioned five background papers. Most of these papers offer little support to those who promote compact development as a way of reducing greenhouse gas emissions.

One paper by University of California economist David Brownstone reviewed the literature on relationships between “the built environment” and driving (as measured by vehicle miles traveled, or VMT). He concluded that there is a “statistically significant link” between the built environment and VMT—but that the available evidence suggests “the size of this link is too small to be useful.”<sup>78</sup> Brownstone also wonders “why controlling VMT should be a policy goal,” since mobility has a high value and evidence suggests that people respond to higher fuel prices by buying more fuel-efficient cars more than by reducing driving.<sup>79</sup>

A paper by transportation engineer Kara Kockelman (who was also on the TRB committee) and colleagues at the University of Texas reviews alternative means of reducing greenhouse gas emissions. The paper concludes that policies emphasizing higher fuel-economy standards will be much more cost-effective at reducing emissions than land-use policies aimed at reducing driving. In fact, the

**A literature review by University of California economist David Brownstone found that the link between the built environment and driving is “too small to be useful.”**

**There is no consensus among researchers about how much compact development would reduce driving, suggesting this is a highly risky proposition.**

paper says, compact development and transit improvements could both substantially *increase* emissions rather than reduce them—the first by increasing congestion (which leads cars to emit more pollution) and the second because transit construction and operations both emit substantial amounts of greenhouse gases.<sup>80</sup>

George Mason University transportation engineer Michael Bronzini wrote a paper on the relationship between land use and truck traffic. He concluded that “low-density development does increase truck traffic” and that “it appears that smart-growth measures could be effective in reducing truck VMT.”<sup>81</sup> However, Bronzini did not assess the cost-effectiveness of such measures.

A paper on housing trends by John Pitkin and Dowell Myers seriously questions Arthur Nelson’s claims that cities should be substantially rebuilt at higher densities to meet the demand for those densities. “Nelson and others have placed too great an emphasis on changing preferences as the driver of changing development patterns,” says the paper. The report found “scant evidence of any net shift of total or elderly population toward central cities,” where development is typically denser.<sup>82</sup> Where Nelson projected that changes in tastes would lead to substantial reconstruction of urban areas, Pitkin and Myers expect “lower replacement rates” and more reliance on existing housing.<sup>83</sup> This suggests that government mandates to rebuild urban areas to higher densities will be far more expensive than suggested by compact-city advocates.

A paper by urban planner Genevieve Giuliano and colleagues at UCLA concludes that two-thirds to three-fourths of jobs in modern urban areas are not located either in downtowns or other urban and suburban centers; instead, they are finely dispersed throughout urban areas. This suggests that concentrating employment, one of the goals of compact-city advocates, will be expensive. The paper also expresses doubt that accomplishing this goal will have significant effects on driving.<sup>84</sup>

Taken together, these papers suggest that using compact development to reduce green-

house emissions is a highly risky proposition. There is no consensus among researchers about how much compact development would reduce driving, and the 25-percent reduction assumed by *Driving and the Built Environment’s* 75-percent scenario is outside the range of literature reviewed by the report. Claims that demand for compact development is increasing also appear overstated, and there are numerous uncertainties about the benefits and costs of such policies as concentrating employment and construction of transit improvements. These risks suggest that all the various compact-development reports are likely to have overstated the benefits and underestimated the costs of compact-city policies.

## Overstating the Benefits

*Growing Cooler* says its policies can reduce the growth rate of driving by 38 percent.<sup>85</sup> *Moving Cooler* says that smart-growth policies can reduce total greenhouse gas emissions by 9 to 15 percent.<sup>86</sup> In fact, a close reading of these and other reports reveals that compact development has minimal effects on driving and greenhouse gas emissions.

- *Growing Cooler* found that building 60 percent of new urban development to compact standards would reduce 2030 carbon dioxide outputs by 79 million tons, or 1.3 percent of current levels.<sup>87</sup>
- *Moving Cooler* was far less optimistic, projecting that building 64 percent of new development to compact standards, including more pedestrian- and bicycle-friendly design and “high-quality transit,” would reduce 2030 carbon dioxide outputs by only 22 million tons, or less than 0.4 percent of current emissions.
- *Moving Cooler’s* maximum effort of making 90 percent of new development compact would reduce 2030 greenhouse gas emissions by 0.6 percent, and 2050 emissions by 1.2 percent below current levels.
- *Driving and the Built Environment* projected that building 75 percent of new devel-

opment to twice current densities would reduce 2050 driving by 11 percent, thereby reducing greenhouse gas emissions by, at most, 1.4 percent below current levels.

The similarity between the *Moving Cooler* and *Driving and the Built Environment* disguises a huge debate among urban planners and economists over how much differences in driving are due to the “built environment” and how much are due to “self selection.” Many studies have found that people who live in dense, mixed-use areas drive less than people in low-density suburbs, but it is likely that a large part of this is because people who want to drive less choose to live in dense, mixed-use neighborhoods with intensive transit service.

*Growing Cooler* dismissed this concern by citing a literature review of studies of the effects of density and urban design on driving. “Virtually every quantitative study reviewed for this work,” the literature review is quoted as saying, “found a statistically significant influence of one or more built environment measures on the travel behavior.”<sup>88</sup> *Growing Cooler* neglected to quote the very next sentence of the literature review: “However, the practical importance of that influence was seldom assessed.”<sup>89</sup> In other words, “statistically significant” does not mean “large”; it only means “measurable.” As David Brownstone’s literature review for TRB concluded, the effects themselves are likely to be “too small to be useful” in reducing greenhouse gas emissions.<sup>90</sup>

Even if the effects projected by these reports are realistic, they hardly make the case for implementing compact-development policies. As one reviewer of the TRB report concluded, “increasing population density in metropolitan areas would yield insignificant carbon dioxide reductions.”<sup>91</sup> But if they are so insignificant, how can the authors of so many of these reports argue that compact development policies are essential or that they can reduce emissions by 9 to 15 percent?

One way is by conflating compact development with other policies. *Growing Cooler*

admits that increasing the cost of auto driving, through taxes and congestion, has a far greater effect on driving than compact development and transit improvements. Moreover, note that *Growing Cooler* does not project that compact development will reduce emissions, only that it reduces the *growth* in driving—and then only by 7.7 percent.

*Moving Cooler*’s claim that “smart growth” could reduce greenhouse emissions by 9 to 15 percent is based on a “bundling” of compact development with other policies, including taxes on existing parking, a freeze on all new parking, HOV lanes, urban nonmotorized zones, and mandates that employers alter their employees’ commuting habits.<sup>92</sup> While *Moving Cooler* claims there are synergistic effects between these policies, it never verifies this claim by comparing the implementation of these other policies with and without the compact-development policies.

Compact-development advocates are so intent on seeing their policies implemented that they never objectively assess the cost-effectiveness of those policies by themselves. A careful look reveals that compact-city programs contemplated by these reports could cost Americans trillions of dollars.

## Underestimating the Costs

While advocates of reducing greenhouse gas emissions might argue that every little bit helps, the truth is that it only helps if it is cost-efficient; cost-inefficient investments would effectively crowd out cost-efficient programs and make it more difficult to achieve reduction targets. Yet the cost of compact development is likely to be extremely high.

The *Moving Cooler* report inexplicably claims that compact development will cost a mere \$1.5 billion no matter whether 43 percent, 64 percent, or 90 percent of new development is compact. But at least one member of the TRB committee believes costs will be much higher. “It’s an enormous amount of effort to achieve a tiny amount of outcome,” says Brookings Institution researcher An-

**Compact-development advocates are so intent on seeing their policies implemented that they never objectively assess the cost-effectiveness of those policies, which could cost Americans trillions of dollars.**

**Portland’s mayor supports putting 300,000 new residents in high-density developments “within one-quarter mile of all existing and to-be-planned streetcar and light-rail transit stops.”**

thony Downs, regarding the TRB 75-percent scenario. “If your principal goal is to reduce fuel emissions, I don’t think future growth density is the way to do it.”<sup>93</sup>

Here are some of the costs that compact-city mandates will impose on Americans:

- Loss of property rights
- Reduced geographic mobility
- Higher housing costs and lower homeownership rates
- Higher taxes or reduced urban services to subsidize compact development
- Increased traffic congestion
- Higher consumer costs
- Reduced economic mobility

#### **Property Rights**

States that have attempted to use compact development to reduce driving have engaged in a substantial amount of coercion, much of which is aimed at limiting the property rights of private landowners. In 1991, Oregon’s land-use planning commission required metropolitan planners to use land-use tools to reduce per capita driving by 20 percent.<sup>94</sup> To reach this goal, the state severely limits what private landowners can do in rural areas, while it mandates high-density development on private land in urban areas.

For example, private landowners in rural Oregon are allowed to build a house on their own land only if they own at least 80 acres, they actually farm it, and they earn at least \$80,000 per year from farming it. The state’s land-use agency is proud that only about 100 homes per year have been built in rural areas since this rule was adopted in 1993.<sup>95</sup> Nearly 98 percent of the state has been zoned “rural” or some similarly restrictive zone.<sup>96</sup>

Meanwhile, about 1.25 percent of the state has been classified as “urban,” or inside of an urban-growth boundary. (The remaining 1 percent is zoned “rural residential,” meaning 5 to 10 acre minimum lot sizes.) While some cities have expanded their growth boundaries in response to population growth, Portland is instead intent on “growing up, not out.” Even where the Portland boundary has been ex-

panded, planners have placed so many obstacles to home construction that it appears the new areas will never be developed.<sup>97</sup>

To accommodate growth without expanding boundaries, Portland-area planners have rezoned dozens of neighborhoods of single-family homes for apartments, using zoning so strict that if someone’s house burns down, they will be required to replace it with an apartment.<sup>98</sup> Portland’s mayor, Samuel Adams, supports putting all new residents—an estimated 300,000 by 2035—in high-density transit-oriented developments “within one-quarter mile of all existing and to-be-planned streetcar and light-rail transit stops.”<sup>99</sup>

Naturally, these sorts of policies generate stiff resistance from rural property owners who do not want their land “downzoned” and urban homeowners who do not want their neighborhoods “densified.” Considering the uncertainty about whether compact development can even have a significant effect on greenhouse gas emissions, this sort of controversy is bound to distract attention from the more serious debate over whether, and by how much, emissions should be reduced—a distraction that emissions-reduction advocates should want to avoid.

Compact-city advocates argue that zoning that prevents developers from building apartments in neighborhoods of single-family homes is itself a restriction on property rights that should be lifted. But such zoning was originally put in place to protect property values. In the absence of zoning, developers have found that sale prices are enhanced when they place covenants on properties that prevent the mixture of single-family housing with other uses. Historically, most zoning of undeveloped areas has been responsive to market demand. Once developed, zoning aims to protect existing property values, and as such it is merely an alternative to such covenants. Compact-city zoning is far more prescriptive, often mandating unmarketable changes to existing uses that can significantly reduce property values, at least for the current owners.

A case can be made that zoning restrictions should be relaxed so that developers can meet

the market demand for higher-density housing. But relaxing restrictions is very different from imposing tighter restrictions that mandate high-density housing. Even when relaxing restrictions, property owners should be given the opportunity to form homeowner associations that can write protective covenants that will protect their neighborhood's property values, as has been suggested by University of Maryland professor Robert Nelson.<sup>100</sup>

### **Mobility**

Americans are the most mobile people on earth, and that mobility is an important part of America's economic well-being. Research has proven that there is a strong correlation between mobility and economic productivity. Regions in which workers can reach more jobs within a 25-minute commute, or employers have access to more workers within 25 minutes, grow faster and provide higher incomes than less mobile regions.<sup>101</sup>

Contrary to implications often made by compact-city advocates, transit is not an adequate substitute for automobility. Even the best public transit systems in the world are slower, reach fewer destinations, and fail to go at all times when automobiles can be available. This is revealed by comparing travel in Europe with that in the United States.

In 2004, the average American traveled more than 15,000 miles by auto, compared with 6,600 miles for the average western European (residents of the fifteen countries in the European Union in 2000). Meanwhile, the average European traveled less than 1,300 miles by bus and rail compared with more than 600 miles by the average American.<sup>102</sup> The 700 additional miles of bus and rail travel hardly make up for the 8,800 fewer miles of auto travel.

When gasoline prices briefly reached \$4 per gallon in 2008, numerous media reports indicated that Americans were driving less and taking transit more. Yet the increases in transit usage actually made up for only a tiny percent of the decline in driving. In the second quarter of 2008, for example, Americans traveled 25 billion fewer passenger miles in urban areas by

car, but transit ridership grew by only 700 million passenger miles, or less than 3 percent of the drop in urban auto travel.<sup>103</sup>

Even to the extent that transit can replace auto trips, the cost is very high. Counting all capital and operating costs, including subsidies, Americans spend about 24 cents per passenger mile on auto travel.<sup>104</sup> By comparison, urban transit costs an average of 81 cents per passenger mile.<sup>105</sup> Nor is it likely that these costs will decline if transit use increases. More than 40 percent of all American transit ridership is in the New York metropolitan area, but New York transit operating costs per trip or passenger mile are only about 20 percent less than the national average.

### **Housing**

Planners create compact cities by using urban-growth boundaries or similar tools that create artificial land shortages. Given the resulting high land prices, higher percentages of home buyers settle for multi-family housing where they might have preferred single family, or settle for small lots where they might have preferred large yards.

In short, compact-development policies greatly increase the costs of all types of housing as well as retail, commercial, and industrial development. States that have required cities to write compact-development plans have significantly less affordable housing than states that do not.<sup>106</sup> Such states also suffered from the worst housing bubbles in the recent financial crisis, while states that did not require such plans tended not to have any bubbles.<sup>107</sup>

Arguably, at least some of these higher costs are a zero-sum game: for every land or homebuyer who must pay more, there is a seller who earns a windfall profit because of the artificial shortage. But at least some of the costs are a deadweight loss to society.

For example, in regions with no urban-growth mandates, cities and counties compete for new development, and the tax revenues that it brings in, by keeping permitting costs low and approval times short. Urban-growth boundaries limit this competition, and cities typically respond by significantly increasing

**Mass transportation is not an adequate substitute for automobility as it tends to be slow and doesn't go where people want to go when they want to go there.**

permit costs and the risk that property owners will never get a permit to build. One study found that such policies increased permitting costs from \$10,000 per home in relatively unregulated Dallas to \$100,000 per home in San Jose, which adopted compact-development policies in 1974.<sup>108</sup>

Many cities have responded to the housing affordability problems created by their compact-development policies by mandating that developers sell 10 to 20 percent of their homes at below-market prices to low-income buyers. This leads to developers to both raise the price of other homes to make up for the losses on the share they must sell below market and to build fewer homes, which creates further affordability problems.<sup>109</sup>

*Growing Cooler* and *Moving Cooler* rely on Arthur Nelson's estimate that 89 million new or replaced homes will be built between now and 2050.<sup>110</sup> If 80 percent of this construction takes place in metropolitan areas and suffers a deadweight cost of \$25,000 per housing unit because of compact-development policies, the cost will reach nearly \$1.7 trillion.

Even to the extent that someone gains when others are forced to pay higher prices for homes and land, the economy as a whole loses for several reasons. First, less affordable housing tends to mean lower homeownership rates. Studies show many positive benefits associated with homeownership. For example, children in low-income families that own their own homes do significantly better in school than those in low-income families that rent.<sup>111</sup>

Areas with high rates of rental housing are traditionally associated with higher unemployment rates. But research has found that compact-city policies can reverse this relationship. Artificial shortages of housing increase the costs of selling and moving, and so discourage people who own their own homes from relocating to a city with more jobs.<sup>112</sup>

Urban areas that make themselves unaffordable using compact-city policies end up with dramatically different income distributions from the rest of the country.<sup>113</sup> Low- and even middle-income families are forced to move out, turning the urban area into "Dis-

neyland for yuppies" (as California demographer Hans Johnson put it) or "boutique cities catering only to a small, highly educated elite" (as Harvard economist Edward Glaeser put it).<sup>114</sup> While that might be good for the region's short-term tax revenues, it slows economic growth and reduces the opportunities for economic mobility that are available to low-income families in more affordable housing markets.

### Taxes and Urban Services

Creating artificial land shortages that boost housing costs is not enough for compact-city planners in many regions. Most cities have supplemented this with subsidies to high-density, mixed-use developments that supposedly reduce driving. The biggest source of these subsidies is probably tax-increment financing, which was discussed under the CCAP report.

Other subsidies include property-tax waivers for favored kinds of development, below-market sales of public land to developers who promise to build at certain densities, and public financing of infrastructure that would otherwise have been built by the developer. Many cities also streamline approval processes and/or waive impact fees for denser developments.

While *Moving Cooler* estimates that the total cost of increasing the density of 90 percent of all new urban development in the United States would be just \$1.5 billion, Portland alone has committed nearly this amount in subsidies to developers of high-density projects. The city has committed more than \$230 million in subsidies to the famous Pearl District (River District) and nearly \$290 million in subsidies to the South Waterfront District (North Macadam), both of which are on the streetcar line; more than \$300 million to the Interstate Corridor on the Yellow light-rail line; more than \$164 million for the Gateway District on the Blue light-rail line; \$75 million for the Lents District on the Green light-rail line; more than \$72 million for Airport Way on the Red light-rail line; and \$66 million to the Central Eastside District, on a

**By making housing more expensive, compact-development policies are likely to impose a deadweight cost on society of at least \$1.7 trillion.**

planned streetcar and light-rail line.<sup>115</sup> This only counts tax-increment financed subsidies and not tax waivers, below-market land sales, or other subsidies.

As described above, projects supported through tax-increment financing and property-tax waivers increase the burdens on Portland schools, fire, police, public health, and other programs, but dedicate the taxes that would have gone to those programs to developers instead. The result is that these other programs have seen declines in both the quality and quantity of services they can provide to the rest of the city.

In many cases, Portland subsidies have exceeded \$100,000 per housing unit. If subsidies averaging \$25,000 per housing unit are applied to 60 percent of the new homes built in metropolitan areas between now and 2050, the total subsidies will exceed \$1 trillion. This assumes 89 million new homes built between now and 2050, as estimated by Arthur Nelson, 80 percent of which would be within metropolitan areas. But the Pitkin and Myers paper commissioned for the TRB study calculates that Nelson overestimated the rate of new construction by 50 percent, which means subsidies would have to be even greater to reach compact-development targets.<sup>116</sup>

Combined, the deadweight losses from compact-development regulations and subsidies are likely to exceed \$2.8 trillion. If these regulations and subsidies produce the maximum reductions in greenhouse gas emissions projected by *Moving Cooler*, the cost per ton of abated emissions will be nearly \$2,000—well above the \$50-per-ton cost-effectiveness threshold set by the McKinsey report. Of course, this does not count other costs of compact development, such as congestion and effects on consumer prices.

### **Congestion**

Increasing roadway congestion appears to be a deliberate part of compact-city plans. If people cannot easily travel long distances, planners hope, they will be more willing to live in denser developments. In 1996, for example, the Twin Cities Metropolitan Council decided

to limit the “expansion of roadways” in the hope that “as traffic congestion builds, alternative travel modes will become more attractive.”<sup>117</sup>

Similarly, Portland decided to allow rush-hour congestion to reach “level of service F” (a traffic engineering term meaning stop-and-go traffic) in most of the city’s highways. When asked why, transportation planner Andrew Cotugno (who was a member of the TRB committee) responded that relieving congestion “would eliminate transit ridership.”<sup>118</sup>

Even if congestion were not a deliberate goal of compact-city planners, it would clearly be a major result of such plans. Using census data, *Moving Cooler* estimated that increasing densities from an average of 3,000 people per square mile by an additional 133 percent to an average of 7,000 people would reduce per capita driving by less than 15 percent.<sup>119</sup> That many more people driving 15-percent less each still means a 100-percent increase in total vehicle miles of travel. Since compact-city planners would oppose any new highways to accommodate that travel, there would obviously be a huge increase in congestion.

Congestion, of course, imposes huge costs on commuters and businesses. It also impacts the environment, as autos in stop-and-go traffic consume far more fuel and emit more pollution and greenhouse gases per mile than autos in free-flowing traffic. In fact, the focus on reducing miles of driving is misguided because miles driven are not proportional to greenhouse gas emissions, since congestion is the leading cause of such disproportionality.

### **Consumer Costs**

Compact development advocates often argue that the loss of mobility resulting from less auto driving can be mitigated by increased accessibility from mixing retail and other uses with, or within walking distance of, residential areas. Why drive when you can simply walk downstairs from your condo and go grocery shopping or have a cup of coffee? “Millions of people could be liberated from their vehicles” if neighborhoods were redesigned to make things accessible without requiring mobility,

**Compact development increases traffic congestion because large increases in densities are required to get small reductions in per capita driving.**

argues Robert Cervero (who was on the TRB committee).<sup>120</sup>

This ignores, however, the nature of the modern retail industry. Major supermarkets and other stores can offer a wide variety of low-cost goods only because large numbers of customers can reach them by car. Shrink the pool of customers by limiting them to those within walking distance and costs rise—while the variety of goods offered declines. Prices rise further when people become captives of one store; the competition that exists when people can reach several stores in one short auto trip encourages retailers to adopt innovative programs that reduce costs.

Moreover, like homebuyers, retailers in compact communities will have to pay more for land, adding further to consumer prices. Thus, the higher prices that are typically found in “accessible” versus mobile communities are not a zero-sum game: the retailers are not earning fatter profits; they are merely suffering higher costs due to inefficient management.

#### **Economic Mobility**

Several studies have found that auto ownership is a key factor to helping low-income families move into the middle class. One found that people without a high-school diploma were 80 percent more likely to have a job and earned \$1,100 more per month if they had a car. In fact, the study found that owning a car was more helpful to getting a job than getting a high-school-equivalent degree.<sup>121</sup> Another study found that closing the black-white auto ownership gap would close nearly half the black-white employment gap.<sup>122</sup>

As a result, numerous analysts have noted that efforts to reduce per capita driving will have their greatest impact on low-income families. “Their most severe effects” of mobility restrictions, says Alan Pisarski, “will fall on those groups that either have recently attained mobility or are just now on the verge of attaining it.”<sup>123</sup>

Transit improvements will not make up for this loss in economic mobility. “Public transit is not a reasonable substitute for the private

vehicle for most people, poor or not poor,” says UCLA planning professor Genevieve Giuliano.<sup>124</sup> For example, an analysis of job accessibility in Cincinnati found that people living in low-income neighborhoods could reach 99 percent of the region’s jobs within 20 minutes by car, but only 21 percent of the region’s jobs in a 40-minute trip by transit. Furthermore, building light rail, the study found, would actually reduce job accessibility for low-income workers.<sup>125</sup>

Economic mobility is the American dream, and geographic mobility is a key component of that dream. No matter how noble the intentions, proposals to reduce mobility should be viewed with the same suspicion as proposals to reduce freedom of speech or freedom of the press.

## **Getting the Prices Right**

Compact development is an indirect and risky way of reducing greenhouse gas emissions. It depends on people responding to compact cities in the ways that planners hope; on the assumption that reduced greenhouse gas emissions from reduced driving will not be offset by increased emissions from more driving in stop-and-go traffic; and on planners’ faith that the costs of unintended (and intended) consequences such as unaffordable housing, congestion, and reduced worker productivities will not be greater than the benefits.

Those who are skeptical of the need to reduce carbon dioxide emissions should naturally reject compact-city schemes as an unnecessary and expensive imposition on personal freedom and mobility. Those who support policies to reduce carbon dioxide emissions should also reject compact-development programs as risky, cost-ineffective ideas that will divert resources and attention away from genuine emission-reduction programs.

One of the most effective ways of reducing carbon emissions is simply to price them using a revenue-neutral carbon tax whose income is offset by reductions in income or

**Mobility is a key component of the American dream, and proposals to reduce mobility should be viewed with the same suspicion as proposals to limit freedom of speech or freedom of religion.**

other taxes. Moving Cooler estimates that carbon pricing would be 10 times more effective at reducing auto-related emissions than compact development, and that the vast majority of that reduction would come from people buying more fuel-efficient cars, not driving less.<sup>126</sup>

Carbon pricing would allow people to choose for themselves whether they respond to higher fuel prices by buying more fuel-efficient cars, using alternative fuels, “eco-driving” in a more fuel-efficient manner, or driving less. Those who choose to drive less could also decide whether they want to live in high-density communities or continue to live in low-density communities but adjust other driving habits, perhaps by living closer to work, trip chaining, or shopping at one-stop supercenters instead of several smaller stores.

Carbon pricing would also have more immediate effects on energy use and carbon emissions than compact development, which will take decades to implement. *Moving Cooler* predicts that, in 2020, maximum use of carbon pricing would reduce auto-related emissions more than 30 times as much as maximum use of compact development, while in 2030 it would be 12 times as much.<sup>127</sup>

These more-immediate effects mean that carbon pricing would be easier to evaluate and fine-tune in order to ensure that any emission-reduction targets are met. By comparison, the slow deployment of compact development, combined with the indirect effects it has on driving and carbon emissions, means that decades will pass and hundreds of billions of dollars will be spent before we know if it is even working.

Finally, carbon pricing would not only be easier to implement than compact development, it would affect all producers of carbon emissions, notably including fossil-fuel-powered electrical plants. This means one tool can address far more sources of carbon emissions, while compact development mainly influences urban auto driving, which produces less than 13 percent of greenhouse gases.

No policy is immune to political abuse, and carbon taxes could easily turn into just

one more source of pork barrel (as seems to have happened to the recent cap-and-trade proposal). If climate change worries prove baseless, a carbon tax is not even necessary. But for those who insist on reducing carbon emissions, a true, revenue-neutral carbon tax makes far more sense than intrusive government policies aimed at coercing people out of their homes and cars and forcing them to live in politically correct multi-family housing and to ride on politically correct mass transit.

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SPECIAL REPORT 298:  
DRIVING AND THE BUILT ENVIRONMENT:  
THE EFFECTS OF COMPACT DEVELOPMENT ON  
MOTORIZED TRAVEL, ENERGY USE, AND CO<sub>2</sub> EMISSIONS

**Key Relationships Between the Built Environment and VMT**

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Paper prepared for the Committee on the Relationships Among Development Patterns,  
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# Key Relationships Between the Built Environment and VMT

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## 1 INTRODUCTION

This paper critically examines the current literature on the relationships between the built environment and household vehicle miles traveled (VMT). VMT itself is rarely of direct policy interest, but VMT is an important component of greenhouse gas emissions and congestion. Furthermore, policies designed to address these problems will very likely influence VMT as well. Section 4 addresses some of issues involved when other policies besides the built environment are considered. One important issue that this paper does not address is the cost/benefit tradeoffs comparing using the built environment to control VMT compared to more direct carbon or fuel taxes.

One of the key conclusions from this review is that the magnitude of the link between the built environment and VMT is so small that feasible changes in the built environment will only have negligible impacts on VMT. For example, Brownstone and Golob's (2008) results imply that increasing density by 1000 dwelling units per square mile (roughly 40% of the mean density value in their sample) will decrease a representative household's VMT by 1200 miles per year (approximately 5% of the mean sample value). As Downs (2004, Chapter 12) clearly shows, increasing density of an existing metropolitan area by 40% requires extreme densities of new and infill development. Bryan, Minton, and Sarte (2007) have recently developed a consistent historical database of U.S. city and regional densities. These data show that only 30 out of 456 cities increased population density more than 40% between 1950 and 1990, and the median city in this sample decreased population density by 36%. The cities that did increase population density by more than 40% are similar to Santa Ana, California. They experienced large increases in low-income immigrants into very tight housing markets. The increase in densities in these cities was largely accommodated by cramming more people into the existing housing stock. This suggests that more direct fuel and congestion taxes will be more effective for controlling vehicle emissions and congestion.

My standards for accepting empirical conclusions from the literature reviewed here are strict. I only consider results that I would be willing to personally recommend to my local planning agency and defend in the inevitable lawsuits that accompany controversial public policy positions. Studies that were reviewed and not discussed in this paper are listed in the Appendix. This standard makes it difficult to find any reliable quantitative estimates of key elasticities. Many studies are based on aggregate data and therefore subject to self-selection bias described in Section 2. Other studies based on disaggregate data typically include nonlinear discrete choice models but only report coefficient estimates and/or elasticities calculated at mean values of the household explanatory variables. This information is simply not sufficient to judge whether the elasticities are statistically significant and/or large enough in magnitude to be useful for policy purposes. Many studies are only concerned with finding statistically significant effects without any attempt to check whether the precisely estimated coefficients are large enough to be relevant

for policymakers. Fang (2008) is a good example of the types of calculations needed to judge policy relevance for these models.

Another important problem with the literature reviewed here is that there is little agreement on what aspects of the built environment are important determinants of VMT. Even when two authors agree on these aspects, they frequently quantify these aspects in different ways that make comparisons across papers difficult. It has also been difficult to get data on many potentially important aspects of the built environment. Therefore many studies just use data from one metropolitan area. This makes it difficult to generalize the results of these studies beyond the particular area studied, so I have given more weight to those studies using nationally representative data. Section 3 addresses these issues.

## 2 SELF-SELECTION

The most important methodological issue for all studies reviewed in this paper is the self-selection issue. Households choose their residential (and work) locations based, among other things, on their preferences for different types and durations of travel. The observed correlations between higher density and lower VMT may just be due to the fact that people who choose to live in higher density neighborhoods are also those that prefer lower VMT and more transit or non-motorized travel. If this is the case, then forcing higher densities may not lead to anywhere near the reduction in VMT “predicted” by observed correlations.

The “gold standard” for solving self-selection problems is to conduct randomized assignment to treatment and control groups. In the context of the links between the built environment and VMT, then this would require randomly assigning households to different neighborhoods and then observing differences in their VMT. Of course this is rarely possible, so various econometric techniques have been employed to try to correct for this problem.

Aggregate studies that just look at bivariate relationships (e.g. Newman and Kenworthy, 1999) typically make no attempt to control for self-selection, so they are the least reliable. Other studies (e.g. Holtzclaw, et. al., 2002) use aggregate sociodemographic variables to try to control for population differences across different zones. Unfortunately the zones used in Holtzclaw et. al. are quite large with an average size of 7000 residents per zone, and there are only limited sociodemographic data available at the zonal level. Most importantly, there are no data on the variability of things like household size and income within each zone. At least for Los Angeles in 2000, the variation of variables like average household income and average household size across traffic analysis zones is a small fraction of the variation of household income and household size for the Los Angeles MSA. Holtzclaw et. al. use smog check odometer readings to get VMT for their zones, but since California exempts new vehicles from smog checks for the first 2 years, this measure systematically biases VMT downwards for zones with large numbers of new vehicles.

Many studies with disaggregate data attempt to control for observable differences between people living in high and low density areas using regression methods. These studies are only valid to the extent that these people differ only on observable characteristics. Therefore studies like Bento et. al. (2005) which includes a rich set of household socioeconomic characteristics should be less affected by self-selection bias.

Finally there are a few more recent studies that jointly model residential location (or at least density) and VMT. These joint models require a lot of assumptions, but if the assumptions

are valid then they properly control for self-selection bias. One source of confusion in the literature is the role of instrumental variables, an old econometric technique to deal with endogenous explanatory variables in linear regression models. Boarnet and Sarmiento (1998) were among the first to use instrumental variables to deal with the endogeneity of residential density (caused by self selection) in regressions explaining VMT. More recently Vance and Hedel (2007) used instrumental variables in a two-stage model of car use and VMT conditional on car use. There is frequently an implicit claim that instrumental variables is preferable to explicit joint modeling of density and VMT since instrumental variables makes no explicit assumptions about the variables explaining density, but in fact the requirements for a valid instrumental variable are identical to those required to identify a joint linear model. In particular, a valid instrument must be strongly correlated with density but uncorrelated with car VMT.

Boarnet and Sarmiento (1998) found no stable link between density and VMT after using instrumental variables to control for the endogeneity of density. However, Vance and Hedel (2007) found significant links between commercial density, road density, and walking minutes to public transit and car VMT using similar instruments to Boarnet and Sarmiento (the percentage of buildings built before 1945, the percentage of buildings built between 1945 and 1985, the percentage of residents more than 65 years old, and the percentage of foreign residents). Vance and Hedel did many tests of the validity of these instruments, so the likely reason is differences between the German panel data and the U.S. data used by Boarnet and Sarmiento. Another possible reason is that German cities tend to be denser and have much better transit than U.S. cities, so U.S. cities may not offer enough transit to be a viable alternative to private cars. For example, roughly 30% of the trips recorded in the German travel diaries did not use private cars.

There have been a number of papers explicitly modeling residential location choice and VMT. Brownstone and Golob (2008) build a simultaneous equations model of households' choice of residential density, VMT, and vehicle fuel use using the 2001 National Highway Transportation Survey. Conditional on a rich set of socioeconomic covariates, they find that residential density choice is not determined by VMT or fuel use, but does influence VMT and fuel use. The magnitude of this effect is very small, which suggests that feasible changes in residential density will not have any important effect on VMT or fuel use. The error terms in the estimated system are independent, implying no self-selection bias conditional on the covariates. However, removing any of the covariates from the model leads to self-selection bias which shows the importance of using household level data.

Zhou and Kockelman (2007) use Heckman's treatment-effects model to account for self-selection between CBD and non-CBD in Austin, Texas. They find little impact of self-selection – about 90% of the observed differences in VMT are due to the treatment effect (living in the CBD). Unfortunately the variable they use to identify the system, the number of visitors to the household on the survey day, is quite weak. It is weakly correlated with the decision to live in the CBD, and it is not clear why it can be excluded from variables explaining VMT on the survey day.

Bhat and Guo (2007) build an ambitious model using San Francisco Bay Area data to build a joint model of residential location and number of household vehicles. Their model allows for self-selection effects (correlation between the error terms in their equations), but after controlling for a rich set of covariates they do not find any significant self-selection effects. Similar to Brownstone and Golob (2008), Bhat and Guo find statistically significant but quantitatively small impacts of built environment measures (street block density, transit availability, and transit access time) in vehicle ownership. Bhat and Guo were able to include a

large number of covariates in their models since they only worked with one metropolitan area. The only variable that frequently appears in residential choice models that is missing in Bhat and Guo's model is school quality, but that is probably highly correlated with zonal income and zonal housing values which are included in their model.

There are also a number of studies which deal with self-selection by trying to directly measure preferences through attitude surveys (Kitamura et. al., 1997 and Bagley and Mokhtarian, 2002, and Frank et. al., 2007). These studies typically find that attitudes explain most of the variation in VMT across households, and the regression model fits (as measured by  $R^2$ ) improve significantly relative to models without attitude measures. The most likely reason for the greatly improved fit is that the attitudes are jointly determined by the outcome variables. People who live in dense urban areas tend to express positive attitudes about urban characteristics, and people who commute long distances are likely to express positive attitudes about large lots and open spaces. If this is the case then these attitudes cannot be treated as exogenous and stable, and their inclusion in models will bias all of the results. It is also possible that the measured attitudes will change with the built environment, and this would invalidate the results from these models.

Krizek (2003) attempts to control for self-selection by looking at changes in travel behavior for households that moved between consecutive years in the Puget Sound Transportation Panel Study. This approach is only valid if households only move for reasons that are unrelated to their preferred type of neighborhood, such as to change jobs or accommodate a change in household size. If a household moves because they were dissatisfied with the characteristics of their initial neighborhood, then Krizek's analysis of movers would be invalid. Looking at changes in panel surveys has become the standard approach to self-selection problems in labor economics (see Heckman and Vytlacil, 2007), but these methods require massive data sets and complex methodology. For example, Krizek considered 6,144 households over 10 years of the panel, but only observed 403 households that moved. Since some of these households moved because of changes in household composition, it is sometimes not clear how to define the household across these moves. Nevertheless using modern dynamic panel data methods and collecting the required panel data is the best way to finally resolve the self-selection issue.

Recent studies with disaggregate data find no impact of self-selection after controlling for rich sociodemographics. This suggests that it is critical to carefully control for sociodemographics when building models of household VMT, and therefore results from studies using aggregate data are likely subject to serious self-selection biases. Although recent studies use state-of-the-art methods, they all have weaknesses in the scope and accuracy of the underlying data. In particular, there is little agreement on the geographic scope or the definition of appropriate measures of the built environment. It is therefore possible that studies using different measures may find significant impacts of self-selection.

### **3 KEY FEATURES OF BUILT ENVIRONMENT**

There are potentially many aspects of the built environment that could affect households' travel behavior. Naturally research has concentrated on those aspects that are easy to measure. Since most measures of the built environment are highly correlated, it may only be necessary to include a few key characteristics to capture the effects. Most national level studies only use residential

and/or employment density since these are the easiest to obtain. One study that put a lot of effort into measuring various aspects of the built environment is Bento et. al. (2005). They generated measures of road density, rail and bus transit supply, population centrality, city shape, jobs-housing balance, population density, land area, and climate and merged these with 1990 NPTS survey respondents living in MSAs. They found that their measure of population centrality was a significant factor explaining vehicle ownership, but not a significant factor explaining VMT conditional on vehicle ownership. **Consistent with other recent studies using disaggregate data, Bento et. al. (2005) found that the magnitude of the impact of any of their built environment measures was too small to support any policy relevance.** They concluded their paper with some simulations using their estimated model to examine the counterfactual experiment of “moving” people from Atlanta to Boston. Even though the impact of any single built environment factor is small, the cumulative impact of changing many factors is sufficient to explain the observed differences in VMT between the two cities. Of course, the cost of making Atlanta look like Boston is prohibitive.

Ewing and Cervero (2001) conducted an extensive review of the literature on the links between travel and the built environment. They argue that elasticities are the best way to summarize the quantitative conclusions from these sorts of studies, and they built an extensive table (Table 8) giving average elasticities for many of the best studies. Even though these elasticities for the nonlinear models are incorrect (they need to be averaged over the sample, not simply evaluated at sample means of the explanatory variables), the numbers in Table 8 are mostly all below 0.1 in absolute value. Standard errors are not provided, but it is likely that the hypothesis that they are all equal to zero cannot be rejected. The largest elasticities (around 0.3) are reported for regional accessibility measures, but as the discussants pointed out these measures are very difficult to change with feasible zoning/planning tools. Ewing and Cervero (2001) also provide a summary table (Table 9) showing that elasticities of vehicle trips and VMT with respect to density, diversity, and local design are all below 0.05.

Badoe and Miller (2000) also surveyed the literature on the interactions between land use and transportation. They tend to be more critical of the existing literature, and mainly conclude that most studies they surveyed suffered from methodological and/or data weaknesses. Their tables also show that regional accessibility measures are important, and they stressed the importance of socioeconomic factors as determinants of travel behavior. The best way to incorporate socioeconomic impacts is to use household level data, but Badoe and Miller point out that using these disaggregate models for forecasting then requires very detailed forecasts of the socioeconomic variables.

Given that there is no clear consensus about which feasible measures of attributes of the built environment are important, it is almost certain that all of the studies reviewed in the paper suffer from measurement error. If this measurement error is large, then the coefficients on these variables will be biased downwards. Although this could explain the inability of most studies to find substantively and statistically significant links between the built environment and VMT, the main impact of measurement error is to increase the variability of the coefficient estimates. Since recent studies using disaggregate data have found statistically significant but substantially very small links between some aspects of the built environment and VMT, it is likely that measurement error is not the main problem.

Another possible reason for the weak links between the built environment and VMT is that there are non-linearities in the relationship, and the U.S. data is primarily in the range where density and other aspects do not have much impact. Some aggregate studies (Newman and

Kenworthy, 1996 and 2006) including foreign cities have found evidence of these non-linearities (or “inflection points”), but as discussed in Section 2 these studies are subject to serious self-selection biases. In particular, many dense foreign cities have much lower incomes and therefore much lower automobile ownership rates than in the U.S. This is a more likely explanation of the inflection point found in these aggregate studies.

#### **4 OTHER POLICIES THAT AFFECT VMT**

It is not clear why controlling VMT should be a policy goal. The worldwide spread of the private automobile (and VMT) shows that people place a high value on increased mobility. Vehicle use is associated with externalities – especially polluting emissions and congestion, and economists have long advocated using Pigouvian taxes as a more efficient policy tool to deal with these problems. Given current technology, taxing greenhouse gas emissions is equivalent to taxing gasoline. The best recent studies (see Small and Van Dender, 2007) suggest that raising gasoline taxes will reduce emissions primarily by inducing people to buy more efficient vehicles. Given current U.S. incomes and gasoline price levels, VMT is not strongly affected by modest tax increases. Larger gasoline tax increases are beyond the range of observed data, but we can speculate that they would have a direct impact on VMT and also a longer-term impact on the built environment.

Households attempting to lower their VMT will try to move residences and/or job locations. This will impact land rents and the demand for public transit (as well as better bicycle and walking facilities), and may in the end accomplish the same types of changes in the built environment advocated by “smart growth” proponents.

Congestion taxes directly tax VMT in certain locations, and are also likely to provide incentives for households to move to reduce their tax bills. The exact impact of congestion taxes depends on their implementation. For example the London toll ring has increased the demand for housing inside the ring, since tolls are only collected at the ring boundaries. HOT facilities similar to the SR91 and I-15 corridors in Southern California may induce lower income households (who are more sensitive to the tolls) to move closer to their job locations.

Although it is simple to increase fuel taxes, implementing optimal congestion taxes can be technically difficult and costly. Fortunately parking charges can be used together with simple cordon congestion pricing schemes to come close to what could be achieved with optimal pricing (see Calthrop, Proost, and Van Dender, 2000). Of course deliberately restricting parking and/or deliberately under-sizing roads to create congestion are also effective at reducing local VMT, but these can never be as efficient as pricing. If parking is restricted then it is possible that congestion and VMT will increase as drivers search for available parking spaces. These negative impacts can be somewhat mitigated by better information. For example, Lucerne, Switzerland, has large electronic information signs at all of the entrances to the city center showing the number of free parking spaces in all of the main parking garages.

Fuel and congestion taxes and parking fees all have the advantage that they work much faster than we could feasibly change the built environment, and there is no doubt that they will reduce emissions and congestion. In order to be effective these taxes will need to be high enough to generate substantial revenue, and some of this revenue could be used to improve transit service (as was done in London).

## 5 CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

There are not enough reliable studies that control for enough socioeconomic characteristics to avoid self-selection bias, cover a representative sample of households and geographic area, and use common measures of built environment to support strong quantitative conclusions. There is evidence that there is a statistically significant link between aspects of the built environment correlated with density and VMT. **Very few studies provide enough detail to judge whether this link is large enough to make manipulating the built environment a feasible tool for controlling VMT, but those that do suggest that the size of this link is too small to be useful.**

Almost all of the studies surveyed in this paper are cross-sectional analyses from the last 2-3 decades, so the conclusions drawn from these studies are only valid to the extent that common background variables do not change. The most obvious problem is energy prices, which have recently almost doubled from their previous stable levels. If these high energy prices persist or a serious carbon tax is imposed, then households will adjust by reducing their VMT, moving to denser neighborhoods, increasing utilization of mass transit, and changing work locations. Existing studies also cannot account for the possible impacts of new travel demand management measures like congestion pricing. Putting a toll ring around a major city (as London has recently done) will cause households to switch to transit and possibly move to more dense neighborhoods. Small (2005) points out that congestion pricing can greatly improve bus service (by improving bus speeds), and this synergistic effect will further shift more households to transit. The only other study that looks at this issue is Cambridge Systematics Inc. (1990), but this only considers large suburban activity centers. The existing detailed disaggregate models can simulate the impacts of an ageing population and continued immigration, but this requires good forecasts of the underlying sociodemographic variables.

The built environment influences far more than just VMT, so a full analysis of the impacts of the built environment must consider all possible outcomes. The literature suggests that density and diversity are correlated with more walking and bicycle trips, which in turn may reduce obesity (see Frank et. al., 2007). There is also evidence that density has a quantitatively small impact on the number and types of vehicles owned by households. However, it is important to remember that there are many reasons for the decreases in residential density and increases in VMT over at least the last 50 years. Some of this may be caused by failure to properly price the externalities associated with vehicle usage, but some of it is also due to household's preferences. **Unless justified by some market failure, policies that force people into higher density areas will very likely reduce welfare (see Brueckner, 2001 and Bento and Franco, 2006).**

My review of this literature does have implications for future research. The most obvious and non-controversial is that we need better data. In particular we need good samples from the relevant population that contain accurate and detailed data on household socioeconomic, travel behavior, and built environment measures. Travel behavior data should be collected using GPS data loggers, since diary collection is burdensome and leads to missing and inaccurate observations. Since many policies work at least partially by altering the number and types of vehicles, it is also crucial to obtain detailed make/model information for all household vehicles (as in the 2001 NHTS survey). Built environment data also needs to be collected in a uniform fashion across geographic areas. This would be much easier if metropolitan planning agencies could agree on definitions and collection methods for key variables. This effort could be helped by coordination and possibly some money from the U.S. Department of Transportation.

Section 2 of this paper highlighted the problems caused by self selection. This implies that there is not much use in continuing to study the links between the built environment and transportation behavior using aggregate data. Another implication of the literature reviewed in Section 2 is that transportation behavior is strongly correlated (and probably caused by) households' socioeconomic characteristics. This implies that using disaggregate models for forecasting requires forecasting socioeconomic characteristics. This difficult task is made even harder by that changes caused by immigration and aging will lead to changes in the built environment and possibly changes in the built environment will cause migration that will alter the socioeconomic makeup of the city. The best way to study these important issues is to collect panel data that follow households over time. These data are very expensive, and the only examples I could find are the German Panel data used by Vance and Hedel (2007) and the Puget Sound Panel Study used by Krizek (2003). A more feasible option would be to try to include transportation behavior questions in an existing U.S. panel study like the Michigan Panel Study of Income Dynamics.

Even though Vance and Hedel (2007) and Krizek (2003) had panel data, they did not exploit the potential of panel data to analyze the dynamics of household responses to changes in prices and built environment. These panels are probably too short (10 years) to observe many changes in the built environment, but hopefully they will continue the panels and eventually this will enable very interesting research.

Finally, many studies (especially more recent ones using complex models) simply do not provide enough information to judge whether their results are useful for policy analysis. Many studies only give tables of parameter estimates which typically can only be used to find out the sign and statistical significance of a variable. Some studies give elasticities, but these are typically evaluated at the means of the "exogenous" variables and almost never include any measures of statistical significance. Hopefully editors and referees will be more careful about requiring more thorough description of model output.

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## 7 APPENDIX: STUDIES NOT EXPLICITLY CITED

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# Environmental assessment of passenger transportation should include infrastructure and supply chains

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## Abstract

To appropriately mitigate environmental impacts from transportation, it is necessary for decision makers to consider the life-cycle energy use and emissions. Most current decision-making relies on analysis at the tailpipe, ignoring vehicle production, infrastructure provision, and fuel production required for support. We present results of a comprehensive life-cycle energy, greenhouse gas emissions, and selected criteria air pollutant emissions inventory for automobiles, buses, trains, and airplanes in the US, including vehicles, infrastructure, fuel production, and supply chains. We find that total life-cycle energy inputs and greenhouse gas emissions contribute an additional 63% for onroad, 155% for rail, and 31% for air systems over vehicle tailpipe operation. Inventorying criteria air pollutants shows that vehicle non-operational components often dominate total emissions. Life-cycle criteria air pollutant emissions are between 1.1 and 800 times larger than vehicle operation. Ranges in passenger occupancy can easily change the relative performance of modes.

**Keywords:** passenger transportation, life-cycle assessment, cars, autos, buses, trains, rail, aircraft, planes, energy, fuel, emissions, greenhouse gas, criteria air pollutants

 Supplementary data are available from [stacks.iop.org/ERL/4/024008](http://stacks.iop.org/ERL/4/024008)

## 1. Background

Passenger transportation's energy requirements and emissions are receiving more and more scrutiny as concern for energy security, global warming, and human health impacts grows. Passenger transportation is responsible for 20% of US energy consumption (approximately 5% of global consumption) and combustion emissions are strongly positively correlated [1]. The potentially massive impacts of securing petroleum resources, climate change, human health, and equity issues associated with transportation emissions have accelerated discussions about transportation environmental policy.

Governmental policy has historically relied on energy and emission analysis of automobiles, buses, trains, and aircraft at their tailpipe, ignoring vehicle production and maintenance,

infrastructure provision and fuel production requirements to support these modes. Such is the case with CAFE and aircraft emission standards which target vehicle operation only [2, 3]. Recently, decision-making bodies have started to look to life-cycle assessments (LCA) for critical inputs, typically related to transportation fuels [4, 5]. In order to effectively mitigate environmental impacts from transportation modes, life-cycle environmental performance should be considered including both the direct and indirect processes and services required to operate the vehicle. This includes raw materials extraction, manufacturing, construction, operation, maintenance, and end of life of vehicles, infrastructure, and fuels. Decisions should not be made based on partial data acting as indicators for whole system performance.

To date, a comprehensive LCA of passenger transportation in the US has not been completed. Several studies and

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models analyze a single mode, particular externalities, or specific phases, but none have performed a complete LCA of multiple modes including vehicle, infrastructure, and fuel inventories for energy consumption, greenhouse gas emissions, and criteria air pollutant emissions incorporating supply chains [6–9]. The automobile has received the greatest attention while buses, rail, and air have received little focus. A review of environmental literature related to the three modal categories is shown in table S1 of the supporting information (SI) (available at [stacks.iop.org/ERL/4/024008](http://stacks.iop.org/ERL/4/024008)).

## 2. Methodology

Onroad, rail, and air travel are inventoried to determine energy consumption, greenhouse gas (GHG) emissions, and criteria air pollutant (CAP) emissions (excluding PM, lead, and ozone due to lack of data). The onroad systems include three automobiles and two urban buses (off-peak and peak). A sedan (2005 Toyota Camry), SUV (2005 Chevrolet Trailblazer), and pickup (2005 Ford F-150) are chosen to represent the range in the US automobile fleet and critical performance characteristics [10–12]. 83% of rail passenger kilometers are performed by metropolitan systems (with Amtrak serving the remaining) [1]. The generalized rail modes (heavy rail electric metro, heavy rail diesel commuter transit, and light rail transit (LRT)) are chosen to capture the gamut of physical size, fuel input, and service niche. The metro and commuter rail are modeled after the San Francisco Bay Area's (SFBA) Bay Area Rapid Transit and Caltrain while the LRT modes are modeled after San Francisco's (SF) Muni Metro and the Boston Green Line. Air modes are evaluated by small (Embraer 145), midsize (Boeing 737) and large (Boeing 747) aircraft to represent the range of impacts from aircraft sizes, passenger occupancy, and short to long haul segment performance [13]. An extended discussion of the characteristics and representativeness of the modes selected is found in the SI. US average data are used for all onroad and air mode components and particular geographic operating conditions are not captured [14, 15]. Rail operational performance is determined from specific systems [15–18].

A hybrid LCA model was employed for this analysis [19]. The use of this LCA approach is discussed in the SI and detailed extensively in [20]. The life-cycle phases included are shown in table 1. The components are evaluated from the materials extraction through the use phase including supply chains. For example, the manufacturing of an automobile includes the energy and emissions from extraction of raw materials such as iron ore for steel through the assembly of that steel in the vehicle. End-of-life phases are not included due to the complexities of evaluating waste management options and material reuse. Indirect impacts are included, i.e., the energy and emissions resulting from the support infrastructure of a process or product, such as electricity generation for automobile manufacturing.

For each component in the mode's life cycle, environmental performance is calculated and then normalized per passenger-kilometer-traveled (PKT). The energy inputs and emissions from that component may have occurred annually (such as from electricity generation for train propulsion) or

over the component's lifetime (such as train station construction) and are normalized appropriately. Detailed analyses and data used for normalization are found in [20], including mode-specific adjustments (such as the removal of freight and mail attributions from passenger air travel). Equation (1) provides the generalized formula for determining component energy or emissions.

$$E_M = \sum_c^C \frac{EF_{M,c} \times U_{M,c}(t)}{PKT_M(t)} \quad (1)$$

where  $E_M$  is total energy or emissions per PKT for mode  $M$ ;

$M$  is the set of modes {sedan, train, aircraft, etc};

$c$  is vehicle, infrastructure, or fuel life-cycle component;

EF is environmental (energy or emission) factor for component  $c$ ;

$U$  is activity resulting in EF for component  $c$ ;

PKT is PKT performed by mode  $M$  during time  $t$  for component  $c$ .

The fundamental environmental factors used for determining a component's energy and emissions come from a variety of sources. They are detailed in SI tables S2–S4 (available at [stacks.iop.org/ERL/4/024008](http://stacks.iop.org/ERL/4/024008)). Further, each component's modeling details are discussed in [20] which provides the specific mathematical framework used as well as extensive documentation of data sources and other parameters (such as component lifetimes and mode vehicle and passenger kilometers traveled). Parameter uncertainty is also evaluated in the SI.

Results for modal average occupancy per-PKT performance are reported. While understanding of marginal performance is necessary for transportation planners to evaluate the additional cost of a PKT given a vested infrastructure and the assumption that many public transit trips will occur regardless, the average performance characteristics allow for the total environmental inventorying of a system over its lifetime.

## 3. Results and component comparisons

With 79 components evaluated across the modes, the groupings in table 1 are used to report and discuss inventory results.

### 3.1. Energy

The energy inputs for the different systems range from direct fossil fuel use such as gasoline, diesel, and jet fuel to indirect fossil fuel use in electricity generation. The non-operational vehicle phases use a combination of energy inputs for direct and indirect requirements. For example, the construction of an airport runway requires direct energy to transport and place the concrete and indirect energy to extract and process the raw materials. Figure 1 shows total energy inputs for each mode.

While tailpipe components account for a large portion of modal life-cycle energy consumption, auto and bus non-operational components have non-negligible results. Active operation accounts for 65–74% of onroad, 24–39% of rail, and 69–79% of air travel life-cycle energy. Inactive operation accounts for 3% of bus, 7–21% of rail, and 2–14% of air

**Table 1.** Analysis components (for each component, energy inputs and emissions are determined. The components are shown by generalized mode, but evaluated independently for each system).

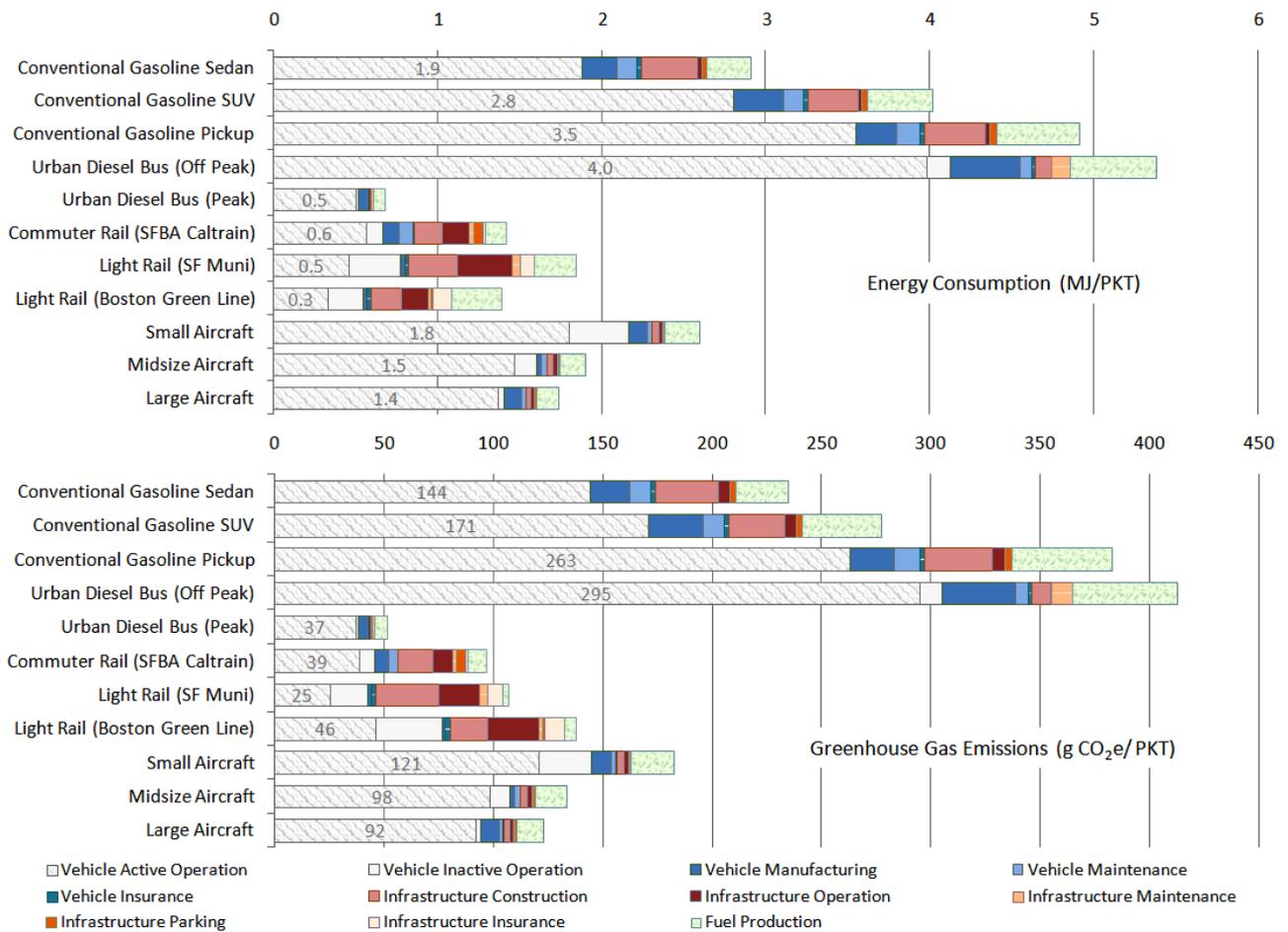
Grouping	Automobiles and buses	Rail	Air
<i>Vehicles</i>			
Operational components			
Active operation	<ul style="list-style-type: none"> <li>• Running</li> <li>• Cold start</li> </ul>	<ul style="list-style-type: none"> <li>• Running</li> </ul>	<ul style="list-style-type: none"> <li>• Take off</li> <li>• Climb out</li> <li>• Cruise</li> <li>• Approach</li> <li>• Landing</li> </ul>
Inactive operation	<ul style="list-style-type: none"> <li>• Idling</li> </ul>	<ul style="list-style-type: none"> <li>• Idling</li> <li>• Auxiliaries (HVAC and lighting)</li> </ul>	<ul style="list-style-type: none"> <li>• Auxiliary power unit operation</li> <li>• Startup</li> <li>• Taxi out</li> <li>• Taxi in</li> </ul>
Non-operational components			
Manufacturing (facility construction excluded)	<ul style="list-style-type: none"> <li>• Vehicle manufacturing</li> <li>• Engine manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Train manufacturing</li> <li>• Propulsion system manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>• Aircraft manufacturing</li> <li>• Engine manufacturing</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• Vehicle maintenance</li> <li>• Tire replacement</li> </ul>	<ul style="list-style-type: none"> <li>• Train maintenance</li> <li>• Train cleaning</li> <li>• Flooring replacement</li> </ul>	<ul style="list-style-type: none"> <li>• Aircraft maintenance</li> <li>• Engine maintenance</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>• Vehicle liability</li> </ul>	<ul style="list-style-type: none"> <li>• Crew health and benefits</li> <li>• Train liability</li> </ul>	<ul style="list-style-type: none"> <li>• Crew health and benefits</li> <li>• Aircraft liability</li> </ul>
<i>Infrastructure</i>			
Construction	<ul style="list-style-type: none"> <li>• Roadway construction</li> </ul>	<ul style="list-style-type: none"> <li>• Station construction</li> <li>• Track construction</li> </ul>	<ul style="list-style-type: none"> <li>• Airport construction</li> <li>• Runway/taxiway/tarmac construction</li> </ul>
Operation	<ul style="list-style-type: none"> <li>• Roadway lighting</li> <li>• Herbicide spraying</li> <li>• Roadway salting</li> </ul>	<ul style="list-style-type: none"> <li>• Station lighting</li> <li>• Escalators</li> <li>• Train control</li> <li>• Station parking lighting</li> <li>• Station miscellaneous (e.g., other electrical equipment)</li> </ul>	<ul style="list-style-type: none"> <li>• Runway lighting</li> <li>• Deicing fluid production</li> <li>• Ground support equipment operation</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• Roadway maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Station maintenance</li> <li>• Station cleaning</li> </ul>	<ul style="list-style-type: none"> <li>• Airport maintenance</li> </ul>
Parking	<ul style="list-style-type: none"> <li>• Roadside, surface lot, and parking garage parking</li> </ul>	<ul style="list-style-type: none"> <li>• Station parking</li> </ul>	<ul style="list-style-type: none"> <li>• Airport parking</li> </ul>
Insurance		<ul style="list-style-type: none"> <li>• Non-crew health insurance and benefits</li> <li>• Infrastructure liability insurance</li> </ul>	<ul style="list-style-type: none"> <li>• Non-crew health and benefits</li> <li>• Infrastructure liability</li> </ul>
<i>Fuels</i>			
Production	<ul style="list-style-type: none"> <li>• Gasoline and diesel fuel refining and distribution (includes through fuel truck delivery stopping at fuel station. Service station construction and operation is excluded)</li> </ul>	<ul style="list-style-type: none"> <li>• Train electricity generation</li> <li>• Train diesel fuel refining and distribution (Caltrain)</li> <li>• Train electricity transmission and distribution losses</li> <li>• Infrastructure electricity production</li> <li>• Infrastructure electricity transmission and distribution losses</li> </ul>	<ul style="list-style-type: none"> <li>• Jet fuel refining and distribution</li> </ul>

modes. The automobile and bus non-operational components are dominated by electricity production, steel production, and truck and air transport of materials in vehicle manufacturing and maintenance [20]. The construction of the US road and highway infrastructure has large energy implications (in material extraction, material production, and construction operations), between 0.3 and 0.4 MJ/PKT for autos [21–23].

Rail modes have the smallest fraction of operational to total energy due to their low electricity requirements per

PKT relative to their large supporting infrastructures [20]. The construction and operation of rail mode infrastructure results in total energy requirements about twice that of operational.

Aircraft have the largest operational to total life-cycle energy ratios due to their large fuel requirements per PKT and relatively small infrastructure. The active and inactive operational groupings include several components (table 1) and energy consumption is dominated by the cruise phase [24, 25].



**Figure 1.** Energy consumption and GHG emissions per PKT (The vehicle operation components are shown with gray patterns. Other vehicle components are shown in shades of blue. Infrastructure components are shown in shades of red and orange. The fuel production component is shown in green. All components appear in the order they are shown in the legend.).

3.2. Greenhouse gases

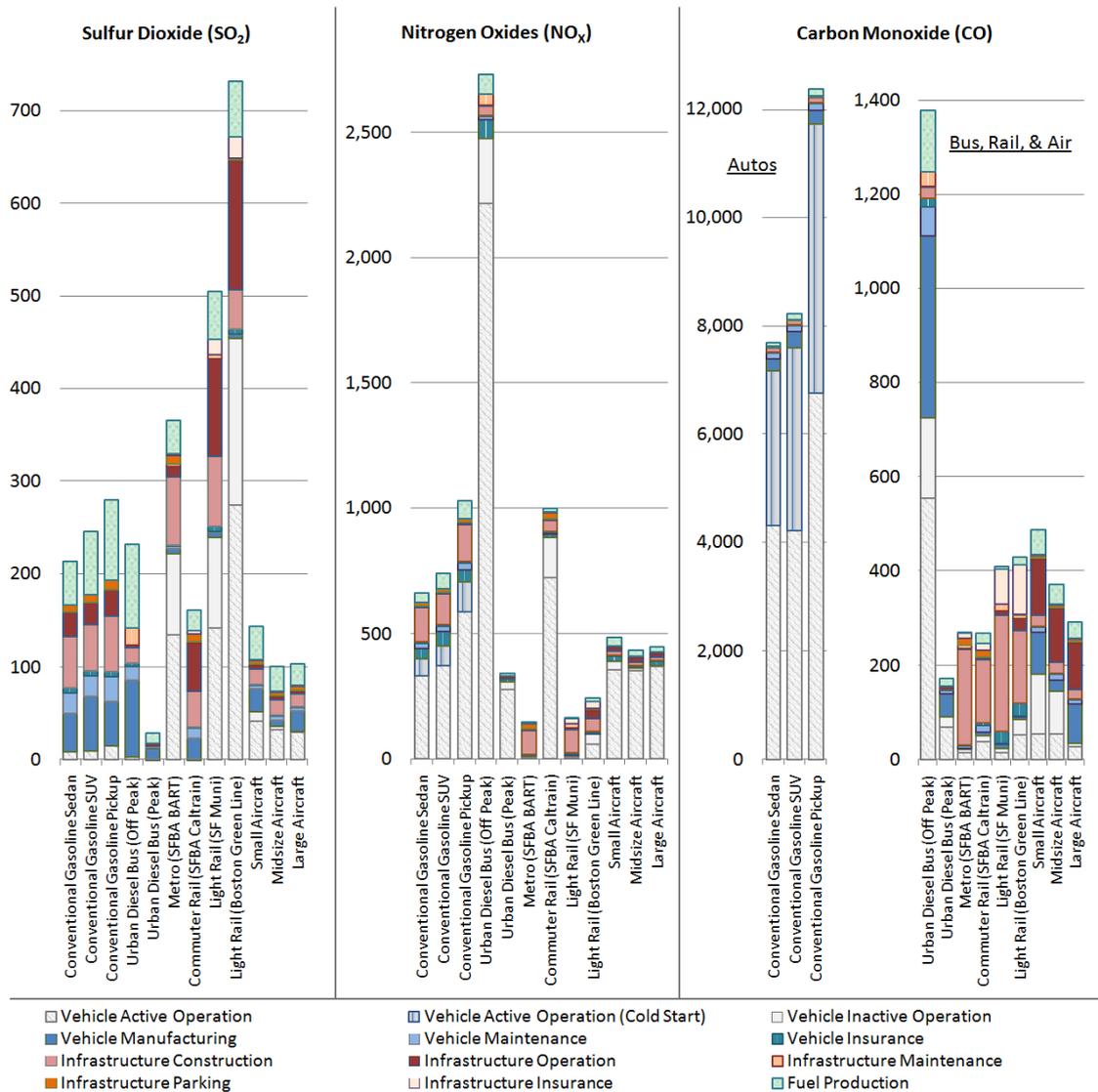
The energy inputs described are heavily dominated by fossil fuels resulting in a strong positive correlation with GHG emissions. The life-cycle component contributions are roughly the same as the GHG contributions and produce 1.4–1.6 times larger life-cycle factors for onroad, 1.8–2.5 times for rail, and 1.2–1.3 times for air than the operational components. Total emissions for each mode are shown in figure 1.

While the energy input to GHG emissions correlation holds for almost all modes, there is a more pronounced effect between the California (CA) and Massachusetts (MA) LRT systems. The San Francisco Bay Area’s electricity is 49% fossil fuel-based and Massachusetts’s is 82% [26, 27]. The result is that the Massachusetts LRT, which is the lowest operational energy user and roughly equivalent in life-cycle energy use to the other rail modes, is the largest GHG emitter.

3.3. Criteria air pollutants

Figure 2 shows SO<sub>2</sub>, NO<sub>x</sub>, and CO emissions for each life-cycle component. The inclusion of non-operational components can lead to an order of magnitude larger emission factor for total emissions relative to operational emissions.

3.3.1. SO<sub>2</sub> contributors. Electricity generation SO<sub>2</sub> emissions dominate life-cycle component contributions for all modes. While electric rail modes have large contributions from vehicle operation components, this is not the case for autos, buses and commuter rail due to the removal of sulfur from gasoline and diesel fuels. Low sulfur levels in fuels result in low SO<sub>2</sub> emissions from fuel combustion compared to the relatively large SO<sub>2</sub> emissions from electricity generation in other components. Total automobile SO<sub>2</sub> emissions are 19–26 times larger than operational emissions and are due to vehicle manufacturing and maintenance, roadway construction and operation (particularly lighting), parking construction, and gasoline production. The electricity requirements in vehicle manufacturing, vehicle maintenance, roadway lighting, road material production, and fuel production (as well as off-gasing) result in significant SO<sub>2</sub> contributions [20, 21, 26, 28]. Bus emissions are dominated by vehicle manufacturing, roadway maintenance [21], and fuel production. Vehicle manufacturing, infrastructure construction, infrastructure operation, parking, insurance, and fuel production produce emission factors for rail modes that are 2–800 times (assuming Tier 2 standards) larger than operational components. The majority of vehicle manufacturing emissions result from direct electricity



**Figure 2.** Criteria air pollutant emissions in mg per PKT (The vehicle operation components are shown with gray patterns. Other vehicle components are shown in shades of blue. Infrastructure components are shown in shades of red and orange. The fuel production component is shown in green. All components appear in the order they are shown in the legend.).

requirements in assembling the parts as well as the energy requirements to produce steel and aluminum for trains. Total aircraft SO<sub>2</sub> emissions are composed of 64–71% non-operational emissions, and are attributed mostly to the direct electricity requirements in aircraft manufacturing and indirect electricity requirements in the extraction and refinement of copper and aluminum [20].

**3.3.2. NO<sub>x</sub> contributors.** Life-cycle NO<sub>x</sub> emissions are often dominated by tailpipe components, however, autos and electric rail modes show non-negligible contributions from other components. Non-operational NO<sub>x</sub> emissions are due to several common components from the supply chains of all the modes: direct electricity use, indirect electricity use for material production and processes, and truck and rail transportation. With onroad modes, electricity requirements for vehicle manufacturing and maintenance as well as truck and rail material transport are large contributors [20]. The

transport of materials for asphalt surfaces is the primary culprit in roadway and parking construction [21]. Fuel refinery electricity and diesel equipment use in oil extraction add to the component’s contribution to total emissions [20]. For rail, the dependence on concrete in infrastructure (resulting in large electricity requirements for cement manufacturing and diesel equipment use in placement) impacts the contribution from construction and maintenance increasing total NO<sub>x</sub> emissions by 2.4–12 times for the electric modes and 1.1 times for commuter rail. Aircraft manufacturing, infrastructure operation, and fuel production produce emissions from aircraft that are 1.2 times larger than operational emissions. The direct electricity requirements and truck and rail transport are the key components in aircraft manufacturing.

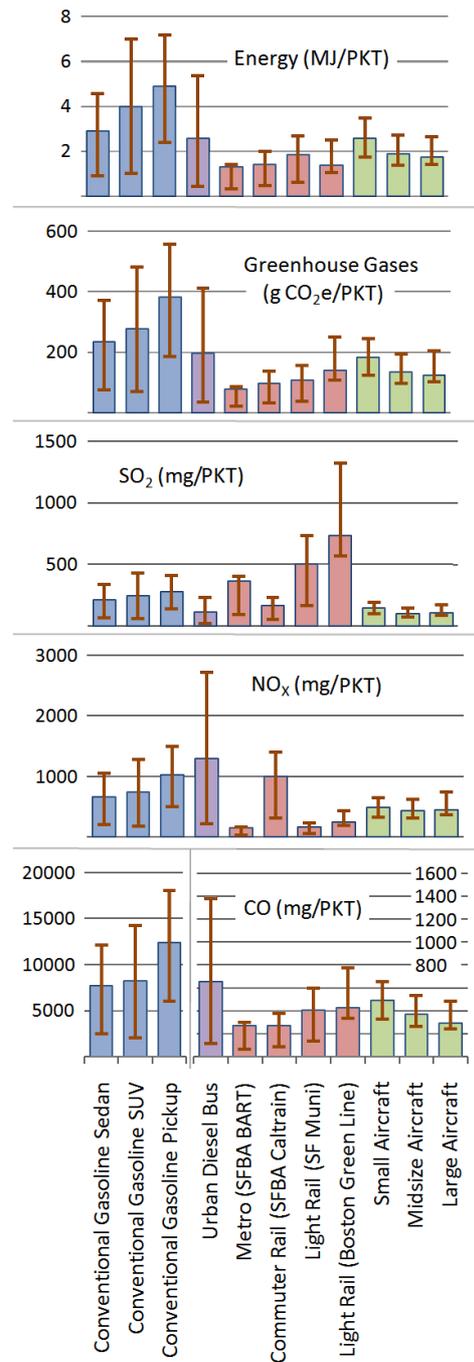
**3.3.3. CO contributors.** While automobile CO emissions are dominated by the vehicle operation phase, this is not the case for bus, rail, and air modes. Automobile CO emissions

are approximately 110 and 40 times larger per PKT than rail and aircraft, respectively, due to a roughly equivalent per vehicle-kilometers-traveled (VKT) emission factor but vastly different occupancy rates. The largest non-operational component is vehicle manufacturing which accounts for about 3% and 28% of total automobile and bus emissions due mainly to truck transport of materials and parts. The production of cement for concrete in stations and truck transport of supplies for insurance operations are the underlying non-operational causes for rail CO emissions. Large concrete requirements result in large CO emissions during cement production for station construction and maintenance [20]. Rail infrastructure emissions (140–260 mg/PKT) are 42–76% of life-cycle emissions (270–430 mg/PKT). Truck transport in aircraft manufacturing, airport ground support equipment (GSE) operation, and jet fuel production produce life-cycle emissions that are 2.6–8.5 times larger than operation (30–180 mg/PKT) [24, 25]. The use of diesel trucks to move parts and materials needed for aircraft manufacturing contributes strongly to the component (20–90 mg/PKT) [20]. The emissions from airport operation are dominated by GSE operations. Particularly, the use of gasoline baggage tractors contributes to roughly half of all GSE emissions [25, 29].

#### 4. Sensitivity to passenger occupancy

While the per-VKT performance of any mode can potentially be improved through technological advancements, the per-PKT performance, which captures the energy and emissions intensity of moving passengers, is the result of occupancy rates. An evaluation of these occupancy rates with realistic low and high ridership illustrates both the potential environmental performance of the mode as well as the passenger conditions when modes are equivalent.

Figure 3 highlights these ranges showing average occupancy life-cycle performance and the ranges of performance from low and high ridership (low ridership captures the largest energy consumption and emissions per PKT, at the worst performing times, while high ridership captures the mode's best performance). Auto low occupancy is specified as one passenger and the high as the number of seats. Bus low occupancy is specified as five passengers and the high as 60 passengers (including standing passengers). Rail low occupancy is specified as 25% of the number of seats and the high as 110% of seats (to capture standing passengers). Aircraft low occupancy is 50% and the high is 100% of the number of seats. The occupancy ranges are detailed in SI table S5 (available at [stacks.iop.org/ERL/4/024008](http://stacks.iop.org/ERL/4/024008)). Discussion of the environmental performance of transit modes often focuses on the ranking of vehicles assuming average occupancy. This approach does not acknowledge that there are many conditions under which modes can perform equally. For example, an SUV (which is one of the worst energy performers) with 2 passengers (giving 3.5 MJ/PKT) is equivalent to a bus with 8 passengers. Similarly, CA HRT with 120 passengers (27% occupancy giving 1.8 MJ/PKT) is equivalent to a midsize aircraft with 105 passengers (75% occupancy). Similarly, commuter rail (with one of the highest average per-PKT



**Figure 3.** Occupancy sensitivity (Average occupancy and life-cycle performance is shown as the blue (autos), purple (bus), red (trains), and green (aircraft) bars. The maroon-colored line captures the range in per-PKT energy consumption and emissions at low and high occupancy).

NO<sub>x</sub> emission rates) at 34% occupancy (147 passengers) is equivalent to a bus with 13 passengers or a sedan with one passenger. Focusing on occupancy improvements does not acknowledge the sensitivity of performance to technological changes. For example, holding occupancy at the average, electric rail modes would have to decrease SO<sub>2</sub> per-PKT emissions between 24 and 85% to compete with onroad modes, an effort that would have to focus on electricity fuel inputs and scrubbers at power plants.

## 5. Appropriate emission reduction targets

The dominant contributions to energy consumption and GHG emissions for onroad and air modes are from operational components. This suggests that technological advancements to improve fuel economy and switches to lower fossil carbon fuels are the most effective for improving environmental performance. Rail's energy consumption and GHG emissions are more strongly influenced by non-operational components than onroad and air. While energy efficiency improvements are still warranted coupled with lower fossil carbon fuels in electricity generation, reductions in station construction energy use and infrastructure operation could have notable effects. Particularly, the reduction in concrete use or switching to lower energy input and GHG-intensity materials would improve infrastructure construction performance while reduced electricity consumption and cleaner fuels for electricity generation would improve infrastructure operation. Utilizing higher percentages of electricity from hydro and other renewable sources for rail operations could result in significant GHG reductions over fossil-based inputs such as coal.

The life-cycle non-operational components are sometimes responsible for the majority of CAP emissions so reduction goals should consider non-operational processes. SO<sub>2</sub> emissions for all modes are heavily influenced by direct or indirect electricity use. Similarly, significant NO<sub>x</sub> emission reductions can be achieved through cleaner electricity generation but also the reduction of diesel equipment emissions in transport and material extraction operations. The reductions could be achieved by decreased or cleaner electricity consumption, using equipment with cleaner fuel inputs, or through the implementation of improved emissions controls. While automobile CO emissions are mainly from active operation (with a large portion attributed to the cold start phase), rail emission reductions are best achieved by reducing the use of concrete in stations. A switch away from diesel or gasoline equipment or stronger emission controls can have strong implications for aircraft total CO emissions in truck transport and GSE operations.

This study focuses on conventional gasoline automobiles and it is important to consider the effects of biofuels and other non-conventional energy inputs on life-cycle results. LCAs of biofuels are starting to be developed and will provide the environmental assessments necessary for adjusting primarily the 'fuel production' component of this LCA. Inputs such as electricity for plugin hybrid electric vehicles could also significantly change several components in this study. Batteries in vehicle manufacturing, differing operational characteristics, and electricity production (especially wind and solar) are just some of the components that would affect the results presented here. This study creates a framework for comprehensive environmental inventorying of several modes and future assessment of non-conventional fuels and vehicles can follow this methodology in creating technology-specific results.

Future work should also focus on environmental effects not quantified herein, such as the use of water [30], generation of waste water, and toxic emissions [31]. Detailed assessments

of the end-of-life fate of vehicles [32], motor oil [33] and infrastructure [34] should also be factored into decisions.

Through the use of life-cycle environmental assessments, energy and emission reduction decision-making can benefit from the identified interdependencies among processes, services, and products. The use of comprehensive strategies that acknowledge these connections are likely to have a greater impact than strategies that target individual components.

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# INDEPENDENT POLICY REPORT

## Below-Market Housing Mandates as Takings: Measuring their Impact

Tom Means, Edward Stringham, and Edward Lopez  
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### *Executive Summary*

Housing affordability has become a major issue in recent years. To address the problem, many cities have adopted a policy known as below-market housing mandates or inclusionary zoning. As commonly practiced in California, below-market housing mandates require developers to sell 10–20 percent of new homes at prices affordable to low-income households.

Many developers, however, argue that the program is in violation of the takings clause of the U.S. Constitution because it forces developers to use some of their property to advance a public goal. Nevertheless, in *Home Builders Association of Northern California v. City of Napa* (2001), the court ruled against the regulatory takings argument, saying that below-market housing mandates are legal because (1) they offer compensating benefits to developers and (2) they necessarily increase the supply of affordable housing.

This study investigates these claims in the following way: Section 2 discusses the history of regulatory takings and discusses why below-market housing mandates may be considered a taking. Section 3 investigates how much below-market housing mandates cost

developers. Section 4 investigates econometrically whether below-market housing mandates actually make housing more affordable.

Our research indicates that the decision by the California Courts of Appeal is on shaky ground. Below-market housing mandates require developers to forego substantial amounts of revenue and they provide little offsetting benefit. A mandate in Marin, California, for example, would require developers to forfeit roughly 40 percent of revenue from a project, and builders are offered almost nothing in return.

We can see how below-market housing mandates affect housing markets by using econometrics to analyze data of price and quantity for California cities in 1990 and 2000. Our regressions show that cities that impose a below-market housing mandate actually end up with 10 percent fewer homes and 20 percent higher prices.

For developers, inclusionary zoning has an effect similar to a regulatory taking. For society in general, affordable housing mandates decrease the supply of new housing and increase prices, which exacerbates the affordability problem.

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# Below-Market Housing Mandates as Takings

## *Measuring their Impact*

*Tom Means, Edward Stringham, and Edward Lopez*

### **I. Introduction**

High housing prices in recent years are making it increasingly difficult for many to purchase a home. Prices have been rising all over the United States, especially in cities on the East and West Coasts. In San Francisco, for example, the median home sells for \$846,500 (Said, 2007, p.11), which requires yearly mortgage payments of roughly \$63,000 (plus yearly property taxes of \$8,500).<sup>1</sup> Not only is the median home unaffordable to most, but there is a dearth of affordable homes on the low end, too. In San Francisco, a household making the median income of \$86,100 can afford (using traditional lending guidelines) only 6.7 percent of existing homes (National Association of Homebuilders/Wells Fargo, 2007). Households making less are all but precluded from the possibility of home ownership (Riches, 2004).

As a proposed solution, many cities are adopting a policy often referred to as below-market housing mandates, affordable housing

mandates, or inclusionary zoning (California Coalition for Rural Housing and Non-profit Housing Association of Northern California, 2003). The specifics of the policy vary by city, but inclusionary zoning as commonly practiced in California mandates that developers sell 10–20 percent of new homes at prices affordable to low-income households. Below-market units typically have been interspersed among market-rate units, have a similar size and appearance as market-rate units, and retain their below-market status for a period of fifty-five years.<sup>2</sup> The program is touted as a way to make housing more affordable, and as a way to provide housing for all income levels, not just the rich. In contrast to exclusionary zoning, a practice that uses housing laws to keep out the poor, inclusionary zoning is advocated as a way to help the poor. Because of its expressed good intentions, the program has gained tremendous popularity. First introduced in Palo Alto, California, in 1973, the program has increased in popularity in the past decade

and is now in place in one-third of the cities in California (Non-Profit Housing Association of Northern California, 2007). And it is spreading nationwide, having been already adopted in parts of Maryland, New Jersey, and Virginia (Calavita, Grimes, and Mallach, 1997).

But the program is not without controversy.<sup>3</sup> In *Home Builders Association of Northern California v. City of Napa* (2001), the Home Builders Association maintained that by requiring developers to sell a percentage of their development for less than market price, the “ordinance violated the takings clauses of the Federal and State Constitutions.” A ruling by the Court of Appeals in California stated that affordable housing mandates are legal and not a taking because (1) they benefit developers, and (2) they necessarily increase the supply of affordable housing. This report investigates these claims by examining the costs of the programs and reviewing econometrically how they affect the price and quantity of housing.

Our report is organized as follows: Section 2 discusses the history of regulatory takings decisions by the courts and relates them to affordable housing mandates. It provides a brief overview of regulatory takings decisions and discusses the arguments about why affordable housing mandates may or may not be considered a taking. When government allows certain buyers to purchase at below-market prices, it is making sellers sell their property at price-controlled prices. If sellers are not compensated for being forced to sell their property at a below-market price, that may be considered a taking.

Section 3 investigates how much affordable housing mandates cost developers. By calculating the price-controlled level and comparing it to the market price, we can observe the costs to developers each time they sell a price-controlled

home. After estimating how much the program costs developers, we discuss to what extent they are being compensated. We find that the alleged benefits to developers pale in comparison to the costs.

Section 4 investigates econometrically whether below-market housing mandates actually make housing more affordable. Using panel data for California cities, we investigate how below-market housing mandates affect the price and quantity of housing. *We find that cities that adopt below-market housing mandates actually drive housing prices up by 20 percent and end up with 10 percent fewer homes.* These statistically significant findings thus bring into question the idea that mandating affordable housing necessarily increases the amount of affordable housing.

Section 5 concludes by discussing why, contrary to *Home Builders Association of Northern California v. City of Napa* (2001), below-market housing mandates should be considered a taking.

## 2. Below-market Housing Mandates and Takings

What are “takings,” and should affordable housing mandates be considered a taking? The most familiar form of taking is when the government acquires title to real property for public use, such as common carriage rights of way (roads, rail, or power lines). Precedent for these types of takings is evident in early U.S. jurisprudence, which institutionalized the principle that the government’s chief function is to protect private property.<sup>4</sup> As such, the government’s takings power was limited in several key respects. Most impor-

tant, the nineteenth-century Supreme Court prohibited takings that transferred property from one private owner to another and upheld the fundamental fairness doctrine that no individual property owner should bear too much of the burden in supplying public uses.

But government's takings power has expanded over time. Takings restrictions were gradually eroded beginning in the Progressive Era and accelerating during the New Deal, as the Supreme Court increasingly deferred to legislative bodies and an ever-expanding notion of public use. Starting in the latter half of the twentieth century, the stage was set to approve takings for "public uses" such as urban renewal (*Berman v. Parker*, 1954), competition in real estate (*Hawaii Housing v. Midkiff*, 1984), expansion of the tax base (*Kelo v. New London*, 2005), and other types of "economic development takings" (Somin, 2004). By the final decade of the twentieth century, one prominent legal scholar described the public use clause as being of "nearly complete insignificance" (Rubinfeld, 1993, p.1078).

Regulatory takings differ in that they are generally not subject to just compensation, because they rest on the government's police power, not the power of eminent domain. Regulatory takings differ also in that the owner retains title to the property but suffers attenuated rights. For example, a government might rezone an area for environmental conservation and thereby prevent a landowner from developing his property. But does an owner still own his property if he is deprived of using it according to his original intent? These were the essential characteristics of the regulation challenged in *Lucas v. South Carolina Coastal Council* (1992).<sup>5</sup> In that case, David Lucas owned two plots of land that he bought for nearly \$1 million and

intended to develop. But the South Carolina Coastal Council later rezoned his property, stating that it would be used for conservation. The Court sided with Lucas, saying that if he was deprived of economically valuable use, he must be compensated. Under *Lucas*, federal law requires compensation if the regulation diminishes the entire value of the property, such that an effective taking exists despite no physical removal.

This so-called "total takings" test is one of several doctrines that could be used to judge regulatory takings. For example, the diminution of value test could support compensation to the extent of the harm done to the property owner. This was the Court's tendency in the 1922 case *Pennsylvania Coal v. Mahon*, which found that a regulatory act can constitute a taking depending on the extent to which the value of a property is lowered.<sup>6</sup> So the *Lucas* Court was not up to something new. As a matter of fact, the concept of regulatory takings was discussed by key figures in the American founding era and became an important topic in nineteenth-century legal scholarship as well.<sup>7</sup>

Following in this tradition, the *Lucas* Court addressed several sticking points with regulatory takings law. For example, the majority opinion cited Justice Holmes as stating the maxim that when regulation goes too far in diminishing the owner's property rights, it becomes a taking. However, as the majority opinion pointed out, the Court does not have a well-developed standard for determining when a regulation goes too far to become a taking. Finally, and most important for our purposes, the *Lucas* Court also stressed that the law is necessary to prevent policymakers from using the expediency of police power to avoid the just compensation required under eminent domain. The *Lucas* Court exam-

ined regulators' incentives and voiced its discomfort with the "heightened risk that private property is being pressed into some form of public service under the guise of mitigating serious public harm."

Because they rezone land, requiring owners to provide a public service of making low-income housing, below-market housing mandates seem like they fit into the *Lucas* Court's description of what could be considered a taking. This specific issue, however, is still being debated in the courts. In 1999, the Home Builders Association of Northern California brought a case against the City of Napa for mandating that 10 percent of new units be sold at below-market rates. The Home Builders Association argued that the affordable housing mandate violated the Fifth Amendment's takings clause stating that "private property [shall not] be taken for public use without just compensation." The trial court dismissed the complaint, and in 2001, the Court of Appeals decided against the Home Builders Association, arguing that "[a]lthough the ordinance imposed significant burdens on developers, it also provided significant benefits for those who complied."<sup>8</sup> In addition, the California court argued that because making housing more affordable is a legitimate state interest, then below-market housing mandates are legitimate, because they advance that goal. Judge Scott Snowden (who was affirmed by Judges J. Stevens and J. Simons) wrote, "Second, it is beyond question that City's inclusionary zoning ordinance will 'substantially advance' the important governmental interest of providing affordable housing for low and moderate-income families. By requiring developers in City to create a modest amount of affordable housing (or to comply with one of the alternatives) the ordinance will necessarily increase the supply of affordable

housing."<sup>9</sup> The Home Builders Association's subsequent attempts to have the case reheard or reviewed by the Supreme Court were denied.

So the Court's argument rests on two propositions that it considers beyond question: (1) affordable housing mandates provide significant benefits to builders that offset the costs, and (2) affordable housing mandates necessarily increase the supply of affordable housing. Both of these are empirical arguments that can be tested against real-world data. We investigate these propositions in the following two sections.

### 3. Estimating the Costs of Below-market Housing Mandates

If one wants to state that "[A]lthough the ordinance imposed significant burdens on developers, it also provided significant benefits for those who complied," one needs to investigate the costs of below-market housing mandates in these programs. Yet when this statement was issued by the Court in 2001, there had been no study of the costs.<sup>10</sup> The first work to estimate these costs was done by Powell and Stringham (2004a). Let us here provide some sample calculations and then present some data for costs in various California cities. Once we present the costs, we can consider whether the programs have significant, offsetting benefits for developers.

First let us consider a real example from Marin County's drafted Countywide Plan.<sup>11</sup> According to the plan, affordable housing mandates would be designated for certain areas of the county (with privately owned property). In these areas, anyone wishing to develop their property would have to sell or lease 50–60 percent of their property at below-market rates.<sup>12</sup>

The plan requires the below-market-rate homes to be affordable to households earning 60–80 percent of the median income, which means price-controlled units must be sold for approximately \$180,000–\$240,000.<sup>13</sup> How much does such an affordable housing mandate cost developers? New homes are typically sold for more than the median price of housing, but for simplicity let us assume that new homes would have been sold at the median price in Marin, which is \$838,750. For each unit sold at \$180,002, the revenue is \$658,748 less due to the price control. Consider the following sample calculations for a ten-unit project in Marin that show how much revenue a developer could get with and without price controls.

*Sample calculations for a ten-unit, for sale development in Marin County*

Scenario 1:

Development without price controls

*Revenue from a ten-unit project without price controls*

[(ten market-rate units) x (\$838,750 per unit)] = \$8,387,500

Scenario 2:

Development with below-market mandate

*Revenue from a ten-unit project, with 50 percent of homes under price controls set for 60 percent of median-income households*

[(five market-rate units) x (\$838,750 per unit)] + [(five price-controlled units) x (\$180,002 per unit)] = \$5,093,760

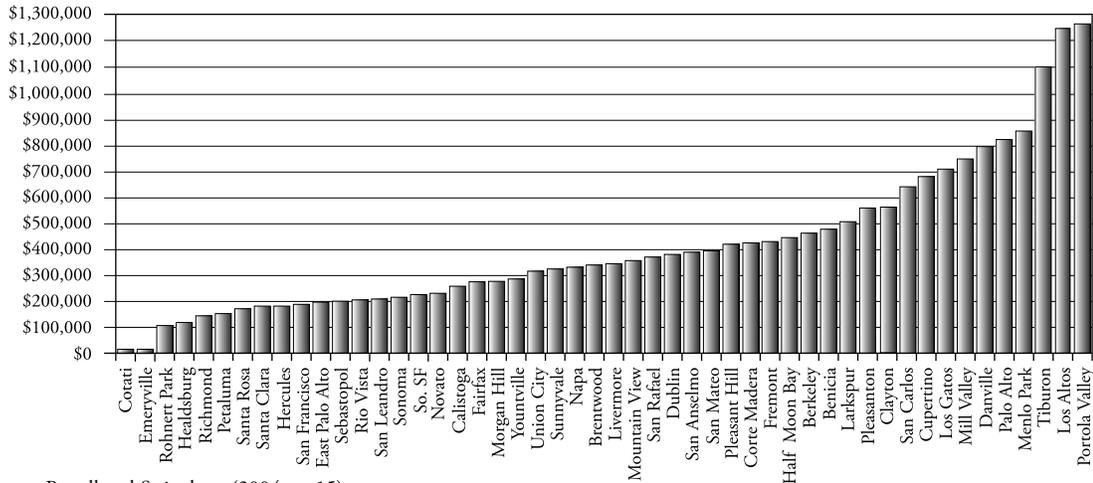
As these calculations show, the below-market housing mandate decreases the revenue from a ten-unit project by \$3,293,740, which is roughly 40 percent of the value of a project. This is just one example, and there are many more.

Powell and Stringham (2004a and 2004b) estimate the costs of below-market housing mandates in the San Francisco Bay Area, Los Angeles, and Orange counties. By estimating how much units must be sold for at below-market rates and comparing this to how much homes could be sold for without price controls, one can estimate how much money below-market housing mandates make developers forgo. Even using conservative estimates (to not overestimate costs), these policies cost developers a substantial amount. Figure 1 shows that in the median San Francisco Bay Area city with a below-market housing mandate, each price-controlled unit must be sold for more than \$300,000 below the market price. In cities with high housing prices and restrictive price controls, such as Los Altos and Portola Valley, developers must sell below-market-rate homes for more than \$1 million below the market price.

One can estimate the costs imposed by these programs on developers by looking at the cost per unit times the number of units built. This measure is not what economists call deadweight costs (which attempts to measure the lost gains from trade from what is not being built), but just a measure of the lost revenue that developers incur for the units actually built. In many cities, no units have been built as a result of the program, but nevertheless, the costs (in current prices) are quite high. The results for the San Francisco Bay Area are displayed in figure 2. In five cities—Mill Valley, Petaluma, Palo Alto, San Rafael, and Sunnyvale—the amount of the “giveaways” in current prices totals over \$1 billion.

The next important question is whether developers are getting anything in return. If Mill Valley, Petaluma, Palo Alto, San Rafael, and Sunnyvale were to issue checks to develop-

Figure 1  
Average Lost Revenue Associated with Selling Each Below-market-rate Unit in  
San Francisco Bay Area Cities



Source: Powell and Stringham (2004a, p.15)

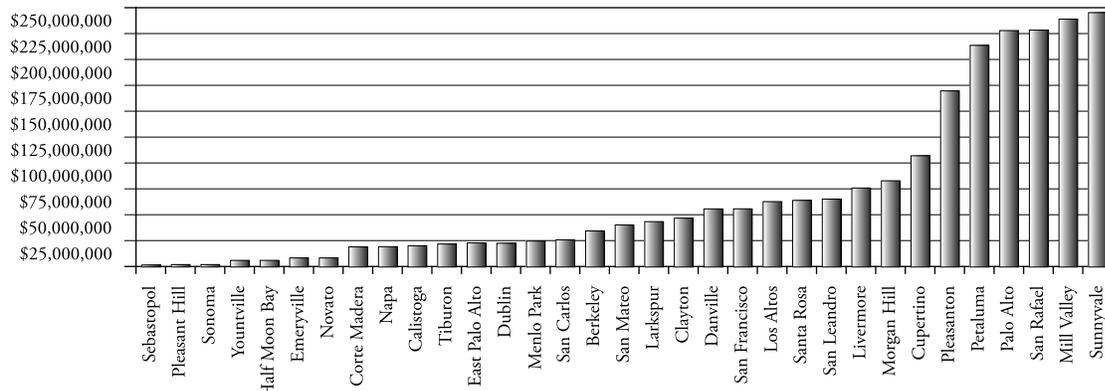
ers totaling \$1 billion, one could say that even though there was a taking, there was also a type of compensation. But the interesting aspect about affordable housing mandates as practiced in California and most other places is that government offers no monetary compensation at all. In fact, this is one of the reasons why advocates of the program and governments have been adopting it. In the words of one prominent advocate, Andrew Dieterich (1996, p. 41), “a vast inclusionary program need not spend a public dime.” In contrast to government-built housing projects, which require tax revenue to construct and manage, affordable-housing mandates impose those costs onto private citizens, namely housing developers. Here we have private parties losing billions of dollars in revenue and receiving no monetary compensation in return.

Monetary compensation for developers is not present, but are affordable housing mandates accompanied by nonmonetary benefits? The Court in *Home Builders Association v. Napa* (2001) stated that “[D]evelopments that include affordable housing are eligible for expedited

processing, fee deferrals, loans or grants, and density bonuses.”<sup>14</sup> According to California Government Code section 65915, government must provide a density bonus of at least 25 percent to developers who make 20 percent of a project affordable to low-income households. The value of these offsetting benefits will vary based on the specifics, but for full compensation to take place, these benefits would have to be more than \$300,000 per home in the median Bay Area city with inclusionary zoning.

One could determine in two ways that the offsetting benefits were worth more than the costs.<sup>15</sup> The first way would be if one observed the building industry actively lobbying for these programs. But in California and most other areas, the building industry is usually the most vocal opponent of these programs. In *Home Builders Association of Northern California v. City of Napa* the court provided no explanation of why the Home Builders Association would be suing to stop a program if it really did provide “significant benefits for those who complied.” If the programs really did benefit developers,

Figure 2  
Average Lost Revenue Per Unit Times the Number of Units Sold in  
Below-market Programs in San Francisco Bay Area Cities



Source: Powell and Stringham (2004a, p.15)

there would be no reason why developers would oppose them.

Why don't builders want to sell units for hundreds of thousands less than market price for each unit sold? Or why don't California builders want to forgo billions in revenue? All of the builders with whom we have spoken have stated that the offsetting "benefits" are no benefits at all. For example, a city might grant a density bonus, but the density bonus might be completely unusable, because density restrictions are just one of a set of restrictions on how many units will fit on the property. Other constraints such as setbacks, minimum requirements for public and private open space, floor area ratios, and even tree protections make it extremely complicated to get more units on the property. Conventional wisdom suggests that building at 100 percent of allowable density will maximize profits, but in reality developers tend to build out at less than full density. The City of Mountain View recently passed a policy requiring developers to provide an explanation for projects that failed to meet 80 percent of the

allowable density.<sup>16</sup> Prior projects had averaged around 65 percent of allowable density. So giving builders the opportunity to build at 125 percent of allowable density is often worth nothing, when so many other binding regulations exist.

The second and even simpler way to determine whether the affordable housing mandates provide significant benefits to compensate developers for their costs would be to make the inclusionary zoning programs voluntary. Developers could then weigh the benefits and costs of participating, and if the benefits exceeded the costs, the developers could voluntarily comply. A few cities in California tried to adopt voluntary ordinances, and perhaps unsurprisingly, they did not attract developers. One advocate of affordable housing mandates argues that the problem with voluntary programs is "that most of them, because of their voluntary nature, produce very few units" (Tetreault, 2000, p.20).

From these simple observations, we can infer that the significant "benefits" of these programs are not as significant as the costs. In this sense, the program has the character of a regu-

latory taking. In addition to observing whether builders would support or voluntarily participate in these programs, we can also analyze data to observe how these programs affect the quantity of housing. If the Court in *Home Builders Association v. Napa* is correct that the benefits are significant, then we would predict that imposing an affordable housing mandate would not affect (or it would encourage) housing production in a jurisdiction. If, on the other hand, the program is not compensating for what it takes, we would predict that cities with the program will see less development than in otherwise similar cities without the program. Here the program is a taking that will hinder new development.

#### 4. Testing How Below-market Housing Mandates Affect the Price and Quantity of Housing

The court in *Home Builders Association v. Napa* puts forth an important proposition, which we can examine statistically. The court states: “By requiring developers in City to create a modest amount of affordable housing (or to comply with one of the alternatives) the ordinance will *necessarily increase* the supply of affordable housing” (emphasis added). Although the court suggests that it is an a priori fact that price controls will increase the supply of affordable housing, the issue may be a bit more complicated than these appellate judges maintain. Before getting to the econometrics, let us consider some simple economic theory and simple statistics about the California experience. First, if a price control is so restrictive, developers cannot make any profits and so the price control can easily drive out all development from an area. Cities such as

Watsonville adopted overly restrictive price controls, and they all but prevented development until they scaled back the requirements (Powell and Stringham, 2005). Over the course of thirty years in the entire San Francisco Bay Area, below-market housing mandates have resulted in the production of only 6,836 affordable units, an average of 228 per year (Powell and Stringham, 2004a, p. 5). Controlling for the length of time each program has been in effect, the average jurisdiction has produced only 14.7 units for each year since adopting a below-market housing mandate. Since the programs have been implemented, dozens of cities have produced a total of zero units (Powell and Stringham, 2004a, pp. 4–5). So unless one defines zero as an increase, it might be more accurate to restate “necessarily increase” as “might increase.”

Economic theory predicts that price controls on housing lead to a decrease in quantity produced. Because developers must sell a percentage of units at price-controlled rates in order to get permission to build market-rate units, this policy also will affect the supply of market-rate units. Powell and Stringham (2005) discuss how the policy may be analyzed as a tax on new housing. If below-market-rate housing mandates act as a tax on housing, they will reduce quantity and increase housing price. This is the exact opposite of what advocates of below-market-rate housing mandates say they prefer. So we have two competing hypotheses, that of economic theory, and that of the court in *Home Builders Association v. Napa*. Luckily, we can test these two hypotheses by examining data for housing production and housing prices in California.

Our approach is to use panel data, which has a significant advantage over simple cross-sectional or time-series data. Suppose a city adopts the policy, there is an unrelated statewide

decline in demand, and housing output falls by 10 percent. A time-series approach would still have to control for other economic factors that might have changed and reduced housing output. One would still need to compare the reduction in output from a city that adopted the policy to a nearby similar city that did not. A cross-sectional approach can control overall economic factors at a point in time but will not control for unobserved city differences. Our approach is to set up a two-period panel data set to control for unobserved city differences and to control for changes over time. The tests, which we explain in detail below, will enable us to see how adopting a below-market-rate housing mandate will affect variables such as output and prices.

#### *4.1. Description of the Data*

The first set of data we utilize consists of the 1990 and 2000 census data for California cities. The 2000 census data are restricted to cities with a population greater than ten thousand, while 1990 census data are not. A decrease in population for some cities during the decade resulted in a loss of fifteen cities from the sample. We do not include the 1980 census, because there were few policies in effect during this decade (Palo Alto passed the first policy in 1972). Focusing on this decade also highlights some economic issues. From 1987 to 1989, housing prices grew very rapidly. Prices for the first half of 1989 grew around 25 percent, only to fall by this amount for the second half of the year, and continue to slide as the California economy declined. For some areas, prices did not recover to their original level until halfway through the 1990 decade. The California economy grew faster in the second half of the decade due to the dot-com boom

in the technology sector. Data from the RAND California Statistics Web site provided average home sale prices for each city for the 1990 and 2000 period. The RAND data do not report 1990 home sale prices for some cities, resulting in a loss of more observations. Summary statistics are provided in table 1.

Data on the policy adoption dates came from the California Coalition for Rural Housing and Non-profit Housing Association of Northern California. Table 2 describes the summary statistics of the policy variables that we constructed. *IZyr* is a dummy variable defined to equal one if the city passed a below-market-rate housing ordinance that year or in prior years. As noted above, differences in population cutoff points and missing 1990 housing prices reduced the sample of cities that passed (or did not pass) an ordinance. Starting in 1985, our sample contains fifteen California cities that had passed an ordinance. The number increased to fifty-nine cities by the end of 1999. The last column reports the difference between decades. In other words, *iz95delta* reports the number of cities that passed an ordinance between 1985 and 1995. The difference variables are fairly constant and capture a large number of cities that passed ordinances during the decade. Focusing on the 1990–2000 decade should allow us enough observations to capture the impact of the policy.

#### *4.2. Empirical Tests*

Jeffrey Wooldridge (2006) provides an excellent discussion of how to test the impact of a policy using two-period panel data. Our approach is to specify a model with unobserved city effects that are assumed constant over the decade (1990–2000) and estimate a first-difference model

to eliminate the fixed effect. We also specify a semilog model so that the first difference yields the log of the ratio of the dependent variables over the decade. Estimating the models in logs also simplifies the interpretation of the policy variable coefficient as an approximate percentage change rather than an absolute difference in averages. For the policy variable, we define IZyr as a dummy variable equal to one if the policy was in effect during the current and previous years. To see the importance of the first-difference approach, consider a model specified for each decade.

**Level Model:**

$$\ln Y_{i,t} = \beta_0 + d_0 YR2000_{i,t} + d_1 IZyr_{i,t} + \beta_1 X_{i,t} + a_i + v_{i,t}$$

(Equation 1)

i = city  
t = 1990, 2000

The dependent variable is either housing output or housing prices, YR2000 is a dummy variable allowing the intercept to change over the decade, IZyr is the policy dummy variable, and the X are control variables. The error term contains two terms: the *unobserved* fixed city component ( $a_i$ ) considered fixed for the decade (e.g., location, weather, political tastes); and the usual error component ( $v_{it}$ ). If the unobserved fixed effect is uncorrelated with the exogenous variables, one can estimate the model using ordinary-least-squares for each decade. The coefficient for IZyr measures the impact of the policy for each decade.<sup>17</sup> Unfortunately, estimating the level model may not capture the differences between cities that passed an ordinance and the ones that did not. In other words, suppose cities with higher housing prices are more likely to adopt the policy. The dummy variable may cap-

ture the impact of the policy along with the fact that these cities already have higher prices.

The above issues can be addressed by differencing the level models to eliminate the fixed city effect, which yields the first-difference model.<sup>18</sup>

**First-Difference Model**

$$\ln Y_{i,2000} - \ln Y_{i,1990} = d_0 + d_1 IZyr_{i,2000} - d_1 IZyr_{i,1990} + \beta_1 X_{i,2000} - \beta_1 X_{i,1990} + v_{i,2000} - v_{i,1990}$$

(Equation 2)

i = city

which can be rewritten as:

$$\ln(Y_{i,2000}/Y_{i,1990}) = d_0 + d_1 \Delta IZyr_{i,t} + \beta_1 \Delta X_{i,t} + \Delta v_{i,t}$$

(Equation 3)

i = city  
t = 2000

Eliminating the unobserved fixed city effect, which we show below in the last two columns of tables 3 and 4, has an important effect on estimating the impact of the policy variable. Differencing the panel data also yields a dummy variable that represents the change in policy participation over the decade (an example of this is the  $\Delta IZyr$  appearing in tables 2 through 6). When policy participation takes place in both periods (1990 and 2000), the interpretation of the differenced dummy is slightly different from the usual policy treatment approach. The differenced dummy variable predicts the average change in the dependent variable due to an increase (or decrease) in participation.

To see the advantage of the first-difference approach, we first estimated (without control variables, which we will add in tables 5 and 6) the un-differenced equations of the log of aver-

Table 1 Summary Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Population 2000	N=446	65,466	(197,087)	10,007	3,694,834
Population 1990	N=431	58,468	(187,014)	1,520	3,485,398
Households 2000	N=446	22,251	(68,673)	1,927	1,276,609
Households 1990	N=431	20,512	(66,074)	522	1,219,770
Housing Units 2000	N=446	23,278	(71,843)	2,069	1,337,668
Housing Units 1990	N=431	21,745	(70,331)	597	1,299,963
Density 2000 (persons/acre)	N=446	7.62	(6.06)	0.42	37.32
Density 1990 (persons/acre)	N=431	6.87	(5.88)	0.08	37.01
Median Household Income 2000	N=446	52,582	(21,873)	16,151	193,157
Median Household Income 1990	N=431	38,518	(14,543)	14,215	123,625
Per Capita Income 2000	N=446	23,903	(13,041)	7,078	98,643
Per Capita Income 1990	N=431	16,696	(8,070)	4,784	63,302
Rents/Income 2000	N=446	27.60%	(3.1%)	14.4%	50.1%
Rents/Income 1990	N=431	28.9%	(2.7%)	14.9%	35.1%
Average Home Price 2000	N=360	300,594	(235,436)	49,151	2,253,218
Average Home Price 1990	N=352	206,754	(112,804)	52,858	1,018,106

age housing prices and output ( $\ln Y_{i,t} = \beta_0 + d_l IZ_{y_{i,t}}$ ) over various lagged policy dummies. The first four columns in table 3 report the estimated coefficients ( $d_l$ ) for each lag year for the level models. The left two columns show the

coefficient estimates for the five regressions that look at housing prices in 1990 and have  $iz1985$ ,  $iz1986$ ,  $iz1987$ ,  $iz1988$ , or  $iz1989$  as the policy variable. The third and fourth columns in table 3 show the coefficient estimates for the five regres-

**Table 2 Summary Statistics – Policy Variables**

Variable	# of cities with inclusionary zoning (in that year)	Variable	# of cities with inclusionary zoning (in that year)	Variable	Change in # of cities with inclusionary zoning (over 10 years)
iz1985	15	iz1995	50	iz95delta (which is iz1995-iz1985)	35
iz1986	19	iz1996	52	iz96delta (which is iz1996-iz1986)	33
iz1987	19	iz1997	54	iz97delta (which is iz1997-iz1987)	35
iz1988	22	iz1998	54	iz98delta (which is iz1998-iz1988)	32
iz1989	23	iz1999	59	iz99delta (which is iz1999-iz1989)	36

**Table 3 Summary of Policy Coefficients from Fifteen Regressions on the Price of Housing by Model and by Lag Year**

Dependent Variable: ln(Price)

Level models for 1990 data		Level models for 2000 data		First-difference models (2000–1990)	
Policy Variable	Coefficient of Policy Variable	Policy variable	Coefficient of Policy Variable	Policy variable	Coefficient of Policy Variable
iz1985	.389	iz1995	.627	iz95delta	.312
iz1986	.431	iz1996	.642	iz96delta	.298
iz1987	.431	iz1997	.637	iz97delta	.278
iz1988	.442	iz1998	.637	iz98delta	.270
iz1989	.457	iz1999	.642	iz99delta	.265

sions that look at housing prices in 2000 and have iz1995, iz1996, iz1997, iz1998, or iz1999 as the policy variable. For example, the 0.389 in the first row indicates that cities with inclusionary zoning in 1985 had 47.6 percent ( $\exp(0.389) - 1$ ) higher than average prices in 1990, and the 0.627

in the first row indicates that cities with inclusionary zoning in 1995 had 87.2 percent higher-than-average prices in 2000. For both decades, the impact increases slightly as the lag period is decreased, though the impact for the 2000 period is much larger than the 1990 period.

**Table 4 Summary of Policy Coefficients from Fifteen Regressions on the Quantity of Housing by Model and by Lag Year**

Dependent Variable: ln(Housing Units)

Level models for 1990 data		Level models for 2000 data		First-difference models (2000–1990)	
Policy Variable	Coefficient of Policy Variable	Policy variable	Coefficient of Policy Variable	Policy variable	Coefficient of Policy Variable
iz1985	.777	iz1995	.665	iz95delta	-.045
iz1986	.751	iz1996	.614	iz96delta	-.024
iz1987	.751	iz1997	.585	iz97delta	-.027
iz1988	.679	iz1998	.585	iz98delta	-.038
iz1989	.653	iz1999	.618	iz99delta	-.051

The estimated coefficients ( $d_t$ ) for 1990 and 2000 range from 0.389 to 0.642 and indicate that cities with inclusionary zoning have 48–90 percent higher housing prices, but this does not take into consideration the possibility that cities that adopted the policy already had higher prices when they did so. To account for this potential problem, the first-difference model estimates how changes in the policy variable (adopting a below-market housing ordinance) alone affect housing prices. The last two columns of table 3 report the first-difference estimates ( $\ln(Y_{i,2000}/Y_{i,1990}) = d_0 + d_1\Delta IZyr_{i,t}$ ). For example, the 0.312 in the last column of the first row indicates that cities with below-market housing mandates have 36.6 percent higher prices. Each of the estimated coefficients in table 3 are significant at the 1 percent level. The results in the last two columns indicate that below-market housing mandates have increased the price of the average home by 30 to 37 percent.

The results for housing output (the number of units) are even more interesting. These results are presented in table 4. The estimates of  $d_t$  for

the level models for 1990 and 2000 are positive and statistically significant at the one percent level, which indicates that cities with inclusionary zoning have more housing production, but similar to the housing price regressions do not take into consideration the possibility that cities that adopted the policy already were growing when they adopted the policy. Again, we need to look at the difference in output based on cities adopting the policy. The last two columns in table 4 show how changes in the policy variable (adopting a below-market-rate housing ordinance) alone affect the quantity of housing. Eliminating the unobserved fixed effect by differencing the data switches the sign of the policy variable from positive to negative (though most are statistically insignificant without control variables). This switch in sign of  $d_t$  provides strong evidence of the importance of eliminating the unobserved fixed city effect. The negative impact increases in size and statistical significance when control variables are added to the first-difference model.

**Table 5 Regression Results of How Below-market Housing Mandates Affect the Price of Housing: First-difference Model with Control Variables**

Dependent Variable:  $\ln(\text{average price } 2000/1990)$

Independent Variable	Coefficients and (Standard Errors)	Coefficients and (Standard Errors)
	$N=431$	$N=431$
Constant	0.001 (0.025)	-0.009 (0.025)
iz95delta	0.228*** (0.038)	
iz99delta		0.217*** (0.037)
median income	0.173*** (0.0126)	0.178*** (0.0125)
density	-0.007 (0.011)	-0.008 (0.011)
population	-0.0017 (0.00661)	-0.00112 (0.00662)
rent %	-0.002 (0.005)	-0.003 (0.005)
Adj. R-Squared	0.4332	0.4300

Tables 3 and 4 indicate the importance of differencing the data and removing the unobserved fixed city effect.<sup>19</sup> The next set of regressions in table 5 report first-difference estimates for housing prices for the five-year and one year lag while adding other control variables that may change over time.<sup>20</sup> The other models (using lag periods iz96delta, iz97delta, and iz98delta) yielded similar results. Adding income, whether median household income or per capita income, increases the size of the estimated policy effect. All policy estimates of  $d_1$  are larger than 0.20, suggesting that *cities that impose an affordable housing mandate drive up prices by more than 20 percent*. Dropping the insignificant variables and adjusting for heteroscedasticity had little impact on the policy and income variables.

The final set of results in table 6 reports the estimated effects on housing quantity for the same lag periods as the price estimates. The results are nearly identical for the other lag periods (iz96delta, iz97delta, and iz98delta). Adding control variables increases the policy impact and its statistical significance. Substituting the number of households for the number of units as the dependent variable does not alter the main results. Adjusting for heteroscedasticity did increase the statistical significance levels slightly for the policy variable. The negative policy coefficients (-0.104 and -0.097) suggest that cities that impose an affordable housing mandate reduce housing units by more than 10 percent.

**Table 6 Regression Results of How Below-market Housing Mandates Affect the Quality of Housing: First-difference Model with Control Variables**

Dependent Variable: ln(units 2000–1990)

Independent Variable	Coefficients and (Standard Errors)	Coefficients and (Standard Errors)
	N=431	N=431
Constant	-0.056** (0.023)	-0.054** (0.023)
iz95delta	-0.104** (0.042)	
iz99delta		-0.097** (0.041)
median income	0.0683*** (0.0132)	0.0660*** (0.0131)
density	0.113* (0.011)	0.114 (0.011)
population	0.0233* (0.00729)	-0.0230* (0.00729)
Adj. R-Squared	0.2921	0.2911

Note: \*, \*\*, \*\*\* denotes significance at the .10, .05, .01 levels, two-tailed test.

## 5. Conclusion

Our research provides answers to two important questions: How much do below-market housing mandates cost developers, and do below-market housing mandates improve housing affordability? After showing that below-market housing mandates cost developers hundreds of thousands of dollars for each unit sold, we discussed how developers do not receive compensation in this amount. Next we investigated how these policies affected the supply of housing. Using panel data and first difference estimates, we found that below-market housing mandates lead to decreased construction and increased prices. Over a ten-year period, cities that imposed a below-market housing mandate on average ended up with 10 percent fewer homes

and 20 percent higher prices. These results are highly significant. The assertion by the court in *Home Builders Association v. Napa* that “the ordinance will necessarily increase the supply of affordable housing” is simply untrue.

The justification for the decision that below-market housing mandates are not a taking rests on some extremely questionable economic assumptions. We are not sure about the amount of economics knowledge of Judges Scott Snowden, J. Stevens, and J. Simons. Below-market housing mandates are simply a type of price control, and nearly every economist agrees that price controls on housing lead to a decrease in quantity and quality of housing available (Kearl et al., 1979, p.28). Because these price controls apply to a percentage of new housing, and builders must comply with them

if they want to build market-rate housing, price controls also will affect the supply of market-rate housing. Because price controls act as a tax on new housing, we would expect a supply shift leading to less output and higher prices for all remaining units.

New names for price controls, like “inclusionary zoning,” make the policy sound innocuous or even beneficial (who can be against a policy of inclusion?), but in reality the program is a mandate that imposes significant costs on a minority of citizens. The costs of below-market housing mandates are borne by developers and other new homebuyers who receive little or no compensation. From this perspective, below-market housing mandates are a taking no different in substance from an outright taking under eminent domain. Below-market housing mandates represent the sort of abuse the *Lucas* Court forewarned, and they should rightly be considered a taking. In terms of economics, below-market housing mandates only differ from an outright taking in degree—there is not a “total taking” but a partial taking and clearly a diminution of value without any compensation. The amount of harm imposed by below-market housing mandates should inform their status under the law.

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### Notes

- 1 Assuming a 30-year fixed-interest-rate mortgage with an interest rate of 6.3 percent.
- 2 For details about the program, see California Coalition for Rural Housing and Non-Profit Housing Association of Northern California (2003) and Powell and Stringham (2004a).
- 3 For review of the literature, see Powell and Stringham (2005).
- 4 "The country that became the United States was unique in world history in that it was founded by individuals in quest of private property. . . . [T]he conviction that the protection of property was the main function of government, and its corollary that a government that did not fulfill this obligation forfeited its mandate, acquired the status of a self-evident truth in the minds of the American colonists." Pipes (1999, p.240).
- 5 *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992).
- 6 *Pennsylvania Coal v. Mahon* 260, U.S. 393 (1922).
- 7 As legal scholar James Ely writes, "In his famous 1792 essay James Madison perceptively warned people against government that 'indirectly violates their property, in their actual possessions.' Although Madison anticipated the regulatory takings doctrine, the modern doctrine began to take shape in the last decades of the nineteenth century. For example, in a treatise on eminent domain published in 1888, John

Lewis declared that when a person was deprived of the possession, use, or disposition of property ‘he is to that extent deprived of his property, and, hence . . . his property may be taken, in the constitutional sense, though his title and possession remain undisturbed.’ Likewise, in 1891 Justice David J. Brewer pointed out that regulation of the use of property might destroy its value and constitute the practical equivalent of outright appropriation. While on the Supreme Judicial Court of Massachusetts, Oliver Wendell Holmes also recognized that regulations might amount to a taking of property. ‘It would be open to argument at least,’ he stated, ‘that an owner might be stripped of his rights so far as to amount to a taking without any physical interference with his land.’” (Ely, 2005, p.43, footnotes in original omitted.)

- 8 *Home Builders Association of Northern California v. City of Napa* (2001), p. 188.
- 9 *Home Builders Association of Northern California v. City of Napa* (2001), pp. 195–6.
- 10 The California Coalition for Rural Housing and Non-profit Housing Association of Northern California (2003, p.3) stated, “These debates, though fierce, remain largely theoretical due to the lack of empirical research.”
- 11 Marin County is one of the highest-income and most costly areas in the San Francisco Bay Area.
- 12 [http://www.co.marin.ca.us/EFiles/Docs/CD/PlanUpdate/07\\_0430\\_IT\\_070430091111.pdf](http://www.co.marin.ca.us/EFiles/Docs/CD/PlanUpdate/07_0430_IT_070430091111.pdf) (accessed August 19, 2007). To simplify the specifics, developers have the choice of selling 60 percent of homes to low-income households or 50 percent of homes to very-low-income households, which calculates to roughly the same loss of revenue, so for simplicity we will focus on the latter scenario.
- 13 Median income for a household of four is \$91,200, so a household earning 80 percent of median income earns \$73,696, and a household earning 60 percent of the median income earns \$55,272. The specific affordability price control formula will depend on certain assumptions (for example, the level of the interest rate in the formula), but using some standard assumptions we can create an estimate (assuming homes will be financed with 0 percent down, a 30-year, fixed-rate mortgage, and an interest rate of 7 percent, and assuming that 26 percent of income will pay mortgage payments and 4 percent of income will pay for real estate taxes and other homeowner costs).

This formula gives us how much a household in each income level could afford and the level of the price controls. In Marin County, a home sold to a four-person household earning 80 percent of median

income could be sold for no more than \$240,003, and a home sold to a four-person household earning 60 percent of the median income could be sold for no more than \$180,002.

The price controls may be set at stricter levels, depending on the city ordinance. For example, the City of Tiburon sets price controls for “affordability” much more strictly than the above formula. Its ordinance assumes an interest rate of 9.5 percent and assumes that 25 percent of income can be devoted to a mortgage. According to Tiburon’s ordinance, a “moderate,” price-controlled home can be sold for no more than \$109,800.

- 14 *Home Builders Association of Northern California v. City of Napa* (2001), p.194.
- 15 Powell and Stringham (2005) discuss this issue in depth.
- 16 Policy on Achieving Higher Residential Densities in Multiple-Family Zones, (September 13, 2005).
- 17 For those readers unfamiliar with semilog models,  $d_1$  provides an interpretation of the policy variable as a percentage change. The estimate of  $d_1$  is interpreted as the approximate percentage change in Y for cities that pass an ordinance. When the estimate of  $d_1$  is large (greater than 10 percent), the more accurate estimate is  $\% \Delta Y = \exp(d_1) - 1$ .
- 18 The first difference model is the fixed-effects model when there are two time periods.
- 19 Controlling for the endogeneity of the policy variable will have little or no impact. The data reveal that cities that passed an ordinance also have higher housing prices on average. It may be that higher-priced cities are more likely to pass an ordinance. Given our results, we have some doubts about whether this will impact our conclusion. First we lagged the policy variable from one to five years and found very little variation in the OLS estimates. A lag of five years (for a potential dependent variable) should reduce or eliminate the potential bias. Second, the first-difference approach reduced the price effect and significantly changed the output effect by controlling for unobserved fixed effects. Finally, there are some limits to finding instrumental variables for a first-difference model. Clearly it would not be appropriate to use any of the 2000 data to control for policies passed in earlier years. One could use the 1990 census data, but even here there are some cities that passed the policy prior to 1990. For these reasons, we believe controlling for endogeneity will not change the basic results.
- 20 The income and population variables are rescaled in units of ten thousand to simplify the coefficient presentation.

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Since 2003, EMF has supported and assisted hundreds of documentary and educational outreach projects dealing with climate change and global warming, alternative energy, earth science, organic farming, urban farming and agricultural practices, marine fisheries, oceans and aquaculture, food safety and security, animals and wildlife, restoration ecology, ecosystem conservation and environmental preservation, social justice, indigenous people and cultures, human health and medicine, green building and growth, urban ecology and industry, and many other issues of general public interest.

At that capacity, EMF and its board and associates interact with scientists, researchers, educators, corporations, private foundations, government agencies, and community activists from around the world, working as a team to learn more about the most pressing environmental challenges of our time.

Notable projects include Natural Heroes, a national PBS series, and the international Harmony Initiatives for the Prince of Wales Trust. An updated list of projects can be found at: <http://www.environmentalmediafund.org/Page.aspx?PageID=91>

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DEVELOPER / MANAGING PARTNER (1987 - 2003) - Developer of 530 units of multifamily, Section 8, low and very low income housing renovation projects in Wyoming, Colorado, Texas and Washington.

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REAL ESTATE DEVELOPMENT CONSULTING AND SERVICES (1982 - 2003) - Services performed for third party private developers involved in single family and multifamily new construction and low income multifamily renovation projects (approximately 300 units).

In addition to the services noted above, other services included general project development feasibility analysis, including preliminary cost and sales projections, financial analysis, property inspections and reporting, construction observation and monitoring of payments, and Clerk of the Works services for major commercial and institutional clients.

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- COLUMBIA SAVINGS BANK, savings and loan, Denver, CO;
- CONAM. property management, Las Vegas, Nevada,
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- GOLD CROWN MANAGEMENT CO., property managers, Denver, CO;
- HALIGMAN & LOTTNER, Attorneys at law, Denver;
- LEINBACH COMPANIES, real estate sales and development, Tulsa, OK;
- MASHBURN ENTERPRISES, Real estate development, Oklahoma City, OK;
- MILLER & SHROEDER FINANCIAL, tax exempt bond underwriters, Minn., MN.;
- PCA/ALLIANCE, Property Company of America and G.E. Capital, Tulsa, OK;

- PHILIPS DEVELOPMENT CO., real estate development, Denver, CO;
- STRIKER PETROLEUM CORP., land subdivision sales, Denver, CO;
- THE BROE COMPANIES, property management, San Diego, CA;
- THE ROSS GROUP, property management, Denver, CO;
- TIMBERLAND INVESTMENT CO., real estate development and sales, Evergreen, CO;
- WEINSTOCK BELL, real estate development, Los Angeles, CA;
- WESTCLIFF SEVEN, LTD., land development, Denver, CO;
- WESTLAND PROPERTIES, real estate development, Denver, CO;

**REAL ESTATE BROKERAGE** (1984 - 2002) - Tiburon Group has provided real estate brokerage marketing and sales services to third parties and partnership entities. Activity included residential single family sales both as listing brokers and buyer's brokers, multifamily property acquisitions, and land sales and marketing for corporate and commercial clients.

**CLIENT LIST**

- PACIFIC UNION VENTURES, San Francisco, CA;
- LA SALLE PARTNERS, Chicago, IL;
- PCA/ALLIANCE (PROPERTY COMPANY OF AMERICA / GENERAL ELECTRIC CAPITAL); Tulsa, OK
- GOLD CROWN MANAGEMENT CO., property managers, Denver, CO;
- HALIGMAN & LOTTNER, Attorneys at law, Denver, CO;
- WESTCLIFF SEVEN, land development, Denver, CO.;
- GOLD CROWN MANAGEMENT, real estate development, Englewood, CO.

**TIBURON GROUP - ARCHITECTURE & CONSTRUCTION**

**TIBURON GROUP - CONSTRUCTION MANAGEMENT SERVICES** (1986-1990): Construction management services to Section 8 low income affordable housing, substantial rehabilitation projects, approximately 250 units in Colorado, Oklahoma and Nevada.

**TIBURON GROUP - GENERAL CONTRACTING: DESIGN/BUILD PROJECTS** (1975 - 1982): Single family residential projects designed and constructed / general contracted by Tiburon Group (formerly Robert Silvestri Design / Construction). Nine custom homes, averaging 2,500 square feet to 11,500 square feet, located in Cherry Hills, CO; Evergreen, CO; Beverly Hills, CA; and Hancock Park, Los Angeles, CA.

TIBURON GROUP, INC. – ARCHITECTURE: Residential and commercial architectural development and design services, land planning and other development related services including public presentations, construction cost analysis, landscape and interior design, bid coordination, contract negotiations and supervision.

RESIDENTIAL: MULTI-FAMILY (1986 - 1990): Architects of Record on Section 8, multifamily substantial rehabilitation projects located in California, Colorado, Nevada, Oklahoma, Texas, Wyoming and Washington. Approximately 1,676 units

COMMERCIAL (1977 -1987): Architects of Record on a variety of commercial, retail and office projects located in Colorado and Los Angeles, CA.

RESIDENTIAL: SINGLE-FAMILY (1975 - 1992): Architects of record on more than 50 project designs for custom residences and renovations constructed in Colorado and California. Projects range in size from 2,500 to 11,000 square feet.

ARCHITECTURAL DESIGN CONSULTING (1980 - 1992): Architectural design services provided for single family and multifamily builders, contractors and developers, commercial and institutional clients.

CHAIRMAN – USF&G / CASTLE PINES DEVELOPMENT COMPANY DESIGN / DEVELOPMENT REVIEW BOARD: A 2800 luxury home development with a PGA Championship Golf Course, located 30 minutes southeast of Denver. The Board is charged with reviewing all improvements within the development. The Board has also been instrumental in the creation of the Builder's Land-Sales Program.

OTHER ARCHITECTURAL PROFESSIONAL EXPERIENCE:

Senior architectural designer and project coordinator for Kamnitzer, Marks Lappin & Vreeland, Beverly Hills, CA; Frank Williams & Associates, New York City, NY; and the NYC Department of Parks & Recreation, NYC.

Projects included multifamily apartment renovation in Beverly Hills, CA; 850 new construction condominiums in Sunrise and Plantation, FL; Community Day Care Centers for the NYC Department of Social Services, and the new

Ft. Green Park Playground design for Ft. Green Park in Brooklyn, NY.

TEACHING (1972); Architecture and Design at the McKinley School in New York City for one semester.

ENVIRONMENTAL TASK FORCE & DOCUMENTARY WORKSHOP (1972); City Planning Study for the City of Lockport, New York, in association with Lawrence Halprin & Associates and Hardy Holzman & Pfiefer Architects, New York City.

THE DENVER MALL; Project coordinator on a promotional film project for the City of Denver, sponsored by the Denver Partnership, Denver, Colorado.

## **RELATED VENTURES**

REHAB SYSTEMS, INC.: Rehab Systems, Inc. operated as a subsidiary of Tiburon Group, Inc. from 1988 through 1991. The company provided technical assistance in multifamily renovation to private developers and Public Housing Agencies. The company's proprietary computer database and analysis software allowed users to better control the costs and the progress of complex substantial rehabilitation projects.

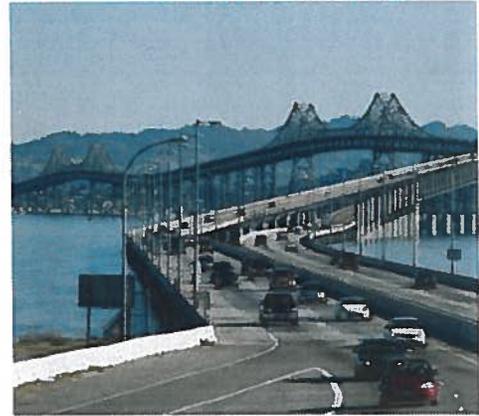
The system was approved and successfully implemented in the renovation of approximately 1,500 multifamily housing units under various HUD and FHA financing programs. The software programs were specially written to interface and correlate HUD/FHA cost formats with private developer/AIA MasterSpec formats for the purposes of cost estimating. Services included scope of work analysis, construction cost estimating and preparation of construction documentation for bidding. The company discontinued operations in December of 1991.

PEAK FINANCIAL: Peak Financial operated as a subsidiary of Tiburon Group from 1988 through 1989. The company provided mortgage consulting, underwriting and correspondence services on approximately \$23,500,000 in FHA coinsured loans. The financing arranged was primarily for multifamily substantial rehabilitation projects in Texas, Oklahoma, Colorado, California and Wyoming.

Services consisted of preliminary underwriting proforma and feasibility, completion

# A Population Forecast

## THE SAN FRANCISCO BAY AREA, MAY 2013



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## Introduction

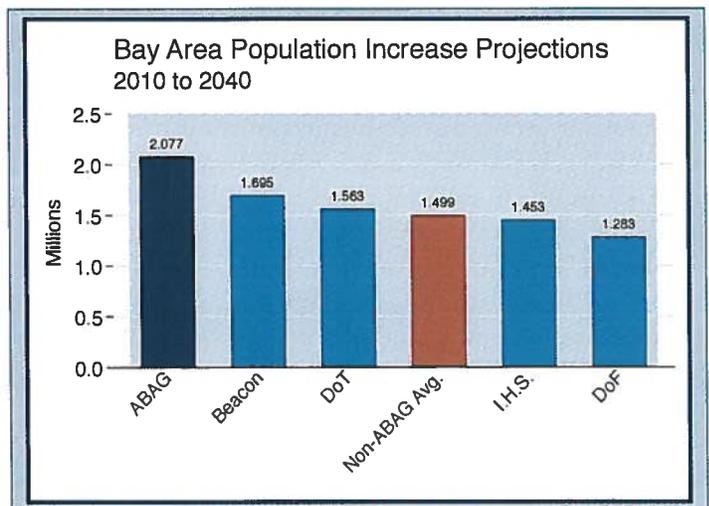
In March 2013, the Association of Bay Area Governments (ABAG), in association with the Metropolitan Transportation Commission, released the Draft Plan Bay Area Report to outline development throughout the Nine-County San Francisco Bay Region (Bay Area). In ABAG's report, the projected population growth for the Bay Area from 2010 to 2040 was approximately 30% and estimated to reach 9.299 million residents by 2040. The group Bay Area Citizens asked Beacon Economics to independently review the methodology and results of the ABAG forecast, and create an alternative forecast that would take into account any issues.

While we at Beacon Economics acknowledge the difficulty of long term forecasting and recognize that there can be a wide variety of potential outcomes, nevertheless we feel that the ABAG forecast likely overstates the rate of population growth the Bay Area might expect over the next few decades. We base this opinion on a number of issues we find with the ABAG methodology, including the failure to acknowledge a general slowing in the natural increase being experienced in the entire nation, misinterpreting the data on job growth in the region and not sufficiently accounting for the negative impact of high housing costs. These issues inflate ABAG's population projection, making it higher than we feel is likely.

Therefore, Beacon Economics has conducted an in-house forecast of the Bay Area's population through 2040, which considers historic growth rates and makes the appropriate adjustments. Our work has been performed independently and our results are completely our own. While our findings actually surpass ABAG's projections for 2020 due to the strong local economy, they also show that the following two decades will have much slower population growth and ultimately the projected population will only reach 8.862 million by 2040. Our projections are based on,

- Revised employment figures for the Bay Area that show employment was 300,000 jobs less than previously reported for 2010 by the California Employment Development Department.
- Shifts in demographic fundamentals that show natural population increases will slow.
- Lower levels of net migration due to home affordability and the previously mentioned slower job growth.

To put both the ABAG and Beacon Economics forecasts in context, we should note that various other entities have also forecasted population growth for the Bay Area and, for the ones we found, their projections for 2040 are even lower. One notable difference between these forecasts, including the California Department of Finance's January 2013 projections (DOF), and ABAG's forecast is in the projected populations for the most densely populated counties – Alameda, San Francisco, San Mateo, and Santa Clara; ABAG's population projections for these counties in 2040 is cumulatively 900,000 persons greater than the DOF.



## Critique of the ABAG Forecasting Model

The following explains some of the differences between Beacon Economics' long-term demographic forecast for the nine-county San Francisco Bay Area and that of the Association of Bay Area Governments (ABAG). The first thing that needs to be acknowledged is, as Yogi Berra famously said, "prediction is very hard, especially about the future." Even a basic five-year forecast model has a relatively large error band around it by the end of the forecast period—the world simply has too much randomness and complexity in it for even the most complex long-term economic projection models to be able to predict outcomes that far into the future with a high degree of certainty. Thirty- or forty-year forecasts verge on speculation—particularly when we consider the possibility of "black swan" events. Nevertheless, when it comes to long-run planning, sometimes we have to just do it, acknowledging that there are a few definitely wrong answers and no completely right ones.

Be that as it may, we do feel there are a number of elements in the ABAG forecast in its current form that tend to bias the results upward, making the long-run population projections too high. In some cases, we have a difference of opinion regarding the methodology used. In other cases, we think that there are long-term drivers of demographic growth that have not been accounted for properly. As such, Beacon Economics' forecast for population growth is lower than the ABAG forecast, although ultimately the difference works out to be slightly over 3% less per decade.

The basic flow of logic in the ABAG forecast starts with the strong tech base in the Bay Area, a base that will allow the region's economy to outperform the U.S. economy in terms of job growth by a good margin. To fill these jobs, the Bay Area will, more or less, have to import people. This will in turn cause an acceleration of population from the current levels. Evidence of this comes from the rebound in employment in the area relative to the U.S. overall, as well as from the growing share of jobs in the region compared to the nation overall. We agree that empirical evidence supports the idea that places with lower unemployment rates enjoy more significant inflows of population than other areas, holding all else equal. We feel, however, that there are other forces that can slow things down.

The ABAG approach of jobs driving population growth is problematic for a number of reasons all by itself, not the least of which that it seems to mischaracterizes the relative success of the Bay Area in recent years. Indeed, better accounting suggests that overall employment growth in the Bay Area has been slower than in other places despite the tech industry that plays such an important role in the local economy.

The ABAG report uses payroll employment as a share of the national total to discuss the relative advantage. Recent high pace of job growth combined with what happened in the late nineties during the tech boom seem to be the predominant evidence of the importance of this driver. But using payroll employment from the Current Employment Statistics (CES) survey makes employment gains in the Bay Area look more robust than they actually were over the past two decades. Payroll employment is based on where people work, not where they live. And payroll figures will double count people with more than one job.

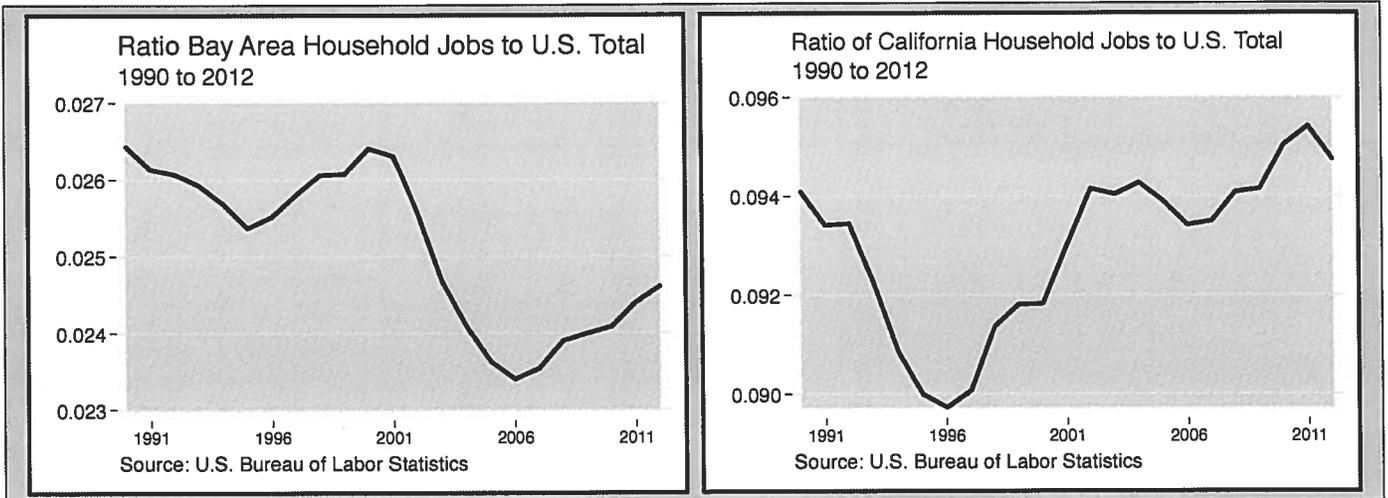
Indeed while it is true that payroll employment in the late nineties was very rapid, growth was significantly faster than population growth, household employment growth or other measures of changes in the local demographic base. It seems as if one impact of the frenzied economy at the time was that many workers had multiple jobs, or equivalently that many were commuting in from other regions for work.

The household employment survey is a better way to measure true job growth in the area—particularly as it relates to population, since it is based on where a worker lives rather than where the worker works. When these are taken

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into account, the Bay Area has actually seen a declining share of overall U.S. household jobs, despite the tech-heavy drivers of the Bay Area economy and despite its position as one of the most successful economies in the nation.

Even with the bounce in local employment in recent years, the overall ratio of jobs in the Bay Area to jobs in the U.S. is still well below 2003 levels, and even farther below where it was in 1990. This is especially notable when we look at the rest of California, where the share of household jobs in recent years is above where it was in 2002 or 1990, despite having a less tech-heavy employment base. In short there is little evidence to show that the booming tech industry has caused an overall acceleration in population growth in the region, and as such shows that it is logically incorrect to assume a high pace of long term demographic growth on this basis.



As for the recent trends, the current acceleration is simply a bounce-back effect driven by the fact that the skilled workforce in the U.S. saw its fortunes improve from the setbacks of the last deep recession faster than the low-skilled workforce. We should not assume that this is anything more than a cyclical effect, and is certainly not evidence that the historic decline in jobs in the Bay area compared to the rest of the U.S. or even California will soon be reversed.

Why has the booming tech industry not been matched by overall higher than average employment growth in the region? From our analysis it is because of the lack of affordable housing in the region. While low unemployment attracts people to a region, high home prices can drive them away. Because of the lack of construction relative to population growth in the Bay Area, the region already has one of the most expensive housing markets in the nation. To put this in perspective, in 1997 the median price of a house in San Francisco County was 2.17 times that of the median price in the nation overall. In March of 2013 that ratio reached 4.24. Even relatively affordable Alameda County has seen its ratio climb from 1.59 to 2.23 over the same time period. It is expensive to live in the Bay Area, particularly for mid-skilled workers.

Date	San Francisco	Alameda
March 1997	2.17	1.59
March 2013	4.24	2.23

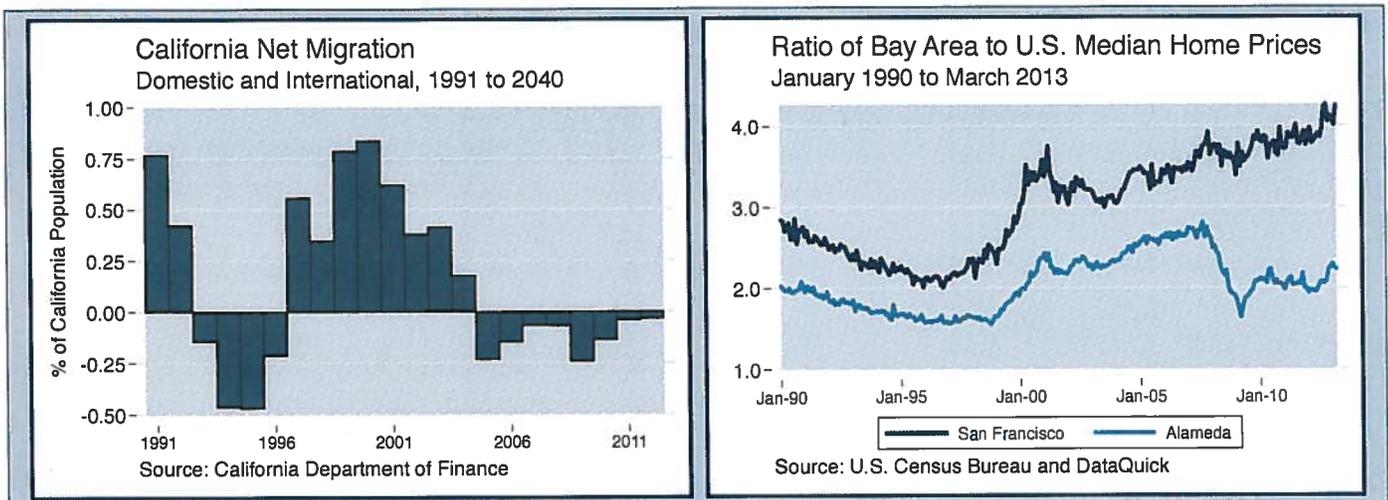
Source: National Association of Realtors and DataQuick

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High housing costs can restrict population growth in a few different ways. Most obviously, people will choose to commute to expensive regions rather than move into them. By our calculations at least 20% of workers in the Inland Empire commute to work in the economies to the west of the region on a daily basis. In large part, people are choosing to commute to Los Angeles and Orange County because of the same lack of affordability that we are seeing in the Bay Area. Given the Bay Area's high median home price, even if the region does experience strong job growth, many workers will decide to live outside the area and commute in. Job growth by itself cannot be used as a sole driver of population growth.

We understand that a primary focus of the Plan and DEIR is to significantly expand the supply of housing in the Bay Area. As such the issue of high housing costs being a negative driver of population growth would seem to be irrelevant. But we are more referring to the fact that now home prices are relatively very high to other areas—and this will serve to restrict growth in the short run. In other words any housing plan would need to first catch up with past deficiencies before future growth can be accommodated for. We have not reviewed these aspects of the Plan and DEIR in detail, and we express no opinion on the likelihood of the success of these proposals, but we will observe that there is no record of any such program being successfully implemented anywhere in the U.S. to the extent projected in the Plan and DEIR.

The impact of high housing costs can be seen clearly in what happened in the state overall through the last housing cycle. As noted, low unemployment rates tend to attract people to the state, as seen clearly in data on negative net migration during the weak economy of the early 1990s and high positive net migration into the state during the hot tech-boom era of the late 1990s. Indeed, this is an important factor in the ABAG forecast, since they state that the hot tech core of the local economy will keep unemployment at 5% and thus draw in a high pace of migration into the area. However, the drop in affordability during the last housing bubble dampened this effect completely. Net migration was negative for California in 2005, despite the hot economy and the low unemployment rate. Because more people were moving out than moving in, the population shrank by .23%.



Then when the economy stumbled hard and home prices fell, despite higher unemployment in the state than the U.S. overall net migration actually stayed steady—higher affordability brought some folks back to the state. To put this in perspective, in 2009 at the height of the recession that hit California so much worse than other states, net migration

## BEACON ECONOMICS

for California was negative, with .24% of the population moving out of the state, roughly the same as in 2005. It is worth noting again that prices in the Bay region have fallen less than in other places

Lastly there is basic demographic changes being seen in the U.S. overall. There will be fewer people to move into the Bay region if there is a slowing in overall population growth in the U.S. This is exactly what is being seen in forecasts for the national overall largely due to falling rates of natural increase (births less deaths). The lower rates of natural increase stem from declines in fertility rates among U.S. women, as well as from the aging of the baby boomers beyond childbearing years. The Census Bureau currently forecasts that population growth in the U.S. will slow from .77% per year in 2015 to .5% per year in 2046. As such, even if the Bay Area does grow more quickly than the nation as a whole, the overall slowing will mean slower growth over the years.

What could change our forecast? If the Bay Area saw a stunning reversal of relative home price trends, then the net migration number would likely increase. But we don't see a reasonable chance of major reforms in CEQA requirements or building permits that would be necessary to spark that pace of construction. Likewise, there have been attempts to broaden the housing market by issuing affordable housing mandates or creating redevelopment agencies with missions—at least on paper—to build more affordable housing. These efforts have failed to make even a dent in housing costs in the Bay Area. As such, we would have to see hard evidence of falling relative prices before we changed our opinion.

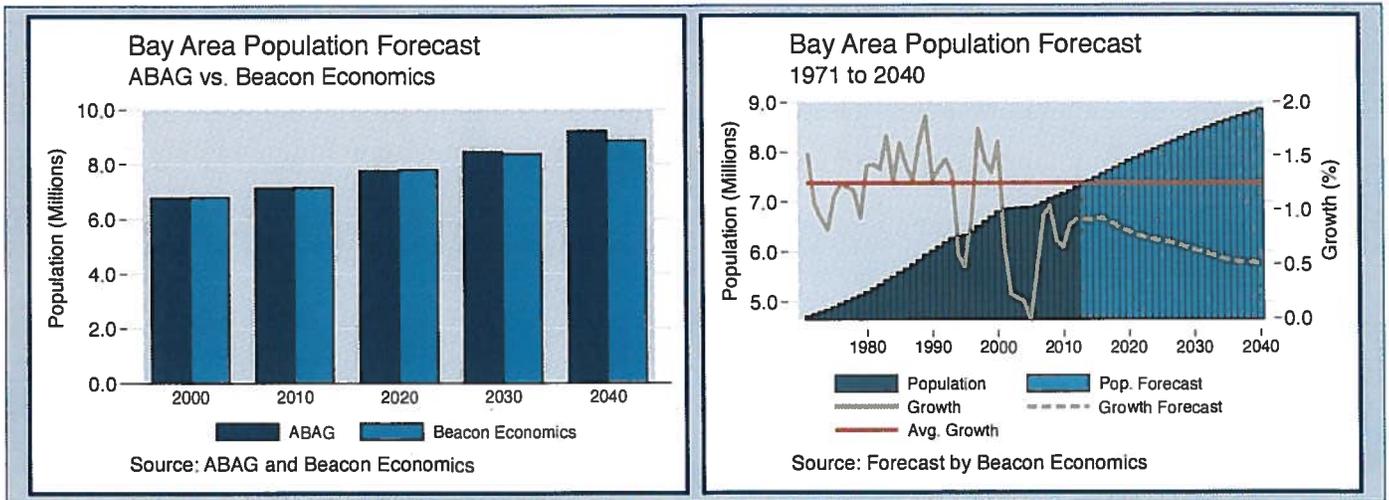
To reiterate, however, there is a wide range of potential outcomes for the Bay Area. The region could be struck by a potentially catastrophic disaster, or it could experience a reversal of fortune in the IT industry, as happened with the one-time seemingly unstoppable aerospace industry in Southern California. On the other hand, the region could experience a new burst of growth, driven by some new discovery in technology or a major housing reform. But, for the reasons cited above, we feel that there is a high probability that our projections will prove to be more accurate than ABAG's higher projections.

## Bay Area Population Forecast

In addition to reviewing the forecast work performed by Stephen Levy, the director of the Center for the Continuing Study of the California Economy, in the ABAG report, Beacon Economics has constructed its own population forecast for the San Francisco Bay Area, extending out to 2040. Overall, Beacon Economics has found that the ABAG report is too optimistic in its projections for population growth in the Bay Area over the next 30 years. Our forecast, which has the benefit of incorporating the latest data from the California Department of Finance (DOF) on population and the components of population change, calls for the Bay Area population to grow to 8.86 million by 2040. This is roughly 367,000 fewer residents than projected by ABAG over the same period, or roughly 4% fewer residents in 2040.

Overall, we are projecting slightly faster growth over the short term, with growth averaging roughly 0.9% per year on a compound annualized basis. Over the longer term, Beacon Economics forecasts that population growth in the San Francisco Bay Area will decline to roughly 0.55% per year.

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Beacon Economics’ long-term population forecast is smaller than that of ABAG for three reasons. First, we use up-to-date data on employment growth—one of the primary determinants of population growth. The recent data indicate that employment fell further than previously determined. Specifically, Beacon Economics is showing roughly 3.1 million jobs in the Bay Area as of 2010, rather than the nearly 3.4 million jobs used in the ABAG forecast. Thus, although Beacon Economics is forecasting roughly 0.5% growth in nonfarm jobs over the long term, which is only slightly lower than ABAG’s 0.6% annual growth in jobs through 2040, the lower starting point means that ABAG’s forecast is overstated by nearly 460,000 jobs by the end of the forecast. Because the Bay Area will gain fewer jobs over the next three decades, Beacon Economics is forecasting that there will be slightly less net migration into the Bay Area. Importantly, the 0.5% job growth projected by Beacon Economics is below the long-run average growth rate of nearly 0.8% per year in the Bay Area. Still, Beacon Economics does envision employment in the Bay Area rising to 4.16 million by 2040. This represents a 1.06 million increase in the number of jobs located within the Bay Area by 2040. In comparison, the ABAG forecast shows employment growing from 3.39 million jobs in 2010 to 4.62 million by 2040. Indeed, even after adjusting for an overstated base year, it is likely that the ABAG forecast would still be too optimistic and overstate future job growth by more than 175,000 positions.

The second (and perhaps more important) reason for the discrepancy between Beacon Economics’ forecast and that of ABAG is that our forecast pays closer attention to the fundamental demographic shifts that are currently underway in the Bay Area and the nation overall. Specifically, there has been a significant slowing in the pace of natural increase—the number of births in a region less the number of deaths. As recently as the early 1990s, natural increase was responsible for generating more than 57,000 new Bay Area residents each year. In the most recent data available (2012), natural increase had fallen to just 41,561 new residents per year.

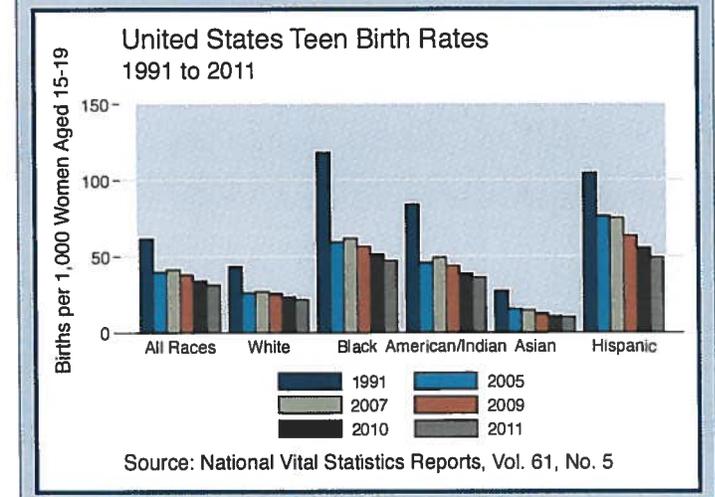
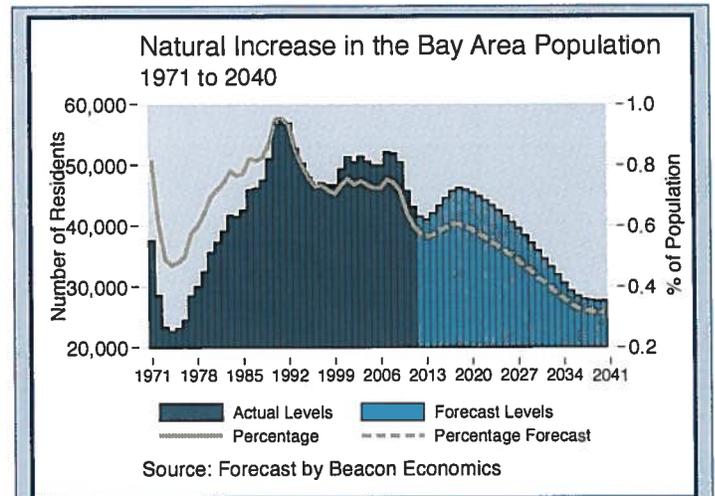
It’s not surprising that we are seeing a trend toward fewer births and greater deaths, given that birth rates are declining while the population is aging. The population in the Bay Area, the state, and the nation overall is becoming older. At almost 25% of the population, the 55 and older age group represents a large share of U.S. residents. As such, deaths are naturally expected to increase as the average age of the population rises. This will tend to put downward pressure on natural increase holding everything else constant. At the same time, birth rates are declining. Indeed, according to data from the World Bank, birth rates in the U.S. have fallen from nearly 24 births per 1,000 people in the early 1960s to just 14 births per 1,000 people in 2010.

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According to the National Vital Statistics Reports<sup>1</sup>, teen birth rates, a common measure of fertility, are down across all ethnicities. Since 1991, birth rates have fallen from 61.8 births per 1,000 women aged 15-19 in the U.S. to just 31.3 by 2011. Typically, U.S. residents of Hispanic or Latino origin have had relatively high birth rates. Given that California has a larger share of Hispanic residents relative to the rest of the nation, the state has seen more natural increase on a proportional basis. However, this data also shows that birth rates among Hispanic women have dropped dramatically, which will mitigate future natural increase in California and the Bay Area. In fact, birth rates for Hispanic women have fallen from 104.6 per 1,000 women in 1991 to just 49.4 in 2011. That marks a 52.8% reduction in birth rates among Hispanics over the 20-year period—a faster decline than the 49.4% reduction in birth rates across all racial and ethnic groups.

With an aging population in California and the Bay Area, and with trends in birth rates showing fewer babies being born to mothers of both Hispanic and non-Hispanic descent alike, Beacon Economics forecasts that natural increase will continue to decline in the coming years. A larger number of deaths will be expected as the mean age of Bay Area residents rises, and these deaths will be offset by a smaller number of births as birth rates continue to slide. As a result, Beacon Economics forecasts that the rate of natural increase in the Bay Area will have fallen to less than 30,000 per year by 2040, or 0.3% of the population base. This will help to drive below-average growth in the Bay Area's population over the long-run relative to the historical performance of the region since 1970, when natural population increase was roughly 0.6% of the population base each year.

The third reason that Beacon Economics' long-term population forecast is smaller than that of ABAG is that we expect fewer people to move to the Bay Area. In addition to experiencing growth from natural increase, the Bay Area's population also grows or shrinks in response to net migration—the net number of people moving into or out of the region. Net migration takes into account the net movement of domestic residents as well as net foreign immigration. Unlike natural increase, net migration into or out of a region is largely a function of economic forces rather than demographic trends. As noted earlier, Beacon Economics is forecasting that fewer jobs will be added to the Bay Area economy from 2010 to 2040 relative to ABAG's forecast. As a consequence, the smaller number of jobs is expected to draw in a smaller number of migrants into the San Francisco Bay Area over the next 30 years. Back in the 1980s, net

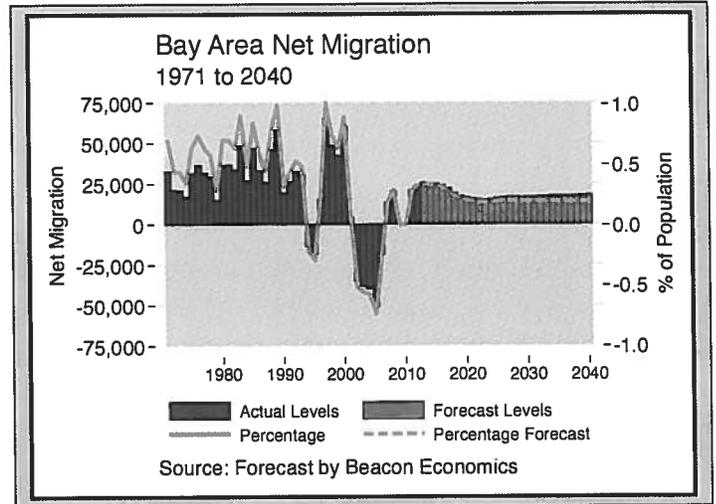


<sup>1</sup>National Vital Statistics Report, [http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61\\_05.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_05.pdf), Vol. 61, No. 5.

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migration contributed 1% to the population base each year. However, from 2002 to 2006 (after the dot-com crash), a larger number of residents moved out of the Bay Area relative to the number of new residents that moved in.

As the economy heals, Beacon Economics expects that net migration into the Bay Area will remain positive through 2040. However, the pace of that migration will be below historical averages. Specifically, Beacon Economics is forecasting that net migration will add an average of just under 20,000 new residents each year (both foreign and domestic on net). This is much lower than the net number of 60,000+ new residents that migrated to the Bay Area each year during the height of the tech bubble, though it is markedly stronger than the out-migration the region faced in the wake of the dot-com bust. On a proportional basis, net migration is only expected to contribute 0.2% to the annual population base over the long run.



Bay Area Employment and Population Projections					
Year	Employment Level			Compound Annual Growth (%)	
	ABAG	Beacon Economics	Difference	ABAG	Beacon Economics
2010	3,385,300	3,104,452	-280,848		
2020	4,068,500	3,763,009	-305,491	1.86	1.94
2040	4,617,500	4,160,373	-457,127	0.63	0.50
Cumulative (%)	36.40	34.01			

Year	Population Level			Compound Annual Growth (%)	
	ABAG	Beacon Economics	Difference	ABAG	Beacon Economics
2000	6,783,762	6,813,183	29,421		
2010	7,152,000	7,166,923	14,923	0.53	0.51
2020	7,786,382	7,823,100	36,718	0.85	0.88
2030	8,477,035	8,391,889	-85,146	0.85	0.70
2040	9,229,000	8,861,569	-367,431	0.85	0.55
Cumulative (%)	29.04	23.65			

Source: ABAG & Beacon Economics

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This slower net migration has two causes. First, the Bay Area remains an expensive place to live relative to the rest of California. The affordability gap becomes even more dramatic when the region is compared to the nation overall. With job growth picking up across the nation, and with relatively cheaper housing in many other parts of the U.S., the incentives to migrate to the Bay Area will be reduced. And given that job growth is expected to be much slower over the next 30 years than it was during either the tech or housing bubbles, net migration into the Bay Area is expected to remain tepid at best.

Because natural increase is slowing and net migration into the region is staying relatively flat, Beacon Economics expects that long-run population growth in the San Francisco Bay Area will decline to 0.5%. As a result, our forecast for the total population in the Bay Area in 2040 shows roughly 367,000 fewer residents than the population forecast in the ABAG report.

## Summary of Other Forecasts

In addition to reviewing the ABAG forecast and providing our own forecast of population growth in the Bay Area, Beacon Economics has also performed a review of other population forecasts. A summary of these additional forecasts is presented here. By looking at additional forecasts for the pace of population growth in the San Francisco Bay Area, we can situate the ABAG and Beacon Economics forecasts in a spectrum of possible trajectories, and thus provide a context for our analysis.

### Other Bay Area Population Forecasts Show Population, Employment, and Multi-family Housing Demand will Come up Short of ABAG Expectations

Prior to the 2012 revisions, it was well known that the California Department of Finance (DOF) forecast for population growth was overly optimistic. The ABAG forecast, which resembles the DOF July-2007 projections, predicts that the Bay Area population will increase from 7.15 million in 2010 to 9.30 million in 2040, a 30.0% increase. In comparison, the new DOF forecast, released in January 2013, projects the population will increase to 8.45 million by 2040. This marks a reduction of 850,000 persons from the ABAG forecast—a decidedly more tepid projection.

Other reports also show lower projections. One written by the California Department of Transportation (DOT) in October 2012 projects that the Bay Area's population will increase to 8.73 million residents by 2040, while IHS Global Insight projects that the Bay Area's population in 2040 will be 8.62 million. ABAG's projections are between 570,000 and 680,000 persons higher than the projections in these two reports.

Overestimating population growth can significantly alter the ABAG forecast for employment and total housing units. For example, based on ABAG's estimate of a 50% labor force participation rate and a 5% unemployment rate, the new DOF population projections would call for a reduced forecast to ABAG's employment projection by 703,750 jobs throughout the Bay Area. Likewise, the DOT projections would reduce the employment forecast by 270,750 jobs, and the IHS projections would reduce the employment forecast by 323,000 positions. Furthermore, overestimating population growth in counties (urban), age groups, and ethnic groups can alter the labor force participation rates and the type of housing units that will be in demand.

**Projected Population in 2040, Bay Area and Nine Counties**

County	2040 Population Level (in millions)				Diff. from ABAG (in millions)		
	ABAG	Dept. of Finance	Dept. of Transportation	IHS Global Insight	Dept. of Finance	Dept. of Transportation	IHS Global Insight
Bay Area	9.30	8.45	8.73	8.62	-0.85	-0.57	-0.68
Alameda	1.99	1.68	1.82	1.78	-0.31	-0.17	-0.21
Contra Costa	1.33	1.39	1.36	1.44	0.06	0.03	0.11
Marin	0.29	0.26	0.29	0.24	-0.03	0.00	-0.05
Napa	0.16	0.17	0.17	0.17	0.01	0.01	0.01
San Francisco	1.09	0.89	0.91	0.88	-0.20	-0.18	-0.21
San Mateo	0.91	0.85	0.77	0.74	-0.06	-0.14	-0.17
Santa Clara	2.43	2.08	2.31	2.22	-0.35	-0.12	-0.21
Solano	0.51	0.55	0.53	0.54	0.04	0.02	0.03
Sonoma	0.60	0.57	0.56	0.61	-0.03	-0.04	0.01

Source: ABAG, DOF, DOT, IHS Global Insight

**Bay Area Population Forecasts by County**

ABAG's population projections for four Bay Area counties are significantly higher than the county projections from DOF, the Department of Transportation, and IHS Global Insight. ABAG forecasts significant population increases in the counties of Alameda (31.6%), San Francisco (34.8%), San Mateo (26.1%), and Santa Clara (36.1%). The new projections from the Department of Finance are lower for all four counties (10.9%, 10.6%, 18.1%, and 16.6%). The DOT projections perhaps most closely resemble the ABAG forecast (20.2%, 12.9%, 7.4%, and 29.2%), though the DOT projections remain significantly lower than those of ABAG by 2040. Finally, the IHS projections further suggest slower population growth in the four counties (17.3%, 8.9%, 2.8%, and 24.3%). ABAG's projections for the four combined urban counties are between 590,000 and 900,000 persons higher than the projections in the three other forecasts.

Reducing the forecasts for these four counties would mean reducing the expected demand for multifamily units. The current (2011) shares of multifamily structures in the four counties are 38.8% in Alameda, 68.0% in San Francisco, 34.5% in San Mateo, and 36.9% in Santa Clara. These are significantly higher than in Contra Costa (26.4%), Marin (30.2%), Napa (27.5%), Solano (24.0%), and Sonoma (24.9%) counties, where ABAG's population forecasts more closely resemble DOF, DOT, and IHS.

Projected Percentage Growth Populations from 2010 to 2040, Bay Area and Nine Counties							
County	Change in Population from 2010 to 2040 (%)				Diff. from ABAG (Change in Percentage Points)		
	ABAG	Dept. of Finance	Dept. of Transportation	IHS Global Insight	Dept. of Finance	Dept. of Transportation	IHS Global Insight
Bay Area	30.0	18.0	21.8	20.1	-12.0	-8.2	-9.9
Alameda	31.6	10.9	20.2	17.3	-20.7	-11.4	-14.3
Contra Costa	27.3	32.3	29.1	36.4	5.0	1.8	9.1
Marin	13.1	2.7	14.8	-6.4	-10.4	1.7	-19.5
Napa	19.9	26.4	26.2	23.7	6.5	6.3	3.8
San Francisco	34.8	10.6	12.9	8.9	-24.2	-21.9	-25.9
San Mateo	26.1	18.1	7.4	2.8	-8.0	-18.7	-23.3
Santa Clara	36.1	16.6	29.2	24.3	-19.5	-6.9	-11.8
Solano	23.7	33.5	28.5	31.4	9.8	4.8	7.7
Sonoma	23.7	18.3	16.5	25.6	-5.4	-7.2	1.9

Source: ABAG, DOF, DOT, IHS Global Insight

### Bay Area Population Forecasts by Age Group

ABAG projects that the senior aged population (65 years and over) in the Bay Area will increase from 900,000 to 2.1 million. The Department of Finance projects that the same group will increase to only 1.9 million. For the population under 25 years of age, both ABAG and DOF project a 25% increase (to 2.8 million, although a typo in the Draft Bay Area Plan 2013 misstates the population estimate for this age group). Since the ABAG projects the population to increase by 850,000 more residents than the DOF, then the ABAG forecast for persons of prime working age (from 25 to 64 years old) is approximately 650,000 persons higher than the DOF forecast.

ABAG assumes that the labor force participation rate will decline from the current 52% to 50% in 2040 because the share of the population in the prime working ages will decline from 56% to 47%. DOF projects this share to decline to 44%, which means that the labor force participation rate would be less than 50%. Although the difference between the two projected shares of residents of prime working age is small (47% vs. 44%), it nonetheless leans toward a lower employment count in 2040.

**Projected Population Growth from 2010 to 2040 by Age Group**

Age Group	2010   2040 Population (in millions)				Cumulative Growth 2010-2040 (%)			Share of Total in 2040 (%)		
	DOF	ABAG	DOF	IHS Global Insight	ABAG	DOF	IHS Global Insight	ABAG	DOF	IHS Global Insight
Bay Area	7.16	9.30	8.45	8.62						
24 and Under	2.24	2.80	2.79	2.34	25.0	24.9	4.6	30.1	33.0	27.1
25 to 64	4.05	4.40	3.75	4.78	8.9	-7.3	18.2	47.4	44.4	55.4
65 and Over	0.88	2.10	1.91	1.50	137.9	116.4	70.1	22.6	22.6	17.4

Source: ABAG, DOF, IHS Global Insight

IHS also breaks down their projections by age. IHS projects the senior aged population in the Bay Area will increase to only 1.5 million, and the population under 25 years of age will increase to only 2.3 million. On the other end of the equation, IHS does project that the population in the prime working ages will increase by 730,000 persons, more than the number in the ABAG and DOF reports. By their calculations, the share of the population in the prime working ages will remain the same from 2010 to 2040 (56%). By the same methodology, an unchanged portion of the prime working age population implies that the labor force participation rate will not decline.

**Bay Area Population Forecasts by Race/Ethnicity**

Both ABAG and DOF project that the white population will decline from 3.05 million in 2010 to between 2.87 million and 2.88 million in 2040. However, their projections for the Hispanic and Asian populations vary. ABAG projects that the Hispanic population will grow from 1.69 million to 3.25 million, while DOF projects that it will grow to only 2.50 million. As for the Asian population, ABAG projects that it will grow from 1.67 million to 2.23 million, while DOF projects that it will grow to only 2.11 million.

**Projected Population Growth from 2010 to 2040 by Race/Ethnicity**

Race/Ethnicity	2010   2040 Population (in millions)				Cumulative Growth 2010-2040 (%)		
	DOF	ABAG*	DOF	Census**	ABAG*	DOF	Census**
Bay Area	7.16	9.30	8.45	N/A			
White (non-Hispanic)	3.05	2.88	2.87	3.00	-5.3	-5.8	-1.5
Hispanic	1.69	3.25	2.50	3.05	92.4	47.9	80.5
Asian	1.67	2.23	2.11	2.98	33.9	26.6	78.9
Other	0.76	0.93	0.97	N/A	22.1	27.7	

Source: ABAG, DOF, U.S. Census Bureau

\*ABAG projections are roughly based on the population percentages provided.

\*\*Census Bureau projections are based on national growth projections by race and ethnicity.

The U.S. Census Bureau does not have a forecast by state or county through 2040; however, their forecast for the U.S. as a whole for race and ethnicity projects that the white population will decline by 1.5% from 2010 to 2040, while

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the Hispanic population will increase by 79%, and the Asian population will increase by 81%. Applied to the Bay Area populations, this would imply that the white population will decline to 3.00 million, the Hispanic population will grow to 3.05 million, and the Asian population will grow to 2.98 million. These figures more closely resemble the ABAG forecast, but bear in mind that these are national projections and the migration, birth, and death patterns observed across the country in aggregate may not apply to the Bay Area specifically.

ABAG assumes that the fast-growing Hispanic and Asian populations will increase the demand for multifamily housing units due to their "historic preference" for this type of housing. Ignoring the notion that this so-called preference may just be the need of new residents to find the most affordable available living space in the Bay Area, a smaller population increase in these ethnic groups, as projected by the DOF, will decrease the demand for multifamily housing.

## Summary & Conclusions

After careful consideration, Beacon Economics finds that the ABAG population forecast for the Bay Area in 2040 requires a significant downward revision of between 367,000 and 850,000 residents, based on our in-house forecast (low-end revision) and the California Department of Finance's forecast (high-end revision). The main reason lies in the various assumptions made in the ABAG report that inflate population projections, which will lead to an unattainable demand for housing units, particularly in those of multifamily type.

In addition, the various assumptions made in regards to future birth rates, migration patterns, job and economic growth inflate projections. Part of the problem with the ABAG forecast is that it seems to have been completed in mid-2011, prior to revised data in both job and population growth. The significant downward revision to job counts during the recession also demonstrates that a greater portion of the recent job growth is part of the recovery rather than an expansion. In other words, more of the recent job growth is the return of jobs rather than the formation of new ones.

With all else considered, since these growth projections will have a profound mandate-like impact for new housing that will be quite burdensome on individual cities, a more conservative and responsible forecast is preferred than the more aggressive ones.

## About Beacon Economics

Beacon Economics, LLC is a leading provider of economic research, forecasting, industry analysis, and data services. By delivering independent, rigorous analysis we give our clients the knowledge they need to make the right strategic decisions about investment, growth, revenue, and policy. Learn more at [www.BeaconEcon.com](http://www.BeaconEcon.com).

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## Christopher Thornberg



Christopher Thornberg is Founding Partner of Beacon Economics, LLC and widely considered to be one of California's leading economists. An expert in economic forecasting, regional economics, labor markets, economic policy, and real estate analysis, he was one of the earliest and most adamant predictors of the subprime mortgage market crash that began in 2007, and of the global economic recession that followed. Since 2006, he has served on the advisory board of Wall Street hedge fund, Paulson & Co. Inc. Between 2008 and 2012, he served as a chief economic advisor to the California State Controller's Office, and as Chair of Controller John Chiang's Council of Economic Advisors.

A highly sought after speaker, Dr. Thornberg regularly presents to leading business, government, and nonprofit organizations across the globe including REOMAC, the California State Association of Counties, Colliers International, State Farm Insurance, and the California and Nevada Credit Union League, among many others. He has testified before the U.S. Congress House Committee on Financial Services on municipal debt issues, and before the California State Assembly Committee on Revenue and Taxation regarding rule changes related to Proposition 13.

Dr. Thornberg has been involved in conducting research and developing analytic products for international clients that explore the trade and economic connections between the United States and the world. This has included analysis and speaking presentations regarding the impact that U.S. trading partners have on U.S. global competitiveness for the Centre for Investor Education in Melbourne Australia, and U.S. and international economic outlooks and their effect on global trade activity for the African Cashew Alliance in Cotonou, Benin. He has also conducted a number of special studies measuring the effect of important events on the economy including the NAFTA treaty, the California electricity crisis, port security, California's water transfer programs, and the terrorist attacks of September 11, 2001.



Dr. Thornberg serves on the editorial board of the *Graziadio Business Report*, a peer-reviewed publication of the Graziadio School of Business and Management at Pepperdine University, and on the Residential Real Estate Committee at the University of San Diego's Burnham-Moores Center for Residential Real Estate. He is a panel member of the National Association of Business Economists' quarterly "Outlook" and a contributor to the "Economic Consensus Outlook" published by the *Journal of Business Forecasting*.

Dr. Thornberg also serves on the boards of a number of business and nonprofit organizations including on the Board of Directors of the Los Angeles Area Chamber of Commerce, as a Business Leader Member of America's Edge, a nonprofit organization focused on strengthening businesses and the economy through public investments in youth and education, and on the Advisory Board of the Asian Real Estate Association of America.

Prior to launching Beacon Economics Dr. Thornberg was a senior economist with UCLA's Anderson Forecast where he regularly authored economic outlooks for California, Los Angeles, the East Bay, and developed specialized forecasts for a variety of public and private entities. He previously taught in the MBA program at UCLA's Anderson School, in the Rady School of Business at UCSD, and at Thammasat University in Bangkok, Thailand. He has also held a faculty position in the economics department at Clemson University.

A well-known media commentator, Dr. Thornberg has appeared on CNN and NPR and is regularly quoted in major national dailies including the *Wall Street Journal* and *New York Times*.

Originally from upstate New York, Dr. Thornberg holds a Ph.D in Business Economics from The Anderson School at UCLA, and a B.S. degree in Business Administration from the State University of New York at Buffalo.



## Jordan G. Levine



**Jordan Levine** is Economist and Director of Economic Research at Beacon Economics, LLC. Mr. Levine plays a leading role in the firm's major consulting projects and is responsible for running and updating Beacon Economics' quarterly state and metro area forecast models. He also manages the firm's EB-5 Visa economic and employment analysis practice. He has conducted economic forecasting and analysis for the Office of the California State Controller, the Los Angeles Chamber of Commerce, the California Bankers Association, and Paulson & Co., Inc., among many others.

Since joining Beacon Economics, Mr. Levine has emerged as a leading authority on the California state economy and its many regional economies. He is in growing demand as a public speaker and is a trusted source among major national and state media. He has been quoted by the New York Times, Los Angeles Times, Sacramento Bee, San Jose Mercury News, Los Angeles Business Journal, KNX Radio in Los Angeles, and Capital Public Radio in Sacramento. An accomplished speaker, Mr. Levine has delivered presentations on the state budget and economy to the California State Controller's Council of Economic Advisors, a wide variety of business organizations, and regularly delivers the state forecast at Beacon Economics' annual regional forecast conferences.

Mr. Levine specializes in analyzing economic indicators such as real output, employment, demographics, home prices, consumer spending, and new construction. He also has extensive experience analyzing the U.S. economy



including gross domestic product; international trade; money, credit, and banking sectors; employment and labor force; and real estate markets. Mr. Levine's expertise includes sub-regional analysis in California. He regularly produces detailed economic reports for metropolitan statistical areas, counties, cities, and sub-city areas. He also authors chapters in Beacon Economics' Regional Forecast Books - detailed analyses of the demographic and economic trends occurring in regions across California.

Prior to joining Beacon Economics, Mr. Levine was an analyst with Quant Economics Inc., where he studied and predicted the economic effects alleged in a variety of business disputes. Projects he managed while at Quant helped to discover hundreds of millions of dollars in monetary damages for his clients.

Mr. Levine's academic background includes an emphasis in international trade, monetary economics, and micro/macroeconomic analysis. His research on the manufacturing industry resulted in an innovative technique to measure the effect of global trade on U.S. employment. He is a member of the American Economics Association, the Econometrics Society, and the National Association of Business Economics.

Mr. Levine holds an M.A. in International Economics with Merit from the University of Sussex and a B.A. in Business Economics from the University of California, Santa Barbara.

## APPENDIX A. URBANSIM BASICS

- “UrbanSim was developed as Land Use and Transport Interaction (LUTI) model in order to respond to a variety of needs to assessing the possible consequences of alternative transportation, land use, and environmental policies, trying to better inform deliberation on public choices with long-term, significant effects. It can be used by cities, counties, non-governmental organizations, researchers and students interested in exploring the effects of infrastructure and policy choices on community outcomes.” [36]
- “UrbanSim is published under the GNU General Public License (Free Software Foundation, 1991). Therefore, the software code is available for free and can be adjusted by any user. Since summer 2006, UrbanSim is available in a new version with improved program design, simplified user and programming interfaces and implemented in the script language Python. Additionally, UrbanSim was put into the larger context of the newly created framework OPUS (Open Platform for Urban Simulation). OPUS follows a modular approach with the aim to encourage the testing and linking of various model approaches for land use simulations. UrbanSim is currently applied by a range of user groups.” [17]
- According to the developer of the model, “UrbanSim has been widely adopted for use by Metropolitan Planning Organizations in the United States for operational use in regional transportation planning, in spite of numerous technical and political challenges in integrating land use and transportation planning and modeling (Waddell, 2011). [29]
- A prerequisite is the availability of an external transport model, since UrbanSim only provides models of land use processes. The transport model provides information on transport supply among TAZ (foremost average travel times). UrbanSim uses such information as input data to calculate accessibility measures. Conversely, the calculated distribution of land uses by UrbanSim can be used as input for a transport model. [17]
- Unlike ABAG that opted for a wholesale deployment of UrbanSim, Fehr & Peers did not recommend “the use of particular model software (either PECAS or UrbanSim) at this time. Their implementation plan recommended a phased approach for the model. This implementation covers the development of the initial model, which would reflect a zone system of approximately 200-300 zones.” [61]
- “Agent-based microsimulation models for land use (e.g., UrbanSim (2010)) or transportation planning (e.g., MATSim-T (2010)) become more and more widespread. These models simulate agents’ decisions over time in order to predict future states of the system. They allow for more detailed and accurate simulation and prediction of, e.g., land pricing and travel demand than traditional aggregate models. However, they also require disaggregate input data. When implementing such a model, the initial step is the definition of agents and their relationships. Most frequently, in this context, the agents of the microsimulation represent the individual people living in the study area, grouped by households.” [51]
- “UrbanSim’s main variables and functional relationships consist of critical exogenous inputs of **macroeconomics** (population, employment) and **travel demand** (travel conditions), and **six models**: (1) accessibility (output: access to workplaces and shops for each cell), (2) transition (output: number of new jobs and new households per year), (3) mobility [output: number of moving (existing) jobs or households], (4) location (output: location of new or

moving jobs  $\pm$  households), (5) real-estate development (output: land-use change), (6) land price (output: land prices). [47]

- “Despite its rather simple structure of independent sub-models, UrbanSim is complex to implement because, basically, it deals with a complex problem. Many details in the way models are estimated and simulations are run can be taken into consideration: sample size, involved agents and datasets, model dependency, definition and sampling of alternatives, data filters, agent group clustering and data storage options, just to name a few, can be defined by the user. For example, the Household Location Choice Model of the application described here has more than 50 setting options, with a similar number for other sub-models. Modifying the settings of a model can easily generate errors that are hard to solve without help from the developers team.” [22]
- “The most recent review includes a discussion of 18 operational tools and suggests that **no tool is sufficient for supporting all of the necessary decisions associated with the metropolitan planning process** because of the complex nature of the decision-making process (Iacono, Levinson, and El-Geneidy 2008). Parker et al. and Sussman et al. support this argument and note that the complexity of the systems being modeled coupled with the decisions that need to be made warrant the development and use of a wide range of models rather than a specific few (Parker et al. 2003; Sussman, Sgouridis, and Ward 2005).” [55]

**APPENDIX B. SAMPLE URBANSIM APPLICATIONS, 2010 to present**

- S. Korea: UrbanSim application in Seoul: “Need better estimation methods for households in multi-story buildings.” This was a limited exploratory application. RESEARCH [05]
- Canton of Zurich, Switzerland: Extensive application of UrbanSim but not with the travel model yet: “...following the case study delimitation, for which the land use transport interaction model finally will be applied. In the case study the land use model UrbanSim and the transport model MATSim will be implemented. INCOMPLETE [02]
- Arizona: “The prototype has been enhanced to incorporate additional feedback between the model systems, and update the travel time matrices used in the simulation process. The land-use model in SimTRAVEL is UrbanSim (Waddell et al 2008). The travel demand model employed is OpenAMOS (Pendyala et al 2011). The traffic microsimulation model system used in SimTRAVEL is MALTA -Multi-Resolution Assignment and Loading of Traffic Activities (Chiu and Villalabos 2008).” RESEARCH [11]
- “The simulation software UrbanSim was chosen for various reasons. Functionality and disaggregation of the simulation software as well as its implementation can be considered advanced. Moreover, there are various applications worldwide and an extended documentation, which is available online (CUSPA, 2006). UrbanSim is not a proprietary software package and therefore available for free.” RESEARCH [17]
- “Within the project, the land use model UrbanSim were adapted and implemented for the Greater Zürich area. However, validation work revealed that there is more need for calibration. This remains to be done in future projects, in which UrbanSim can be applied in case studies within the Greater Zürich area for the comparison of development scenarios.” INCOMPLETE [17]
- Waddell: “Draft versions of a data imputation toolkit for use in preparing UrbanSim data at a parcel level are currently in field testing by planning agencies in Seattle and Detroit, both of which have reported very positive results compared to previous data cleaning methods available to them.” INCOMPLETE [37]
- UrbanSim is part of a system with DynusT based on Puget Sound Regional Council model; in development. INCOMPLETE [38]
- At the moment, UrbanSim is adapted to a European context (see the according research project SustainCity, [www.sustaincity.eu](http://www.sustaincity.eu)).” INCOMPLETE [43]
- Three components are used in this modeling effort: UrbanSim (Waddell 2000; Waddell 2002; Waddell and Borning 2004) for land use, TransCAD (Caliper, Inc.) for travel demand modeling and traffic routing, and TRANSIMS (Nagel and Rickert 2001; Rilett 2001) for traffic routing through micro simulation. RESEARCH [49]
- Simulating household location choice in Lyon using UrbanSim. RESEARCH [56]
- Simulating housing prices in Lyon with UrbanSim: predictive capacity and sensitivity analysis. RESEARCH [57]
- Simulating the Impact of increasing oil prices on land use and mobility in Hamburg. RESEARCH [58]
- Simultaneous Modeling of Developer Behavior and Land Prices in UrbanSim. RESEARCH [59]
- Application of UrbanSim and technical issues in the Real Estate module. RESEARCH [65]

**APPENDIX C. URBANSIM POSITIVE ASSESSMENTS AND PUBLISHED RESULTS, 2010 to present**

- Analysis of tolling strategies: “The conclusion is that the static and the dynamic urban modeling frameworks [UrbanSim], despite their fundamental differences, can generate, in most cases, comparable empirical results, which are intuitively logical and can be used for policy scenarios evaluations.” [01]
- Projections of changes in Seattle’s built environment and demographics between 2000 and 2030 were obtained from an urban simulation model (UrbanSim) for water curtailments during drought. [14]
- “Integrated land use and transport simulations have achieved a level of technical maturation, which enables in principle their use in practice. But, the best simulation system is dependent on the underlying data used for the model estimations and the base year data of the initial state.” [17]
- UrbanSim received the highest score (33) but the training time that has to be calculated to set up a basic model and the enormous amounts of high scale geodata (e.g. socioeconomic data at household level) that has to be acquired to set up a basic model disqualifies UrbanSim for prototype development for one single person.” “...45 points is the highest possible score, meaning that a simulation system is perfectly suitable for the suggested simulation framework.” [34]
- “UrbanSim is a much more complex model. It can be edited to create scenarios and add agent-based modeling, but takes years to set up for a city. This modeling has already been set up for the City of Phoenix, so we could use Phoenix [to investigate] Water, Energy, Land Use, Transportation and Socioeconomic Nexus: A Blue Print for More Sustainable Urban Systems.” [74]
- Waddell: “UrbanSim land use model in San Francisco, using individual land ownership parcels as the basic geographic unit for real estate development and individual buildings on parcels as the locational unit for households and businesses. We link this model system to the San Francisco activity-based travel model system (SF-CHAMP) using a loose coupling approach.” [42] This application was limited to rather small corridors. “One noteworthy methodological result is that the extreme level of disaggregation of the model, using individual business establishments, households, buildings, and parcels for the whole of San Francisco, generated remarkably robust estimation results. The goodness of fit on the estimated models was generally higher than has been the case with previous applications using grid cells or zones as units of analysis, in spite of considerable noise in the data.” [42]
- “There is also an increasing number of applications implemented by researchers, urban planning offices or public authorities outside the UrbanSim core developers team. These include, among others, the case studies of Paris, France (De Palma et al., 2005); Phoenix, Arizona (Joshi et al., 2006); Volusia County, Florida (Zhao and Chung, 2006); Zurich, Switzerland (Buergle et al., 2005; Loechl et al., 2007); Lausanne, Switzerland (Patterson and Hurtubia, 2008; Patterson and Bierlaire, 2010); Lyon, France (Kryvobokov et al., 2008); Brussels, Belgium (Patterson et al., 2010); Rome, Italy (Zio et al., 2010) and Seoul, Korea (Joo et al., 2011; Hassan and Jun, 2011). Many of the applications are prototype

or proof-of-concept models with simplified datasets and assumptions. Some of the applications report an intensive use of human resources, in some cases excessive considering the quality of the obtained results (Nguyen-Luong, 2008). [22]

- Sprawl indicators were calculated and forecasted for Maricopa County, AZ, for 2000 to 2030. The study area is subdivided into one square mile grid cells. The analysis is based on the demographic projection data from a software-based simulation model called UrbanSim.” [53]
- Both the PECAS and UrbanSim model provide data and analysis suitable for many of the duties which SCAG performs. These models would be particularly useful in the development of demographic forecasts, which is a key task performed by SCAG.” [61] “These models integrate well with regional travel demand models, another key analysis tool utilized by SCAG.” [61]
- UrbanSim was used to project the urban land-cover growth of Houston, Texas from 1992 to 2025. An important feature of UrbanSim is that it accounts for key actors in the urban development processes: (1) household and business actors reflecting consumer preferences for place or location; and (2) developer actors reflecting where and which type of construction is built. Government, political and environmental constraints are inputs designed to restrict development activity. Urban development is treated as an interaction between market behavior and governmental projections. This feature makes it very useful for assessing the impacts of alternative governmental plans and policies related to land use. [67]
- The Zurich Case Study of UrbanSim: At present a first running environment that forms a very basic “super simplified” simulation environment has been realised. This includes very reduced household location choice and employment location choice models. The first phase of the Zurich Case Study within the SustainCity project including data conditioning and implementing the first model in UrbanSim is therefore mostly finished. [68]

## APPENDIX D. URBANSIM DIFFICULTIES AND WEAKNESSES

Highlights of critiques (verbatim) are included below with clarification added in [brackets]. All pertain to very recent sources published between 2010 and 2012 to avoid stating weaknesses potentially applicable to earlier versions only.

- Calibration of UrbanSim is a difficult process. “The parameter estimation problem for an integrated urban microsimulation problem was investigated. The operational difficulty of jointly estimating all parameters of the urban model was met with two different approaches: the decoupling through estimated process interactions and the deployment of response surfaces and metamodels to mathematically approximate intractable, simulation-based processes.” [03] There is no good reason why the parameters calibrated to match 2005 or 2010 data are applicable in 2035 or 2040.
- UrbanSim requires an extensive amount of data at disaggregated levels spatially. Very few regions or metropolitan areas routinely collect all the data needed by UrbanSim, not to mention smaller urban areas. [13]
- A recent urban simulation evaluation in Australia chose TransCad and ArcGIS. They **did not choose UrbanSim**. “More recently, Klosterman and Pettit (2005) suggested that the most notable off-the-shelf planning support systems are CommunityViz, SLEUTH, INDEX®, UrbanSim and What if?™. From this set of Planning Support Systems (PSS) only CommunityViz and INDEX provide comprehensive impact assessment tools. [07]
- Recent evaluation of land use models that included but **did not choose UrbanSim** include the States of Florida [20] and Indiana: “The Regional Economic Models, Inc. (REMI), model is the fundamental tool employed by Indiana Department of Transportation to provide long-range socioeconomic forecasts that are used as inputs to the Indiana Statewide Travel Demand Model.” [63]
- “Urban modeling has revived since the 1980s. Many new urban growth models have been developed, such as CUF, GSM, LUCAS, SLEUTH, UrbanSim, What if?, etc.” They conducted an evaluation and **did not choose UrbanSim**; SLEUTH was chosen. [16]
- “In UrbanSim, the insignificance of the public transport accessibility coefficient creates a major limitation of the model.” [17]
- “Housing policies are harder to implement in a modeling platform. [UrbanSim in this application.] For example, rent control should affect somehow the Real Estate Price Model but it is not clear how the rent thresholds affect the prices in general in the real-estate market. Social housing can be included as forced developments of a particular type of housing unit in the Development Project Transition Model; however this must be exogenously defined by the analyst.” [18]
- Working with UrbanSim requires good programming skills preferable with Python programming language. The program cannot yet be mastered via the graphical user interface only. [68]
- “The story that seems to emerge is that for the PSRC implementation of UrbanSim, even drastic accessibility changes have little impact on construction activity or population growth.”[19]

- “The model, implemented in the urban simulation platform UrbanSim and the traffic microsimulator MATSim, is estimated and applied to the city of Brussels.... Results obtained with UrbanSim seem reasonable, although inertia in income distribution and prices seems to be strong, with little variation in an eight year simulation period.” [22]
- “As there are multiple secondary reasons that might obfuscate the model estimation process, it is recommended that UrbanSim model estimation results are compared against standard econometric software to make sure that the data and underlying assumptions made by UrbanSim are indeed understood correctly.” [26]
- “One of the key components of UrbanSim is the use of land or real estate price data. These are applied in the model system as an indicator of the relative market valuations for attributes of housing, non-residential space, and location (Waddell et al., 2003). However, finding suitable data sources of real estate transaction prices and rents might be a challenge while setting up an UrbanSim application when transaction and rent price data from data suppliers are unavailable.” [27]
- Waddell: “The first challenge is that in any spatial choice model, the assumption of IIA may be difficult to fully support. In most spatial choice situations, there is likely to be correlation in unobserved attributes that are correlated with preferences, and which would violate IIA assumption. ... Recent work by Guevara and Ben-Akiva (2009) has begun to clarify the path to extending sampling to other non IIA-based models, which offer considerable potential for enriching location choice models using parcel-level detail.” [37]
- Waddell: “The second remaining challenge is how to deal with the massive choices sets in the application of the models in predictive, or simulation mode. Unfortunately, for models such as parcel level location choice models, the universal choice set is potentially a million or more in size, for a moderate sized metropolitan area. This would be both behaviorally implausible as an approach (since people cannot actually make this kind of assessment), and is likely to run into problems from a flattening of the probability distribution predicted by the model, since each of the alternatives receives a non-zero probability.” [37]
- Waddell: “Computational performance and inability to validate integrated microsimulation models due to stochastic variation and instability, were raised as very legitimate concerns. We need to take uncertainty in models seriously. If our models have high levels of embedded uncertainty arising from uncertainty in input data, in model parameters, and even in model specifications and structures, then we should be able to analyze and even calibrate the uncertainty in the models.” [37]
- The main purpose of this review was to ascertain the potential and the challenges of future simulation efforts and the applicability of these simulation models to phenomena such as urban shrinkage. UrbanSim is an Agent Based Model that is applied with the opposite view point... expansion.” [47]
- A lack of data necessary for calibrating and validating simulation models was identified, especially with respect to decisions made by households rather than individuals. [47]
- The Census is collected every 10 years which restricts the choice of the base year for the microsimulation model.”[51]

- “In addition to the study of the TRANSIMS model, preliminary scenario analysis of UrbanSim for Chittenden County has been conducted. UrbanSim simulations have been run for many scenarios. The simulation results show a job number increase in the main region of Charlotte when the parameter **near-arterial-threshold** is **doubled**; a household number increase in the northwest of Milton when the parameter **mid-income-fraction** is **reduced to half**; and a job number increase in main region of Charlotte together with a household number increase in the northwest of Milton when the **parameter near-arterial-threshold** is **doubled** and **mid-income-fraction** is **reduced to half**.” [54] This demonstrates the sensitivity to parameter settings, for just one county. These are just two out of 50 plus parameters with a wide range of settings, not just doubling or halving the base value.
- We conclude that the calibrated residential Real Estate Price Model from the UrbanSim application in Lyon is sensitive to changes in accessibility and provides good predictive capacity in the city centre, but underestimates prices in other areas. [57]
- “A strong inter-dependence exists between the decision to develop land and the expected returns to be gained from that development. Current practice in UrbanSim modeling treats developer behavior and the emergence of land prices as independent processes. This assumes that land prices are exogenous to the interaction between buyers and sellers—an **assumption hard to sustain in urban economics and real estate research**.” [59]
- The Regional Economic Models, Inc. (REMI) model, like its competitors, is vulnerable to the trends contained in the historical data it uses, especially recent trends. After the most recent periodic update in data, the performance of the REMI PI+ model improved, that is, it produced long-term forecasts that were more credible. Based on a review of the research literature, **transportation infrastructure appears to be a necessary, but not sufficient, condition for generating economic development**. [63]

## APPENDIX E. ABAG / MTC USE OF URBANSIM FOR PLAN BAY AREA

With respect to Plan Bay Area, UrbanSim's intended use and limitations are described by the model's developer and consultant to MTC and ABAG as follows.

**Intended Uses of the Model System [24]:** UrbanSim has been developed to support land use, transportation and environmental planning, with particular attention to the regional transportation planning process. The kinds of tasks for which UrbanSim has been designed include the following:

- Predicting land use information for input to the travel model, for periods of 10 to 40 years into the future, as needed for regional transportation planning.
- Predicting the effects on land use patterns from alternative investments in roads and transit infrastructure, or in alternative transit levels of service, or roadway or transit pricing, over long-term forecasting horizons. Scenarios can be compared using different transportation network assumptions, to evaluate the relative effects on development from a single project or a more wide-reaching change in the transportation system, such as extensive congestion pricing.
- Predicting the effects of changes in land use regulations on land use, including the effects of policies to relax or increase regulatory constraints on development of different types, such as an increase in the allowed Floor Area Ratios (FAR) on specific sites, or allowing mixed-use development in an area previously zoned only for one use.
- Predicting land use development patterns in high-capacity transit corridors.
- Predicting the effects of environmental policies that impose constraints on development, such as protection of wetlands, floodplains, riparian buffers, steep slopes, or seismically unstable areas.
- Predicting the effects of changes in the macroeconomic structure or growth rates on land use. Periods of more rapid or slower growth, or even decline in some sectors, can lead to changes in the spatial structure of the city, and the model system is designed to analyze these kinds of shifts.
- Predicting the possible effects of changes in demographic structure and composition of the city on land use, and on the spatial patterns of clustering of residents of different social characteristics, such as age, household size and income.
- Examining the potential impacts on land use and transportation of major development projects, whether actual or hypothetical. This could be used to explore the impacts of a corporate relocation, or to compare alternative sites for a major development project.

**Assumptions and Limitations of the Model System [24]:** UrbanSim is a model system, and models are abstractions, or simplifications, of reality. Only a small subset of the real world is reflected in the model system, as needed to address the kinds of uses outlined above. Like any model, or analytical method, that attempts to examine the potential effects of an action on one or more outcomes, there are limitations to be aware of. Some of the assumptions made in developing the model system also imply limitations for its use. Some of the more important of the assumptions and limitations are:

1. Boundary effects are ignored. Interactions with adjacent metropolitan areas are ignored.
2. The land use regulations are assumed to be binding constraints on the actions of developers. This is equivalent to assuming that developers who wish to construct a project that is inconsistent with current land use regulations **cannot get a waiver or modification of the regulations in order to accommodate the project.** This assumption is more reflective of reality in some places than others, depending on how rigorously enforced land policies are in that location. **Clearly there are cities in which developer requests for a variance from existing policies meets with little or no resistance.** For the purposes the model system is intended, however, this assumption, and the limitation that it does not completely realistically simulate the way developers influence changes in local land use policies, may be the most appropriate. It allows examination of the effects of policies, under the expectation that they are enforced, which allows more straightforward comparisons of policies to be made.
3. Large scale and microscopic events cannot be accurately predicted. While this limitation applies to any and every model, not just UrbanSim, it bears repeating since the microscopic level of detail of UrbanSim leads to more temptation to over-invest confidence in the micro-level predictions. Though the model as implemented in the Bay Area predicts the location choices of individual jobs, households, and developers, the intent of the model is to predict patterns rather than discrete individual events. No individual prediction made by the model, such as the development of a specific development project on a single parcel in a particular year 20 years from now, is likely to be correct. But the tendencies for parcels in that area to have patterns or tendencies for development is what the model is intended to represent. Model users should therefore not expect to accurately predict large scale, idiosyncratic events such as the development of a specific high-rise office building on a specific parcel. It would be advisable to aggregate results, and/or to generate multiple runs to provide a distribution of results. A related implication is that the lower level of sensitivity and appropriate use of the model system needs to be determined by a combination of sensitivity testing, experience from use, and common sense. It would not be likely, for example, that changing traffic signalization on a particular collector street intersection would be a large enough event to cause significant changes in model results.
4. Errors in input data will limit the model to some extent. Efforts were made to find obvious errors in the data, and to prevent these from affecting the results, **but there was not sufficient time or resources to thoroughly address all data problems encountered, including some extreme values, missing values, and inconsistencies within and among data sources.** The noise in the input data limits to some extent the accuracy of the model, though the statistical estimation of the parameters should help considerably in developing unbiased parameters even in the presence of missing data and other data errors. Over a longer period of time, it would be well worth investigating how much difference errors in input data make in model results, and to fine-tune a strategy to invest in data where it makes the most effective use of scarce resources.
5. **Behavioral patterns are assumed to be relatively stable over time.** One of the most common assumptions in models, and one rarely acknowledged, is that behavioral

patterns will not change dramatically over time. Models are estimated using observed data, and the parameters reflect a certain range of conditions observed in the data. **If conditions were to change dramatically, such as massive innovation in currently unforeseen fuel technology, it is probably the case that fundamental changes in consumption behavior, such as vehicle ownership and use, would result.**

## APPENDIX F. GENERIC CRITICISM OF PLANNING MODELS

“Nearly twenty years after the passage of ISTEA and the ruling against the MTC, there appears to be a revival in the development and adoption of using large-scale urban models as changes in society, technological advances, and improvements in data collection have all but forgiven Lees’ seven deadly sins (Rabino 2007). Proponents of using large-scale regional models point to how these models have improved over time in forecasting ridership.” [55]

“The application of large-scale modeling tools such as TRANSIMS and UrbanSim brings up a historical debate on their use as part of the decision-making process. In 1973, Lee professed the eventual disappearance of large-scale urban models because of ‘seven deadly sins’ including hyper-comprehensiveness, grossness, data hungriness, wrongheadedness, complicatedness, mechanicalness, and expensiveness (Lee, Jr. 1973). Today, much of the debate surrounding the use of large-scale regional models centers on criticizing the overall usefulness of such tools that are so complex in nature that they are expensive to run (expensiveness), difficult to use (complicatedness), and unable to represent reality (wrongheadedness) (Rabino 2007).” [55]

“Critics of large-scale regional models point to the historic mis-use of these tools during the 1970s and 1980s as part of the planning for rail systems in U.S. cities and the manipulation of the models in such a way as to provide erroneous results that only catered to political needs (Kain 1990). Pickrell provides a succinct analysis of this phenomenon in showing how regional planning models significantly overestimated ridership forecasts and underestimated capital costs (Pickrell 1992). The results of these large-scale urban models were used to justify spending billions of dollars on heavy- and light-rail transit systems in the U.S. for the purpose of economic development.” [55]

“In developing discrete choice models, McFadden demonstrated the inaccuracies of the regional demand models used for the planning of the Bay Area Rapid Transit (BART) system in the San Francisco Bay Area. The regional demand model forecasted 15% demand in the transit system while McFadden predicted 6.3%. In an analysis of actual demand, the real number was 6.2% (McFadden 1974).” [55]

“A number of models like UrbanSim, Sleuth, Clue-s or what-if, developed for both laboratory and commercial purpose facilitate the spread of Planning Support Systems (PSS) and improve the cognition of this concept to urban planners in particular. **Comparing to the academic success, the application in the professional world is rather disappointing.**” [39]

Waddell: “...and **integrated land use and transportation models** based on a dynamic microsimulation formulation (Salvini and Miller 2005; Waddell 2000, 2002). Although there has been some crossover in these research areas, **little has made its way into practical application in the field.**” [42]

“For the acceptance of such complex simulation systems in planning practice, not only a moderate implementation effort is necessary but also a **certain degree of trust** of the potential users. The base for that trust is built by well-founded analysis of the reliability of land use and transport simulation results that go beyond the model fit values of single model estimations.” [17]

“The study findings suggest that improved models derived from the academy may not translate into better practice in the field, unless the procedural dimension of modeling activities is improved. ...Workshop participants were asked to rate the importance of dealing with these challenges on a scale from 1 (unimportant) to 5 (critical importance).” The top five choices of planners and modelers were: Data preparation (4.8), **Planners do not understand models and the modeling process** (4.6), Modelers do not understand the policy development and decision making process (4.4), Changing models (4.4), and Flexibility of models (4.4)” [16]

“Modeling of socio-economic and environmental interactions: The modeling of the considered phenomena must take into account many factors of different nature which interact via various functional relationships. These heterogeneous dynamics are a priori nonlinear and complex: they may have saturation mechanisms, threshold effects, and may be density dependent. The difficulties are compounded by the strong interconnections of the system (presence of important feedback loops) and multi-scale spatial interactions. ... **At this stage, it is crucial to understand that the scientific fields considered here are far from being mature.**” [44]

“The relocation decision of a household is a major subject in the reviewed literature. Land use models usually focus more in the location choice process than in the elements that trigger relocation. The relevance (and complexity) of modeling the relocation decision process should be addressed carefully, maybe accounting more explicitly for the changes in the household’s life cycle or identifying relocation triggers (like changes in land price or neighborhood quality of the current location of a household).”[18]

“Most projects utilizing large planning models seem to be in a permanent experimental status within an academic domain, few operational models exist. The learning curve for all the systems is steep and all the evaluated systems lack a satisfying visualization of simulation results.” [34]

“UrbanSim takes a micro-simulation approach, modeling and simulating choices made at the level of individual households, businesses, and jobs, for instance, and it operates on a finer geographic scale than TRANUS. Now, let us focus on key challenges more directly related to modeling issues. Model calibration and validation: the above models consist of several interacting modules. Currently, these modules are typically calibrated independently; this is clearly sub-optimal as results will differ from those obtained after a global calibration of the interaction system, which is the actual final objective of a calibration procedure. Sensitivity analysis consists, in a nutshell, in studying how the uncertainty in the output of a model can be apportioned to different sources of uncertainty in the model inputs. It is complementary to an

uncertainty analysis, which focuses on quantifying uncertainty in model output. **Model calibration and validation, as well as sensitivity analysis have largely been ignored until now, when they are really critical in this context. They are also extremely arduous and complex.**" [44]

"There is very little on evaluation of model performance: Conduct ex post evaluations of model forecasting and scenario allocation results: In hindsight, **did they get the locations right? Why or why not?**" [45]

"Although performance measures encourage agreement in other disciplines, measures for state transportation and land use may engender disagreement among stakeholders. A literature review and a survey of 25 states and three metropolitan planning organizations identified 41 such measures." [23]

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## APPENDIX A

In his most recent assessment, renowned professor Bent Flyvbjerg of Oxford University places direct suspicion on the American Planning Association. Here are five passages from his assessment.<sup>12</sup>

- **When Planners Lie with Numbers:** Based on a sample of 258 transportation infrastructure projects worth US\$90 billion and representing different project types, geographical regions, and historical periods, it is found with overwhelming statistical significance that the cost estimates used to decide whether such projects should be built are highly and systematically misleading.
- Dr. Flyvbjerg's study documents a **cost overrun of 45% for rail projects**, 34% for bridges and tunnels, and 20% for roads.
- The implications of these findings are that (1) **planners are doing an exceptionally poor job** at costing major public works projects, sometimes perhaps intentionally, (2) this results in large scale waste of public money and violations of basic principles of democracy, and, (3) APA, as the main professional body for planners, has a responsibility to help rectify this situation.
- **Several planners have written to support Dr. Flyvbjerg:** "After having been involved with APA for several decades he cannot recall a single example of a planner being expelled from APA for ethical violations" was said to Dr. Flyvbjerg by a former APA president. This is not because planners are uniformly well-behaved, but because APA is in denial about the possibility of bad planning and malpractice.
- The APA is found to employ two well-known strategies for dealing with uncomfortable knowledge such as the revelations by Dr. Flyvbjerg: Denial and Diversion.

To recap: When it comes to very large infrastructure projects, rail projects in particular, planners tend to lie or use subpar methodology to estimate project costs and forecasts. They are not accountable to anyone for their errors, and the public is hurt by having to support poor projects. In some cases, planners help the client to deny opposition and divert the public's attention from the facts and primary objectives.

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<sup>12</sup> Bent Flyvbjerg, **How planners deal with uncomfortable knowledge: The dubious ethics of the American Planning Association**, Cities, Elsevier (in print.) Available online 8 February 2013.

## APPENDIX B

Compared to the Plan Alt. 4 has the following advantages:

- Farmland conversions: 5,913 acres for the Plan, 5,338 acres for Alt. 4; a **>10% advantage** for Alt. 4.
- Acres of Williamson Act conversions: 724 acres for the Plan, 678 acres for Alt. 4; a **6% advantage** for Alt. 4.
- Acres of Open Space conversions: 2,395 acres for the Plan, 1,443 acres for Alt. 4; a **40% advantage** for Alt. 4.
- Acres of Forest and Timberland conversions: 1,395 acres for the Plan, 270 acres for Alt. 4; an **80% advantage** for Alt. 4.
- Residents located in PDAs and TPPs that are subject to sea-level rise inundation: 75,070 for the Plan, 47,400 for Alt. 4; a **17% advantage** for Alt. 4.
- Same as above for the entire 9-county area: **4% advantage** for Alt. 4 as stated in Table 3.1-34.
- Also **22% advantage** for Alt. 4 with respect to jobs in inundation areas as stated in Table 3.1-40.
- Residents in low lying areas in the entire 9-county area that are subject to higher probability for flooding or inundation: **43% advantage** for Alt. 4 as stated in Table 3.1-37.
- Also **32% advantage** for Alt. 4 with respect to jobs in low lying areas as stated in Table 3.1-43.
- Table 3.1-27 on Total Energy Use per Capita by Bay Area Alternative: Plan = 241,254, Alt. 4 = 233,390; a **3% advantage** for Alt. 4.

In addition, Alt. 4 and the Plan compare as follows:

- Per capita<sup>13</sup> VMT is equal to 19.6 miles in 2040 for both Plan and Alt. 4.
- Per trip commute travel time is imperceptibly longer than the Plan and in Table 3.1-9 it is 0% worse than the Plan.
- Per trip non-commute travel time is imperceptibly longer than the Plan and in Table 3.1-10 it is only 1% worse than the Plan.
- Roadway with noise level over 66 dBA is 62.3% for Plan and 64.3% per Alt. 4, which is within the 3 dBA range of imperceptibility.<sup>14</sup> (Again Alt. 4 has +4% population and +1% jobs compared to the Plan.)

<sup>13</sup> Per capita comparisons must be used because Alt. 4 has a higher population and employment than all other alternatives.

<sup>14</sup> dBA is a somewhat cumbersome logarithmic scale. The EIR correctly states in its noise introduction that regardless of the source, noise differences less than 3 dBA are not perceivable by people.

**Appendix**

Appendix A: How planners deal with uncomfortable knowledge, Brent Flyvbjerg

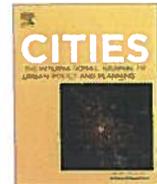
## **Appendix A**

How planners deal with uncomfortable knowledge, Brent Flyvbjerg



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Cities

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## Viewpoint

## How planners deal with uncomfortable knowledge: The dubious ethics of the American Planning Association

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## ABSTRACT

With a point of departure in the concept “uncomfortable knowledge”, this article presents a case study of how the American Planning Association (APA) deals with such knowledge. APA was found to actively suppress publicity of malpractice concerns and bad planning in order to sustain a boosterish image of planning. In the process, APA appeared to disregard and violate APA’s own Code of Ethics. APA justified its actions with a need to protect APA members’ interests, seen as preventing planning and planners from being presented in public in a bad light. The current article argues that it is in members’ interest to have malpractice critiqued and reduced, and that this best happens by exposing malpractice, not by denying or diverting attention from it as APA did in this case. Professions, organizations, and societies that stifle critique tend to degenerate and become socially and politically irrelevant “zombie institutions”. The article asks whether such degeneration has set in for APA and planning. Finally, it is concluded that more debate about APA’s ethics and actions is needed for improving planning practice. Nine key questions are presented to constructively stimulate such debate.

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### Introduction: Uncomfortable knowledge

In organizational theory, uncomfortable knowledge is knowledge that is disagreeable or intolerable to an organization. Rayner (2012, pp. 5–7) identifies four strategies in increasing order of sophistication for how organizations typically deal with uncomfortable knowledge:

1. *Denial* represents a refusal to acknowledge or engage with information.
2. *Dismissal* acknowledges that information exists, and may involve some minimal engagement up to the point of rejecting it as faulty or irrelevant.
3. *Diversion* involves the creation of an activity that distracts attention away from an uncomfortable issue.
4. *Displacement* occurs when an organization engages with an issue, but substitutes management of a representation of a problem for management of the problem itself.

What follows is a case study of how the American Planning Association manages uncomfortable knowledge about urban policy and planning. APA typically projects a “sunny, relentlessly positive” image of urban planning, in the words of an insider and informant for the present study. Thus APA presents itself as the

promoter and guardian of the public interest, participation, transparency, openness, truth, social justice, and ethics in planning, as evidenced in APA’s own publications. By taking a look behind the sunny image – at how APA handled a study containing uncomfortable knowledge about malpractice in planning – this article uncovers another side to APA, what Flyvbjerg (1996) and Yiftachel (1998) calls the “dark side” of urban policy and planning.

We will see that in this case APA’s immediate reaction to uncomfortable knowledge was simple denial, i.e., strategy 1 above, which Rayner (2012, p. 7, 12) defines as the refusal or inability of organizations to acknowledge information, even when external bodies or individuals within the organization seek actively to bring it to collective attention. We will also see that, when pressed, APA escalated its strategy for dealing with uncomfortable knowledge from denial to diversion, diversion being defined as the organizational strategy of establishing a decoy activity that distracts attention from a subject or problem, thus trying to ensure that knowledge about it is not created or shared (Rayner, 2012, p. 7, 12).

Finally, we will consider more productive strategies for dealing with uncomfortable knowledge than those employed by APA. In the case study, APA said it would not promote a study published by JAPA, which contained uncomfortable knowledge about malpractice and bad planning, to protect APA members’ interests. Here it is argued that it is in members’ interest to have malpractice critiqued and reduced, and that this can only happen by exposing malpractice, not by hiding it as APA does. Critique is historically

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a main driver of progress in human affairs. Professions, organizations, and societies that stifle critique tend to degenerate and become socially and politically irrelevant “zombie institutions” (Beck, 1994, p. 40). This article raises the question of whether such degeneration and irrelevance applies to APA and urban planning and, if so, what can be done to counter it.<sup>1</sup>

### When planners lie with numbers

The author first became aware of APA's approach to uncomfortable knowledge about urban policy and planning when he and his co-authors submitted an article to APA's flagship academic publication, the *Journal of the American Planning Association (JAPA)*, called “Underestimating Costs in Public Works Projects: Error or Lie?” (Flyvbjerg, Holm, & Buhl, 2002). The abstract of the article reads as follows:

“This article presents results from the first statistically significant study of cost escalation in transportation infrastructure projects. Based on a sample of 258 transportation infrastructure projects worth US\$90 billion and representing different project types, geographical regions, and historical periods, it is found with overwhelming statistical significance that the cost estimates used to decide whether such projects should be built are highly and systematically misleading. Underestimation cannot be explained by error and is best explained by strategic misrepresentation, that is, lying. The policy implications are clear: legislators, administrators, investors, media representatives, and members of the public who value honest numbers should not trust cost estimates and cost-benefit analyses produced by project promoters and their analysts.”

The article shows that as a consequence of cost underestimation nine out of ten large public works projects have cost overruns. Cost overruns are large, even when measured in conservative terms, i.e., excluding inflation and using the final business case as base line. The study documents a cost overrun of 45% for rail projects, 34% for bridges and tunnels, and 20% for roads. Standard deviations are large, too, indicating risk to the second degree, i.e., risk of cost overrun *and* of the overrun being much larger than expected. Most interesting of all, overruns have been constant for the 70 years for which data are available, indicating that no improvements in estimating and managing costs have been made over time. Finally, the study raises serious concerns that cost underestimation appears to be deliberate in many cases.<sup>2</sup>

<sup>1</sup> The research for this paper was carried out during and immediately after the events described. Main sources quoted in the article have been given opportunity to comment on earlier drafts and their comments have been incorporated in this final version, where relevant. Publication of the research has been delayed in order to protect informants, several of whom acted like O'Leary's (2010: 8) “guerrilla employees”. Many of these have now moved on to other positions. For further protection, all sources have been anonymized. The author knows the names of all sources quoted in the study. Documentation of all quotes and other data are on file in the author's archives. Finally, publication was also delayed in order to emphasize that the study is about matters of principle – malpractice and professional ethics in planning – and not about individuals and individual actions.

<sup>2</sup> A former APA president provides the following explanation of the reasons why planners misinform about costs and why APA does nothing about it: “I believe planners and consultants in general deliberately underestimate project costs because their political bosses or clients want the projects. Sometimes, to tell the truth is to risk your job or your contracts or the next contract. I think the professional organizations [like APA] are likely to simply point to their code of ethics and let it go at that [i.e., enforcing no sanctions for those who violate the code]. For example, Article B 11 in the AICP [American Institute of Certified Planners] code says: ‘Planning process participants should not misrepresent facts or distort information for the purpose of achieving a desired outcome’, [but I have not seen it enforced]”. (Personal communication, author's archives). The AICP is APA's professional institute, providing certification of professional planners, ethical guidelines, professional development, and more.

In sum, the study documents billions of dollars of cost overruns and waste that could, in large part, be eliminated by better policy and planning. It seemed obvious to the authors that the results must therefore be effectively communicated to policy makers and planners, which is why we submitted the paper to *JAPA*, following and expanding upon a tradition pioneered by Martin Wachs's (1989) classic article, “When Planners Lie with Numbers”, and by Kain (1990), Pickrell (1992), and Wachs (1990). We aimed to give this area of study more weight by contributing the largest and best dataset seen so far, making statistical analyses of cost underestimation and overrun possible for the first time and allowing firmer conclusions than previously about forecasting outcomes and forecasting behavior.

*JAPA* accepted the study for publication and agreed it documents a major issue in urban policy and planning that needs public attention. In the months leading up to publication, *JAPA* therefore contacted APA to enlist professional support for disseminating the study to media. Contacting APA was *JAPA*'s idea, but we agreed that seeking professional support for media contacts made sense. As it turned out, the person we liaised with at APA initially found the study “very newsworthy” and developed a comprehensive media strategy, including a press conference about the study; exclusives with *The New York Times*, *The Sunday Times* of London, and a major US television network; coverage by The Associated Press and Reuters; and finally regional press releases for media in the 8–12 largest US metropolitan areas. We agreed that APA would manage the media strategy in the US and we, with our university's press office, would manage it in the rest of the world.

However, after a few weeks – while we were busy collaborating with APA on the press releases – our APA liaison suddenly wrote to let us know he needed to discuss the media strategy internally at APA. The effort had evidently grown to a size where he clearly felt uncomfortable by continuing it without involving top management. Soon after, he returned with the following discouraging message:

“After discussion and consideration, [APA] does not want me to do anything in terms of promoting, whether as an exclusive story or on a regional basis, the results of your infrastructure cost underestimation study as appearing in the Summer issue of *JAPA* ... I'm sorry I can't be of further help.”

This was a complete turnaround in both tone and content, compared with APA's previous enthusiasm for the project and our extensive correspondence and the comprehensive publicity strategy developed by APA. Our joint work, including on the press releases, was stopped unilaterally by APA. A colleague got in touch with a former top-level official with APA, who had good connections within the organization, to find out what was going on. This person said that he believed “it was the ‘higher ups’ [in APA] who put the ‘kabosh’ [sic] on the press release[s]”, but also that “the APA staff was [still] anxious to promote and publicize your work”.

### Denial

When asked what the reasons were for APA's sudden change of heart, our APA liaison explained it was, first, fear that “the media will cast this story negatively and planners will be among the guilty” and, second, that “some of the study's finding[s] ... could work against us [APA and its members]”. Our APA liaison further explained that he felt responsible for what he called APA's “180 degree switch” and that he found the study both exciting and newsworthy, exactly what journalists and editors are looking for. With a background in journalism, he had reacted to the study with the gut instinct of a journalist, seeing the potential for maximum media coverage, only to learn that APA would prefer no coverage at all:

"I readily admit that I became excited about your research findings and the fact that *JAPA* is publishing a very newsworthy story. My background is journalism, and as a former daily and weekly newspaper reporter and editor ... I started to think about a publicity strategy for your article first and the possible negative implications for the planning profession second. In terms of my job at APA, I need to think about the latter."

Our contact at *JAPA* similarly explained:

"[APA] is worried that the spin will be that planners are liars, even though this is not what you say in your article, and [APA] is trying to protect the profession from that bad press."

Our APA liaison further pointed out that, "Given APA's concerns, I would encourage taking a much more restrained approach in the press release" than we had done in the release we had been collaborating on so far. Finally, our APA liaison said he had been asked by APA to draft such a more subdued release covering the study. This was bad news for the authors, because it meant that a powerful organization like APA would now write its own press release about our study. We would have no control over the APA release, which we understood would not be designed to emphasize the newsworthiness of the study, but would instead gloss it over in order to protect APA member interests. I asked our APA liaison to kindly let me comment on APA's press release before it was finalized. He agreed to this and said he would send me a copy for comment, but he did not do so. Our contact with APA quickly died out as we made the move from partners to opponents, from collaboration to conflict. Commenting on this paper, our APA liaison now explains APA's approach by saying "It was clear to us the article had high news value and, after discussing this point internally and with you – and learning of your own extensive efforts to obtain publicity – we concluded that the article did not need the APA's promotion and publicity to generate news coverage". However, this is not consistent with what we were told at the time, nor with the fact that our and our university's efforts to obtain publicity for the article in the US did not begin until *after* APA dropped its media strategy for the article and only because they dropped it.

At first, *JAPA* was on our side. *JAPA*'s management decided that *JAPA* would assert their independence of APA by single-handedly facilitating media coverage of the study in the US, no matter what APA said. Our contact at *JAPA* sent us the following message:

"I was very disappointed to see [APA's representative, name deleted] latest note to you saying APA does not want him to work on PR for *JAPA* articles. I think our editors will be discussing this policy with the APA. Regarding your article, however, I'm prepared to do what I can to facilitate media coverage in the US."

But despite his good will, or perhaps because of it, within days our *JAPA* contact clearly came under pressure to retract his decision, now explaining:

"I'm afraid I spoke out of turn in offering to pitch a story on your article to the US media ... APA has particular political reasons not to spotlight your findings. [We, at *JAPA*] discussed this ... [and] agreed that it would not be right for me to do this in light of APA's stance. I am therefore afraid I will have to retract my offer ... I apologize for this about face. I personally hope your findings get a great deal of media attention."

It was instructive to see how APA was able to produce one "180 degree switch" and "about face" after another. But power defines rationality, as argued in Flyvbjerg (1998, pp. 227–234). This was power at work, making individuals do what they did not want to, against their basic beliefs. The personal greeting from our *JAPA* liaison that he hoped the study would get a "great deal of media attention", despite APA's determination not to promote the paper,

testifies to this. In effect, APA's "particular political reasons" seemed to be dictating the actions of a supposedly independent academic journal, the world-leader in its field, and thus violating rule number one in academic publishing: that such publishing must be thoroughly independent from outside interests.

Instead of APA openly acknowledging the implications of the *JAPA* study, that

- planners are doing an exceptionally poor job at costing major public works projects, sometimes perhaps intentionally,
- this results in large-scale waste of public money and violations of basic principles of democracy, and,
- APA, as the main professional body for planners, has a responsibility to help rectify this situation,

APA had decided to gloss this over and suppress publicity of the unpleasant facts. APA's idea of protecting member interests was apparently to deny and undermine malpractice concerns in planning, thus defending the status quo. Our idea was to improve planning by problematizing malpractice and demonstrating how it may be avoided.

To APA, the study on cost overrun was a clear instance of Rayner's (2012, pp. 5–7) "uncomfortable knowledge", described above, i.e., knowledge that is disagreeable or intolerable to an organization. Of the four strategies for how organizations typically deal with uncomfortable knowledge – denial, dismissal, diversion, and displacement – here we see denial at work: APA refused to acknowledge the concerns about planners' apparent misrepresentation of costs in large public works projects, even when bodies like *JAPA* and individuals like the authors of the study were actively seeking to bring this knowledge to the collective attention of APA and its membership. When we pressed further to get the information heard, APA ramped up from denial to the more sophisticated strategy of diversion, which consists in establishing a decoy activity that attempts to distract attention from an issue, thus trying to ensure that knowledge about it is not created or shared (Rayner, 2012, p. 7, 12). Let us see how APA did this.

### Diversion

Presumably in order to control information about the *JAPA* study, APA decided they would try to "track and monitor all reporter requests for copies [of the study]". To achieve this, APA now instructed *JAPA* to not get involved with media contact at all and instead "direct reporter inquiries to [APA] and we [APA] will follow-up [sic] ... We are doing this so that if we want to talk to a reporter about the study, we do not give him or her a copy of the study until we've had a chance to talk with them". According to APA's plan, neither *JAPA* nor the authors would have a say in what the media were told by APA about the study.

*JAPA* accepted APA's machinations, we did not. It was less than 3 weeks to publication when APA's attempt at controlling public exposure of the study hit us out of the blue, and we quickly decided to try and beat APA to the media. First, we personally pitched our story and offered exclusives to the editors of *The New York Times* and *The Sunday Times* of London, which they both accepted.<sup>3</sup> We figured that if two prominent newspapers like these would cover the study, then the rest of the media would follow. This proved to be correct. We realized we did not need PR people to communicate with media. In fact, editors and journalists seemed to prefer to deal with us directly. Second, while *The New York Times* and *The Sunday Times* of London were printing their exclusives, we emailed copies

<sup>3</sup> Printed on July 11 and 7, 2002, respectively.

of the study and a press release to every other main media in the English-speaking world, including the US. Many of these media covered the study.

It must have taken APA a few days to realize they had little sway over who received the study and how it was covered. APA then ramped up its strategy from denial to diversion, i.e., APA now actively tried to distract attention away from the study and the uncomfortable issues it raised. APA did this by posting a public comment about the study on its website, in effect a disclaimer that tried to paper-over and downplay the study's findings:<sup>4</sup>

"While we [APA] can appreciate the technical skill and data collection capability employed in the article, as well as the policy questions that are raised, readers of this technical article should bring their own context to the discussion ... Planners ought to be concerned not only with the costs of public works ... There is a danger in being overly analytical about the details of processes that are ultimately not empirical so much as they are democratic and political – a behavior that Alfred North Whitehead called, aptly, 'misplaced concreteness.' " (American Planning Association, 2002).

APA's public comment was written by our APA liaison. It is interesting to note that in the APA comment he now tried to frame the study as "technical", by twice labeling it as such, and as being "overly analytical", thus undoubtedly encouraging a certain reserve with readers against the study. This was at complete odds with his own views about the study expressed to us previously, when he had described it as "very newsworthy" and himself as "excited about your research findings".

It is also interesting to note APA's artificial juxtaposition in the comment of "empirical" on one side and "democratic and political" on the other, as if democratic and political issues cannot be studied empirically, which is plain wrong. Finally, things get even more obfuscated with the deployment of Whitehead, the heavyweight mathematician, logician, mentor and collaborator of Bertrand Russell, and someone who would recognize a technical argument if he saw one. But unfortunately APA gets Whitehead wrong. The fallacy of misplaced concreteness is about treating abstractions as realities. It is not about being overly analytical about details or being empirical at all, but quite the opposite. APA's use of Whitehead appears to be a botched attempt at oppressive deployment of symbolic capital rather than an actual rational argument. Fortunately, the media did not buy APA's interpretation of the study but covered it instead like APA had originally intended for them to do, i.e., as newsworthy and exciting.

In its public comment on the *JAPA* study APA also boosted its own high ethics in the manner that has become a trademark of the organization, taking a normative stand for participation, transparency, the public interest, and good information:

"This [the technical character of the study, etc.] doesn't mean planners shouldn't get involved. Of course planners have an ethical obligation to promote sound project planning and the greatest possible degree of public involvement, transparency, and the understanding of the options available ... [E]ven if [planners] are not necessarily able to effect as much control over the process as would be useful to the public's interest, [planning] still requires their strong and active presence and voice for good information and an open and ethical process" (American Planning Association, 2002).

<sup>4</sup> A colleague, who had previously held a high-ranking position within APA, and who commented to us on the unfolding of events, sent us this observation about APA's comment: "[APA] seems to want to paper-over your scholarly findings and downplay the importance of your article ... I think this is important".

It is interesting to note that APA's comment, which stresses the virtues of transparency, ethics, etc., itself seems to be a deliberate and direct attempt by APA to block transparency, information, and openness for an important but uncomfortable planning issue, namely cost overruns of billions of dollars on major planning projects. APA's words and actions are diametrically opposed on this point, showing a double standard that is used by APA because it feared the *JAPA* study might present planners in a bad light. APA's comment and its double standard can be seen as an attempt at managing uncomfortable knowledge by the "diversion strategy" described above, where the comment and its obfuscating and misleading content functions as a decoy activity that aims at distracting attention from the issue at hand – here planners who appear to systematically misrepresent the costs of projects – thus hampering the spread of knowledge about this issue.

### Is *JAPA* truly independent?

The perhaps most surprising thing about APA's attempts at diverting attention away from the uncomfortable issues raised by the cost study is the fact that the *JAPA* editors let APA do its maneuvering without weighing in against it. Scholars generally believe that scholarly values must be upheld at all times for scholarly work. The independence of journal editors and their journals is one such core value. Publication of the study was the *JAPA* editors' responsibility, because they had approved it. Although *JAPA* did in fact publish the study, APA, their parent organization and sponsor, refused to let *JAPA* promote the study and actively tried to undermine it in public, as we saw with APA's public comment above. Several of our US colleagues saw this as APA "second guessing" the *JAPA* editors. One colleague, who served on AICP's (American Institute of Certified Planners) Ethics Committee for several years before the *JAPA* study was published and in other official roles later, put it like this:

"I feel that if there is one principle that is strong and must be honored continuously, it is the independence of the editorial review process from the elected members of the APA Board and the AICP Commission.<sup>5</sup> So I would also suggest that it might be appropriate for the editor [of *JAPA*] to comment [on APA's actions regarding the study] ... on the propriety of them [APA] second guessing the editorial process."

This commentator later added the following viewpoint about the relationship between *JAPA* and APA, placing responsibility for the unsatisfactory treatment of our article not only with APA but also with *JAPA*:

"The relationship between the editor of the *JAPA* and the APA staff is puzzling to me. A good editor could have been more aggressive, so I am not sure the problem resided mostly with the APA staff."

The lack of reaction on *JAPA*'s part indicated that *JAPA* might not have the true independence from outside forces, including from APA, its sponsor, that an academic journal must have to be fully credible. This is not to say APA interfered with *JAPA*'s decisions on publication, which are made by its editor based on double-blind peer review. But in this case APA interfered with the public exposure of a *JAPA* study, trying to control and "spin" it to protect APA's boosterish image of planning. With no comment or other reaction forthcoming from *JAPA*, our US colleagues suggested we ask APA for permission to write a comment ourselves on how we saw APA's actions. A few days after APA published its comment on the study I therefore asked APA for permission to write a rejoinder. But again

<sup>5</sup> The AICP Commission is the governing body of AICP.

APA practiced its denial response. I received no answer, including to a later reminder.

Two weeks after APA's public comment about our study and almost a month after its publication in *JAPA*, our contact at the journal reported that there continued to be a "flurry of requests for the article and the subsequent news stories" and that he had received a request from the Sierra Club for permission to reprint the article as part of a protest against a project. This would be the first of many similar requests from groups opposing major projects, who would use the research to resist specific projects. Finally, *JAPA* had received a letter to the editors about the article, to which my co-authors and I duly responded (Flyvbjerg, Holm, & Buhl, 2003). The report from *JAPA* confirmed what we already knew: Despite APA's attempts to deny and divert attention away from the study, we had succeeded in effectively communicating its results to the public sphere, as we had set out to do, for the results to inform policy and practice. This would eventually lead to policy changes in a number of countries on how major public works projects are planned and managed (Flyvbjerg, 2012, p. 176) and to an endorsement of our recommendations from the godfather of behavioral economics and Nobel Prize winner in economics 2002, Daniel Kahneman, as "the single most important piece of advice [that exists] regarding how to increase accuracy in forecasting" (Kahneman, 2011, p. 251). The policy changes and endorsement would most likely not have happened if APA had had its way with its attempt to suppress publicity of the 2002 *JAPA* study. Later, as we published more on better forecasting theory and methodology, including in *JAPA* (Flyvbjerg, Holm, & Buhl, 2005), APA too would find reason to endorse our thinking (American Planning Association, 2005b). APA clearly found it easier to embrace our constructive work than our earlier problematizations, although the latter was a precondition for the former.

### The REAL ethics of APA

In its efforts to deny, spin, and divert attention from the *JAPA* study on cost overrun, we consider that APA violated its own Code of Ethics on at least six counts. First, the APA/AICP Code of Ethics specifically states that a planner's primary obligation is to serve the public interest (American Planning Association, 2005a).<sup>6</sup> It would clearly serve the public interest that the public got to know about the billion-dollar cost overruns, misinformation, and waste of public resources that are typical of major public works projects and are documented by the *JAPA* study. By trying to suppress and divert publicity for the study, APA was actively working against the public interest and thus against the "planner's primary obligation".

Second, the APA/AICP Code of Ethics stipulates that a planner must strive to provide full, clear, and accurate information on planning issues to citizens. The *JAPA* study strives to do exactly that by publishing the largest dataset and set of analyses that exist on cost underestimation and overrun in major planning projects. With its attempt to suppress publicity and divert attention from the study, APA was actively attempting to hinder such information in reaching citizens and was thus violating its own Code of Ethics.

Third, a planner must accurately represent the qualifications, views, and findings of colleagues, according to the Code of Ethics. With APA's public comment on the *JAPA* study, posted prominently on the APA website, APA deliberately tried to put its own spin on the findings of the study, as shown above, and not just in our view, but in the view of colleagues, members of APA, and people who held or had held office with APA. APA thus violated its own Code of Ethics on this point, too.

<sup>6</sup> This is the APA/AICP Code of Ethics that applied in 2002, when our study came out (American Planning Association 1991). The Code was revised in 2005, but still contains similar rules of conduct (American Planning Association 2005a).

Fourth, the Code of Ethics states that a planner must share the results of experience and research, which contribute to the body of planning knowledge. With the *JAPA* study, we were trying to do just this. With their diversion strategy and tactics, described above, and their attempts at suppressing media coverage of the study, APA management was trying to hinder such sharing of results, and thus worked against the APA/AICP Code of Ethics.

Fifth, a planner must not commit a deliberately wrongful act, which reflects adversely on the planner's professional fitness, says the Code of Ethics. Here, the actions of APA regarding the *JAPA* study were, in our view, wrongful and deliberate, despite the Code saying they "must not" engage in this type of behavior. As such their actions reflect adversely on APA's professional fitness.

Finally, the APA/AICP Code of Ethics specifies that a planner must systematically and critically analyze ethical issues in the practice of planning. With the *JAPA* study we attempted to do this. However, with its papering over of the results and its efforts at suppressing publicity, APA systematically tried to suppress knowledge of our critical analysis and to limit its impacts on the public and on the planning profession, breaching its own Code of Ethics one more time.

That's a lot of "musts" disregarded by the very body that stipulates that the "musts" must be observed. It is a matter of serious concern that the AICP Ethics Officer, who, in collaboration with the AICP Ethics Committee, is responsible for upholding the Code of Ethics is not independent but is also APA's Chief Executive Officer, the same person today as when the *JAPA* study was published. A former member of the AICP Ethics Committee who commented on the present study observed about this that the lack of an independent Ethics Officer within the structure of APA is a fundamental problem and that this "set the stage" for APA's dubious treatment of the *JAPA* study. In 2001, an independent counsel, who had been asked by AICP to assess its Code of Ethics, recommended the establishment of an independent Ethics Officer. However, APA's CEO cum Ethics Officer was against the proposal and successfully blocked it, according to the Committee member. This has left APA with its questionable practice of conflating in one and the same person the roles of CEO and Ethics Officer. The consequence is a lack of arm's length principle in APA's ethics.

### Nine questions for a debate about APA's ethics

Upon reading the above analysis, an editor at *JAPA* commented, "I agree that APA seriously breached its own ethics" and that it "is a good summary of some serious APA shenanigans". A former APA president similarly called the study a "sad but true comment on the way APA protects what it perceives as its turf". Then the ex-president made a remark that surprised me:

"I agree with your interpretation of events, except I think you may be a bit soft on APA and its code of ethics" (emphasis added).

I was surprised, because I thought that the analysis of APA's ethics above might be seen as too hard, despite all efforts at being as balanced and evidence-based as possible. But the former APA president explained that to an insider like himself there are more basic issues at stake with APA's ethics than what is uncovered here. To him the real problem is that after having been involved with APA for several decades he cannot recall a single example of a planner being expelled from APA for ethical violations.<sup>7</sup> According to the

<sup>7</sup> The author has checked this statement with other APA insiders and with APA's CEO and found that exclusions of members of APA/AICP for ethical violations seem very rare; like the former APA president no one appears to be able to remember specific instances. According to the CEO, however, "[t]here have been individuals whose membership has been revoked as a result of ethics proceedings" (personal communication, author's archives).

former president this is not because planners are uniformly well-behaved, but because APA is in denial about the possibility of bad planning and malpractice and tends to see all planning as good.<sup>8</sup> That is the real problem with APA, according to the former president, and in relation to this larger problem the analysis above seems to him just the tip of the proverbial iceberg and therefore soft on APA. However, given the fundamental nature of the issues at stake for planning as a profession and the principled debates needed to deal with them, the author would rather err on the side of softness, because being too hard runs the risk of the critique being rejected as exaggerated and thus having no effect.<sup>9</sup>

Nevertheless, the former APA president is right that APA appears to be in denial about bad planning and potential malpractice and that this is a fundamental problem. To underestimate billions of dollars of costs in planned projects, and thereby cause billions of dollars of cost overruns, is bad planning by any definition of the term. And if underestimation is deliberate then it is lying, which is unethical by any code of conduct and unlawful in many jurisdictions for this type of issue (Bok 1979; Cliffe, Ramsey, & Bartlett 2000; Wachs 1989).<sup>10</sup> Such bad planning and unethical behavior place citizens, taxpayers, investors, and other stakeholders in public projects at a risk that is deliberately hidden from them. APA helps hide the risk to the extent that APA suppresses publicity, and manipulates the spread, of knowledge about it, as we saw APA do above. This demonstrates a lack of concern over bad planning and malpractice which must result in a lack of accountability, without which a profession cannot make proper progress. To not take malpractice concerns and accountability seriously is to not take the profession of planning seriously. We therefore arrive at the paradoxical conclusion that APA is not taking the profession of planning seriously and is holding back its development. APA's management say they protect member interests, but they do quite the opposite. It is in members' interest to have malpractice problematized and reduced, and this can only happen by exposing malpractice, not by denying or diverting attention from it as APA did in the case of the *JAPA* study described above.

Lord Acton famously said that power tends to corrupt, and absolute power corrupts absolutely. APA is the biggest and most powerful professional organization for planners in the world. Backed by this kind of authority, it is cause for worry if APA violates its own Code of Ethics and sweeps under the carpet concerns about bad planning and malpractice, as we saw above, so as to not

upset the boosterish image of planning that APA is at pains to uphold. Such moral hypocrisy should give planners, planning academics, and planning students pause to think. We need to ponder and debate the real ethics of our profession in order to improve upon it. The present article was written to constructively contribute to this type of debate and we end by raising the following nine questions about APA's ethics and actions for serious discussion and dialogue, as opposed to polemics:

1. How can the planning profession improve and make progress if critique and self-critique of planning and planners are not addressed by our biggest and most powerful professional organization, APA?
2. How can planners become better if they are always already portrayed as good by APA – in the boosterish image of planning that APA paints – and if APA deliberately turns a blind eye on and glosses over planners doing bad planning, i.e., planning that violates basic norms of democracy, efficiency, and equity?
3. Is APA so deeply in denial about bad planning and malpractice that APA is part of the problem instead of the solution?
4. Is it really true, as suggested by a former APA president, that APA practically never excludes members due to violations of its Code of Ethics? How do the numbers and types of reported and sanctioned code violations for planners compare with those of other professions, including medicine, law, and accounting? How have the numbers developed over time?
5. What should be done and by whom about APA's moral hypocrisy, documented above, where APA seems to disregard its own Code of Ethics, will undermine critical reviews, and will block transparency in order to deny and divert information about and critique of bad planning and malpractice?
6. Is there a fundamental conflict between being an advocacy body and being the guardian of professional ethics? Between booster and regulator? Should the two functions be separated? Does APA need a fundamental rethink of its role in those terms?
7. Does APA/AICP need an independent Ethics Officer, as proposed by an independent counsel in 2001? Does the fact that APA's Ethics Officer is also APA's CEO lead to a conflict of interests and lack of arm's length principle? Do other professional organizations conflate these roles like APA does?
8. What are the consequences of a boosterish professional organization like APA being linked to its field's major academic publication, *JAPA*? Is *JAPA* truly independent of APA? Is there a conflict of interest? If yes, what should be done about it?
9. Critique is historically a main driver of progress. Professions, organizations, and societies that stifle critique tend to degenerate and become socially and politically irrelevant zombie institutions. Is APA and planning in danger of such degeneration and irrelevance? Has it already set in? What should be done, if anything?

By debating these and similar questions, perhaps we can begin to see APA and planning for what they are, warts and all, and then work to improve them. Instead of being stuck with the relentlessly positive picture-book image of planning that APA and many planners have been painting for too long to the detriment of progress for the profession. Planning is too important to be treated like that.

If planners choose to *not* engage in this debate, the risk is that ever more members of APA and AICP will follow the example of this former AICP member, who used to be seriously engaged and hold high office with the organization, but who wrote me after having read the analysis above:

"I need to tell you that I have let my membership in AICP lapse. This may be a surprise or perhaps it is not. I am no longer entitled to put FAICP after my name. I think that the AICP is an orga-

<sup>8</sup> The former APA president explains: "I've been involved with APA for about 40 years having served as [several top-level positions deleted here for reasons of anonymity] and I don't recall more than a handful of planners being brought up on ethical charges and no one being drummed out for ethical violations. APA believes all planning is good; note the slogan 'Making Great Communities Happen' and the sunny, relentlessly positive contents of its *Planning Magazine*".

<sup>9</sup> A former member of the AICP Ethics Committee similarly commented that the article "doesn't go far enough" in placing responsibility with specific people within APA for APA's apparent lack of adherence to its own Code of Ethics. For full disclosure, it should be mentioned that the study did uncover material that is substantially more critical of specific individuals than what is revealed here. A surprising number of respondents, who worked for APA as officials or employees, were remarkably critical and even resentful of the organization and how it is managed. Such resentment may be an interesting topic for further study, but is not the issue here. Here focus is on APA's ethics and knowledge management.

<sup>10</sup> It is worth noting that if, instead of public planners, it were employees of private corporations who deliberately underestimated costs like documented in the studies mentioned here, they might be committing a criminal offense under the Sarbanes-Oxley Act (2002). The Sarbanes-Oxley Act (Section 802[a], 18 U.S.C. § 1519) states that whoever knowingly alters, destroys, mutilates, conceals, covers up, falsifies, or makes a false entry in any record, document, or tangible object with the intent to impede, obstruct, or influence the investigation or proper administration of any matter within the jurisdiction of any department or agency of the United States or any case filed under title 11, or in relation to or contemplation of any such matter or case, shall be fined, imprisoned not more than 20 years, or both. This is not to suggest that planners engage in criminal activity, but to consider that similar behavior in another context might be criminal.

nization founded upon principles of self promotion and self interest among planners [as opposed to the public interest stressed in the AICP Code of Ethics] ... In order to be a member, a person has to engage in 'continuing education,' and to amass continuing education credits by enrolling in courses, attending conferences, and so forth. They state that the purpose is to insure high quality and professional job performance by professional planners. The cost to attend the national AICP conference is [high], and I found the sessions to be boring and shallow. I interpreted the fees charged as being in the interest of the organization which is run like a business ... I made a personal choice to stop accumulating 'credit' by attending specific events that offered credit unless I happened to want to attend them. So, I was eventually informed that my membership in AICP would 'lapse' this year unless I signed up for a certain number of units of credit. I informed AICP that I preferred to allow my membership to lapse ... This reflects my own assessment of their professional status and standing."

### Summary and conclusions

With a point of departure in the concept "uncomfortable knowledge", this article presents a case study of how the American Planning Association deals with such knowledge, in the form of knowledge about potential malpractice by planners and bad planning. APA is found to employ two well-known strategies for dealing with uncomfortable knowledge: denial and diversion. APA actively suppresses publicity of and undermines information about malpractice concerns and bad planning in order to sustain a boosterish image of planning and planners. In the process, APA appears to have disregarded and violated its own Code of Ethics on multiple counts. In so doing, APA is potentially placing principles of transparency and democracy at risk, together with billions of dollars of citizens' money. APA justified its actions as necessary to protect APA members' interests, i.e., prevent planning and planners from being presented to the public in a bad light. The article concludes, however, that it is in members' interest to have malpractice critiqued and reduced, and that this best happens by exposing and addressing malpractice concerns, not by denying or diverting attention from them as APA did in this case. Critique is historically a main driver of progress. Professions, organizations, and societies that stifle critique tend to degenerate and become socially and politically irrelevant. The article asks whether such degeneration has set in for APA and planning. Finally, it is concluded that more debate about APA's ethics and actions is needed for improving

planning practice. Nine key questions are presented for stimulating such debate.

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**Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
and Environmental Impact Report Plan Bay Area Draft, page**

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**Item 1-1 of Appendix I**

**CEQA Section 15126.6 (e) (2),**

**Pages 1/17, 9/17, 10/17, & 11/17**

# CEQA

## The California Environmental Quality Act

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*Title 14. California Code of Regulations*  
**Chapter 3. Guidelines for Implementation of the  
 California Environmental Quality Act**

## Article 9. Contents of Environmental Impact Reports

### Sections 15120 to 15132

#### 15120. General

(a) Environmental Impact Reports shall contain the information outlined in this article, but the format of the document may be varied. Each element must be covered, and when these elements are not separated into distinct sections, the document shall state where in the document each element is discussed.

(b) The EIR may be prepared as a separate document, as part of a general plan, or as part of a project report. If prepared as a part of the project report, it must still contain one separate and distinguishable section providing either analysis of all the subjects required in an EIR or, as a minimum, a table showing where each of the subjects is discussed. When the Lead Agency is a state agency, the EIR shall be included as part of the regular project report if such a report is used in the agency's existing review and budgetary process.

(c) Draft EIRs shall contain the information required by Sections 15122 through 15131. Final EIRs shall contain the same information and the subjects described in Section 15132.

(d) No document prepared pursuant to this article that is available for public examination shall include a "trade secret" as defined in Section 6254.7 of the Government Code, information about the location of archaeological sites and sacred lands, or any other information that is subject to the disclosure restrictions of Section 6254 of the Government Code.

**Note:** Authority cited: Section 21083, Public Resources Code; Reference: Sections 21100, 21105 and 21160, Public Resources Code.

**Discussion:** This section provides general information on the EIR document. The document may be prepared in a wide variety of formats so long as the essential elements of information are included. In order to promote public understanding of the document, the Guidelines require that when the required elements are not separated into distinct sections, the document must include a statement as to where each element is discussed.

Subsection (b) is also designed to allow Lead Agencies flexibility in preparing the document. This section provides that the EIR may be a separate document by itself, or the EIR may be included within another document. Where the EIR is included within another document, the EIR must be a distinguishable section of that larger document.

The flexibility allowed by this section enables Lead Agencies to achieve efficiencies in different situations. For example, where a Local Agency Formation Commission has prepared a large document analyzing the effects of a proposed annexation, the LAFCO may reduce its cost by including the EIR within the larger document. The decision in *Russian Hill Improvement Association v. Board of Permit*

Authority: Section 21083, Public Resources Code. Reference: Sections 5020.5, 21002, 21003, 21100 and 21084.1, Public Resources Code; *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553; *Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376; *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; *Laurel Heights Improvement Association v. Regents of the University of California* (1993) 6 Cal.4th 1112; and *Sacramento Old City Assn. v. City Council of Sacramento* (1991) 229 Cal.App.3d 1011.

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## 15126.6 Consideration and Discussion of Alternatives to the Proposed Project.

(a) Alternatives to the Proposed Project. An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decisionmaking and public participation. An EIR is not required to consider alternatives which are infeasible. The lead agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives. There is no ironclad rule governing the nature or scope of the alternatives to be discussed other than the rule of reason. (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553 and *Laurel Heights Improvement Association v. Regents of the University of California* (1988) 47 Cal.3d 376).

(b) Purpose. Because an EIR must identify ways to mitigate or avoid the significant effects that a project may have on the environment (Public Resources Code Section 21002.1), the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly.

(c) Selection of a range of reasonable alternatives. The range of potential alternatives to the proposed project shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects. The EIR should briefly describe the rationale for selecting the alternatives to be discussed. The EIR should also identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency's determination. Additional information explaining the choice of alternatives may be included in the administrative record. Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts.

(d) Evaluation of alternatives. The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. A matrix displaying the major characteristics and significant environmental effects of each alternative may be used to summarize the comparison. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the project as proposed. (*County of Inyo v. City of Los Angeles* (1981) 124 Cal.App.3d 1).

(e) "No project" alternative.

(1) The specific alternative of "no project" shall also be evaluated along with its impact. The purpose of describing and analyzing a no project alternative is to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. The no project alternative analysis is not the baseline for determining whether the proposed project's

environmental impacts may be significant unless it is identical to the existing environmental setting analysis which does establish that baseline (see Section 15125).

(2) The "no project" analysis shall discuss the existing conditions at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services. If the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives.

(3) A discussion of the "no project" alternative will usually proceed along one of two lines:

(A) When the project is the revision of an existing land use or regulatory plan, policy or ongoing operation, the "no project" alternative will be the continuation of the existing plan, policy or operation into the future. Typically this is a situation where other projects initiated under the existing plan will continue while the new plan is developed. Thus, the projected impacts of the proposed plan or alternative plans would be compared to the impacts that would occur under the existing plan.

(B) If the project is other than a land use or regulatory plan, for example a development project on identifiable property, the "no project" alternative is the circumstance under which the project does not proceed. Here the discussion would compare the environmental effects of the property remaining in its existing state against environmental effects which would occur if the project is approved. If disapproval of the project under consideration would result in predictable actions by others, such as the proposal of some other project, this "no project" consequence should be discussed. In certain instances, the no project alternative means "no build" wherein the existing environmental setting is maintained. However, where failure to proceed with the project will not result in preservation of existing environmental conditions, the analysis should identify the practical result of the project's non-approval and not create and analyze a set of artificial assumptions that would be required to preserve the existing physical environment.

(C) After defining the no project alternative using one of these approaches, the lead agency should proceed to analyze the impacts of the no project alternative by projecting what would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.

(f) Rule of reason. The range of alternatives required in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision making.

(1) Feasibility. Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site (or the site is already owned by the proponent). No one of these factors establishes a fixed limit on the scope of reasonable alternatives. (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553; see *Save Our Residential Environment v. City of West Hollywood* (1992) 9 Cal.App.4th 1745, 1753, fn. 1).

(2) Alternative locations.

(A) Key question. The key question and first step in analysis is whether any of the significant effects of the project would be avoided or substantially lessened by putting the project in another location. Only locations that would avoid or substantially lessen any of the significant effects of the project

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need be considered for inclusion in the EIR. ~~Plan Bay Area 2040 Final Environmental Impact Report~~

(B) None feasible. If the lead agency concludes that no feasible alternative locations exist, it must disclose the reasons for this conclusion, and should include the reasons in the EIR. For example, in some cases there may be no feasible alternative locations for a geothermal plant or mining project which must be in close proximity to natural resources at a given location.

(C) Limited new analysis required. Where a previous document has sufficiently analyzed a range of reasonable alternative locations and environmental impacts for projects with the same basic purpose, the lead agency should review the previous document. The EIR may rely on the previous document to help it assess the feasibility of potential project alternatives to the extent the circumstances remain substantially the same as they relate to the alternative. (*Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 573).

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(3) An EIR need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative. (*Residents Ad Hoc Stadium Committee v. Board of Trustees* (1979) 89 Cal. App.3d 274).

**Note:** Authority cited: Section 21083, Public Resources Code. Reference: Sections 21002, 21002.1, 21003, and 21100, Public Resources Code; *Citizens of Goleta Valley v. Board of Supervisors*, (1990) 52 Cal.3d 553; *Laurel Heights Improvement Association v. Regents of the University of California*, (1988) 47 Cal.3d 376; *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; and *Laurel Heights Improvement Association v. Regents of the University of California* (1993) 6 Cal.4th 1112.

**Discussion:** This section examines the required discussion of project alternatives. Subsection (b) states that the discussion shall focus on alternatives to the project or its location which can avoid or substantially lessen any of the significant impacts of the project and shall evaluate their comparative merits. Subsection (c) includes guidance on the selection of a reasonable range of feasible alternatives, including the need to document the process of selecting alternatives. Subsection (e) describes the ♦no project♦ alternative, including its relationship to the baseline conditions under which the project is evaluated for potential significance and the analysis of the potential impacts if the project is not undertaken. Subsection (f) discusses the ♦rule of reason♦ in detail, including such factors as feasibility, location, and speculation, which help agencies select a reasonable range of alternatives.

## 15127. Limitations on Discussion of Environmental Impact

The information required by Section 15126.2(c) concerning irreversible changes, need be included only in EIRs prepared in connection with any of the following activities:

- (a) The adoption, amendment, or enactment of a plan, policy, or ordinance of a public agency;
- (b) The adoption by a Local Agency Formation Commission of a resolution making determinations; or
- (c) A project which will be subject to the requirement for preparing an environmental impact statement pursuant to the requirements of the National Environmental Policy Act of 1969, 42 U.S.C. 4321-4347.

**Note:** Authority cited: Section 21083, Public Resources Code; Reference: Section 21100.1, Public Resources Code.

**Discussion:** The reference in this section to previous subsection (e) of Section 15126 has been deleted. The statutory requirement for a discussion of the relationship between short-term uses and long-term productivity was repealed by Chapter 1230 of the Statutes of 1994.

## 15128. Effects Not Found to be Significant

Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
and Environmental Impact Report Plan Bay Area Draft, page

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**Item 1-2 of Appendix I**

**Notice of Preparation (NOP): pages 1-3,  
plus pages 4, 10 & 11 of Attachment A to  
NOP**



## **Notice of Preparation**

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**To:** Interested Agencies, Organizations, and Individuals

**Subject:** Notice of Preparation of a Draft Environmental Impact Report for Plan Bay Area

**Lead Agencies:**

Metropolitan Transportation Commission  
& Association of Bay Area Governments  
Joseph P. Bort MetroCenter  
101 Eighth Street  
Oakland, CA 94607-4700

**Contact Person:**

Ashley Nguyen, EIR Project Manager  
Metropolitan Transportation  
Commission  
Phone: 510.817.5809  
Fax: 510.817.5848  
Email: [anguyen@mtc.ca.gov](mailto:anguyen@mtc.ca.gov)

The Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) are co-lead agencies for preparing a program-level Draft Environmental Impact Report (EIR) for the Plan Bay Area in accordance with the California Environmental Quality Act (CEQA).

This Notice of Preparation (NOP) is intended to seek comments with specific detail about the scope and content of the environmental information that will be evaluated in the EIR. Agencies who have statutory responsibilities in connection with the project to be evaluated should share their views. Such agencies will use the EIR prepared by MTC and ABAG when considering a permit or other approval of a discrete project from Plan Bay Area. Local jurisdictions and transportation agencies may also elect to use this program-level EIR for tiering in second-tiered EIRs covering land use projects or transportation plans, projects, or programs.

MTC and ABAG seek your input on the following questions:

- Are there potential environmental issues that MTC and ABAG should analyze that are not identified in Attachment A to this notice?
- Are there any alternatives that MTC and ABAG should evaluate that are not identified in Attachment A to this notice?
- What types of mitigation measures should be considered that would help avoid or minimize potential environmental impacts of the proposed Project and alternatives?
- What elements of this EIR would help your agency with CEQA exemptions and tiering?

Four regional scoping meetings will be held to solicit input on the scope of the Draft EIR:

**Wednesday, June 20, 2012**

**6:00 p.m. to 8:00 p.m.**

Joseph P. Bort MetroCenter  
MTC Auditorium  
101 Eighth Street  
Oakland, CA 94607

**Thursday, June 21, 2012**

**10:00 a.m. to Noon**

Dr. Martin Luther King, Jr. Library  
Room 255/257  
150 East San Fernando Street  
San Jose, CA 95112

**Tuesday, June 26, 2012**

**10:00 a.m. to Noon**

San Francisco Planning + Urban  
Research (SPUR)  
Public Assembly Hall – 2<sup>nd</sup> Floor  
654 Mission Street  
San Francisco, CA 94105

**Wednesday, June 27, 2012**

**1:30 p.m. to 3:30 p.m.**

Embassy Suites Hotel  
Novato/Larkspur Room  
101 McInnis Parkway  
San Rafael, CA

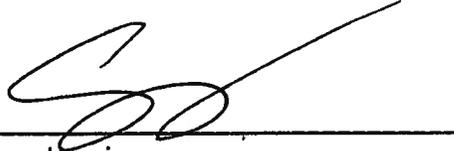
All interested agencies, organizations and individuals are welcome to participate in the scoping meetings. Oral and written comments will be accepted at the scoping meetings. Due to the time limits mandated by State law, your response must be sent at the earliest possible date but ***no later than 30 days*** after receipt of this notice. **Please send your response to Ashley Nguyen, EIR Project Manager by July 11, 2012 through any of the following methods.** Remember to include a return address and the name of the contact person.

Mail	Fax	E-mail
Ashley Nguyen, EIR Project Manager Metropolitan Transportation Commission Joseph P. Bort MetroCenter 101 Eighth Street Oakland, CA 94607-4700	510.817.5848	<a href="mailto:eircomments@mtc.ca.gov">eircomments@mtc.ca.gov</a>

The project description, location and the potential environmental effects are contained in the attached materials. An Initial Study is not required and thus not prepared.

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**Project Title:** Environmental Impact Report for Plan Bay Area  
**Project Location:** San Francisco Bay Area Region, California  
(Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo,  
Santa Clara, Solano, and Sonoma Counties)  
**Attachment:** Attachment A: Project Description & Scope of Environmental Analysis  
**Date:** June 11, 2012



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Steve Heminger  
MTC Executive Director



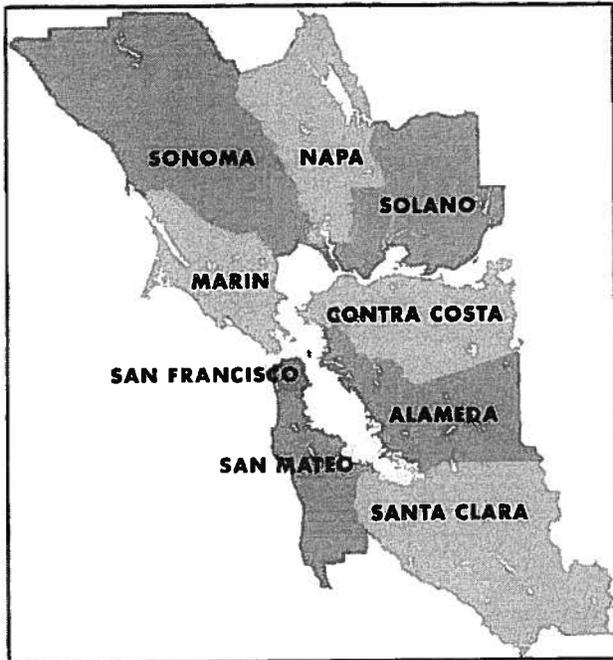
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Pat Jones  
ABAG Assistant Executive Director

## ATTACHMENT A PROJECT DESCRIPTION & SCOPE OF ENVIRONMENTAL ANALYSIS

### NOTICE OF PREPARATION

The Notice of Preparation (NOP), along with this Attachment A, is being issued to interested agencies, organizations and individuals, to solicit comments that will assist in the preparation of the Draft Environmental Impact Report (EIR) for Plan Bay Area. As a result of the responses to the NOP and staff analysis, the project description and scope of the environmental analysis described herein will likely be revised and then further refined through the course of preparing the EIR.



### BACKGROUND

The Metropolitan Transportation Commission (MTC) is the transportation planning, coordinating, and financing agency for the nine-county San Francisco Bay Area (which includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties). Created by the State Legislature in 1970, MTC functions as both the regional transportation planning agency (RTPA)—a state designation—and for federal purposes, as the region's metropolitan planning organization (MPO). As required by State legislation (Government Code Section 65080 et. seq.) and by federal regulation (Title 23 USC Section 134), MTC is responsible for preparing the Regional Transportation Plan

(RTP) for the San Francisco Bay Area Region. An RTP is a long-range plan that identifies the strategies and investments to maintain, manage, and improve the region's transportation network.

In the past, MTC has undertaken the task of regional transportation planning somewhat separately from the regional population and employment projections and regional housing needs allocation processes conducted by the Association of Bay Area Governments (ABAG). ABAG is a joint powers agency formed in 1961 pursuant to California Government Code §§ 6500, *et seq.*, and is the council of governments (COG) for the San Francisco Bay Area. ABAG prepares demographic and economic forecasts, and prepares the state-mandated Regional Housing Needs Allocation for the Bay Area. Consistent with the requirements of the Sustainable Communities and Climate Protection Act of 2008 (SB 375), MTC and ABAG are jointly developing a Regional Transportation Plan and Sustainable Communities Strategy, known as Plan Bay Area. In addition, MTC and ABAG are jointly preparing and certifying the EIR for Plan Bay Area.

- Potential increase in non-point pollution of storm water runoff
- Potential increases in rates and amounts of runoff due to additional impervious surfaces
- Potential placement of structures within a 100-year flood hazard area which would impede or redirect flows
- Potential exposure of people to significant risk of loss, injury, or death involving flooding, seiche, tsunami, or mudflow

#### Biological Resources

- Potential adverse effect on sensitive or special-status species
- Potential adverse effect on riparian habitat, protected wetlands, or other sensitive natural community
- Potential interference with the movement of any native resident, migratory fish, or wildlife species
- Potential conflict with adopted local conservation policies

#### Visual Resources

- Potential adverse effect on scenic vistas
- Potential damage to scenic resources within a scenic highway,
- Potential degradation of existing visual character
- Potential creation of a new source of substantial light or glare

#### Cultural Resources

- Potential adverse change or damage to the significance of a historic resource, unique archaeological resource, and/or a unique paleontological resource/site
- Potential disruption of any human remains

#### Public Utilities

- Potential adverse effect on water supply, wastewater/storm water facilities, and solid waste

#### Growth-Inducing Impacts

- Potential direct or indirect substantial, unanticipated increases in population beyond those currently projected

Impact categories not specifically addressed in this EIR include hazardous materials, public services, recreation and mineral resources because no significant impacts of regional importance are expected to occur in these areas. These impact areas will be addressed in project-specific environmental documents.

#### **PROPOSED PROJECT AND ALTERNATIVES TO BE ANALYZED IN THE EIR**

The proposed Project and preliminary draft alternatives that may be evaluated in this EIR are described below. MTC will use the latest planning assumptions in the EIR analysis, as well as the same regional growth control totals of 1,120,000 new people, 2,147,000 new jobs, and 660,000 new housing units except for Alternative 4 (see Alternative 4 for details). It is

important to note that more precise definitions of the alternatives, or new alternatives, will likely emerge as the EIR scoping and preparation process evolves.

#### **Alternative 1 – No Project**

CEQA requires the evaluation of a No Project alternative. The No Project alternative addresses the effect of not implementing Plan Bay Area as required by Section 15126.6(e) (2) of the CEQA Guidelines. It includes “what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services” (CEQA Section 15126.6(e) (2)). The No Project alternative allows decision-makers to compare the impacts of approving the proposed Project with the impacts of not approving the proposed Project.

For purposes of this EIR, the No Project alternative consists of two elements: (a) the existing 2010 land uses plus continuation of existing land use policy as defined in adopted general plans, zoning ordinances, etc. from all jurisdictions in the region and (b) the existing 2010 transportation network plus a set of highway, transit, local roadway, bicycle and pedestrian projects that have either already received funding or are scheduled for funding and have received environmental clearance by May 1, 2011.

#### **Alternative 2 – Jobs-Housing Connection (Proposed Project)**

The Jobs-Housing Connection alternative is the proposed Project, as approved by ABAG and MTC on May 17, 2012. This alternative lays out a land use pattern that is structured around four key elements: (1) over 200 locally selected Priority Development Areas (PDAs) that support job growth and accessibility as well as housing diversity and affordability, (2) the region’s core transit network, (3) the Bay Area’s network of open spaces and conservation land, including 100 Priority Conservation Areas (PCAs), and (4) a network of complete communities in which each community is supported by the appropriate services and amenities. To distribute future growth, regional growth factors were applied to address the changing economic, demographic and housing needs of the region.

- **Employment Distribution:** The approach for distributing new employment growth accounts for job growth by sector and is linked to transit infrastructure. Local planning and economic analysis regarding growing industries in the Bay Area informed focused growth in PDAs. Knowledge-sector jobs (such as information technology companies, legal or engineering firms, and biotechnology firms) are expected to grow based on current concentrations, specialization, and past growth as well as transit services and access. Population-based jobs (such as retail, stores, or restaurants) are expected to grow in a manner reflecting the distribution of future household growth. All other jobs (such as government, agriculture and manufacturing) are expected to grow according to the existing distribution of jobs in each of these sectors.
- **Housing Distribution:** The strategy for locating new housing begins with local plans at the county, city, and PDA levels. Housing growth in each place was then adjusted to ensure that regional goals were advanced based on five regional growth factors: (1) level of transit service, (2) vehicle-miles traveled per household, (3) employment by 2040, (4) low-wage workers commuting from outside each place, and (5) housing value.

Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
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**Item 1-4 of Appendix I**

**DEIR pages i through iii, & pages 3.1-3 through 3.1-5**

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## Approach to Assessing Alternatives

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### MITIGATION MEASURES

Mitigation measures, as identified for the proposed Plan in *Part Two: Settings, Impacts, and Mitigation Measures* of this EIR, would apply to all alternatives other than the No Project, since the No Project alternative would not include adoption of a new plan. The No Project alternative is assumed to implement existing regulations. Projects taking advantage of CEQA Streamlining provisions of SB 375 can and should apply the mitigation measures described in *Part Two*, as feasible, to address site-specific conditions. However, MTC/ABAG cannot require local implementing agencies to adopt mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore this EIR finds that it cannot be ensured that this mitigation measures would be implemented in all cases, and therefore, many impacts would remain significant. Where existing regulatory requirements (i.e., for hazards or water resources) or permitting requirements exist (i.e., for biological resources), it is assumed that since these regulations are law and binding on responsible agencies and project sponsors, it is reasonable to determine that they would be implemented, thereby reducing impacts to less than significant where relevant.

### MODELING

See *Chapter 1.2: Overview of the Proposed Plan Bay Area* for a detailed overview of the modeling methodology.

#### Travel Demand Forecasting Model – Travel Model One

The MTC travel demand model, Travel Model One, is a regional activity-based travel model for the San Francisco Bay Area. This model produced all of the key outputs used in assessing the significance of transportation impacts for all alternatives, including outputs such as vehicle miles traveled, vehicle hours of delay, and accessibility, as well as other outputs such as volume to capacity ratios and level of service.

#### Land Use Forecasting Model – UrbanSim

ABAG developed regional control totals—forecasted numbers of households and employed residents—for the time period between 2010 and 2040, as described in *Chapter 1.2*. UrbanSim, the regional land use forecasting model, relied upon these regional control totals as model inputs. Based on the assumed levels of household and job growth in the region, UrbanSim analyzed the impact of specific policy inputs for each of the alternatives, such as zoning, fees, incentives, and growth boundaries, on the regional development pattern.

Subsequently, GIS raster data was developed by MTC using UrbanSim land use outputs, including the forecast location of new jobs and housing throughout the region for each alternative. Due to modeling constraints, adjustments were made to the proposed Plan model outputs to better reflect the land use pattern of the proposed Plan, which went through an extensive planning process involving refinements by local jurisdictions.

Adjustments were not made for the other alternatives given that they did not have the same degree of pre-defined land use outcome targets (alternatives are defined by policy inputs, as described above).

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Using these data, urbanized land footprints were developed for each alternative<sup>1</sup> and land use impacts were analyzed using the parcel dataset.

Detailed information on modeling processes, including adjustments and outputs, is included in the Summary of Predicted Land Use Responses supplemental document, released in March 2013. This data and other documents can be obtained from the MTC/ABAG Library, or from OneBayArea website at [onebayarea.org](http://onebayarea.org).

### Integration of Travel Model One and UrbanSim

In order to appropriately consider the symbiotic relationship of transportation and land use, Travel Model One and UrbanSim are unified in an integrated model framework. This allowed for analysis of how transportation projects affect the surrounding land use pattern, as well as how changes to household and employment locations affect transportation demand. See *Chapter 1.2: Overview of the Proposed Plan Bay Area* for more detail on this process.

For calculations relying on outputs from Travel Model One and population totals (i.e., per capita VMT or per capita energy use), model-simulated population levels were used to ensure consistency. Simulated population may be slightly different than overall population forecasts for the proposed Plan and alternatives due to slight variability in modeling tools. Further clarification on this issue is in the Plan Bay Area EIR technical appendices.

### References

The Summary of Predicted Traveler Responses and Summary of Predicted Land Use Responses supplemental documents, released in March 2013, provide detail regarding the modeling assumptions and outputs for Plan Bay Area. Raster land use data development is outlined in an appendix to the Summary of Predicted Land Use Responses. MTC and ABAG also have a large body of detailed published documentation regarding the integrated travel demand and land use model. This data and other documents can be obtained from the OneBayArea website at [onebayarea.org](http://onebayarea.org).

## Alternatives Analyzed in this EIR

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This EIR evaluates the No Project alternative as required by CEQA, as well as three other alternatives refined through the scoping process. The descriptions of the alternatives are provided below, followed by an analysis that compares the environmental impacts of each alternative to the proposed Plan. A complete listing of projects by alternative is provided in Appendix C.

Consistent with the Notice of Preparation (NOP) of this EIR, the alternatives are listed and referred to in the following order:

1. No Project alternative,

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<sup>1</sup> Future urbanized footprints apply a density threshold of 4 households per acre and 10 jobs per acre to the 2040 growth areas.

Part Three: Alternative and CEQA-Required Conclusions  
Chapter 3.1: Alternatives to the Proposed Plan

2. Alternative 2: Proposed Plan,
3. Alternative 3: Transit Priority Focus,
4. Alternative 4: Enhanced Network of Communities, and
5. Alternative 5: Environment, Equity and Jobs.

Descriptions of the key policies of each alternative follow, emphasizing where they deviate from the proposed Plan.

### ALTERNATIVE 1: NO PROJECT

The No Project alternative represents the potential scenario if Plan Bay Area is not implemented. Under this alternative, no new regional policies would be implemented in order to influence local land use patterns and no uncommitted transportation investments would be made. The key elements of the No Project alternative that vary from the proposed Plan include the following:

- **Land Use Policies:** No new regional land use plan would be developed and no new policies would be implemented to influence the locations of housing and employment centers in the region. No new fees, subsidies, or land development incentives would be provided on the regional level. Urban growth boundaries would be assumed to expand at historical rates, allowing for additional development potential in greenfield locations.
- **Transportation Investments:** Projects and programs that are identified as “committed” in MTC Resolution 4006 Committed Projects and Programs Policy are included in this alternative – this is similar but not identical to the list of projects in Transportation 2035. The transportation network in this alternative would therefore not be equivalent to existing conditions. The committed projects and programs include transportation projects/programs that were sufficiently through the environmental review process as of May 2011 and had full funding plans in place. In addition, regional programs with executed contracts or funding already secured are considered committed and included in the No Project alternative, through the existing contract period for each program. However, Express Lane projects in MTC’s regional network are listed as committed but technically are uncommitted;<sup>2</sup> all of the MTC Network Express Lane projects are therefore excluded from the No Project alternative (VTA’s Express Lane Network is a fully committed project and included in every alternative).
- **Transportation Policies:** Tolls would remain the same as measured in constant year dollars. Parking prices would remain the same as measured in constant year dollars, and localized parking minimums would remain the same for new development.

### ALTERNATIVE 2: PROPOSED PLAN

Alternative 2, proposed as the Jobs-Housing Connection in the NOP, was selected by MTC and ABAG as the preferred plan option for Plan Bay Area, and is the proposed Plan evaluated throughout this EIR.

<sup>2</sup> The region’s two Express Lane networks—MTC’s regional network and VTA’s network—are each viewed as a project made up of individual project segments. Unless the entire network is fully funded and committed, the entire network, or “project”, is uncommitted. As a result, MTC’s Express Lane Network is an uncommitted project; VTA’s Express Lane Network is a fully committed project.

Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
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**DEIR pages 3.1-8 through 3.1-10**

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would still be legal, as per SB 375, based on the input of the EEJ stakeholders, this alternative would not reference TPPs, thus making it impossible for project sponsors to streamline. The modeling analysis for this alternative therefore did not include any benefits from CEQA streamlining to encourage development.

- **Transportation Investments:** This alternative seeks to strengthen public transit by significantly boosting service frequencies in most suburban and urban areas, other than on Muni, BART or Caltrain, and providing free transit passes to youth throughout the region. This alternative includes a reduced scope highway network which excludes all uncommitted road projects, other than maintenance projects, from the Transportation Investment Strategy. As with Alternative 1, the No Project alternative, all of the MTC Network Express Lane projects are excluded as they are considered uncommitted (VTA's Express Lane Network is a fully committed project and included in every alternative). As such, this alternative does not include the Regional Express Lanes Network, with the exception of committed projects.
- **Transportation Policies:** Most notably, this alternative includes the implementation of a vehicle miles traveled (VMT) tax to fund the expanded investments in public transit. This tax, assumed at a rate of one cent per mile on annual vehicle miles traveled within the region, would provide a substantial revenue source, while also discouraging residents from driving; exemptions from the tax would be provided for low-income households. Furthermore, the San Francisco-Oakland Bay Bridge would have an increased peak-period toll of \$8, consistent with Alternatives 3 and 4, providing additional revenue in the Transbay corridor.

**ALTERNATIVES COMPARISONS**

Table 3.1-1 provides an overview comparison of the land use policies, transportation investments, and transportation policies proposed in the five Plan Bay Area alternatives. The full list of which transportation projects are included in each alternative is provided in Appendix C.

**TABLE 3.1-1: POLICY MEASURE COMPARISON**

	<i>Alt 1 No Project</i>	<i>Alt 2 Proposed Plan</i>	<i>Alt 3 Transit Priority</i>	<i>Alt 4 Enhanced Net</i>	<i>Alt 5 Environment, Equity, and Jobs</i>
<b>LAND USE POLICIES</b>					
<b>Zoning</b>					
Existing General Plans	•				
PDA-Focused Growth		•		•	•
TPP-Focused Growth			•		•
<b>Growth Boundaries</b>					
Current Trends Continue	•				
Strict Boundaries		•	•	•	•
<b>Fees and Subsidies</b>					
No New Fees	•				
Subsidies for PDA Growth		•		•	

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Chapter 3.1: Alternatives to the Proposed Plan

**TABLE 3.1-1: POLICY MEASURE COMPARISON**

	<i>Alt 1 No Project</i>	<i>Alt 2 Proposed Plan</i>	<i>Alt 3 Transit Priority</i>	<i>Alt 4 Enhanced Net</i>	<i>Alt 5 Environment, Equity, and Jobs</i>
Subsidies for Urban Core			•		
Subsidies for PDA/TPP Opportunity Areas					•
Fee on High VMT Area			•		
<b>Incentives</b>					
None	•				
OneBayArea Grants		•	•	•	•
CEQA Streamlining		•	•	•	(see table note 1)
TPP Redevelopment		•	•		•
<b>TRANSPORTATION INVESTMENTS</b>					
<b>Road Network</b>					
Committed Projects Only	•				
Preferred		•		•	
Preferred w/ Reduced Express Lanes			•		
Preferred w/o Highway Expansion or Operational Projects					•
<b>Transit Network</b>					
Committed Projects Only	•				
Preferred		•		•	
Increased Funding for BART, AC Transit			•		
Additional Service for All Major Transit Operators other than Muni, BART or Caltrain					•
<b>Climate Initiatives</b>					
Regional Electric Vehicle Public Charger Network		•	•	•	•
Vehicle Buy-Back & Plug-In or Electric Vehicles Purchase Incentives		•	•	•	•
Car Sharing	•	•	•	•	•
Vanpool Incentives		•	•	•	•
Clean Vehicles Feebate		•	•	•	•

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**TABLE 3.1-1: POLICY MEASURE COMPARISON**

	<i>Alt 1 No Project</i>	<i>Alt 2 Proposed Plan</i>	<i>Alt 3 Transit Priority</i>	<i>Alt 4 Enhanced Net</i>	<i>Alt 5 Environment, Equity, and Jobs</i>
Program					
Smart Driving Strategy		•	•		•
Commuter Benefits Ordinance	•	•	•	•	•
<b>TRANSPORTATION POLICIES</b>					
<b>Road Pricing</b>					
None	•	•			
Higher Peak Toll on Bay Bridge			•	•	•
VMT Tax					•
<b>Parking Policies</b>					
Status Quo	•				
Reduced Minimums		•	•	•	•
1. Unlike Alternatives 3 and 4, Alternative 5 would discourage CEQA streamlining for TPP-eligible areas. While streamlining would still be legal, as per SB 375, based on the input of the EEJ stakeholders, the Plan would not reference TPPs, thus making it impossible for project sponsors to streamline.					

**Comparative Demographic Forecasts**

All of the alternatives, except for Alternative 4, are designed to accommodate the same population and employment in the year 2040 based on forecasts developed by ABAG, with varying locational distributions of growth.

Unlike all other alternatives, Alternative 4 has different levels of household and employment growth in the region. Compared to the proposed Plan, it includes four percent more households and one percent more jobs. This higher growth total reflects the Senate Bill 375 requirement to house the region’s entire population (i.e., provide a house for every household employed in the region).

Table 3.1-2 displays the differences in demographics between the various alternatives. As a result of the lower levels of transit infrastructure investment and more dispersed land use pattern under the No Project alternative, the share of households with zero cars is slightly lower than the proposed Plan (nine percent versus 11 percent). Otherwise, the other three alternatives have similar car ownership rates as compared to the proposed Plan.

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Part Three: Alternative and CEQA-Required Conclusions  
 Chapter 3.1: Alternatives to the Proposed Plan

**TABLE 3.1-2: BAY AREA DEMOGRAPHIC FORECASTS (2010-2040)**

	2010	2040 Plan (Alt 2)	2040 No Project (Alt 1)	% Difference from Proposed Plan	2040 Transit Priority Focus (Alt 3)	% Difference from Proposed Plan	2040 Enhanced Network of Communities (Alt 4)	% Difference from Proposed Plan	2040 Environment, Equity, and Jobs (Alt 5)	% Difference from Proposed Plan
Total Population	7,091,000	9,196,000	9,196,000	0%	9,196,000	0%	9,535,000	+4%	9,196,000	0%
Total Employment	3,385,000	4,505,000	4,505,000	0%	4,505,000	0%	4,550,000	+1%	4,505,000	0%
Employed Residents	3,269,000	4,350,000	4,350,000	0%	4,350,000	0%	4,513,000	+4%	4,350,000	0%
Total Households	2,608,000	3,308,000	3,308,000	0%	3,308,000	0%	3,431,000	+4%	3,308,000	0%
% of Households with Zero Autos	9%	11%	9%	N/A	10%	N/A	11%	N/A	10%	N/A
% of Households with One Auto	33%	33%	33%	N/A	33%	N/A	33%	N/A	33%	N/A
% of Households with Multiple Autos	58%	56%	58%	N/A	57%	N/A	57%	N/A	57%	N/A
Average Vehicles per Household	1.78	1.75	1.81	+3%	1.76	+1%	1.77	+1%	1.77	+1%

Sources: Association of Bay Area Governments, 2012; Metropolitan Transportation Commission Travel Forecasts, 2012

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**DEIR pages 2.2-1 & 2.2-12**

## 2.2 Air Quality

This section evaluates the regional air quality impacts of implementing the proposed Plan. The analysis focuses on the following criteria pollutants: (1) ground-level ozone precursor emissions, for which the Bay Area is currently designated as a non-attainment area under the national and state standards, (2) particulate matter (PM) emissions, for which the Bay Area is currently designated as non-attainment under the national and state standards; and (3) carbon monoxide emissions, for which the Bay Area is designated as attainment under the national standard. It also evaluates criteria pollutants and Toxic Air Contaminants (TACs) from construction activity and local and regional emissions of TACs and fine particulate matter (PM<sub>2.5</sub>).

This EIR examines these at a regional level. However, for TACs and PM<sub>2.5</sub> a localized analysis is provided to identify potential public health impacts from locating new sensitive receptors within Transit Priority Project (TPPs) areas. The EIR does not examine the effects on local or regional air quality from specific land use and transportation improvements in the proposed Plan.

The related issues of greenhouse gas emissions and potential climate change effects are addressed separately in *Chapter 2.5: Climate Change and Greenhouse Gases* of this EIR.

## Environmental Setting

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### PHYSICAL SETTING

Air quality is affected by the rate, amount, and location of pollutant emissions, and the associated meteorological conditions that influence pollutant movement and dispersal. Atmospheric conditions, including wind speed, wind direction, and air temperature, in combination with local surface topography (i.e., geographic features such as mountains and valleys), determine the effect of air pollutant emissions on local and regional air quality.

### Climate, Meteorology, and Topography

The Bay Area region has a Mediterranean climate characterized by wet winters and dry summers. Rainfall totals can vary widely over a short distance, with windward coastal mountain areas receiving over 40 inches of rain, while leeward areas receive about 15 inches. During rainy periods, horizontal and vertical air movement ensures rapid pollutant dispersal. Rain also washes out particulate and other pollutants.

Normally, air temperatures decrease with increasing elevations. Sometimes this normal pattern is inverted, with warmer air aloft, and cool air trapped near the earth's surface. This phenomenon occurs in all seasons. In summer, especially when wind speeds are very low, a strong inversion will trap air

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Public Review Draft Environmental Impact Report

air pollutant emissions projected for a RTP/SCS are within the emissions limits (“budgets”) established by the SIP.

Conformity requires demonstration that transportation control measures (TCMs) in ozone nonattainment areas are implemented in a timely fashion. TCMs are expected to be given funding priority and to be implemented on schedule and, in the case of any delays, any obstacles to implementation have been or are being overcome. A total of 33 TCMs have been fully implemented since the 1982 Bay Area Air Quality Plan; 12 TCMs were originally listed in the 1982 Bay Area Air Quality Plan, 16 additional TCMs were adopted by MTC in February 1990 in response to a 1990 lawsuit in the federal District Court to bring the region back on the “Reasonable Further Progress” track, and five TCMs were adopted as part of the 2001 1-Hour Ozone Attainment Plan. These TCMs include strategies such as improved transit service and transit coordination, ridesharing services and new carpool lanes, signal timing, freeway incident management, and increased gas taxes and bridge tolls to encourage use of alternatives modes.

MTC must make a determination that the proposed Plan conforms to the SIP and is consistent with the applicable air quality attainment plans. The transportation conformity analysis and findings prepared by MTC for the proposed Plan are addressed in a separate process from the Plan Bay Area environmental review process, and are included as a Supplemental Report to Plan Bay Area that is available for review at [www.onebayarea.org](http://www.onebayarea.org).

## State Regulations

### **California Clean Air Act**

The California Clean Air Act (CCAA) of 1988 requires nonattainment areas to achieve and maintain the state ambient air quality standards by the earliest practicable date and local air districts to develop plans for attaining the state ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide standards. The ARB sets the state ambient air quality standards.

Under the CCAA, areas not in compliance with the standard must prepare plans to reduce ozone. Non-compliance with the state ozone standard does not impact the ability to proceed with any transportation plan, program, or project. The first Bay Area Clean Air Plan (CAP) was adopted in 1991, and updates to the CAP have occurred since then, with the most recent being the *Bay Area 2010 Clean Air Plan*. The Bay Area 2010 CAP provides “all feasible measures” to reduce ozone in the Bay Area.

### **Senate Bill 656 (Chapter 738, Statutes of 2003)**

In 2003, the Legislature enacted Senate Bill (SB) 656 (Chapter 738, Statutes of 2003), codified as Health and Safety Code Section 39614, to reduce public exposure to PM<sub>10</sub> and PM<sub>2.5</sub>. SB 656 requires ARB, in consultation with local air pollution control and air quality management districts (air districts), to develop and adopt, by January 1, 2005, a list of the most readily available, feasible, and cost-effective control measures that could be employed by ARB and the air districts to reduce PM<sub>10</sub> and PM<sub>2.5</sub> (collectively referred to as PM). The legislation establishes a process for achieving near-term reductions in PM throughout California ahead of federally required deadlines for PM<sub>2.5</sub>, and provides new direction on PM reductions in those areas not subject to federal requirements for PM. Measures adopted as part of SB 656 will complement and support those required for federal PM<sub>2.5</sub> attainment plans, as well as for State ozone plans. This will ensure continuing focus on PM reduction and progress towards attaining California’s more health protective standards. This list of air district control measures was adopted by the ARB on

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these emissions. This disproportionate effect in CARE communities would result in a potentially significant impact.

## IMPACTS AND MITIGATION MEASURES

### Impact

#### 2.2-1(a) Implementation of the proposed Plan could conflict with or obstruct implementation of the primary goals of an applicable air quality plan.

The region's most recent ozone plan, the Bay Area 2010 Clean Air Plan (2010 CAP), prepared by BAAQMD, was developed in response to ozone planning requirement in the California Health and Safety Code. The 2010 CAP set forth a control strategy that includes control measures to reduce emissions and atmospheric concentrations of ozone and its precursors, PM<sub>2.5</sub>, key toxic air contaminants, as well as the "Kyoto 6" greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride).<sup>13</sup>

The primary goals of the 2010 CAP are to improve Bay Area air quality and protect public health. The control strategy in the 2010 CAP recognizes the need to reduce motor vehicle travel and emissions by integrating transportation, land use, and air quality planning. Cleaner fuels and improved emission controls have substantially reduced emissions from mobile sources in recent decades. However, growth in motor vehicle use (as measured in VMT on both a per capita and an absolute basis) has offset some of the benefit of the improved emission controls. This increase in VMT has been caused or facilitated by dispersed development patterns that result in people being dependent on motor vehicles for all types of trips and activities, in addition to increases that are the result of population and job growth. Therefore, the 2010 CAP recognizes the need to encourage future population and job growth in areas that are well served by transit and where mixed-use communities provide jobs, housing, and retail in close proximity.

Key themes embedded in the 2010 CAP include:

- The need to reduce motor vehicle emissions by driving cleaner, driving smarter, and driving less;
- Reducing per capita VMT and promoting policies that enable families to choose reduce their motor vehicle ownership;
- Designing communities where people can walk, bike, or use transit on a convenient basis; and
- Ensuring that focused growth in priority areas is planned and designed so as to protect people from both existing sources and new sources of emissions.

Consistent with the 2010 CAP, the proposed Plan is based on the goals of reducing emissions of greenhouse gases from the transportation sector, reducing VMT on a per capita basis, and focusing growth in areas that are well-served by transit and existing infrastructure.

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<sup>13</sup> The 2010 Clean Air Plan prepared by BAAQMD can be found here:  
<http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx>

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**Pages 1 through 3 of  
State Housing Element Law**

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**STATE HOUSING ELEMENT LAW****Overview**

State law requires each city and county to adopt a general plan containing at least seven mandatory elements including housing. Unlike the other general plan elements, the housing element, required to be updated every five to six years, is subject to detailed statutory requirements and mandatory review by a State agency, the California Department of Housing and Community Development (Department). Housing elements have been mandatory portions of local general plans since 1969. This reflects the statutory recognition that housing is a matter of statewide importance and cooperation between government and the private sector is critical to attainment of the State's housing goals. The availability of an adequate supply of housing affordable to workers, families, and seniors is critical to the State's long-term economic competitiveness and the quality of life for all Californians.

Housing element law requires local governments to adequately plan to meet their existing and projected housing needs including their share of the regional housing need. Housing element law is the State's primary market-based strategy to increase housing supply, affordability and choice. The law recognizes that in order for the private sector to adequately address housing needs and demand, local governments must adopt land-use plans and regulatory schemes that provide opportunities for, and do not unduly constrain, housing development.

The housing element process begins with the Department allocating a region's share of the statewide housing need to the appropriate Councils of Governments (COG) based on Department of Finance population projections and regional population forecasts used in preparing regional transportation plans. The COG develops a Regional Housing Need Plan (RHNP) allocating the region's share of the statewide need to the cities and counties within the region. The RHNP is required to promote the following objectives to:

- (1) Increase the housing supply and the mix of housing types, tenure, and affordability in all cities and counties within the region in an equitable manner;
- (2) Promote infill development and socioeconomic equity, the protection of environmental and agricultural resources, and the encouragement of efficient development patterns; and
- (3) Promote an improved intraregional relationship between jobs and housing.

Housing element law recognizes the most critical decisions regarding housing development occur at the local level within the context of the periodically updated general plan. The housing element component of the general plan requires local governments to

## State Housing Element Law

### Page 2

balance the need for growth, including the need for additional housing, against other competing local interests. Housing element law promotes the State's interest in encouraging open markets and providing opportunities for the private sector to address the State's housing demand, while leaving the ultimate decision about how and where to plan for growth at the regional and local levels. While land-use planning is fundamentally a local issue, the availability of housing is a matter of statewide importance. Housing element law and the RHNP process requires local governments to be accountable for ensuring that projected housing needs can be accommodated. The process maintains local control over where and what type of development should occur in local communities while providing the opportunity for the private sector to meet market demand.

In general, a housing element must at least include the following components:

#### **A Housing Needs Assessment:**

- Existing Needs - The number of households overpaying for housing, living in overcrowded conditions, or with special housing needs (e.g., the elderly, large families, homeless), the number of housing units in need of repair, and assisted affordable units at-risk of converting to market-rate.
- Projected Needs - The city or county's share of the regional housing need as established in the RHNP prepared by the COG. The allocation establishes the number of new units needed, by income category, to accommodate expected population growth over the planning period of the housing element. The RHNP provides a benchmark for evaluating the adequacy of local zoning and regulatory actions to ensure each local government is providing sufficient appropriately designated land and opportunities for housing development to address population growth and job generation.

#### **A Sites Inventory and Analysis:**

The element must include a detailed land inventory and analysis including a site specific inventory listing properties, zoning and general plan designation, size and existing uses; a general analysis of environmental constraints and the availability of infrastructure, and evaluation of the suitability, availability and realistic development capacity of sites to accommodate the jurisdiction's share of the regional housing need by income level. If the analysis does not demonstrate adequate sites, appropriately zoned to meet the jurisdictions share of the regional housing need, by income level, the element must include a program to provide the needed sites including providing zoning that allows owner-occupied and rental multifamily uses "by-right" with minimum densities and development standards that allow at least 16 units per site for sites.

**State Housing Element Law**  
**Page 3**

 **An Analysis of Constraints on Housing:**

- Governmental - Includes land-use controls, fees and exactions, on- and off-site improvement requirements, building codes and their enforcement, permit and processing procedures, and potential constraints on the development or improvement of housing for persons with disabilities.

 **Housing Programs**

Programs are required to identify adequate sites to accommodate the locality's share of the regional housing need; assist in the development of housing for extremely low, lower- and moderate-income households; remove or mitigate governmental constraints; conserve and improve the existing affordable housing stock; promote equal housing opportunity; and preserve the at-risk units identified.

 **Quantified Objectives**

Estimates the maximum number of units, by income level, to be constructed, rehabilitated, and conserved over the planning period of the element.

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**Final Regional Housing Need Allocation to be  
Released Summer 2013**

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## Final Regional Housing Need Allocation to be Released Summer 2013

### Background:

State law recognizes the vital role local governments play in the supply and affordability of housing. Each local government in California is required to adopt a Housing Element as part of its General Plan that shows how the community plans to meet the existing and projected housing needs of people at all income levels.

### Highlights:

- ABAG Executive Board adopts Final RHNA Methodology
- ABAG releases Draft RHNA numbers
- RHNA Schedule

The Regional Housing Need Allocation (RHNA) is the state-mandated process to identify the total number of housing units (by affordability level) that each jurisdiction must accommodate in its Housing Element. As part of this process, the California Department of Housing and Community Development (HCD) identifies the total housing need for the San Francisco Bay Area for an eight-year period (in this cycle, from 2014 to 2022). ABAG and MTC must then develop a methodology to distribute this need to local governments in a manner that is consistent with the development pattern included in the Sustainable Communities Strategy (SCS). Once a local government has received its final RHNA, it must revise its Housing Element to show how it plans to accommodate its portion of the region's housing need.

As part of the RHNA process, local jurisdictions within a county have the opportunity to form a subregion to develop their own methodology and carry out their own allocation process. For the 2014-2022 RHNA, subregions were formed in Napa, San Mateo, and Solano Counties.

### Process:

ABAG and MTC have sought to engage local jurisdictions, stakeholders, and members of the public throughout the process of developing the RHNA. In January 2011, ABAG and MTC convened the SCS Housing Methodology Committee, comprised of local elected officials, staff and stakeholders from throughout the region, to advise staff on developing the RHNA methodology. Between January 2011 and April 2012, the committee met almost every month to deliberate about how best to allocate the region's housing need to jurisdictions and ensure consistency between RHNA and the SCS.

In addition, public participation is encouraged throughout the process of developing the RHNA, especially at public meetings and during official public comment periods following the release of discussion documents and board decisions. The major milestones of the RHNA process are outlined in the 2014-2022 RHNA / SCS Schedule. The key steps are described in more detail below.

### Key Milestones:

In February 2012, HCD provided ABAG with its determination of total regional housing need. HCD indicated that Bay Area jurisdictions must plan for 187,990 units between 2014-2022.

In May 2012, the ABAG Executive Board approved the draft RHNA methodology and a draft share of the region's total housing need for each of the subregions. Release of the draft methodology initiated a 60-day comment period, including a public hearing on June 6, 2012, for ABAG to receive comments about the methodology.

In July 2012, the ABAG Executive Board adopted the final RHNA methodology and released draft allocations.

Release of the draft allocations on July 20, 2012 initiated a 60-day period in which a local jurisdiction could request a revision to its RHNA. By the September deadline, ABAG received revision requests from 14 jurisdictions. None of the revision requests were granted.

Local jurisdictions that requested a revision had until February 2013 to appeal ABAG's decision in response to the revision request. Eight jurisdictions submitted appeals. ABAG's Executive Board has formed an ad hoc committee to hear the appeals and provide its recommended actions to the Executive Board. The Appeals Committee will hold a public hearing to hear the appeals on April 1, 2013.

### Next Steps:

- April 1, 2013 - RHNA Appeal Committee considers appeals submitted by local jurisdictions
- June 2013 - ABAG issues final RHNA allocation
- July 18, 2013 - ABAG adopts final RHNA allocation
- December 2014 - Local governments adopt housing element revisions

### Staff Contacts:

Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
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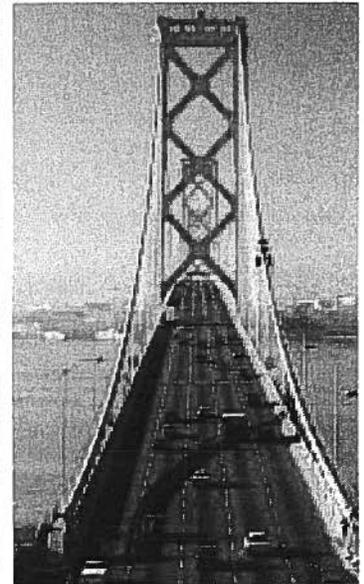
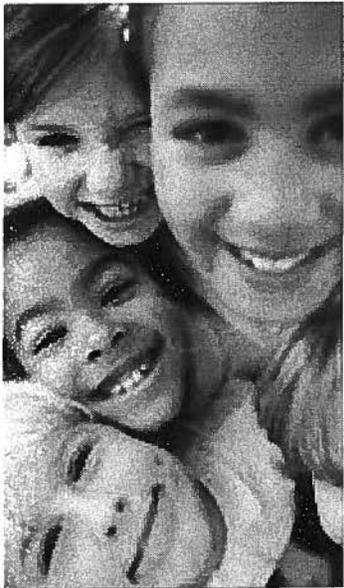
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**of**

**Smart Growth Strategy, October 2002.**

Smart  
art Growth Strategy Regional Livability Footprint Project

Shaping the Future of the Nine-County Bay Area



*Briefing Book for Public Workshop Participants and Other Bay Area Residents*

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# Creating Vision

## SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

*Energized by an abundance of INNOVATIVE IDEAS,  
the Smart Growth Strategy/Regional Livability Footprint Project  
harnessed the commitment and creativity of our diverse population  
to both VISUALIZE and chart a course for a BETTER FUTURE*

### YEARS IN THE MAKING: CREATING THE VISION

In the waning months of the 20th century, a number of visionary Bay Area leaders began looking ahead to the next century: to what life will be like in the coming decades when an expected 1 million more residents and 1 million more jobs are added to this burgeoning region. In the face of the growing pains we face today — lack of affordable housing, crowded roadways and shrinking open space — they began envisioning where everyone will live and work in 2020. How will we maintain the region's beauty, natural resources, diversity and quality of life if the current growth pattern of spreading ever outward continues?

Is it possible, they asked, to change the course of current growth: to find ways for the Bay Area to accommodate its expanding population, provide adequate housing, improve transportation, and at the same time protect the environment and preserve open space?

A tall order indeed. Challenged by the impending need and inspired by new styles of development, committed Bay Area citizens and organizations joined with local and regional government agencies to undertake the task of investigating if and how the Bay Area can grow smarter.

The investigation began in 1999, when the Bay Area's five regional agencies<sup>1</sup> — those responsible for transportation planning, environmental protection and regional planning — came together to promote and nurture seeds of "smart growth" that were cropping up throughout the region. At the same time, the Bay Area Alliance for Sustainable Development, a coalition of 40 organizations representing business, the environment, social equity and government, embarked on an ambitious effort to develop public consensus and support for a "regional livability footprint," that is, a

preferred land-use pattern that could direct the Bay Area to a more sustainable future. In 2000, the regional Bay Area Alliance combined their outreach effort with the Smart Growth Strategy/Regional Livability Footprint Project.

Over the next two years, elected officials, business leaders, environmentalists, social equity advocates, analysts, mapmakers, agency representatives and citizens devoted thousands of hours to the project. They met, planned, debated, generated ideas, drew projections and analyzed outcomes. More than 2,000 people from throughout the region attended daylong Safer Growth Workshops held in each of the Bay Area's nine counties in spring 2002. Participants conceptualized how future growth should occur in their individual neighborhoods and in the region as a whole.

Never in the history of the Bay Area have so many organizations and agencies joined forces to solve the region's problems. Unlike prior attempts to develop regional growth plans, this project was organized from the start around the widespread support that was essential. In addition to a high level of commitment from the private sector and local and regional agencies, the involvement of local communities was essential. The interest, creative ideas and participation by people from Gilroy to Guerneville, and from Pacifica to Pleasanton, provided a solid base that enables the region to move forward with confidence and direction.

<sup>1</sup>Association of Bay Area Governments (ABAG), Metropolitan Transportation Commission (MTC), Bay Area Air Quality Management District, Bay Area Council on Development, and Regional Water Quality Control Board.



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SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

WORKSHOP PROCESS

broadened its reach in the fall of 2001, when more residents participated in Saturday workshops held in nine counties. Some came in their professional capacities as officials, planners, developers and environmental equity advocates. Others came as representatives of neighborhood groups or out of concern for their children's future. A mix of diverse interests made for lively discussions and decisions about the pace, character and shape of development in our communities. Using large maps of their county, participants identified promising locations for various types of development. Their suggestions were then fed into a special program that illustrated the impacts of decisions on housing supply, open space, transit accessibility and quality of livability, and allowed participants to adjust accordingly.

The workshop produced up to a dozen schemes for managing future growth in a smarter way, with a cumulative 100 countywide scenarios for the Bay Area. The project team combed through the proposals, searching for common threads and ultimately distilling them into three smart growth alternatives for the region (see box at near top right). The team then invited planning officials and business, labor and social equity leaders from throughout the nine counties to review the draft alternatives. Based on their input and discussion, the team made revisions to the draft to better reflect local ideas and concerns.

Each of the three different visions of a future Bay Area, each of the alternatives promoted the goals of smart growth. Each alternative sought to provide for the million new residents expected by 2020, to support workers who otherwise would commute from distant counties. Each allowed for expected economic growth at the same time, by channeling growth into a more balanced development pattern, consumed less land than is currently projected.

THE SMART GROWTH ALTERNATIVES

The **Central Cities** alternative located compact, walkable, mixed-use and mixed-income development in the region's urban cores (San Francisco, Oakland and San Jose) and in each county's largest city or cities. It also emphasized growth around existing public transit stations and avoided development in outlying areas by concentrating growth in dense, vibrant cities.

The **Network of Neighborhoods** alternative called for development in many of the same locations as the first alternative, but at lower densities. Additional compact, walkable, mixed-use and mixed-income development took place in other existing communities, along an expanded public transit network and on major corridors. This alternative envisioned a rail renaissance, with new and old stations surrounded by a range of diverse types of housing, jobs and services.

The **Smarter Suburbs** alternative proposed compact, walkable, mixed-use and mixed-income development in many of the same places as the first and second alternatives, but at still lower densities. Additional growth occurred at the region's edges at higher densities than the current norm and with a better balance of jobs and housing than is typical of existing or planned new suburbs.

Each of these three alternatives represented a departure from the "current trends base case," a term coined to describe the region's future growth if nothing is done to chart a new course. The base case fails to provide sufficient housing for an increased population and workforce, resulting in continued rapid growth in outlying areas, increased long-distance commuting and further environmental degradation. It envisions development focused in edge communities, with residential areas largely segregated from other uses and continued reliance on the automobile as the primary mode of travel.



PROJECT GOALS

Create a smart growth vision for the Bay Area that minimizes sprawl, provides affordable housing, improves mobility, protects environmental quality and preserves open space.

Identify and advocate for regulatory changes needed to achieve these objectives.

Develop 20-year long-range transportation plans based on the vision and impact of the new infrastructure investments in the Metropolitan Transportation Commission and other partners.

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SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

The three alternatives were put to the test to see how they measured up in terms of promoting a livable and sustainable lifestyle in the Bay Area circa 2020. An extensive analysis examined the impacts of each on the environment, transportation, housing, jobs/housing balance and social equity.

The analysis further estimated the feasibility of each scenario, as well as the incentives, regulatory changes and other public policy changes identified by workshop participants that would be needed to make any smart growth process a reality.

**Alternatives Report**

In the spring of 2002, a comprehensive *Alternatives Report* describing the three smart growth strategies was published, thus heralding the start of a second round of county-level public forums. More than 1,000 residents, the majority of them new to the process, attended the Saturday sessions held in April and May. At each Round Two county workshop, participants voted on one alternative as the starting point for further fine-tuning. They then developed and agreed on guidelines for modifying their choice, and with the aid of county maps, adjusted this alternative to bring it closer to their vision of their particular county's future.

**Regionwide Vision**

Following the Round Two workshops, the nine countywide alternatives were stitched together to create a single regionwide smart growth land-use vision. The regionwide vision incorporates the choices and decisions made by participants in the nine county workshops. It reflects their selections of mixed, matched and changed alternative growth scenarios appropriate for each county.

The resulting portrait of the Bay Area's future shows a *pattern* of growth that, by and large, looks like Alternative 2, the Network of Neighborhoods. The *amount* of growth, however, varies quite a bit from county to county. The regionwide map depicts higher densities in major urban areas and a proliferation of compact, mixed-use and mixed-income neighborhoods along transit corridors, particularly near transit stations, as well as in town centers and in a handful of peripheral areas. This pattern of growth is far from a "cookie cutter" overlay of development on the region, however,

and the smart growth scenario clearly shows how the housing and job growth varies from county to county. This reflects the vision of workshop participants who in some cases chose to reduce development foreseen under Alternatives 1 and 2, while participants in other counties increased it.

In August 2002, the project steering committee (composed of locally elected officials who sit on the boards of the various agencies) adopted an illustrative, written description of the smart growth vision of workshop participants. In subsequent action, they accepted the specific patterns of growth projections that workshop participants had identified for each county as a starting point for ABAG as they develop a policy-based (rather than a scenario-based) set of 20-year jobs/housing projections for the region.

**NEXT STEPS**

In fall and winter 2002, local jurisdictions and other agencies adopted these smart growth policy-based projections as their own. In early 2003, the ABAG Executive Board will consider and approve these alternative projections. If adopted, they will form the backbone of the Metropolitan Transportation Commission's *2004 Regional Transportation Plan*, the document that outlines transportation investments in the region for years 2004 through 2012, as well as the Bay Area Air Quality Management District's plans and other regional plans.

To build on the momentum that has been generated in the Bay Area for the Smart Growth Strategy/Regional Livability Footprint Project, an ongoing public education and outreach campaign will be spearheaded by the Bay Area Sustainable Development Council.

Undoubtedly, the biggest challenge facing the project is to enact the fiscal incentives and regulatory changes needed to make smart growth more than a good idea. ABAG, working together with the other regional agencies, the Bay Area Sustainable Development Council and local governments throughout the region to pursue needed policy changes. It will take time to achieve these goals, but the path has been laid out, and a critical mass of Bay Area residents believes it is time to begin.

**Biggest challenge to enact FISCAL INCENTIVES & REGULATORY CHANGES to make smart growth an a good idea.**

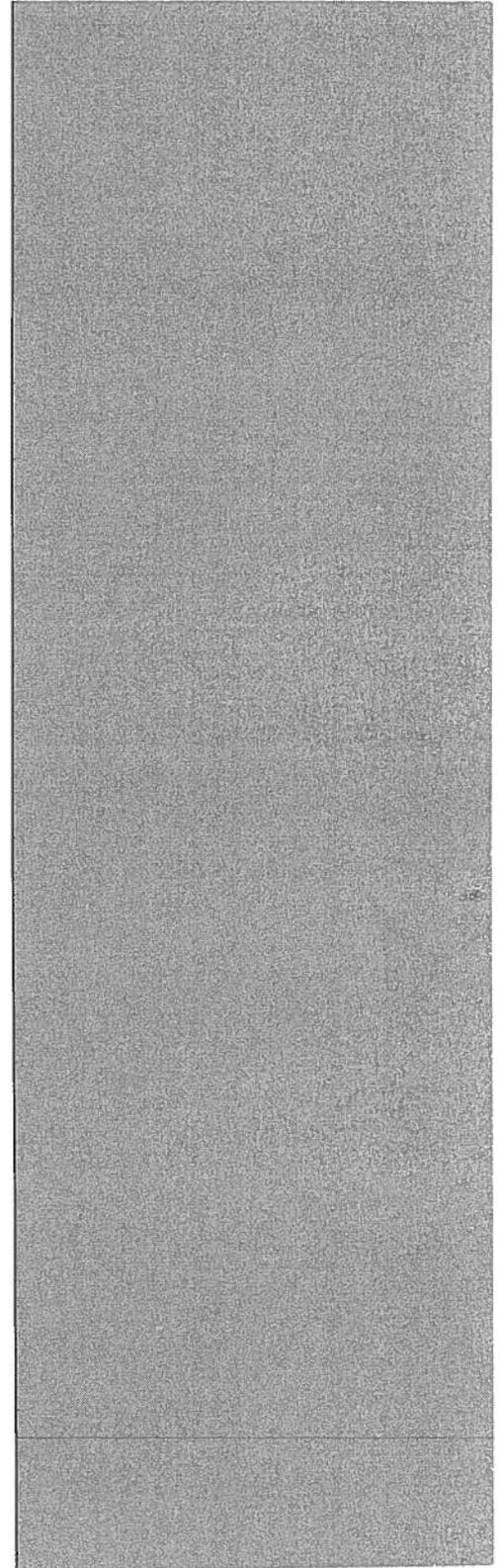
**CALL-OUTS**

See map at the back of the report which indicates the types and locations of future development identified by workshop participants, as well as areas to be preserved as open space and agricultural lands.

**Key Update.** Central to the smart growth process are the incentives and regulatory changes needed to get there, discussed on pages 13-18 and in the callouts on the front cover of this report.

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# MAKING VISION REALITY: POLICIES AND REGULATORY CHANGE



SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

## INCENTIVES AND REGULATORY CHANGE

As participants in the smart growth workshops realized, envisioning a smart growth future is far simpler than the task of making it a reality. To build a smarter future for the Bay Area, we will need to change our tax system, our regulations on land use and the criteria we use for distributing state and federal funds. Indeed, we must change the “carrots and sticks” that shape land-use decisions by localities, neighborhoods and private developers.

Altering decades of fiscal and regulatory tradition will require a major shift in thinking and the creation of new inducements for smarter development patterns.

Local governments already have policy options they can use to promote and implement smart growth projects, but the state and federal government need to institute new incentives and regulatory changes to encourage local governments — as well as developers, neighborhood groups and others — to move ahead in developing smarter communities. Meanwhile, the Bay Area’s regional agencies can help create a more conducive environment by adopting new policies and strengthening existing ones that promote smart growth.

As workshop participants confronted the challenges of initiating change, they proffered hundreds of ideas on how to cultivate smart growth projects that are emerging in various parts of the Bay Area and to propagate them throughout the region.

Listed below are brief descriptions of some of the kinds of legislative incentives and regulatory changes that could help achieve smart growth objectives. They were suggested by Smart Growth/Footprint Project participants, but are only examples. They have not been approved by the project steering committee nor by any participating stakeholder groups. Each and every incentive and regulatory change on these pages would involve trade-offs that must be thoroughly considered before any are pursued.

**Objective 1: Stimulate housing construction and promote permanently affordable housing.**

### **Remove disincentives to providing housing.**

The state constitution could be amended to protect locally levied taxes from being reallocated. Under state Proposition 13 and subsequent taxpayer-sponsored initiatives, including Proposition 218, local governments have lost much of their control over tax rates and expenditure of public funds to the governor and the Legislature. If local governments were given back their share of property taxes, they would look more favorably upon new housing as a source of revenue to pay for necessary services, such as schools, fire, police, libraries and parks.

### **Fund neighborhood-level planning to provide certainty in development review process.**

Specific plans that cover multiple development projects in a focused area can allow cities to define appropriate types of construction before a developer commits to a particular site. This process gives certainty to developers when they reach the development review process, thus encouraging desired development. New state and regional grants could help local planners prepare such plans and environmental documents for mixed-use, infill and transit-oriented projects and could link such funds to a commitment to build needed housing.

### **Provide incentives to promote housing affordable to the region’s workforce.**

Local governments can offer incentives to nonprofit and for-profit developers to create permanently affordable housing by allowing higher densities than would be otherwise permitted, expediting the permitting process, and relaxing zoning standards. Parking requirements for housing near public transit, for example, can be reduced, because residents and workers in dense neighborhoods near transit tend to own fewer cars.

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SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

**INCENTIVES**

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nities ommission has tripled nunities program, from rogram funds pedestrian- nts, and includes a sepa- transit-oriented housing.

Inclusionary zoning laws require new housing developments to include a certain percentage of units (usually 10 percent to 20 percent) that is affordable to very low-, low- and moderate-income residents. Although some feel that such policies unfairly burden buyers of market-rate units in the same development, San Francisco, East Palo Alto, Union City, Dublin, Danville, Richmond, Napa, Petaluma, Santa Rosa and several cities in Marin County have adopted such requirements.

Many communities also have adopted jobs/housing linkage fees that require all new job-generating projects to pay a fee toward the development of affordable housing. Although some feel that these fees unfairly penalize businesses producing new jobs, many communities have already adopted them, including San Francisco, Menlo Park, Cupertino, Pleasanton, Livermore and Napa. Sonoma County is considering a countywide program.

**Objective 2: Improve urban infrastructure**

**Create a stable revenue stream for local governments (e.g., return of property taxes).**

During the 1990s, the state shifted approximately \$3 billion of local property taxes annually from local governments to the Educational Revenue Augmentation Fund (ERAF), which supports public schools. The loss of property tax revenue — a trend exacerbated by the difficulty of establishing new revenue sources — has caused many communities to rely primarily on development fees and retail sales taxes to fund local services. Unlike property taxes, these revenue streams can fluctuate widely from year to year, making long-term budgeting and planning difficult for local governments. Returning ERAF funds to local governments and restoring state support of public schools through other means could help reduce local reliance on fees and sales taxes and provide a more stable revenue stream for local governments.

*Parking requirements for housing NEAR PUBLIC TRANSIT can be **reduced** because residents and workers in dense neighborhoods near transit tend to own **FEWER CARS.***

The inside front pocket of this report contains a more detailed summary of specific legislative changes being pursued by the Smart Growth Strategy/ Regional Livability Footprint Project. A description of these legislative efforts also is available online at: [www.abag.ca.gov/planning/smartgrowth](http://www.abag.ca.gov/planning/smartgrowth).

SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

**Prioritize infrastructure funds for smart growth infill projects.**

The state could demonstrate support for smart growth by prioritizing funds to help improve and replace existing infrastructure facilities — new roads, sewer lines and other utilities — in already urbanized areas.

**Provide state funds for cleanup of brownfields and to limit liability for contamination.**

The state could provide fiscal incentives for cleanup of old industrial “brownfield” sites — contaminated properties — that are suitable for new uses, particularly for housing. Developers also would be more inclined to develop on such sites if limits were set on their liability for prior contamination. As an inducement to develop on contaminated infill sites, some local governments like Emeryville already post on their city’s website the location of vacant parcels and their soils analysis.

**Subsidize infrastructure for water recycling to ensure adequate water supply.**

Subsidies for construction of separate irrigation systems would encourage use of recycled water for nonpotable uses. Similarly, price differentials for fresh versus recycled water would promote greater use of recycled water for golf courses and the like.

**Link funding for new schools to smart growth criteria, such as: locating in neighborhood centers to promote pedestrian and bicycle access; designing for after-hours use as community centers; and building smaller scale structures to maximize proportion of nearby students.**

Schools, both new and renovated, that also function as community centers give vitality to neighborhoods during non-school hours, while providing needed gathering places. School districts can be rewarded for developing joint community facilities in connection with new neighborhood schools.

**Reward local governments for enacting smart building codes that allow retention of historic character while ensuring public safety.**

The state can offer incentives to local governments that adopt building codes that allow and encourage retention of historic aspects of their communities. Creating flexible regulations while maintaining safety takes creativity on the part of planners and building officials.

**Objective 3: Avoid displacement of existing residents and businesses.**

**Require that the existing stock of affordable housing be maintained.**

Housing trust or bond funds can provide funding for existing affordable housing developments in danger of losing subsidies or tax-exempt status.

**Create programs and regulations that promote living-wage jobs and services in low-income communities.**

By setting a minimum wage that can support a full-time worker, the state could help foster stable communities. In addition, aggressive job training and economic development programs can be fostered by the state in low-income communities to create better job and entrepreneurial opportunities for local residents. Merchants can be encouraged to locate grocery, clothing, hardware and other types of stores and services in low-income neighborhoods to enable local residents to work, shop and generate income in their own communities.

**Create programs to allow local public employees to live in the communities in which they work.**

State or regional funds could be used to offer housing subsidies or income tax credits to employees who live close to their workplaces. Many local governments already provide such subsidies to teachers, police officers and firefighters.

SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

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**Streamline the California Environmental Quality Act (CEQA) process for specific kinds of development.**

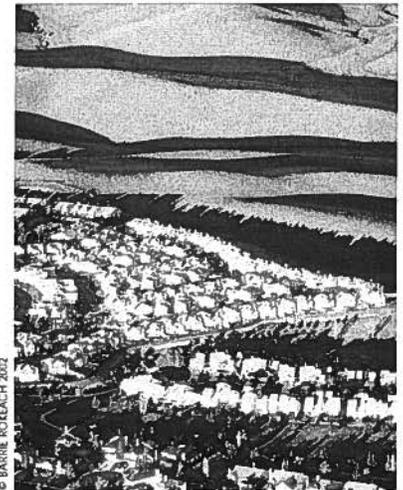
Although transit-oriented and mixed-use projects can increase local congestion by attracting more people and cars to an area, such projects can allow more residents to commute on public transit and run more errands in the surrounding neighborhood on foot. Although some workshop participants were nervous about discussing any changes to CEQA, others proposed exempting these projects from CEQA altogether or only from currently required traffic analyses. A similar exemption already exists for low-income housing projects of 100 units or less.

**Provide incentives that encourage mixed-use, compact, transit-oriented, infill development.**

Local governments can encourage developers to create attractive new neighborhoods near public transit, with narrow streets, landscaping and other amenities that invite walking and bicycling. Congestion management agencies can work with local jurisdictions in updating their general plans to reflect more transit-supportive land uses along the transit network and can include those new land-use scenarios in countywide transportation plans. State financial rewards for such development can help local governments, developers and others overcome biases toward single-use, spread-out developments that favor automobile use.

**Provide increased funding to improve the safety, reliability and convenience of transportation alternatives such as rail, bus, ferry, bicycling and walking.**

The Bay Area plans to spend 77 percent of all transportation funds over the next 25 years on public transit. This will help attract new riders. Only when it becomes easier, safer and more reliable to ride a bus, ferry or rail line than to drive a car will the choice be a viable one. Likewise, when the safety of pedestrian and bicycle pathways is assured, more people will opt to walk or bike to their destinations and leave their cars at home.



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*In addition to  
protecting our  
remaining OPEN SPACE,  
growth boundaries  
help maintain the  
VITALITY  
of cities.*

SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

**Provide tax bonuses to cities that approve compact, mixed-use development near public transit, perhaps in designated “smart growth zones.”**

“Smart growth zones” can be created in communities that reshape their land-use policies and meet smart growth criteria, in return for which they will receive tax incentives, grants, loans and technical assistance from the state for planning and environmental review.

**Use parking pricing and availability to encourage use of transportation alternatives.**

Free parking can serve as a disincentive to using alternatives to the single-occupant vehicle. Meanwhile, some places have such high demand for parking that people are willing to pay a fee, generating funds that could be used to improve public transit. Cities also can institute parking ceilings that limit the amount of parking in new developments.

### INNOVATIVE BAY AREA AFFORDABLE HOUSING PROGRAMS

Already, Bay Area communities have created programs to spur affordable housing development. Here are some examples:

**Housing Trust Funds** The Housing Trust of Santa Clara County is a unique public/private partnership that has raised over \$20 million, two-thirds of it from the private sector, and the remainder from public agencies including Santa Clara County and each of the 15 cities in the county, to provide first-time homebuyer assistance for 800 families, create affordable rental housing for 3,000 families, and build transitional and permanent housing for the homeless.

**Flexible Zoning** The city of San Jose provides for flexible zoning with its Discretionary Alternate Use policies such as density bonuses and the use of city-owned surplus land for affordable housing developments.

**Farm Worker Housing** Recently-passed state legislation — backed by the Napa Valley Vintners Association — allows Napa County to levy an annual fee on planted vineyards to provide and maintain housing for farm workers. Vineyard property owners who provide housing for their workers are exempted from the fee.

**Bonds** In 1996, San Franciscans passed a \$100 million general obligation bond to create and preserve 2,400 affordable homes. Building on this success, voters will decide on a \$250 million bond measure in November 2002. If passed, three-quarters of the money will fund affordable rental housing, with the balance assisting families buying their first home.

**Inclusionary Zoning** The city of Petaluma program requires 10 percent to 15 percent affordable homes in both rental and for-sale housing developments of five homes or more. Working with developers, Petaluma has created 1,400 affordable homes for lower and moderate income households since 1984.

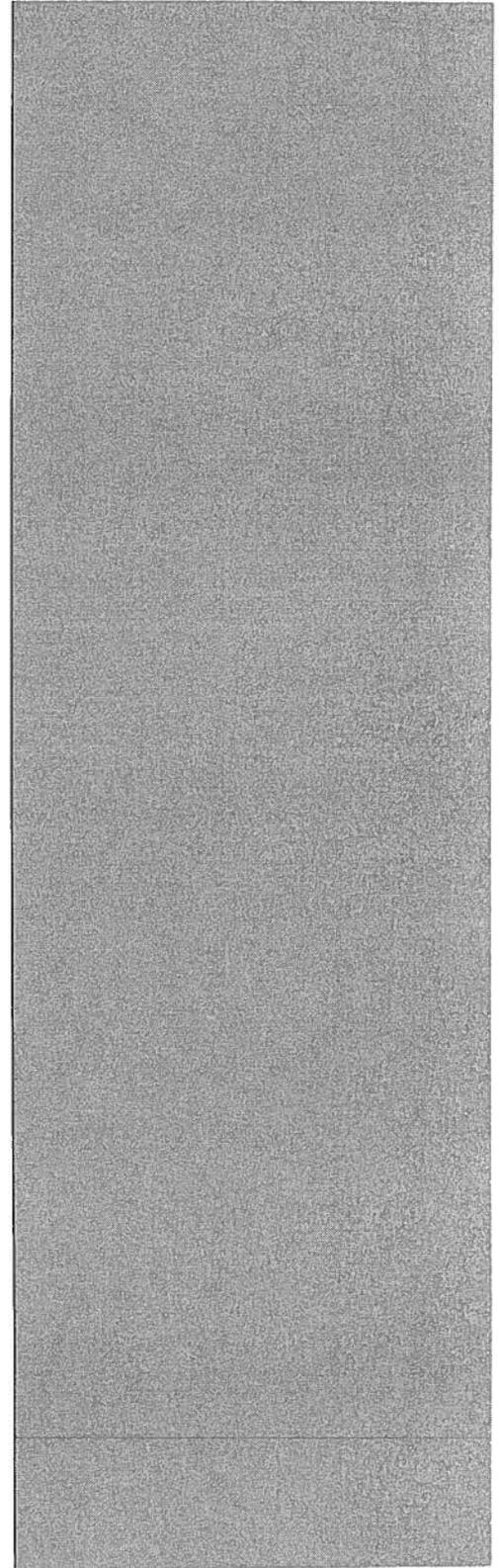
**Redevelopment Agency Commitments** Oakland, San Francisco, San Jose and Santa Clara are raising the proportion of their redevelopment funds dedicated to affordable housing.

**Location Efficient Mortgages (LEMs)** These are special mortgages for housing in convenient, transit-rich neighborhoods where data show members of typical households drive less and spend less on transportation. Available through a demonstration project in the Bay Area, LEMs allow households to qualify for larger mortgages by taking reduced automobile expenses into consideration.

**Jobs/Housing Linkage Programs** Sonoma County and cities within the county are taking the first steps toward adopting a countywide linkage program that would require new developments to contribute funding for affordable housing. This could generate as much \$35 million over the next five years, which could be combined with other funding sources to build 1,200 affordable homes.

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# THE VISION UP CLOSE: AN ANALYSIS OF ONE SMART GROWTH SCENARIO



## SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

**ANALYSIS OF ONE SMART GROWTH SCENARIO**

This chapter summarizes the quantitative analysis of the specific smart growth land-use scenario developed by participants in county workshops in 2001 and 2002. The analysis provides an objective comparison of this smart growth scenario to the “current trends base case,” i.e., the pattern of land use that is likely to occur if we do nothing to chart a new course.

Although this chapter analyzes the specific land-use scenario developed by workshop participants, there are innumerable ways to accomplish smart growth in the Bay Area. The analysis explores one possible model of a smart growth future for the Bay Area.

**ENVIRONMENT****Greenfield Development**

If the Bay Area continues to grow as it has in the recent past, 83,000 acres of “greenfields” (i.e., currently undeveloped land) could be converted to urban use by 2020. Amounting to an 11 percent increase in the urbanized Bay Area, this acreage is more than twice the area of San Francisco and will erode farmland, greenbelts, community separators and other open spaces.

Moreover, the current trends base case would not provide nearly enough housing within the nine Bay Area counties for the number of workers expected by 2020. Therefore, the housing that would need to be built outside the Bay Area to accommodate in-commuters might require as many as 45,000 additional acres, assuming today’s average densities in surrounding counties.

By contrast, the smart growth land-use scenario would increase the urbanized footprint of the Bay Area by less than 16,000 acres, or 2 percent. It provides significantly more housing for new residents, but at the same time, saves highly prized open space and agricultural land — both within the Bay Area and in outlying areas such as the fertile Central Valley — by calling for compact, mixed-use communities that are close to transit lines and employment centers.

**Air Quality**

Loss of greenfields is not the only way that future development will impact the environment, both within the region’s borders and beyond. Although a much cleaner vehicle fleet is improving air quality regardless of development patterns, air quality will suffer or improve, depending on how the Bay Area grows. All things being equal, the more that residents, workers and others depend on single-occupant vehicles, the more difficult it will be to improve our air quality. Bay Area households make approximately ten trips a day, on average, and 82 percent of these are by car. Dense, walkable neighborhoods invite residents to shop and do errands on foot, potentially reducing travel by car. When these communities are centered around public transit services that can transport residents to more distant jobs and other destinations, the air quality benefits are multiplied.

Under current growth trends, a continued Bay Area housing shortfall will require up to 265,000 workers (and their families) to live in outlying areas and commute to jobs within the region. These people will commute long distances, primarily in single-occupant vehicles.

The smart growth scenario, on the other hand, provides enough transit-accessible housing within the region to accommodate Bay Area workers who otherwise would have to live in distant towns and commute from afar. Providing more housing in the region — built in transit-rich, walkable neighborhoods — is expected to result in about the same air quality within the Bay Area as the base case, even while accommodating these additional households.

SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

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Water utilities and engineers are constantly searching for new sources for the region, and continually monitoring and conserving our water supply is a way of life in the Bay Area.

Smart growth can't change the fact that each new job or household requires water to serve it. In fact, with the interconnected nature of the state's water system, new development just about anywhere in California affects the same overall water supply.

But smart growth can help communities minimize water use. In the Bay Area, new development in cooler areas near the Bay requires less water than new development in hotter inland areas. The combination of compact development and more townhouses, condominiums and apartments also reduces water demand by calling for less landscaping.

Currently, each residential unit in the Bay Area uses an average of 300 gallons of water per day. Under the base case, this rate is likely to continue for new development; it might even increase since new development is projected to be primarily in hotter inland areas and to be composed of single-family homes. The smart growth scenario developed by workshop participants emphasizes development in cooler, Bay-side parts of the region, and in multi-family units. This combination of changes is expected to result in a 17 percent reduction in water consumption — down to an average 250 gallons a day — in new housing units.

**Future Research**

The case study at left begins a discussion about the relationship between smart growth and water demand. Future work is needed to estimate the change in demand as a result of smarter growth patterns and future pipeline and storage requirements throughout the region. Work also is needed to identify the specific regulatory changes and incentives needed — such as funding for infrastructure to allow widespread use of recycled water for nonpotable use — to promote water conservation and increase supplies.

**SMART GROWTH PROJECTIONS**

The land-use scenario developed by workshop participants shows specific numbers of new housing units and jobs — as well as the types and locations of new development and areas to be protected as open space and agricultural land. The same information also is being used by ABAG as the *starting point* for a new set of regionwide, policy-based growth projections.

The specifics of the smart growth scenario analyzed in this chapter may change in the future as ABAG seeks public comment and input from local governments in the process of developing these policy-based projections. (Please see project website for review opportunities: [www.abag.ca.gov/planning/smartgrowth](http://www.abag.ca.gov/planning/smartgrowth).) It also is important to recognize that a series of incentives and regulatory changes, such as those discussed beginning on page 13, are critical variables in estimating an alternative future.

## SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

## TRANSPORTATION

Most of the Bay Area, like many U.S. metropolitan regions, grew after World War II with spread-out communities of housing, stores and offices segregated from each other; developers and officials assumed that people would drive from place to place. Today, only about a quarter of the region's residences and a third of its jobs are within convenient walking distance of a rail station or bus stop with frequent service. Since little new development is expected in already-developed areas, if current trends continue, these figures are likely to shrink.

In contrast, under the smart growth scenario, fully half of all new development would be near frequent public transit service. This dramatic improvement reflects a common theme of the smart growth scenario: New development in compact, mixed-use communities near high-quality public transportation.

A comprehensive analysis of the three smart growth alternatives arising out of the first round of workshops, conducted by the Metropolitan Transportation Commission (MTC), projected that all three alternatives would result in more people riding transit, walking and bicycling to their destinations than would the base case growth scenario. (See Alternatives Report, pp. 10-11). Based on this earlier analysis, MTC estimates that the land-use pattern in the final smart growth scenario developed by workshop participants also would encourage more residents to walk, bicycle or take transit to work than the base case.

How can the smart growth scenario — which houses many more workers within the region than the base case — allow people to travel less by car? By locating more jobs and housing where many short trips can be made on foot and longer ones by transit. If current trends continue, there will be no change from today in the percentage of trips using public transportation. Under the smart growth scenario, MTC estimates the number of public transit riders to increase by one third over current levels.

### Congestion

MTC further estimates that the total number of vehicle miles traveled in the smart growth scenario — both for work trips and total trips — would be only slightly higher than in the base case despite the fact that it provides housing for a quarter million more residents than the base case. Furthermore, average commute speeds are expected to be about the same as in the base case, indicating that peak hour traffic would not be any worse. However, localized traffic congestion could worsen in areas with intensive new infill development.

### Auto Ownership

With many more people riding transit, bicycling and walking, does this mean that households in this smart growth future will own fewer cars? Typically, there is a strong correlation between household income and auto ownership and the amount of travel by automobile. Since the smart growth scenario calls for a tremendous amount of new housing affordable to very low- and low-income families, it follows that more Bay Area residents would be riding public transit as a result of income alone. (Note: There are some important Bay Area exceptions to this rule of thumb. In some of today's densest and most upscale neighborhoods, many households rely on public transit, despite being able to afford owning and operating a car.)

In order to isolate the effect of smart growth on public transit ridership, MTC's analysis assumes a distribution of household income regionwide similar to that expected in the current trends base case.

Using this assumption, MTC finds a significant increase in the proportion of households with zero automobiles, in contrast to the base case in which the number and share of households with no automobiles is expected to decrease over the next two decades. This, again, reflects the large numbers of new housing units and jobs in central areas, well served by public transit, that are included in the smart growth scenario.

SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

modest units, and wealthier households outbid everyone else for housing originally built for middle-income residents.

From 1988 to 1998, the Bay Area produced 251,000 housing units — enough for 375,000 workers — while the number of jobs increased by nearly 500,000, forcing thousands of workers and their families to seek housing outside the region. Of these units, only about 100,000 were affordable for very low-, low- and moderate-income families, while almost twice that many units were needed for these segments of the population.

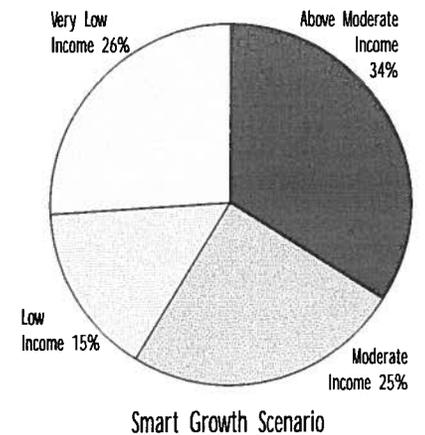
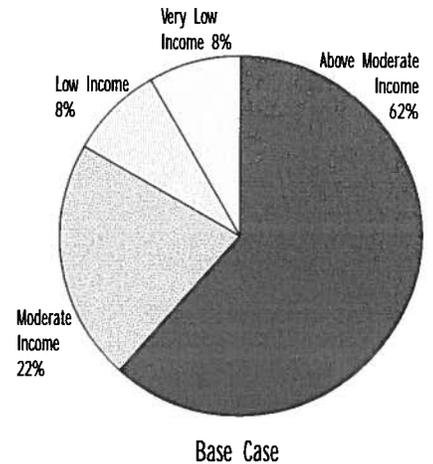
An increase in the total supply of housing, including apartments, condominiums, and rental and owner-occupied houses, is critical for the economic stability and overall well-being of the region. Involvement of both for-profit and nonprofit homebuilders in the smart growth process is vital to determining how to increase the production and affordability of housing. Without government assistance and subsidies, however, housing affordable to low- and very low-income households likely will remain unobtainable.

The smart growth scenario developed by workshop participants calls for construction over the next 20 years of 340,000 more housing units than the base case. This alternative growth scenario also greatly increases the proportion of new housing affordable to very low- and low-income households — 41 percent — far outpacing current trends in affordable housing production. In recent years, the Bay Area averaged only 23,000 new housing units per year, with 16 percent of them affordable to lower income families.

To meet the housing goals of smart growth workshop participants, new incentives and regulatory changes will be needed to counteract existing forces that discourage local governments and developers from supporting or building residential, mixed-use and compact development. In addition, special incentives will be needed to provide the levels of very low- and low-income housing envisioned by participants.

<sup>1</sup> "Cost of Land Drives Home Prices," *San Jose Mercury News*, August 4, 2002.

AFFORDABILITY OF NEW HOUSING UNITS



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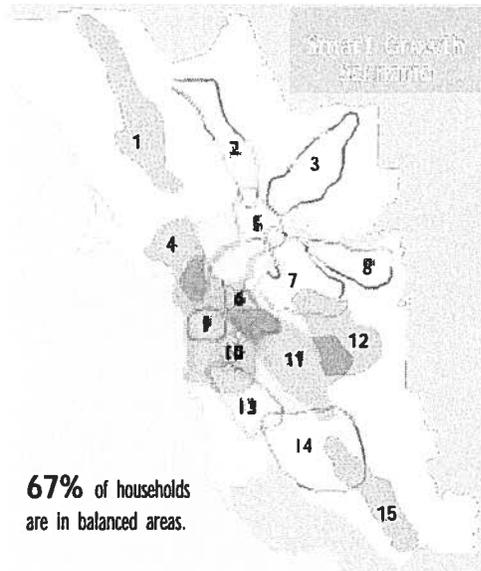
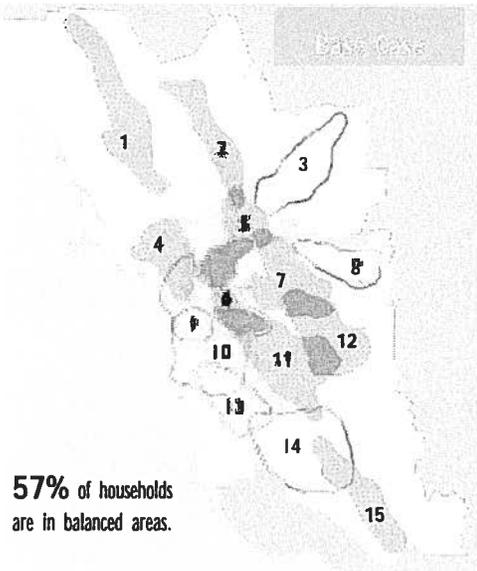
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	\$63,800

al wages for the five Bay Area PMSAs (calculated to 2001); BAE

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SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

**HOUSEHOLDS IN AREAS WITH JOBS/HOUSING BALANCE**  
by key commute corridors



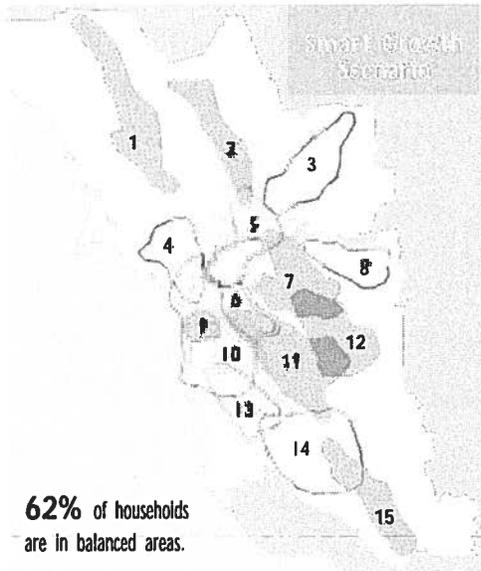
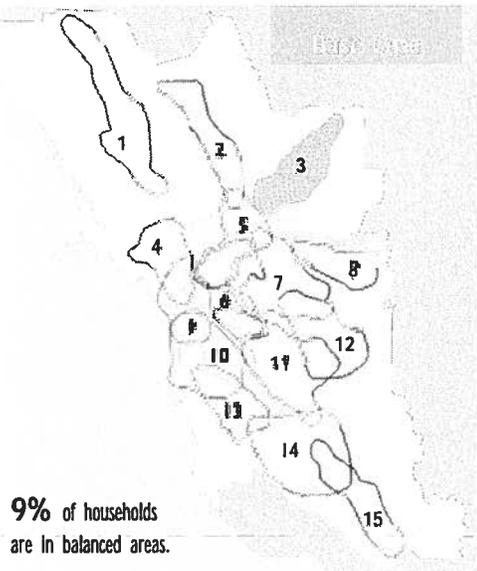
**MAPS**

These maps illustrate 15 key corridors or commute areas around the Bay Area. The maps at the top compare total units of housing to total jobs in the year 2020 in each of the commute areas. Under the smart growth scenario, an impressive 67 percent of Bay Area households would be in areas with a balance of workers and jobs (assuming 1.5 workers per household). By comparison, under the base case (which perpetuates current growth patterns) only 57 percent of households would be in balanced areas.

The second pair of maps looks at the match between the pay scales of new jobs and the cost of new housing in each area. The differences here are more stark, with the smart growth scenario providing a match of new housing costs and local incomes for 62 percent of new households, while the base case achieves such a match in just 9 percent of households.

Areas where at least 85 percent of households are in balance/match are coded blue.

**HOUSEHOLDS IN AREAS WITH NEW JOB PAY MATCHED TO NEW HOUSING COST**  
by key commute corridors



SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

nine of the 15 analysis areas — accounting for just 57 percent of Bay Area residents — in 2020. The base case’s strong job growth without companion housing growth to support it is responsible for this low number.

By contrast, the smart growth scenario would result in a total balance of jobs and housing for 67 percent of Bay Area households. Almost 20 percent more people would live in a “balanced” area under the smart growth scenario than under the base case because of the greater proximity of new housing to employment centers and increased interest in mixed-use development.

**Focusing on New Growth**

Another school of thought contends that striving for a total balance of jobs and housing is neither realistic nor advisable. Given that current Bay Area residents already have their jobs and homes, proponents of this line of thinking suggest that it is more important to try to balance job and housing growth only in new development.

Looking at the relationship between new jobs and housing also makes it possible to add another dimension to the analysis: jobs/housing match. An analysis of match considers how the cost of new housing available in each area compares to the pay scales of new jobs in the same area. Such an analysis is not meaningful when assessing total jobs and housing supply, since the Bay Area’s current housing prices preclude a match between housing costs and incomes in most markets. But it is possible to see whether the projected incomes from new local jobs would be high enough to allow new workers and their families to afford new nearby housing.

Under current trends, there would be a very poor match between future jobs and housing. Development, under the current trends base case would lead to a match of new housing costs and local incomes in just one analysis area, accounting for only 9 percent of the total household growth projected under the base case.

Under the smart growth scenario, the picture improves dramatically. There would be an acceptable match of new jobs and new housing in seven of the analysis areas, incorporating 62 percent of all new households.

*Just 9 percent of  
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SMART GROWTH  
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## SOCIAL AND ECONOMIC EQUITY

Social equity within the smart growth framework means that people of all income levels have access to good schools and various types of employment. It means that low-income residents in particular benefit from new investment in their communities and have access to affordable housing and reliable transportation. Social equity gives all individuals access to economic opportunities, mitigates displacement caused by rapidly increasing housing costs, and promotes active engagement and participation by all residents in community planning efforts.

Under both the current trends base case and the smart growth scenario, the Bay Area's population and job growth will present challenges and opportunities for lower income communities, and for making housing, services and employment available to residents of impoverished neighborhoods throughout the region. Smart growth strategies have the potential to reduce some of the current inequities in these areas. If not managed well, however, smart growth could trigger changes that disrupt communities and lead to increased displacement, and more economic and social isolation.

To assess these issues, growth envisioned under the smart growth scenario in impoverished communities throughout the Bay Area was compared to growth expected in these neighborhoods if current trends continue. A community is considered impoverished if the median household income is less than 80 percent of the county median income. This analysis looks at a total of 38 such communities, which are spread throughout the nine-county Bay Area. (See map page 27.)

### Growth Patterns in Impoverished Communities

The population and job growth rates of Bay Area impoverished communities show major differences between the base case and the smart growth scenario, particularly in household growth.

Under the base case, the number of households in the region's most impoverished communities would grow by only 15 percent

through 2020, and employment by 24 percent. In contrast, the smart growth scenario envisions a 46 percent increase in housing — more than three times that of the base case — and a 32 percent increase in jobs by 2020.

If managed well, the sizable increases in household and job growth foreseen for impoverished areas would provide a significant opportunity to create healthy, diverse, mixed-income communities and give low-income residents access to quality affordable housing.

### Job Skill Level

Unless residents have needed job skills, however, providing more jobs in the region's impoverished communities will not help improve standards of living, even if wages are high enough to cover local housing costs. Over recent decades, there has been a decline in traditional high-paying manufacturing employment and a stronger focus on the information-based "new economy." In the next 20 years, most jobs commanding incomes sufficient to raise a family above the poverty level will continue to require high levels of education and job skills, regardless of the pattern in which growth occurs.

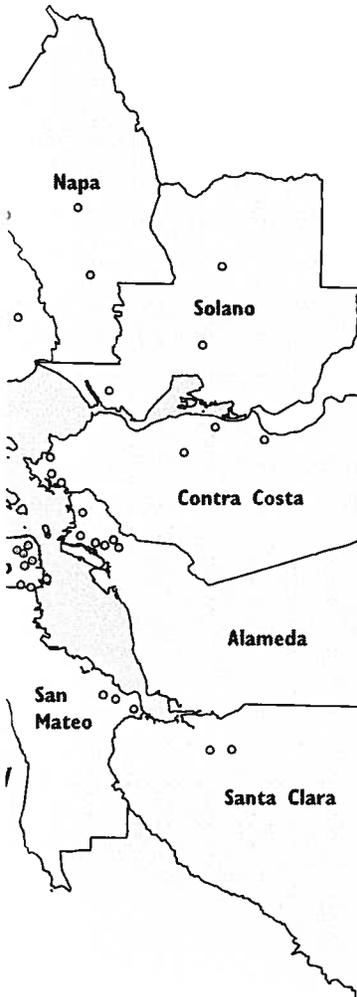
Local workers in impoverished communities may not qualify for new jobs in their areas without aggressive job training and economic development programs. Thus training and education must be part of any smart growth scenario.

### Commercial Services

The region's impoverished communities have far fewer retail establishments than their demographics would suggest they can support. The lack of retail stores means that more money than necessary leaves these neighborhoods; residents need to travel long distances to meet their basic shopping needs; and few local retail jobs and businesses are created as a result of residents' spending. Even in impoverished communities that are well-served by public transit, it is often difficult to carry groceries, take children to childcare and run other errands on the bus or train.



SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT



Under the base case, existing conditions in impoverished neighborhoods would change much less, creating little impetus for new retail development.

**Overcrowding**

The tight, expensive Bay Area housing market has forced two or more families to share housing units designed for a single family, particularly in the region's low-income neighborhoods.

Significant new housing construction in low-income communities, as foreseen in the smart growth scenario, can help to address this issue, provided that new units are offered at prices affordable to people living in overcrowded units in these neighborhoods.

The base case has less capability to address overcrowding since it includes far less new housing development in the region's most impoverished areas.

**Access**

The physical access of residents to employment and the larger region is another key issue in planning for equity. Even though impoverished communities are often traversed by major mass transit routes, many are currently lacking adequate transit service, especially during reverse commutes and off-peak hours. Poor transit accessibility can prevent lower income residents from reaching jobs for which they are qualified.

Increases in residential densities in impoverished communities would bring a potential increase in the number of transit riders and thus encourage bus and rail operators to add service in these areas. A concerted effort would be required to ensure more transportation options, since without them, impoverished communities will remain isolated, with potentially even more underserved residents.

*The base case offers significantly less opportunity for economic revitalization than the SMART GROWTH SCENARIO, AND could result in FURTHER STAGNATION of these communities.*

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## SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

**Displacement and Neighborhood Change**

As noted above, the substantial growth in the region's impoverished communities proposed in the smart growth scenario can lead to important new opportunities in housing, retail services and transit. But if this growth is not well managed, it could lead to displacement and instability. Lower income renters and businesses in neighborhoods that currently have relatively affordable building stock and access to downtown districts are the most likely to experience displacement as higher income renters and businesses move in. Programs to minimize displacement must be included in any smart growth scenario.

Much less growth would occur in low-income communities in the base case than in the smart growth scenario. Therefore, residents and businesses would feel less displacement pressure. At the same time, the base case offers significantly less opportunity for economic revitalization, and could result in further stagnation of these communities.

**Capitalizing on Change**

In order to capitalize on opportunities to revitalize lower income communities, while also discouraging displacement, the smart growth scenario relies on parallel strategies for reinvestment and affordability. Here are some of the policies that residents of these communities believe could help bring about needed improvements:

- Train and educate local residents to help them qualify for new, local jobs.
- Develop new jobs in low-income communities that are targeted to the current skill levels of local residents.
- Increase transit-oriented development and alternatives to single-occupant auto travel to improve access to new and existing jobs and services throughout the region.

- Provide new business opportunities in low-income neighborhoods targeted to local firms and residents.
- Build affordable housing throughout the region to avoid concentration in impoverished communities.
- Address current overcrowded conditions by giving existing residents priority for new units in a given neighborhood.
- Maintain affordability of existing housing through methods such as new financing for long-term subsidies set to expire soon.

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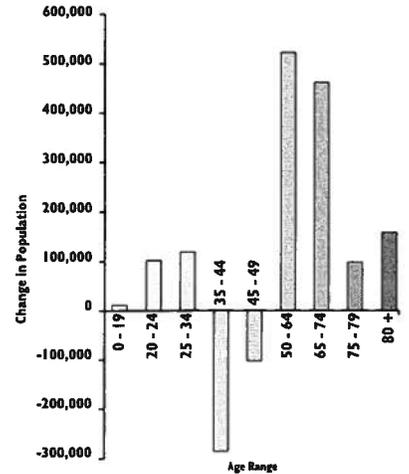
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questions. Would people in the Bay Area flock to multi-family and attached housing? Or will hordes of Bay Area commuters continue to migrate to the Central Valley in pursuit of the American dream of owning a single-family home with a big back yard?

In a 2000 survey, the Home Builders Association (HBA) of Northern California found that 43 percent of shoppers looking for a home in single-family subdivisions were “mainly considering a single-family home.”<sup>1</sup> Yet in the same survey, 42 percent of potential home buyers said they would be willing to buy a higher density, attached housing unit if it meant living near their work, and it cost no more than a conventional single-family home in an outlying area. This same interest in more compact housing types in exchange for a shorter commute has been found in studies conducted for downtown Oakland and downtown San Francisco, particularly among young, single workers and “empty nesters.”<sup>2</sup>

On a national level, too, acceptance of smart growth design principles, such as smaller lots and more compact development, is growing. One study of 2,000 buyers of both newly constructed and resale homes noted, “Often what buyers want is NOT what they get. One of the main reasons behind this is that they couldn’t find what they wanted in their markets.”<sup>3</sup> This study found that homebuyers wanted less sprawl and more “small town,” pedestrian-oriented shopping and gathering places.

Changes in the Bay Area’s demographics also may support the construction of more multi-family units. Household types, such as young singles, childless couples, “empty nesters” and the elderly, tend to be attracted to urban infill housing. These groups are expanding in the Bay Area, which is expected to undergo a dramatic change in its age composition in the next 20 years. As shown on the chart to the right, the 20- to 24-year-old and 55-and-over population groups together are expected to increase by over 1.2 million people in the next 20 years. Both have relatively high proportions of people who are interested in small units, senior and assisted housing, compact housing near workplaces and urban amenities, and other types of infill housing.



BAY AREA POPULATION CHANGE BY AGE GROUP (2000-2020)

*Changes in  
 the Bay Area's  
 DEMOGRAPHICS  
 will support the  
 construction  
 of more  
 MULTI-FAMILY  
 units.*

**SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT**

These trends, taken together, suggest that there could be increasing market demand for the types of housing foreseen in the smart growth scenario developed by workshop participants. As stated in a national study of future housing demand, "Since the driving force for the future is age-based growth of households that have largely completed child-rearing, the residential future of cities may well depend on how they appeal to people in life's later stages."<sup>4</sup>

**Available Land Supply**

During the Smart Growth Strategy/Regional Livability Footprint workshops, participants were encouraged to envision future Bay Area development patterns over a 20-year period without explicit regard for whether new development would fit on current vacant lands. Instead, participants placed development on lands they considered appropriate for either development or redevelopment over the next 20 years. But, since the smart growth scenario envisions a variety of building types in each place, many existing structures would be consistent with the vision of workshop participants.

An analysis of the smart growth scenario compared the proposed development patterns and densities desired by workshop participants in each planning area to the amount of vacant land, according to county assessor parcel data published by MetroScan. The goal of this "fit" analysis was to determine the number of acres that would need to be redeveloped to accommodate the smart growth scenario. The analysis assumed that new growth in each planning area would first occur on vacant land, and that other land in each planning area would be redeveloped to accommodate any remaining growth.

The "fit" analysis found that the smart growth scenario, depending on the density of development, would require the redevelopment of approximately 48,000 acres. By contrast the base case would require almost no redevelopment, since it presumes that most new growth will take place on currently undeveloped sites.

Redevelopment sites generally contain underutilized and older buildings. They typically occur along older transportation corridors, in obsolete industrial areas or on large surplus sites such as the Alameda Naval Air Station and San Francisco's Mission Bay.

Over the 20-year planning horizon, the redevelopment foreseen in the smart growth scenario would require about 2,400 acres per year. While this level of redevelopment is ambitious, it also may be quite feasible, given that redevelopment projects are common throughout the region and that it amounts to just 0.3 percent of currently urbanized land (or 5 percent over 20 years). However, it might exceed the capacity of the marketplace, and will likely face resistance in some areas from "NIMBYs" — proponents of Not In My Back Yard — who oppose change in their communities. Beginning on page 13, the Incentives chapter of this report discusses policies and regulatory changes that might help to address these issues.

**Financial Feasibility**

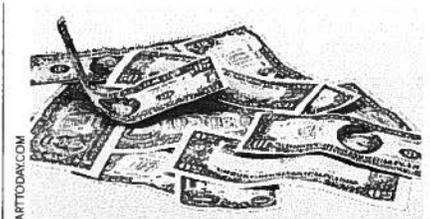
It will take more for smart growth to succeed than interested buyers and enough building sites. In order for developers to build compact, infill and transit-oriented development, it needs to be financially feasible. Both for-profit and nonprofit developers must make their projects "pencil out" if they are to build them. Government subsidies can help in some cases to make ends meet, but in the long run, infill development costs (including a reasonable profit) cannot exceed the rent or purchase price that future residents will be willing and able to pay.

The financial feasibility of new development in the region will vary substantially depending on a host of factors, including location, timing, national economic trends, local market conditions, land prices, construction costs, local regulations, and the financial requirements of developers and investors. Due to the complexity and variability of each of these factors, this analysis does not look at the financial returns of future development projects. However, all of the types of development in the smart

SMART GROWTH STRATEGY REGIONAL LIVABILITY FOOTPRINT PROJECT

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**The challenge**  
is to make **COMPACT,**  
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**Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
and Environmental Impact Report Plan Bay Area Draft, page**

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**Item 1-35 of Appendix I**

**Appendix D to DEIR,**

**Cover page, & pages D-1 & D-4**

## **Appendix D: Scoping Comments on Alternatives**

## Appendix D: Scoping Comments on Alternatives

This appendix documents the comments received on proposed alternative scenarios in response to the Notice of Preparation (NOP) for the EIR. The below tables summarize comments regarding definition of alternatives and information on why these suggestions were either included or not included for full evaluation in the EIR. General comments on methodology are not included.

### GENERAL COMMENTS ON ALTERNATIVES

<i>Topic</i>	<i>Comments</i>	<i>Response</i>
Pricing	Alternatives should avoid the usage of pricing or other policy levers. Each alternative should include the use of policy measures such as pricing. (separate comments)	The alternatives may include land use or transportation policies that are feasible and achieve the project objectives. Alternatives include a variety of road pricing and policy incentive options for local jurisdictions, including using none at all.
Alternative Planning Strategy	Given potential infeasibility of meeting GHG targets, consider an Alternative Planning Strategy (APS). Alternatives 3, 4 and 5 should be assessed within the context of an Alternative Planning Strategy and MTC should evaluate the need to environmentally clear these alternatives.	An APS was not considered as the proposed Plan, as well as Alternatives 3 and 5 can achieve the state assigned GHG targets. Because multiple alternatives meet the GHG targets an APS was not considered at this time. Also, an APS must only be developed for the Plan selected and adopted by MTC and ABAG, not every alternative, and only if that final Plan cannot achieve the GHG targets.
Growth Forecasts	Include an Alternative with lower rate of employment and residential growth, based on an assumption that the Bay Area and regional economy do not see a significant economic recovery. Make clear that all Alternatives (except Alternative 4) will be analyzed using the same growth forecasts, and demographic and economic forecasts for Alternative 4 should be provided. Alternatives should plan for the housing level in the Eliminate Inter-Regional Commute alternative.	All alternatives are based on the same regional forecasts for population and job growth. The forecasts are considered static, and each alternative considers various distributions of the projected growth. The exception of Alternative 4 accommodates a higher population by assuming no regional in-commute from outside counties, but uses the same baseline population and job growth projections otherwise.

Plan Bay Area 2040  
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**COMMENTS ON ALTERNATIVE 1 IN NOP – NO PROJECT**

<i>Topic</i>	<i>Comments</i>	<i>Response</i>
Role of PDAs	Concerns about how this varies from the "Preferred Scenario" if the PDAs have already been established, and in particular how the "No Project" could mean "No PDAs" if they are already established.	The No Project scenario is based on currently adopted general plans. If those general plans reflect a local government's desire to see growth in the PDAs then the PDAs are <i>de facto</i> in the No Project alternative. However, if PDAs have not been re-zoned to match their PDA designations, then the alternative does not assume they will be. The No Project alternative also does not include OBAG funding (which goes to PDAs), since this is not a committed funding source without implementation of the Plan.
RTP 2035	Alternative should be modified so that it is the implementation of the existing Regional Transportation Plan, Transportation 2035.	The transportation system in the No Project alternative consists of those projects that would go forward without another RTP or further environmental review. That would be the system in Transportation 2035, minus those projects that have not received funding, or have not received environmental clearance by May 1, 2011.
Scale of Development	Alternative should include limiting future development to either a few remaining developable lots and/or infill development within the current scale and character of the town [of Fairfax].	None of the alternatives assign specific land uses, designate future development at the parcel level, nor set the scale and character of future development. Such details are the responsibilities of local jurisdictions through their land use plans and zoning. The alternatives are determined by applying specific policy measures rather than by tweaking growth projections for individual cities.  For the No Project alternative, the UrbanSim model forecasts how future growth will likely distribute based on existing general plan policies and associated development regulations, plus some additional capacity from the expansion of urban growth boundaries based on historical trends.

**Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
and Environmental Impact Report Plan Bay Area Draft, page**

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**Item 1-36 of Appendix I**

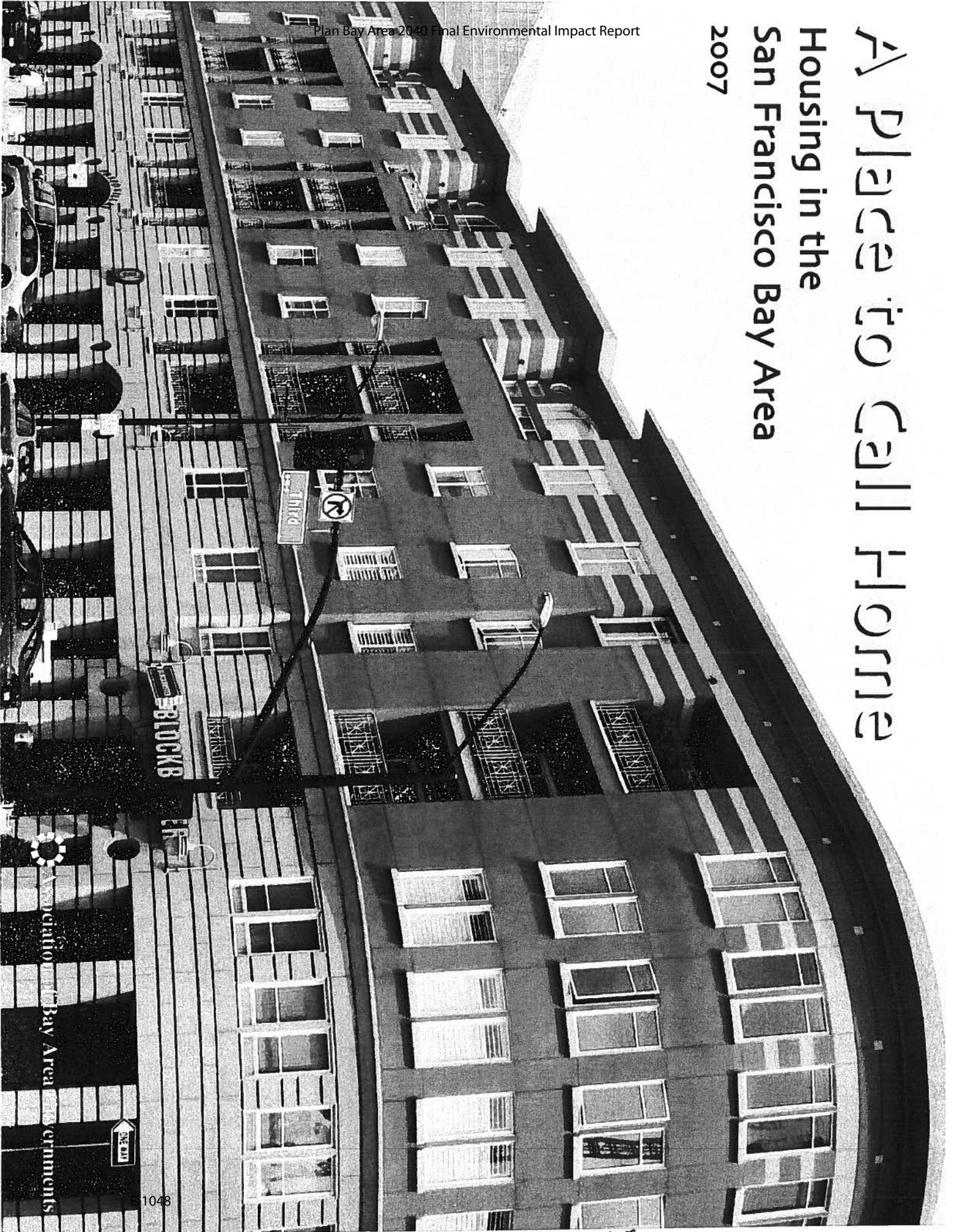
**A Place to Call Home,**

**Cover page, & pages 1, 3, 8 through 28, & 34**

# A Place to Call Home

## Housing in the San Francisco Bay Area

2007



# A Place to Call Home: Housing in the San Francisco Bay Area

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## The Emerging Consensus

After decades of development of auto-oriented communities, support is growing for more traditional styles of development. In particular, there is increased support for more compact communities near public transit that are not focused around the demands of the automobile. There is a growing demand for homes in areas that include jobs, shops, and services close to transit so that people can walk, bike or take public transit, in addition to using their car.

In the Bay Area, the State, regional agencies, and local governments are promoting planning and developments that are consistent with a more compact land use pattern. As a result of this momentum, resources are being shifted to support efforts to add housing in “infill” locations (areas that are already part of an existing community) and near transit services around the San Francisco Bay.

For example, the State of California includes infill development and efficient development patterns as objectives of the Regional Housing Needs Allocation (RHNA) process, which requires each jurisdiction in the Bay Area to develop a plan for meeting its share of the region’s housing need.<sup>1</sup>

In addition, the passage of Proposition 13 in 2006 was the result of collaboration between Governor Schwarzenegger and the state legislature to support infill housing and transportation infrastructure in urban areas. Prop 13 provides \$300 million toward Transit-Oriented Housing Development, \$850 million toward infill housing, and an additional \$1.4 billion toward affordable housing development. While it has not yet been determined exactly how this money will be spent, it is clear that the State considers promoting housing development in existing communities a priority.

Bay Area regional agencies have long been supporters of developing housing near transit and in existing communities. For example, the Metropolitan Transportation Commission (MTC) has directed transportation funding to local governments that plan for housing in infill areas and near transit through its Station Area Planning, Transportation for Livable Communities, and Housing Incentive Programs. For the 2007-2014 RHNA period, the Association of Bay Area Governments (ABAG) worked with local governments to create a methodology that directs new housing to existing communities and areas near jobs and transit. The goal of creating more compact communities near transit

has also been a major component of Focusing Our Vision (FOCUS)—the planning effort led by ABAG, MTC, the Bay Area Air Quality Management District (BAAQMD), and the Bay Conservation and Development Commission (BCDC) to create a shared development and conservation strategy for the Bay Area.

During outreach conducted for FOCUS and a regional study of three Bay Area transportation corridors (East 14<sup>th</sup> Street, San Pablo Avenue, and El Camino Real—examined as part of ABAG’s Corridor Program), it became clear that local governments in the Bay Area also understand the need for adding housing in infill areas and near transit. Many communities are creating plans that identify target areas for infill development near transit and create policies to promote the addition of housing in these areas. Cities of all sizes are building housing to revitalize downtowns and place commuters near rail stations and along major transportation corridors.

There is a clear emerging consensus at all levels of government to pursue the strategic implementation of a compact development pattern that adds to the housing supply in the state and in the region.

## Regional Efforts to Promote Housing

The Bay Area has started to address its challenges. Work has been undertaken to put the region on a more sustainable course for the future. In 2002, regional agencies, local governments, community groups, and residents in the Bay Area created a vision for the region to address housing and traffic problems while improving the quality of life for all residents. Working together, these groups identified several goals to guide regional growth, including:

- Strengthen and support existing communities
- Create compact communities with a diversity of housing, jobs, activities, and services to meet the daily needs of residents
- Increase housing choices
- Improve housing affordability
- Increase transportation efficiency and choices
- Protect and steward natural habitat, open space, and agricultural land
- Improve social and economic equity
- Promote economic and fiscal health
- Conserve resources, promote sustainability, and improve environmental quality
- Protect public health and safety.

In 2002, ABAG's Executive Board resolved to use regional policies as the basis for *Projections*, ABAG's long-term growth forecast. This decision changed *Projections* from a trends-based forecast to a policy-based one that forecasts more growth in existing communities and near transit, with less growth in undeveloped areas. Since *Projections* is the basis for the Regional Housing Need Allocation (RHNA), these same regional policies influence how to plan for future housing need within the region.

There are several planning efforts currently happening in the Bay Area that incorporate the regional goals for growth to promote housing in the right locations. These efforts include RHNA and FOCUS, which both promote infill development and the addition of homes near transit to enhance existing neighborhoods and provide housing and transportation choices for all residents while protecting open space and agricultural areas.

### Regional Housing Needs Allocation

The need for more housing choices and more affordable options is a problem that plagues communities throughout much of California. In response, the State of California has made increasing the housing supply a priority. The State requires each city and county to

identify a sufficient amount of land to accommodate its "fair share" of the state's housing need.

In the RHNA process, the California Department of Housing and Community Development (HCD) gives each region a number representing the amount of housing needed, for all income groups, based on existing need and expected population growth. As the Bay Area's designated Council of Governments, ABAG is required by the State to create an allocation methodology that allocates a portion of the region's housing need to each local jurisdiction and sets targets for developing homes that are affordable to people at all income levels.

Several laws were passed in 2004 to clarify the policy objectives of RHNA, to give local governments more input, and to make the planning process more transparent. By law, the methodology that ABAG adopts must satisfy the objectives and rules spelled out in the statutes, and must be adopted using a fair and open public process.

Once it receives its allocation, each jurisdiction must demonstrate how it will accommodate these units in the Housing Element of its General Plan. The General

Plan is the document that outlines the community's long-term growth strategy. Once completed, Housing Elements are then certified by HCD.

**Local Concerns About RHNA**

Local communities understand the need to address the housing shortage and the need for more homes that people can afford. The League of California Cities has shown its support for addressing this need, and has identified expanding the supply of affordable housing as one of its top goals for 2007.<sup>16</sup>

Although they acknowledge the need for action, most cities and counties across the state have negative views about the RHNA process. Many jurisdictions see the State mandate as an unwarranted intrusion on local authority. Local governments resent being "forced" to plan for more housing, even though they have autonomy in planning where and at what densities it can occur. There is also a perception that the State's estimates of future growth, and consequently the number of housing units for which local communities must plan, are unrealistically high.

Many jurisdictions resent the goals set by the State because they believe that the estimates do not adequately consider local issues and growth constraints. Many communities in the Bay Area consider themselves to be "built out," with no room for growth. In addition,

A Place to Call Home

**RHNA Performance, 1999-2006\***

As part of the RHNA process, the State estimates the amount of housing needed in the Bay Area. These estimates are based on demographic data about the population in the region that will form new households, and need homes to move into. The number of households formed is determined by both the age of the population and migration. Most new households are formed by young people moving out of their parents' homes or by people who move into the region to take advantage of job opportunities.

During the 1999-2006 RHNA period, Bay Area local governments issued building permits for 92 percent of the total estimated need for the region. While this performance is better than what jurisdictions have achieved in past decades, it still demonstrates the region is not building enough housing to meet the need.

Jurisdictions also met 44 percent of the target for very low-income units, 75 percent for low-income units, 37 percent for moderate-income units, and 153 percent for above moderate units.

These units are affordable to households making 50 percent or less, 50 to 80 percent, 80 to 120 percent, and 120 percent or more, respectively, of the Area Median Income (AMI). For example, in Alameda County a very low-income unit would be affordable for a family of four making \$41,900 per year, a low-income unit would be affordable to a family with an income of \$66,250, and a moderate-income unit would be affordable for a family that makes \$83,800.<sup>1</sup>

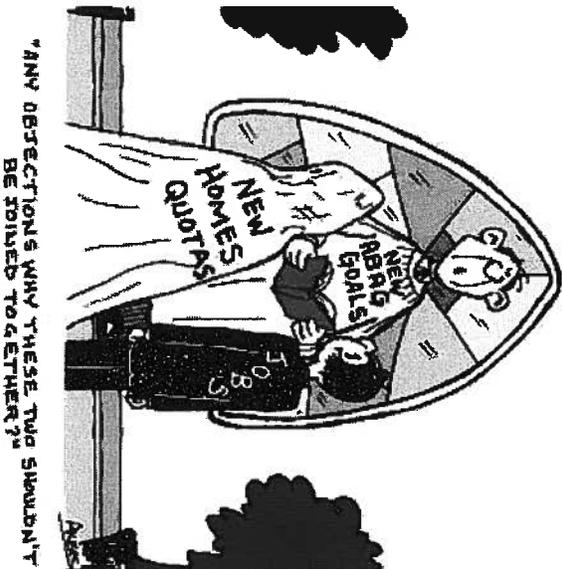
\* Information in this section and the table below was updated in August 2007, based on corrections affecting Santa Clara and Solano Counties. <sup>1</sup> Cresswell, C. *Official State Income Limits for 2007*. Department of Housing and Community Development.

**Table 1. Bay Area RHNA Performance, 1999 to 2006**

County	RHNA Allocation	Housing Permits Issued	Allocation Minus Permits	Percent of Allocation Permitted
Alameda	46,793	33,697	13,096	72%
Contra Costa	34,710	47,956	-13,246	138%
Marin	6,515	5,772	743	89%
Napa	7,063	5,245	1,818	74%
San Francisco	20,372	17,439	2,933	86%
San Mateo	16,305	10,289	6,016	63%
Santa Clara	57,991	52,018	5,973	90%
Solano	18,681	18,572	109	99%
Sonoma	22,313	20,971	1,342	94%
<b>Regional Total</b>	<b>230,743</b>	<b>211,363</b>	<b>19,380</b>	<b>92%</b>

Source: ABAG Analysis

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Darrel Akers/ Reprinted with permission of The Reporter in Vacaville

Many people are confused about who is responsible for the RHNA process, and are dissatisfied with its limited scope. While the cartoon above cites "New ABAAG Goals," in actuality they are the State of California's goals.

there is the perception that planning for housing promotes growth and that, if communities simply do not plan for it, it will not happen. What goes unacknowledged is that this growth does occur, and local land use policy choices put significant pressure on neighboring regions, including the Central Valley, to absorb spillover growth.

Another concern about the RHNA process is that it focuses on planning for housing, rather than producing housing. Even though most jurisdictions are able to identify sufficient development potential to satisfy their RHNA targets, the housing goals set by the State are generally not met. The plans local governments create influence how and where growth occurs, but they cannot control the market forces and decisions that determine if the housing actually gets built.

Although local planning alone cannot solve the problem, ensuring that development can occur is a key first step in meeting housing needs. Thus, despite the limitations of the RHNA process, many cities acknowledge that Housing Element updates spur them to focus attention on the housing needs in their communities and to develop creative solutions for addressing them. Housing developers in both the for-profit and nonprofit sectors also indicate that the RHNA process, a State mandate, is an important part of the solution.

Another concern with RHNA is that the process makes no distinction for where new housing is built, and many jurisdictions that are able to meet their RHNA targets do so by building housing on previously undeveloped land where there is no public transit or access to jobs. In addition, there is a lack of funding for the process and for supporting the development of housing for very low-, low- and moderate-income households, which impedes communities that seek to implement their Housing Elements.

For those communities that want to provide more housing options to residents, but think there is no more room, identifying development potential helps them to develop new strategies for accommodating housing. These jurisdictions recognize that, given the popularity of the Bay Area, population growth will continue and, therefore, real thought should be given to how that growth can best serve local communities and the region.

**RHNA Methodology, 2007 - 2014**

The Bay Area is currently working on the RHNA process for the 2007-2014 planning period. The methodology has been completed, and housing allocations will be made to local jurisdictions in July 2007.

The two primary purposes of the RHNA process are to increase the supply of housing and to ensure that local governments consider the housing needs of individuals at

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all income levels. As a result, the two major components of the RHNA methodology are a formula for allocating units among jurisdictions and another formula that separates each jurisdiction's total need into the four income categories defined by the State.<sup>17</sup> The methodology also includes rules for how to address issues such as spheres of influence, the relationship to subregions, and voluntary transfers of housing units between jurisdictions.<sup>18</sup>

Given the concerns and reservations that many jurisdictions have about RHNA, ABAG took steps to ensure local government involvement in the process, and to make sure the methodology reflected local conditions and concerns about regional growth. One of ABAG's first steps was to create the Housing Methodology Committee (HMC), which brought together elected officials and local staff to advise ABAG staff on the allocation methodology. Each of the nine Bay Area counties had three representatives and there were also six members to represent stakeholder groups, such as Greenbelt Alliance, the Non-Profit Housing Association of Northern California, and the Home Builders Association of Northern California.

The HMC was tasked with creating a methodology that would meet the statutory requirements for RHNA and also reflect local conditions and support the Bay Area's regional goals for growth (page 8). The four statutory objectives of RHNA include

increasing housing supply, affordability, and housing types; encouraging efficient development and infill; promoting jobs-housing balance; and reducing concentrations of poverty.<sup>19</sup> These objectives are consistent with the Bay Area's regional policies regarding growth.

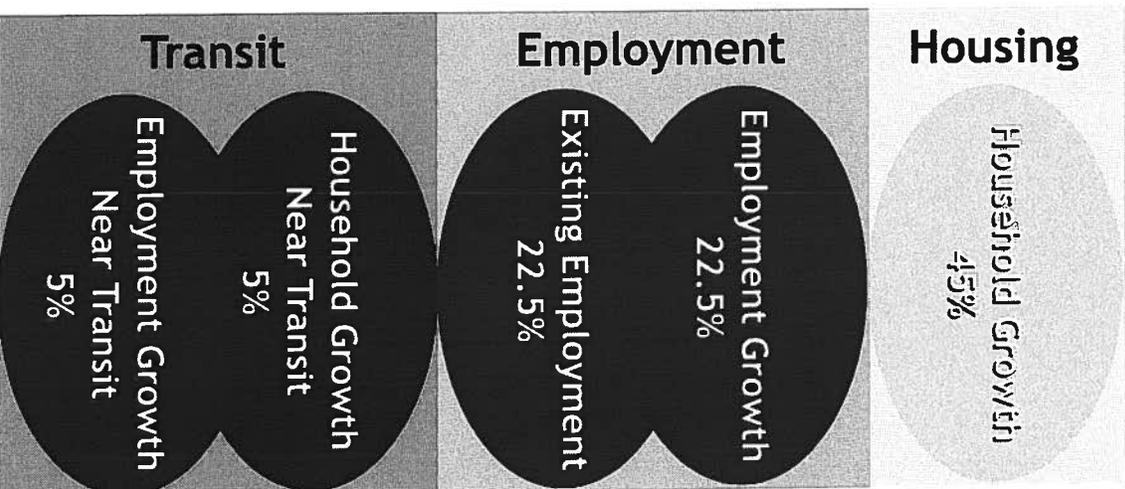
The allocation methodology<sup>20</sup> includes factors related to housing, employment, and public transit. The specific factors used are household growth, employment growth, existing employment, and both household and employment growth near transit stations.

These factors are all based on data from the *Projections 2007* forecast. The methodology is intended to:

- Direct housing units to areas where housing growth is expected
- Ensure that housing and job growth happen together while also addressing existing jobs-housing imbalances
- Encourage housing development along major transit corridors
- Allocate fewer units to outlying areas to reduce development pressures on agricultural lands

Members of the HMC felt it was particularly important to weight the housing- and employment-related factors equally, as a way to encourage a better jobs-housing balance. By including transit factors, the methodology

**Figure 2. Weighted Factors, RHNA Methodology 2007-2014**



The methodology factors use data from *Projections 2007*.

also builds on the regional policies that are already in *Projections* that assume additional growth along transit corridors and in existing communities. Some jurisdictions felt this made the transit factors in the methodology unnecessary, but most felt it was important to include them to be consistent with the regional goals for growth.

ABAG's Executive Board adopted the final methodology with a resolution that committed ABAG to working with its regional agency partners to secure incentives for the jurisdictions that accepted significantly higher RHNA allocations. The intent was both to support the jurisdictions taking a larger share of the regional housing need and to mitigate the potential "shortfall" resulting from smaller allocations to other jurisdictions. Specific funding possibilities are discussed in the Housing Incentives section (page 13).

To accomplish the second part of the housing need allocation, which is the separation of each jurisdiction's allocation into the four income categories, the methodology moves the income distribution in each jurisdiction 175 percent toward the regional income distribution. Using this approach, those jurisdictions that have a larger proportion of households in an income category will receive a smaller allocation of housing units in that category. Conversely, those jurisdictions that have a relatively low

proportion of households in a category would receive a higher allocation of housing units in that category.

The effect of the 175 percent shift is to change the income distribution in each jurisdiction to more closely match the regional distribution. This is done by taking both a jurisdiction's existing conditions and future development into account. By addressing existing concentrations of low-income households, these scenarios more aggressively promote an equitable regional income distribution while ensuring that all communities do their fair share to provide affordable housing.

For example, a city where 12 percent of existing households are in the very low-income category is compared to the regional average of 23 percent of very low-income households.<sup>21</sup> This difference—11 percent—is multiplied by 175 percent and the result is added to the city's initial proportion of very low-income households. In the end, the city will have 31 percent of its total allocation in the very low-income category.

#### **RHNA Next Steps**

In April 2007, HCD determined that, at a minimum, the Bay Area must plan for 214,500 units during the 2007-2014 period. ABAG must use the adopted methodology to allocate this regional need to each city and county in the Bay Area in July 2007. Once

these numbers are released, the public and local jurisdictions will have several opportunities to provide comments. Once these comments have been taken into consideration, final allocations will be issued by ABAG in 2008. After this point, local jurisdictions will have one year to incorporate these housing targets into the Housing Elements of their General Plans.

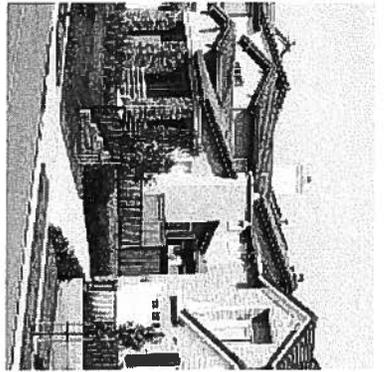
#### **Subregions**

The laws passed in 2004 gave contiguous cities and counties the opportunity to form a subregion that would plan for the allocation of housing units for its member jurisdictions. The 21 jurisdictions in San Mateo County decided to pursue this subregional option. These jurisdictions have a history of working together and saw the subregional process as an opportunity to continue that tradition. They also wanted the chance to have greater local control and flexibility in developing solutions to the housing challenges that face the county as a whole.

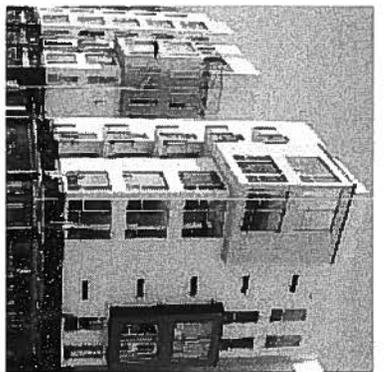
The San Mateo County subregion received a share of the region's total housing need that is consistent with its projected household growth during the 2007-2014 period. Based on household growth, the San Mateo share of the regional allocation is 15,738 units. The San Mateo subregion was responsible for developing its own allocation methodology. As with the regional process, the subregion's adopted methodology and resulting allocations must achieve state housing goals, including



Meridian Apartments, San Bruno



Victoria by the Bay, Hercules



Oakland



Novato

the objective that every jurisdiction do its "fair share" to provide affordable housing. In the end, the San Mateo County subregion opted to use a method identical to the regional method.

### Identification of Priority Areas Through FOCUS

FOCUS serves as a platform for engaging Bay Area local governments and stakeholders in a regional dialogue to create a specific and shared concept of where growth in the region can best be accommodated and what areas need protection.

Interested local governments have the opportunity to apply to the regional agencies for **Priority Development Area** and **Priority Conservation Area** designations. As is consistent with the regional goals for growth, a **Priority Development Area** must be an

area within an existing community, near existing or planned fixed transit or served by comparable bus capacity, and planned or in the planning process for more housing. Once these areas have been adopted, the FOCUS program will work to direct existing and future incentives to these areas.

To identify **Priority Conservation Areas**, regional agencies have been working with the Green Vision group, a coalition of regional and local open space organizations. Regional staff will collaborate with local governments to determine Priority Conservation Areas, based upon local plans, the results of the Green Vision project, and criteria related to urgency, community support, and regional significance. Open space acquisition of Priority Conservation Areas will be determined relative to state-level open space funds based upon regional significance and

local support for preservation. The deadline for nominating a Priority Conservation Area is August 17, 2007.

The application process for Priority Development Areas is now complete, and local and regional staff are reviewing applications to ensure that the three basic criteria are met. The Priority Development Areas and Priority Conservation Areas will be adopted by the regional agencies in Fall 2007.

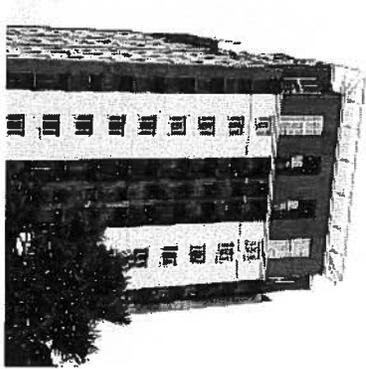
### Housing Incentives

RHNA and FOCUS planning efforts will establish the framework for future growth in the region. However, creating on-the-ground change requires the support and action of local governments. Local jurisdictions will need a variety of resources to enable implementation of plans and projects that move the region toward its goals.

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Half Moon Bay



City Heights, San José



Park Place, Mountain View

To assist local governments, regional agencies are currently working to identify and secure incentives related to planning funds, technical assistance, and capital infrastructure that can be aligned with local Priority Development Areas as established in FOCUS. Subsequent to adoption, jurisdictions with Priority Development Areas will be eligible to apply for the incentives.

The primary objective of these resources will be to facilitate infill development, especially near transit. Allocation of incentives will emphasize achieving results and providing examples of how Priority Development Areas can be developed as “complete communities” that provide for the day-to-day needs of current and future residents. The incentives will include capital and planning grants as well as services to assist local governments with priority area planning and development activities. These services will include technical and outreach assistance, networking assistance, and best practices information.

Potential sources include future funding from MTC’s Transportation for Livable Communities and Housing Incentive Program, as well as additional transportation funds from MTC’s Regional Transportation Plan (RTP) 2009 Update. How the RTP funds might be directed to align with priority development areas will be a primary consideration as the RTP update process proceeds. The State is also considering aligning funding from the recently passed housing and resource bonds to be consistent with regional priorities, potentially including FOCUS priority areas.

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## Local Efforts to Promote Housing

The RHNA process and FOCUS initiative will help provide a roadmap for how the Bay Area can move forward to address the housing needs of the region's residents. FOCUS represents a shared partnership between regional agencies and local governments to encourage a pattern of growth that will increase the vitality and walkability of existing neighborhoods, provide more housing and transportation choices for all residents, and reduce growth pressures on undeveloped lands.

As noted in previous sections, regional agencies are working to identify available incentives, including financial and technical assistance, that can help local governments pursue the addition of housing in infill locations and near transit. However, since local governments control local land use decisions, they play a key role in ensuring success. It is a daunting task to pursue a new pattern of growth, and there are many challenges to adding homes in infill locations near transit. But many local governments throughout the region are already finding solutions and achieving success. Some of the strategies they have used to expand housing choices in their communities are outlined in the following sections.

### Making Room for Housing

Land use regulations are necessary to protect and promote public health and safety, and to ensure that developments meet community needs. Many factors combine to make a community vibrant and desirable, including access to jobs, shopping and services, parks and recreational opportunities, community spaces, and a diverse range of housing choices. All of these different features and uses must be accommodated in a local government's land use plans. Since most communities have a finite amount of land with which to work, local governments and the public must make choices about their priorities and how best to dedicate available resources, including land.

Many communities in the Bay Area have land use plans and zoning codes that do not provide enough development potential for housing, compared to the region's need. This is partly because, to maximize tax revenues, many jurisdictions emphasize commercial development, while limiting residential development. There are also significant concerns about the impacts of housing growth on the need for additional public services, such as schools and police and fire services. Other communities have adopted policies to protect certain types of land uses, such as open space or single-family neighborhoods.

Although these policies protect some of the features that make the Bay Area special and give the region its unique sense of place, they also limit the amount of land available for providing a wider variety of housing choices, such as townhomes and apartments.

Since local plans must balance the need for housing, employment, retail services, schools, parks, and other land uses, it is important for policies that limit growth in certain areas to be part of a comprehensive vision for how growth should occur. To ensure that it is meeting its housing needs, a community should consider implementing complementary policies that make room for housing. For example, more development sites and higher densities could be allowed in downtowns and near available transit options. These areas often consist of older commercial and industrial sites that might bring greater benefits to the community if revitalized with new housing, retail services, and the people they bring.

### Revisiting Zoning Codes and Development Standards

One of the most important steps local governments can take to encourage housing production is to ensure there is land available for housing. Since many communities in the Bay Area are already developed, with little

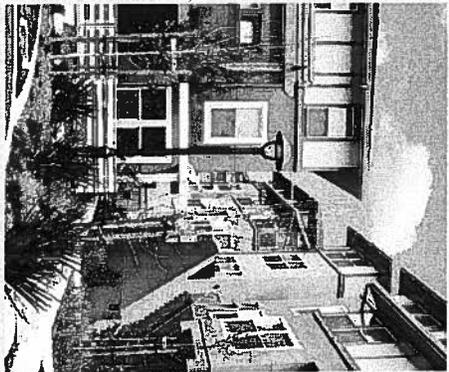
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## Green Building

How homes are designed and built impacts the environment. People living in homes use water and energy—21 percent of all the energy in the country<sup>1</sup> and 64 percent of all urban water use in the region.<sup>2</sup> The construction and demolition of homes also use a number of resources and contribute significantly to the waste stream. Forty-two percent of all the wastes in California come from the construction and operation of homes.<sup>3</sup>

Green building is an approach to designing and constructing buildings that reduces the impact on the environment. Green building design encourages use of recycled, non-toxic materials; energy and water conservation; and a positive impact on the indoor and outdoor environments. Green buildings incorporate features such as energy-producing solar panels, stormwater retention and recycling, design that reduces the need for air conditioning or heating, and recycled building materials.

Green homes offer a number of benefits to local governments, developers, and residents. Green homes can create energy and use less water, reducing the demand on jurisdictions for electricity, water, and waste disposal services. Green homes can also assist in managing stormwater, reducing the load on local stormwater systems during storms. Energy and water savings translate into lower utility bills for residents—making a green home more affordable in the long run. Developers can also save money with green building by reusing materials from demolition or qualifying for green building incentives.



Sara Conner Court, Hayward

Photo Provided by Katie Lamont, Eden Housing and Bruce Mast, Build It Green

Across the region, local governments are actively promoting green homes. Many governments have adopted “Construction and Demolition” ordinances that require a certain amount of construction waste to be recycled. Several cities in the Bay Area have passed ordinances that require new homes to be designed according to green building standards. A larger number of cities have voluntary green building programs that offer services—such as design guidelines, technical expertise, and financial incentives—to builders and residents. Local governments can learn more through Build It Green’s Public Agency Council,<sup>4</sup> a coalition of public agencies promoting green building in the region.

<sup>1</sup> United States Department of Energy, *Buildings Energy Data Book*, 2006, Washington, D.C.: United States Department of Energy.  
<sup>2</sup> State of California Department of Water Resources, *California Land and Water Use 2007*, Available at: [www.landwateruse.water.ca.gov/annualdata/datalists.cfm](http://www.landwateruse.water.ca.gov/annualdata/datalists.cfm).  
<sup>3</sup> State of California Integrated Waste Management Board, *Statewide Waste Characterization Study*, December 2004.  
<sup>4</sup> For more information, see [www.builditgreen.org/guild/index.cfm?searcher=agencies](http://www.builditgreen.org/guild/index.cfm?searcher=agencies).

vacant land available, they have had to identify creative solutions for finding land that could be used for housing. In this regard, the most significant impact of the RHNA process is that cities and counties must zone enough sites to accommodate their housing need allocations. Although there are critics of RHNA, many local governments acknowledge that the State mandate has been a primary motivation for identifying ways to promote housing development.

It is particularly important for cities and counties to classify specific sites where multi-family housing is allowed. This is not to say that every jurisdiction must adopt zoning codes that allow for the types of development that would be found in a major city. However, cities should consider whether allowing higher densities or taller buildings in some areas of their community might enhance the vitality of existing neighborhoods while providing more housing options.

There may also be opportunities to make adjustments to policies that can facilitate housing development. For example, the City of Vacaville adopted a zoning strategy that allows certain commercially zoned sites to be used for multi-family housing without requiring a General Plan amendment or zoning change. To promote affordable housing, the City of San Francisco prohibits market-rate housing development in its Service/Light Industrial District. Residential developments in these

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areas must include 100 percent affordable or single room occupancy units. These kinds of changes help simplify the development process for those trying to provide a wider range of housing choices, especially affordable options.

When considering ways to make more room for housing in existing communities, it is important for local governments to think proactively about making zoning and development standards more inclusive. In some areas, requirements for single-use zoning create missed opportunities for mixed-use development that can provide additional space for housing units and also create more vibrant neighborhoods that link housing, jobs, local services, and retail.

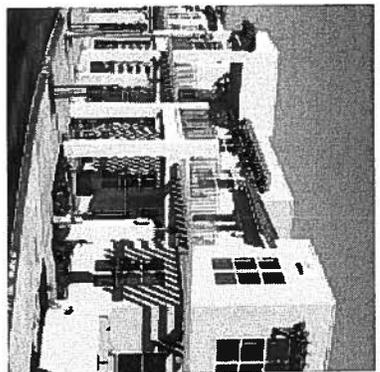
In addition, the requirements for successful infill housing development are often different than those for suburban-style neighborhoods. Given the constraints of working in already-developed areas, standards such as large minimum lot sizes, and limitations on heights and densities can act as barriers to housing development. For example, a study of opportunities for development near transit in San Mateo County suggested allowing reduced setback requirements, exemption from height limit or Floor Area Ratio (FAR) requirements, and increased densities on smaller parcels for infill projects.<sup>22</sup>

**Revitalizing Underutilized Land**

As communities change over time, the way they use land changes as well. Many jurisdictions end up with developed lands that no longer meet the needs of residents and workers. Adding a mix of uses, higher-density housing, and pedestrian amenities can often revitalize underused areas such as older shopping centers, surface parking lots, and surplus lands. With designs that respect surrounding neighborhoods, these underused commercial spaces can be transformed into vital focal points for community interaction and activity.

For example, traditional suburban-style shopping centers, regional malls, and other commercial spaces often use significant amounts of land for both retail space and parking. Rezoning commercial strips to mixed-use can both add housing and help create a more walkable environment. In Marin County, for example, planners and citizens have collaborated to create a conceptual master plan for Marinwood Village, a mixed-use center with up to 100 units (up to 50 of which will be affordable), a grocery store, and other shops. This village will replace what is now a failing strip commercial center with many vacant stores.

Communities of all types are also considering surface parking lots near transit as places for new homes or mixed-use development. The close proximity of parking lots to the stations



The Arbors, Rohnert Park



Palo Alto



Abella Paseo Homes, San Pablo

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makes these prime locations for development that takes advantage of transit services. In the Bay Area, this type of development has occurred around a wide variety of transit services, including commuter rail stations, light rail stops, ferry terminals, and stops along bus corridors.

For example, the Santa Clara Valley Transit Authority (VTA) and Eden Housing have constructed affordable housing and community facilities on a former 1,100-space lot along the Guadalupe light-rail line. The site now accommodates diverse uses and is part of the neighborhood. Called Ohlone-Chynoweth Commons, it includes 194 units of affordable housing, retail, a community center, and 369 parking spaces. VTA benefits from the development because it allows residents to have easy access to the light rail line. VTA also receives a dedicated source of funding due to the ground lease, which should bring in at least \$250,000 each year for the next several decades.<sup>23</sup>

In addition to surface parking lots, local governments and transit agencies have also been looking at surplus publicly-owned land as future locations for housing. As part of its *Transit-Oriented Development Opportunity Study*, the San Mateo County Transit District inventoried publicly-owned property near BART and Caltrain stations and highlighted parcels for redevelopment.

In Dublin, the Alameda County Surplus Property Authority obtained a vacant military property near the Dublin Transit Center. Recognizing that retail employees in the area needed homes they could afford, the County worked with EAH Housing to provide family-friendly apartments and townhouses. The resulting development, Camellia Place, provides an opportunity for some of those employees to live near their jobs, reducing the environmental impact and other burdens created by commuters who travel to the Tri-Valley area every day for work.

**Converting Industrial Sites to Homes**

Many cities in the Bay Area have identified industrial lands as areas for infill housing. Economic forces and the shift toward more service-oriented jobs have reduced the need for industrial land in the region. Underutilized industrial areas are prime targets for residential uses because they tend to be low-density uses and in many communities are often near transit stations. Redeveloping industrial buildings into multi-family apartments can create new residential communities with minimal impact on older neighborhoods. As a result, many local governments have been converting these lands to housing to meet the existing demand.

The question of whether or not to redevelop vacant industrial lands depends on local needs and opportunities. Many cities want to preserve industrial areas as a way to promote

economic development, including living-wage jobs and green, localized industries, and so maintain the existing industrial infrastructure in the region. However, cities can use policies such as raising allowable floor area ratios to better utilize industrial lands. This type of strategy enables jurisdictions to maintain land for industrial uses while opening up opportunities for housing development on excess sites.

When considering converting industrial lands, jurisdictions should also consider how residential and industrial uses may conflict and whether industrial areas proposed for housing can function as complete neighborhoods. It is important to plan for how residents will access necessary amenities and services, such as shopping, transit, schools, and parks. In addition, careful planning is needed to avoid potential conflicts between new residents and existing industrial operations. Possible negative impacts include exposure to noise pollution, harmful chemicals, or poor air quality—all of which can affect the health of residents. Residents' concerns about these issues can also make it difficult for the businesses to continue operations.

For those cities that want to convert underutilized industrial spaces into new housing, a checklist of these factors can be a useful tool for evaluating proposals to convert industrial to residential land. The City of

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Santa Clara's *Industrial to Residential Conversion Planning Criteria Guidelines* evaluate proposed conversions for General Plan and zoning compatibility, residential suitability, environmental compatibility, service availability, and other criteria. A copy of the checklist is available at [www.bayareavision.org/ta/localresources.html](http://www.bayareavision.org/ta/localresources.html)

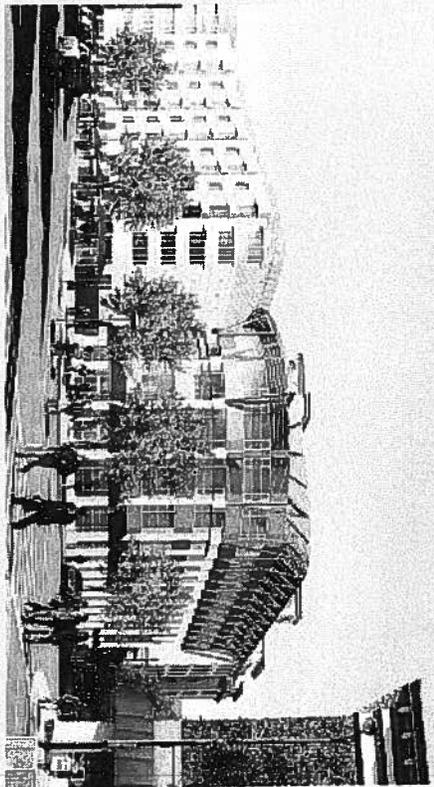
### Flexibility and Incentives Encourage Housing Choice

In addition to identifying sites for housing development, many cities and counties in the Bay Area are taking other significant steps to promote housing. These efforts often involve changing policies that present impediments to housing production as well as offering incentives to encourage more housing.

Many developers, both for-profit and nonprofit, cite the permitting and entitlement process as a barrier to increased housing production. They assert that the tangle of regulations they often encounter causes delay and uncertainty. In some cases, this situation is made worse by a lack of coordination between different regulatory agencies that must approve a project. For developers, a lengthy approval process translates into costs that will be passed on to consumers—homeowners and renters—which ultimately reduces housing affordability.

### Oxford Plaza, Berkeley

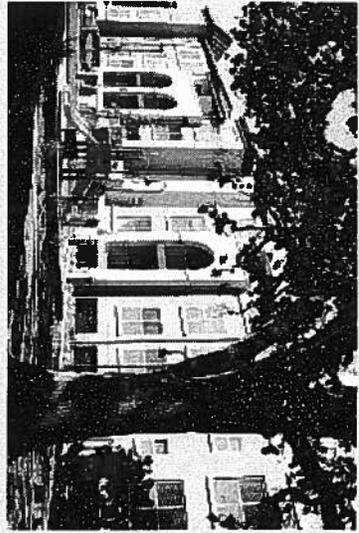
In the City of Berkeley, construction is underway to transform a city-owned parking lot into a centerpiece mixed-use development. The development will consist of the David Brower Center, a major environmental center and space for cultural activities, a parking garage (to replace existing parking), and Oxford Plaza, a 96-unit affordable apartment building with ground-floor retail.



This project is notable for its contribution to sustainable and equitable development. The buildings will be an excellent example of infill on an underused site located near the Berkeley BART station in Downtown Berkeley. Parking standards are dramatically reduced for the residential portion of the project, and densities are appropriate to support the available transit. The units will be a mix of studios and one- to three-bedroom rental units that are affordable to a mix of incomes (from extremely low- to low-income). The residential building, Oxford Plaza, will also incorporate many green and sustainable elements into its design.

Due to the varied uses (residential, office, retail, and civic), this project required an extensive process that involved establishing a diverse project team and

assembling a wide range of funding sources. It is being developed through a partnership between the nonprofit Resources for Community Development and the David Brower Center, and the project will be jointly owned by those two organizations and the City of Berkeley. For the residential portion of the project, the City used \$12 million in local funds, including \$6.2 million in funds from the City's Housing Trust Fund Program, Redevelopment Agency, and HUD Section 108 loan funds. The total \$12 million local investment was leveraged with approximately \$70 million in other private and state funds to complete the rest of the project. The project process also consisted of a five-year community engagement process.



### Villa Montanaro, Pleasant Hill

The Pleasant Hill BART station area was the location of one of the first transit villages to be planned in the region, as part of the Pleasant Hill BART Specific Plan in 1983. Villa Montanaro, the latest development in the area, increases housing choices by adding 163 rental units in a city that is mostly ownership units. It includes nine units affordable to very low-income households and three for moderate-income residents.

Villa Montanaro replaced an underutilized and deteriorated site that is 1/4 mile from the BART station and close to shops and services. The development has a density of 40 units per acre. Even though the building height of 50 feet exceeded the city's current limit of 35 feet, it was approved and supported by the community because of the project's strengths and location, as well as a recognition of the importance of expanding housing choices in Pleasant Hill.

Villa Montanaro won the 2007 ABAG Growing Smarter Together Award: On the Ground—Getting It Done.

Another factor often highlighted as contributing to escalating housing costs are the impact fees imposed by cities, counties, and special districts for new housing development. Since property tax revenues are limited, many communities use impact fees as a way to cover the costs of providing services to new residents. Impact fees, however, do not cover the continuing costs of these services. Although these fees are an important funding source that enables jurisdictions to provide needed services, they add to the costs of developing housing, which can act as a barrier to housing affordability.

There is a range of policy changes and incentives local governments can offer to promote housing production, and affordable housing in particular. Some of the options in use by Bay Area jurisdictions include permit streamlining, density bonuses, fee waivers, and land assembly.

The City of Fremont provides one example of a jurisdiction that has developed comprehensive strategies for encouraging affordable housing. Developments with five or more units can qualify for a density bonus if affordable units are included. In addition to the density bonus, other incentives include site identification assistance, marketing and tenant screening, modification of development standards, and streamlined processing of plans and permits.

In Fremont's new multiple family zone, additional incentives include reduced parking requirements for affordable units, allowance for commercial uses on the ground floor of multi-family residential buildings on major streets, and the option for creating live-work units. In addition, for projects where at least 49 percent of the units are affordable, Fremont offers deferred impact fee payments, financial assistance, help with community engagement, and assistance in identifying possible sites.

### Developing Infill and Homes Near Transit

Development in infill locations and in areas with access to public transit is a major component of the region's vision for growth. It is a key strategy for expanding housing and transportation choices. However, building homes in these areas involves a variety of challenges that do not usually arise when building on undeveloped land. Cities that want to promote infill development often encounter challenges related to attracting developers to infill sites, working with small parcels, applying appropriate transportation and parking standards, and responding to the needs and concerns of existing residents.

### Targeting Development with Specific Plans

Building on infill parcels often involves a great deal of complexity, since the development must fit in with the streets and buildings that are already part of a neighborhood. In this situation, jurisdictions,

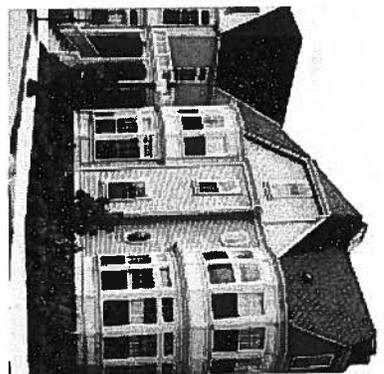
developers, and the community must work together to determine how best to integrate a new development into the existing fabric of the community.

Creating a specific plan, neighborhood plan, precise plan, or other detailed plan for a community also provides an opportunity to engage community members in thinking broadly about how to incorporate more housing into a neighborhood while addressing some of their concerns about the potential impacts of new residents. The process of developing a specific plan allows a local government to consider the best way to link new housing to existing transportation networks, community services, and retail locations.

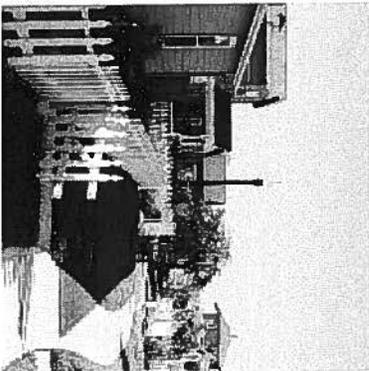
Identifying areas where housing is desired encourages housing production because it provides certainty to developers and sends a strong signal that the community is supportive of proposals for more housing. In addition, since the design and aesthetics of a development are particularly important to existing residents, giving developers guidance about desired development types and design standards shows them how best to meet the needs and desires of the community. This kind of guidance can lead to faster and better results from the entitlement process—for both the developer and the community.

Redwood City recently adopted a Downtown Precise Plan that uses the strong regional demand for housing as an engine for local community revitalization.<sup>24</sup> Created with extensive community input, the Precise Plan articulates the city's collective vision in careful detail. The plan describes distinct zones, each with its own unique design guidelines. It directs new developments to maximize public benefits by treating the street as a public space. Permitted building heights of up to 12 stories are calculated to minimize the need for public subsidies. Clear, well-researched, and community-based development guidelines have attracted local and national developer interest and help to ensure that new construction fulfills the city's goals.

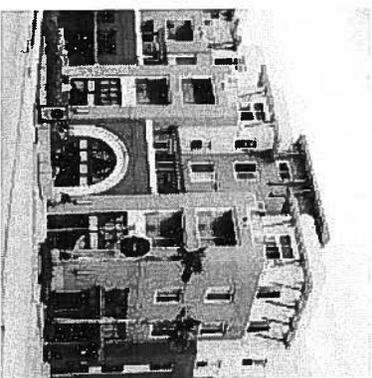
The City of Milpitas has also created a vision for their Midtown area in the Midtown Specific Plan. This plan takes advantage of rail stations (VTA and BART) in the area to increase housing choices and densities, and create a walkable district focused along Main Street. As part of the plan, Milpitas identified 252 acres of vacant land that can accommodate up to 4,900 housing units based on allowable densities. These new housing units will be interspersed with and linked by pedestrian and bike trails as outlined in the city's Streetscape and Trails Plans. The city is refining this vision by creating the Milpitas Transit Area Specific Plan, which focuses on a subset of the midtown area adjacent to BART and VTA stations.



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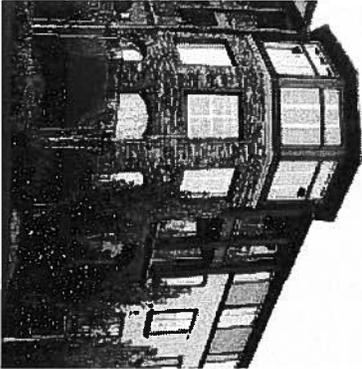


Domicillo, Santa Clara

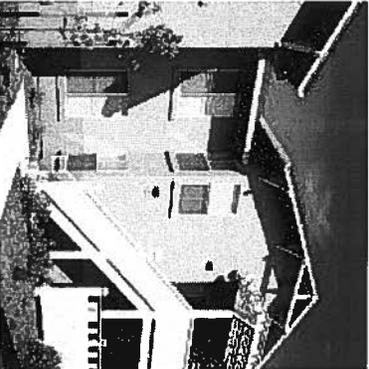
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Greenridge, South San Francisco



Alma Apartments, Walnut Creek



Cochran Village, Morgan Hill

### Working with Small Parcels

A common refrain in Bay Area cities is that infill housing is impossible without land assembly. Underused parcels of land in urban areas are often small or oddly-shaped, particularly near transit stations crossed with rail lines and street alignments. Many real estate developers are interested in multi-acre properties, and need local government assistance to obtain neighboring parcels. In turn, cities look for financial assistance to purchase properties and tools such as eminent domain to negotiate with property owners in blighted areas. However, large parcels and parcel assembly are not always financially feasible, even with public assistance. The process of assembling parcels can sometimes take many years and, as a result, in some cases this strategy can slow down new infill development.

An alternative to land assembly may be to alter the development strategy to favor buildings on small parcels. On small parcels, developers can achieve high densities at a small scale, if allowed by local zoning codes. Physical and financial analyses show that projects can achieve densities ranging from 70 to 139 units an acre on parcels that are a fraction of an acre in size.<sup>25</sup> What makes this development feasible is allowing a mix of uses (retail adds to the profitability of a project), and reducing parking standards. Berkeley and Redwood City have achieved densities of 100 units per acre on parcels of less than one acre and in projects that are five stories or less.

Building on small lots may be more beneficial to a city than large-scale developments, especially when this strategy is coordinated through a detailed area plan that helps weave new projects into the existing community.

Small projects can work within the confines of a city's existing street grid pattern and often result in diverse building types and aesthetically interesting streetscapes for people—making neighborhoods more walkable. In addition, a neighborhood where older buildings are preserved has a better opportunity to support both high- and low-rent businesses, allowing for a mix of chain and independent businesses that often makes a community unique. They also enhance, instead of alter, existing communities and are more likely to gain community support—especially if they also offer needed housing choices and services. Furthermore, developers of small parcels tend to be local entrepreneurs with knowledge of the community. These benefits have encouraged communities to work closely with developers to get projects built on small parcels.

### Redefining Transportation Standards

In much of the region, automobiles are the primary mode of transportation, and land use and development patterns are arranged to meet the needs of drivers. In contrast, one of the primary benefits of infill locations is that they encourage alternative transportation options, such as walking, bicycling, and public transit use. Recent studies have shown that people who live within a half mile from transit

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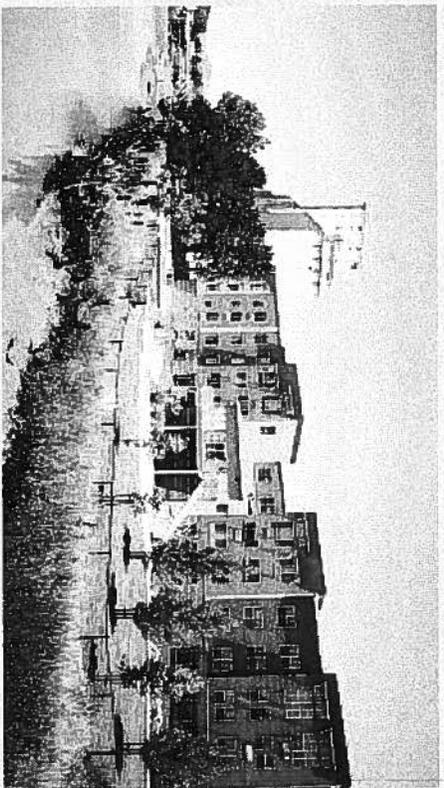
are twice as likely to walk and four times more likely to take transit for all trips.<sup>26</sup>

Unfortunately, housing production in infill locations is often hampered by the application of transportation standards that do not take into account these differences in travel patterns. When considering approval of a proposed development, planners must consider potential impacts on traffic in the area. City planners often use Institute of Transportation Engineers (ITE) standards, which are developed using data from suburban-style developments, to estimate the number of trips a project will generate and the impact it will have on traffic congestion and delay at nearby intersections (known as “Level of Service” or “LOS” standards).

Use of these conventional standards can result in an overstatement of potential auto trips and the resulting traffic congestion. Although new development may lead to an increase in local traffic, evidence indicates development in urban areas generates fewer auto trips than in suburban areas. In addition, meeting LOS standards poses a particular challenge for higher-density and infill projects, since they are generally located in dense areas that already have traffic congestion. For example, pedestrian-oriented downtowns are places where cars naturally move slowly and experience delays. Therefore, these areas often have poor or failing LOS grades.

### Downtown River Apartments, Petaluma

The City of Petaluma in Sonoma County has emerged as a housing leader in the region, exceeding its RHNA allocations in all income categories. The Downtown River Apartments is an excellent example of how affordable housing can contribute to community revitalization while providing housing for working people and families.



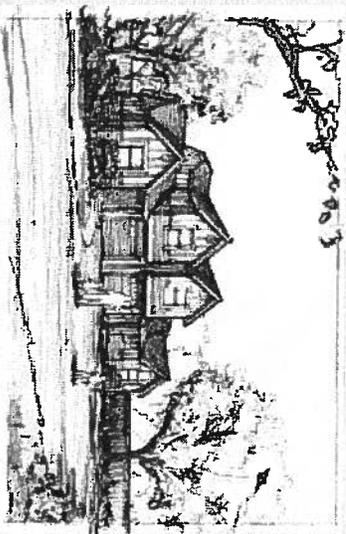
This development consists of 81 income-restricted apartments with one-, two- and three-bedroom units. It is home to families paying no more than \$1100 for a three bedroom apartment. The project has plentiful common space, both in an inner courtyard and a small park along the river. It is located directly across the river from the city's historic downtown, a walkable district with a variety of stores and services in the midst of a revitalization. It has contributed to this revitalization with new homes, stores, and public spaces where an underutilized lot used to be.

The city's partnerships with nonprofit partners are a key to the success of the city's housing program. The city works actively with nonprofits to leverage funds and to develop and manage properties. Eden Housing, Inc. used a variety of state and local funds to develop the Downtown River Apartments, and the nonprofit continues to manage the development. The city also partners with the Boys and Girls Club in this and all family-oriented affordable developments to provide after school activities.

The use of conventional standards to assess these developments can have significant implications for whether or not these projects are successful. The reported congestion often results in neighborhood resistance to a development. In response to community concerns about traffic, cities often plan and approve development at lower densities. In

some cases, these required changes can keep the project from being financially feasible, which means the loss of an opportunity to add housing units to a community. Although these standards are perceived to be objective, since they rely largely on data from auto-oriented sites, they overweight the

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**Virginia Grove, Novato**

In the most expensive county in the Bay Area, a small suburban town has found an innovative way to provide affordable homeownership opportunities in an existing single-family neighborhood. Virginia Grove consists of eight single-family homes, four of which are deed-restricted for low-income families.

The development does not rely on public subsidies to make the homes affordable. Instead, the design focuses on smaller homes to maximize the efficient use of the land. With the use of a density bonus, Virginia Grove will replace a single-family home with eight homes, for an increase in residential density from 1.5 to 12 units per acre.

The development's design also ensures that it is sensitive to the existing surroundings. The project includes a number of environmentally-friendly features, including retention of native trees, vegetated swales, and passive solar heating and cooling. While Virginia Grove is a small project, it provides a reproducible model for providing affordable homes in an exclusively suburban area.

importance of automobiles at the expense of the needs of people—which runs counter to the goal of creating and enhancing vibrant, walkable neighborhoods and community centers. It is also important to note that these standards for measuring local traffic congestion do not take into account the added regional traffic burden created by pushing new housing to the edges of the region and into neighboring regions and forcing people to drive to reach job centers and other destinations in central areas.

Bay Area cities have found ways to navigate around these challenges. Cities can develop policies that accept lower LOS standards, explicitly allowing for some amount of traffic delay, as a way to add new construction without widening streets or harming a pedestrian-oriented downtown.

San Leandro has a lower LOS standard for its downtown area than for the rest of the city, which ensures that downtown will continue to be a pedestrian area. The City of San José has an “intersection protection policy” that designates certain intersections where no further increases in width or capacity are allowed. Design changes at these intersections to encourage walking, biking, and transit use reduce the need for new lanes and other improvements that expand automobile capacity. To encourage use of these alternative forms of transportation, LOS grades at these intersections can be poor or failing.

**Rethinking Parking**

In addition to measures of trip generation and traffic congestion, many cities and counties have parking requirements that are also based on suburban-style development. While this might be appropriate for single-family neighborhoods, the needs of people living in infill and transit-oriented developments are different. As noted above, people who live near transit are more likely to use it, reducing their dependence on automobiles. In addition, a study by MTC found that residents who live within a half-mile of transit stations own fewer cars than people who live further away. Nearly one third of households near transit do not own a car at all.<sup>27</sup> In infill locations, where the amount of land is limited and multi-level parking structures are necessary (and expensive), using conventional parking standards can be a significant impediment to housing development, especially affordable units.

As a result, many jurisdictions in the Bay Area have made changes to their parking standards to encourage a range of development choices, and to make housing more affordable. The City of San Francisco replaced minimum parking standards for its downtown with a maximum that allows no more than 0.75 spaces per unit.<sup>28</sup> The City of San José provides automatic parking reductions for low-income housing, senior housing, and housing near transit.<sup>29</sup> The City of San Rafael also lowered parking standards for housing in its downtown after

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surveying parking use in existing apartment developments in the area. A complementary policy is to “unbundle” parking, which means that residents pay for parking separately. This allows people who do not want access to a parking space to pay less, making units more affordable.

In addition to reduced parking requirements, jurisdictions are also conducting studies to examine existing parking resources and find ways to manage them more effectively. Successful parking management strategies can reduce the need for additional spaces and, in some cases, can make surface parking lots unnecessary—opening up land for development. To manage parking, cities are using pricing to encourage individuals to drive less and to direct drivers to underused parking spaces. Another strategy is to allow developments that create demand for parking at different times, such as an office building and a movie theater, to share parking spaces. Shared parking lowers the amount of land devoted to parking, while still offering enough spaces to meet the needs of drivers.

In June 2007, MTC released a toolkit of regional best parking strategies, including pricing and shared spaces strategies. This report will be an excellent resource for local communities looking for alternative ways to manage parking.<sup>30</sup>

**Overcoming Community Resistance**

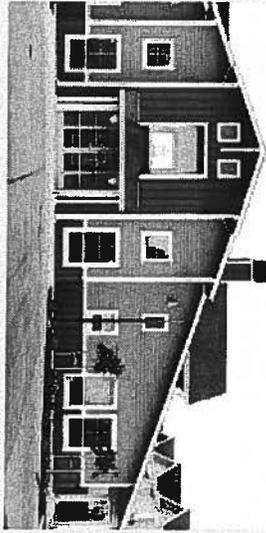
One of the primary barriers that developers and local governments face in producing housing—particularly in infill locations—is opposition from existing residents. Although community members may recognize the need for more housing, they may still oppose new developments because of anxiety about how a proposed development will affect their neighborhood. Residents often object to projects because of concerns that more housing, especially higher-density housing, will lead to increased traffic, displace existing residents, or change the character of the neighborhood. As a result of community resistance, proposals for new housing often must be reworked with lower densities or, in some cases, are denied entirely. In addition, many developers focus on creating housing in undeveloped areas to avoid the challenges of dealing with neighborhood opposition.

Many local governments have come to realize that the best way to reduce community resistance to new housing development is to give community members an active role in determining what kind of housing and amenities their community will have. Giving community members a real voice requires that local governments go beyond the minimum outreach requirements mandated by law to find ways to truly engage residents and others in the planning and decision-making processes.

*When residents are engaged as partners and seen, and see themselves, as part of the solution then a collaborative relationship is possible. If, on the other hand, residents are viewed solely as customers then the... underlying dynamic can become adversarial and the opportunity for collaborative change missed.*

**—Strong Neighborhoods Initiative,  
City of San Jose**

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**Murphy Ranch, Morgan Hill**

Murphy Ranch is an affordable housing community in Morgan Hill that incorporates a variety of environmentally-friendly features. It was funded, in part, by the Santa Clara County Housing Trust Fund and consists of 100 units that are affordable to tenants who earn 22-60 percent of the Area Median Income (AMI). At 14 units per acre, it is more dense than most housing in the area, but the buildings were designed to fit in with the rural character of Morgan Hill.

Murphy Ranch is near downtown and within walking distance of a Caltrain station, a bus stop, and various stores and services. To encourage transit use, residents are given an Eco-Pass that provides unlimited free rides on the county's bus and light rail system.

The green building features of the project include use of recycled-content building materials and non-toxic finishes, energy-efficient appliances, water-conserving landscaping, and solar panels to meet the power needs of the community center.

One strategy for successful community engagement is for local governments to work with community members to establish a vision for the future. This can help to alleviate residents' concerns and help them see how new housing is part of a larger vision to enhance existing neighborhoods. The City of Hercules and the Town of Windsor have revitalized portions of their communities with new housing based upon plans that came out of visioning processes. Community members are now highly supportive of development projects that fit the concepts from the visioning process. New homebuyers have increased confidence that they will enjoy their community decades into the future.

Other innovative community engagement strategies include the City of Richmond's "plan van," which travels to schools and community events to gather input into the process for updating the City's General Plan. Richmond also established a Youth Visioning Program to engage students in the update. The City of Pittsburg has made use of local and regional community-based organizations to help spread information to local neighborhood and church groups about their Railroad Avenue eBART Specific Plan. As part of their Better Neighborhoods Program, the City of San Francisco includes "talk to the planner" walk-in sessions for community residents and business owners.

It is also important for local governments to include residents during the development

process. By doing so, a jurisdiction can make sure development projects fit the shared vision for an area, and can get constructive community buy-in early on. Using community-based organizations, neighborhood organizations, and other grassroots institutions to distribute information to the community can be an excellent means of reaching many community members with relative ease. Cities can also attract more residents to meetings by making public meetings more accessible. This includes using less technical and procedural language, as well as providing translation, food, and childcare.

Some jurisdictions are trying to move beyond one-time, issue-based community engagement to build a base of citizens who share responsibility and decision-making processes with the local government. By doing so, local governments create a long-term strategy that directly involves citizens in shaping their communities. For example, Redwood City has focused on community building, where citizens share in the decision-making yet are in part responsible for the results of public efforts. Redwood City encourages active citizenry through a citizen's academy, speaker series, and town hall meetings that discuss community issues, including those related to planning and development.

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Through the Strong Neighborhoods Initiative, the City of San Jose has realigned its approach to manage neighborhood services based upon a series of neighborhood plans. This initiative is a partnership between the City, the Redevelopment Agency, and the community to improve neighborhood conditions and livability while building strong, independent, and capable neighborhood organizations and leaders. Partners develop Neighborhood Improvement Plans, and prioritize “Top-Ten” Action Agendas. Comprehensive engagement strategies such as San José’s ensure that changes to neighborhoods are long-term, popular, and sustainable. They build on community assets and strengths, and help community members understand policy decisions, resource limitations and trade-offs.

For more outstanding examples of community engagement, visit the FOCUS Best Practices Conference Series webpage. ([www.bayareaavision.org/outreach/sce.html](http://www.bayareaavision.org/outreach/sce.html))

### **Making Affordable Housing Happen**

In the Bay Area, there is a continuing need for more homes that are affordable. During the 1999-2006 RHNA period, jurisdictions in the region issued permits for only 47 percent of their allocations for units affordable to very low-, low-, and moderate-income households. Local governments had the most success at creating units affordable to low-income households, issuing permits for 79 percent

of the RHNA allocation. Making homes affordable for very low-income households is challenging because these units require larger subsidies, which are hard to obtain. Providing homes affordable to moderate-income households is equally difficult because there are few subsidies available for people in this income group.

There are a variety of strategies to increase housing choices for people at all incomes. These approaches focus on increasing the supply of homes people can afford and creating new sources of funding to devote to developing more affordable homes.

### **Inclusionary Housing**

For many Bay Area communities, inclusionary housing—including a certain percentage of units that are affordable to lower-income households in market-rate developments—is a key policy driving creation of affordable housing. In 1970, Petaluma and Palo Alto were the first local jurisdictions in California to adopt inclusionary housing ordinances. Use of this strategy has expanded tremendously so that, by 2006, 65 of the region’s 101 cities and 9 counties have inclusionary ordinances.<sup>31</sup>

The goal of inclusionary housing policies is to ensure the continued growth of the region makes room for people at all income levels, but specific policies and requirements vary by individual jurisdiction. Most communities

encourage development of the affordable units on the same site as the market-rate homes; many also try to offer developers flexibility in how they meet the inclusionary requirements. In some cases, developers can construct the affordable units on a different site, or they may be able to count excess units from one project as the inclusionary requirement of a different project.

Some ordinances offer alternatives to construction of the required affordable units, such as allowing the developer to donate land or pay an “in-lieu” fee into a local fund dedicated to construction of affordable homes. The City of Santa Rosa has made use of in-lieu fees, in conjunction with other funds, to create a large amount of affordable housing in their city.

For these options to be effective, the local jurisdiction must ensure the donated land is suitable for affordable development and that the in-lieu fee is sufficient to cover the costs of constructing the affordable units. These alternatives can allow consolidated projects that may provide housing in a more cost-effective way. This is particularly true for very-low income housing and housing that serves special needs populations.

Criticism of inclusionary ordinances has centered on the idea that developers, land owners or purchasers of market-rate housing must bear the cost of subsidizing the

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*My housing mantra is that to make affordable housing happen*

*you need three things: political will, money, and sophisticated nonprofits. It will only work if all three of these things are present. In addition, you must keep things simple, flexible, and enforceable.*

**—Bonne Gaebler  
Housing/CDBG Administrator  
City of Petaluma**

inclusionary units. However, these costs can be offset in a number of ways. For instance, developers can receive “density bonuses” as part of an inclusionary ordinance. This means more units can be included in a project, which reduces the per-unit cost and increases its overall value. In addition, cities can charge partial “in-lieu” fees, reducing costs for the developer yet allowing the city to receive money which it can then leverage and apply toward new housing.

While the Home Builders Association of Northern California opposes inclusionary housing policies, they recently worked with the Non-Profit Housing Association of Northern California to develop a number of key principles that improve inclusionary housing policies. Those principles include:

- Affordable housing policies that require the development of “like for like” units distributed uniformly throughout the market-rate development are often not the most efficient way of providing affordable housing.
- To increase effectiveness and efficiency, inclusionary housing programs should provide flexibility and allow a range of alternative methods of providing affordable units.
- Affordable housing policies that maximize resources by providing more housing opportunities or deeper levels of

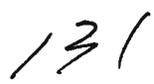
affordability at the same or less cost should be encouraged.

- Local communities with inclusionary housing programs have a responsibility to contribute tangible and substantial resources so that the cost of providing affordable housing is spread fairly across the community.<sup>32</sup>

**Preservation of Existing Affordable Units**

One of the major issues affecting the supply of homes that people can afford is the conversion of affordable units to market-rate units. The loss of affordable units not only displaces current tenants, but also represents a permanent loss of affordable housing choices in a community. Preserving and rehabilitating the existing affordable housing stock is, therefore, an integral part of a community’s strategy for providing affordable housing choices.

The use of public subsidies is the primary method for producing homes that very low- and low-income households can afford. These subsidies come from a variety of federal, state, and local sources. In return for receiving public subsidies, owners of the properties developed agree to keep them affordable for a certain number of years. Many of these subsidy programs have been around for several decades and the rent restrictions on many older buildings are expiring. This allows the owner to convert affordable units



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Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
and Environmental Impact Report Plan Bay Area Draft, page  
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**Item 1-39 of Appendix I**

**Appendix A to**

**Item 1-36 (A Place to Call Home),**

**Bay Area RHNA Performance, 1999 to 2006**

**Pages 35 through 40**

# Appendix A: Bay Area RHNA Performance, 1999 to 2006

Bay Area Affordable Housing, 1999 to 2006

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
Alameda County													
Alameda <sup>a</sup>	443	300	68%	265	36	14%	611	120	20%	843	496	59%	952
Albany <sup>a</sup>	64	5	8%	33	10	30%	77	54	70%	103	91	88%	160
Berkeley <sup>a</sup>	354	239	68%	150	257	171%	310	94	30%	455	762	167%	1,352
Dublin <sup>a</sup>	796	263	33%	531	243	46%	1,441	378	26%	2,668	2,948	110%	3,832
Emeryville <sup>a</sup>	178	124	70%	95	63	66%	226	183	81%	278	1,452	522%	1,822
Fremont <sup>a</sup>	1,079	361	33%	636	142	22%	1,814	340	19%	3,179	2,128	67%	2,971
Hayward <sup>a</sup>	625	40	6%	344	17	5%	834	818	98%	1,032	1,727	167%	2,602
Livermore <sup>a</sup>	875	202	23%	482	259	54%	1,403	657	47%	2,347	2,628	112%	3,746
Newark <sup>a</sup>	205	0	0%	111	0	0%	347	0	0%	587	314	53%	314
Oakland <sup>a</sup>	2,238	610	27%	969	690	71%	1,959	155	8%	2,567	6,847	267%	8,302
Piedmont <sup>a</sup>	6	0	0%	4	0	0%	10	0	0%	29	9	31%	9
Pleasanton <sup>a</sup>	729	120	16%	455	410	90%	1,239	272	22%	2,636	1,589	60%	2,391
San Leandro <sup>a</sup>	195	108	55%	107	0	0%	251	161	64%	317	1,245	393%	1,514
Union City <sup>a</sup>	338	177	52%	189	55	29%	559	59	11%	865	1,561	180%	1,852
Unincorporated <sup>a</sup>	1,785	50	3%	767	253	33%	1,395	4	0%	1,363	1,571	115%	1,878
<b>Total</b>	<b>9,910</b>	<b>2,599</b>	<b>26%</b>	<b>5,138</b>	<b>2,435</b>	<b>47%</b>	<b>12,476</b>	<b>3,295</b>	<b>26%</b>	<b>19,269</b>	<b>25,368</b>	<b>132%</b>	<b>33,697</b>

<sup>a</sup> Data was provided by local planning or housing staff.

<sup>b</sup> Data was estimated by ABAG staff. Total housing units based on data from the Construction Industry Research Board (CIRB). Estimates of affordable units in the low- and very low-income categories were produced by using CDLAC and TCAC data. Projects were identified as "Placed in Service" and having received funding between 1998 and 2005. ABAG staff reviewed data to ensure the units in projects that received funding from both sources were not double counted. Redevelopment Agency reports to the State Department of Housing and Community Development were used to estimate moderate-income housing production. This data may include rehabilitated units as well as new construction.

<sup>c</sup> Data for 1999-2005 was provided by local planning or housing staff. ABAG staff estimated data for 2006.

<sup>d</sup> Partial data provided by local planning or housing staff. Other data estimated by ABAG staff.

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**Bay Area Affordable Housing, 1999 to 2006**

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
<b>Contra Costa County</b>													
Antioch <sup>a</sup>	921	435	47%	509	403	79%	1,156	1,923	166%	1,873	3,213	172%	5,974
Brentwood <sup>a</sup>	906	376	42%	476	238	50%	958	2,166	226%	1,733	7,687	444%	10,467
Clayton <sup>a</sup>	55	67	122%	33	17	52%	84	16	19%	274	119	43%	219
Concord <sup>a</sup>	453	171	38%	273	115	42%	606	76	13%	987	2,411	244%	2,773
Danville <sup>c</sup>	140	85	61%	88	56	64%	216	84	39%	666	496	74%	721
El Cerrito <sup>a</sup>	37	0	0%	23	5	22%	48	19	40%	77	210	273%	234
Hercules <sup>a</sup>	101	96	95%	62	68	110%	195	93	48%	434	1,818	419%	2,075
Lafayette <sup>a</sup>	30	15	50%	17	2	12%	42	0	0%	105	186	177%	203
Martinez <sup>b</sup>	248	0	0%	139	0	0%	341	0	0%	613	424	69%	424
Moraga <sup>a</sup>	32	21	66%	17	0	0%	45	0	0%	120	65	54%	86
Oakley <sup>a</sup>	209	168	80%	125	293	234%	321	51	16%	553	1,888	341%	2,400
Orinda <sup>b</sup>	31	0	0%	18	0	0%	43	0	0%	129	157	122%	157
Pinole <sup>a</sup>	48	34	71%	35	6	17%	74	80	108%	131	52	40%	172
Pittsburg <sup>a</sup>	534	247	46%	296	381	129%	696	800	115%	987	2,477	251%	3,905
Pleasant Hill <sup>a</sup>	129	95	74%	79	69	87%	175	226	129%	331	362	109%	752
Richmond <sup>a</sup>	471	200	42%	273	1,093	400%	625	131	21%	1,234	805	65%	2,229
San Pablo <sup>a</sup>	147	214	146%	69	70	101%	123	16	13%	155	366	236%	666
San Ramon <sup>a</sup>	599	157	26%	372	407	109%	984	1,143	116%	2,492	5,538	222%	7,245
Walnut Creek <sup>a</sup>	289	99	34%	195	80	41%	418	175	42%	751	1,123	150%	1,477
Unincorporated <sup>a</sup>	1,101	372	34%	642	177	28%	1,401	77	5%	2,292	5,151	225%	5,777
<b>Total</b>	<b>6,481</b>	<b>2852</b>	<b>44%</b>	<b>3,741</b>	<b>3,480</b>	<b>93%</b>	<b>8,551</b>	<b>7,076</b>	<b>83%</b>	<b>15,937</b>	<b>34,548</b>	<b>217%</b>	<b>47,956</b>

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Bay Area Affordable Housing, 1999 to 2006

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
<b>Marin County</b>													
Belvedere <sup>a</sup>	1	0	0%	1	0	0%	2	2	100%	6	7	117%	9
Corte Madera <sup>a</sup>	29	0	0%	17	0	0%	46	0	0%	87	99	114%	99
Fairfax <sup>a</sup>	12	0	0%	7	0	0%	19	0	0%	26	18	69%	18
Larkspur <sup>a</sup>	56	7	13%	29	6	21%	85	3	4%	133	37	28%	53
Mill Valley <sup>a</sup>	40	69	173%	21	28	133%	56	41	73%	108	32	30%	170
Novato <sup>a</sup>	476	297	62%	242	527	218%	734	496	68%	1,130	1,646	146%	2,966
Ross <sup>b</sup>	3	0	0%	2	0	0%	5	0	0%	11	22	200%	22
San Anselmo <sup>b</sup>	32	0	0%	13	0	0%	39	0	0%	65	70	108%	70
San Rafael <sup>a</sup>	445	25	6%	207	87	42%	562	388	69%	876	684	78%	1,184
Sausalito <sup>a</sup>	36	22	61%	17	0	0%	50	0	0%	104	51	49%	73
Tiburon <sup>a</sup>	26	4	15%	14	3	21%	32	0	0%	92	144	157%	151
Unincorporated <sup>a</sup>	85	104	122%	48	100	208%	96	110	115%	292	643	220%	957
<b>Total</b>	<b>1,241</b>	<b>528</b>	<b>43%</b>	<b>618</b>	<b>751</b>	<b>122%</b>	<b>1,726</b>	<b>1040</b>	<b>60%</b>	<b>2930</b>	<b>3453</b>	<b>118%</b>	<b>5,772</b>

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<b>Napa County</b>													
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	Total Permits Issued
American Canyon <sup>a</sup>	230	114	50%	181	60	33%	353	51	14%	559	2,110	377%	2,335
Calistoga <sup>c</sup>	44	3	7%	31	15	48%	41	0	0%	57	60	105%	78
Napa <sup>a</sup>	703	177	25%	500	351	70%	859	582	68%	1,307	1,287	98%	2,397
St. Helena <sup>a</sup>	31	10	32%	20	10	50%	36	22	61%	55	82	149%	124
Yountville <sup>a</sup>	21	0	0%	15	2	13%	20	19	95%	31	46	148%	67
Unincorporated <sup>a</sup>	405	30	7%	272	45	17%	466	63	14%	826	106	13%	244
<b>Total</b>	<b>1,434</b>	<b>334</b>	<b>23%</b>	<b>1,019</b>	<b>483</b>	<b>47%</b>	<b>1,775</b>	<b>737</b>	<b>42%</b>	<b>2,835</b>	<b>3,691</b>	<b>130%</b>	<b>5,245</b>

Bay Area Affordable Housing, 1999 to 2006

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
<b>San Francisco City &amp; County</b>	<b>5,244</b>	<b>4,203</b>	<b>80%</b>	<b>2,126</b>	<b>1,101</b>	<b>52%</b>	<b>5,639</b>	<b>661</b>	<b>12%</b>	<b>7,363</b>	<b>11,474</b>	<b>156%</b>	<b>17,439</b>
San Francisco <sup>a</sup>	5,244	4,203	80%	2,126	1,101	52%	5,639	661	12%	7,363	11,474	156%	17,439
<b>San Mateo County</b>													
Atherton <sup>a</sup>	22	0	0%	10	0	0%	27	0	0%	107	5	5%	5
Belmont <sup>a</sup>	57	24	42%	30	20	67%	80	10	13%	150	287	191%	341
Brisbane <sup>a</sup>	107	7	7%	43	1	2%	112	7	6%	164	93	57%	108
Burlingame <sup>a</sup>	110	0	0%	56	0	0%	157	72	46%	242	32	13%	104
Colma <sup>b</sup>	17	0	0%	8	73	913%	21	0	0%	28	14	50%	87
Daly City <sup>a</sup>	282	11	4%	139	22	16%	392	0	0%	578	383	66%	416
East Palo Alto <sup>c</sup>	358	57	16%	148	155	105%	349	15	4%	427	492	115%	719
Foster City <sup>a</sup>	96	88	92%	53	0	0%	166	44	27%	375	401	107%	533
Half Moon Bay <sup>b</sup>	86	0	0%	42	106	252%	104	0	0%	226	250	111%	356
Hillsborough <sup>c</sup>	11	0	0%	5	15	300%	14	19	136%	54	109	202%	143
Menlo Park <sup>b</sup>	184	0	0%	90	0	0%	245	11	4%	463	204	44%	215
Millbrae <sup>a</sup>	67	0	0%	32	0	0%	90	0	0%	154	262	170%	262
Pacifica <sup>a</sup>	120	0	0%	60	10	17%	181	0	0%	305	169	55%	179
Portola Valley <sup>a</sup>	13	12	92%	5	3	60%	13	2	15%	51	44	86%	61
Redwood City <sup>a</sup>	534	36	7%	256	70	27%	660	18	3%	1,094	341	31%	465
San Bruno <sup>a</sup>	72	138	192%	39	187	479%	110	0	0%	157	542	345%	867
San Carlos <sup>b</sup>	65	0	0%	32	0	0%	89	1	1%	182	207	114%	208
San Mateo <sup>a</sup>	479	125	26%	239	85	36%	673	50	7%	1,046	1,511	144%	1,771
So. San Francisco <sup>a</sup>	277	121	44%	131	71	54%	360	104	29%	563	1,014	180%	1,310
Woodside <sup>b</sup>	5	0	0%	3	0	0%	8	0	0%	25	126	504%	126
Unincorporated <sup>a</sup>	252	31	12%	146	0	0%	454	0	0%	828	1,982	239%	2,013
<b>Total</b>	<b>3,214</b>	<b>650</b>	<b>20%</b>	<b>1,567</b>	<b>818</b>	<b>52%</b>	<b>4,305</b>	<b>353</b>	<b>8%</b>	<b>7,219</b>	<b>8,468</b>	<b>117%</b>	<b>10,289</b>

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Bay Area Affordable Housing, 1999 to 2006

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
<b>Santa Clara County*</b>													
Campbell <sup>a</sup>	165	23	14%	77	14	18%	214	98	46%	321	482	150%	617
Cupertino <sup>a</sup>	412	36	9%	198	12	6%	644	79	12%	1,466	1,212	83%	1,339
Gilroy <sup>a</sup>	906	189	21%	334	327	98%	1,030	425	41%	1,476	1,636	111%	2,577
Los Altos <sup>a</sup>	38	24	63%	20	16	80%	56	2	4%	147	705	480%	747
Los Altos Hills <sup>a</sup>	10	26	260%	5	6	120%	15	5	33%	53	195	368%	232
Los Gatos <sup>a</sup>	72	13	18%	35	73	209%	97	16	16%	198	505	255%	607
Milpitas <sup>a</sup>	698	524	75%	351	177	50%	1,146	464	40%	2,153	2,153	100%	3,318
Monte Sereno <sup>a</sup>	10	12	120%	5	7	140%	13	15	115%	48	59	123%	93
Morgan Hill <sup>a</sup>	455	258	57%	228	298	131%	615	313	51%	1,186	1,466	124%	2,335
Mountain View <sup>a</sup>	698	118	17%	331	5	2%	991	128	13%	1,403	1,233	88%	1,484
Palo Alto <sup>a</sup>	265	214	81%	116	130	112%	343	134	39%	673	1,955	290%	2,433
San Jose <sup>a</sup>	5,337	4,415	83%	2,364	3,886	164%	7,086	776	11%	11,327	18,184	161%	27,261
Santa Clara <sup>a</sup>	1,294	279	22%	590	479	81%	1,786	665	37%	2,669	3,340	125%	4,763
Saratoga <sup>a</sup>	75	60	80%	36	1	3%	108	108	100%	320	455	142%	624
Sunnyvale <sup>a</sup>	736	55	7%	361	57	16%	1,075	194	18%	1,664	1,861	112%	2,167
Unincorporated <sup>a</sup>	325	325	100%	158	158	100%	651	152	23%	312	786	252%	1,421
<b>Total</b>	<b>11,496</b>	<b>6,571</b>	<b>57%</b>	<b>5,209</b>	<b>5,646</b>	<b>108%</b>	<b>15,870</b>	<b>3,574</b>	<b>23%</b>	<b>25,416</b>	<b>36,227</b>	<b>143%</b>	<b>52,018</b>

\* Data was updated in August 2007, based on corrections to the permits issued by the City of Campbell.

**Bay Area Affordable Housing, 1999 to 2006**

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
<b>Solano County*</b>													
Benicia <sup>d</sup>	70	54	77%	49	128	261%	90	165	183%	204	385	189%	732
Dixon <sup>c</sup>	268	0	0%	237	0	0%	379	15	4%	580	1,002	173%	1,017
Fairfield <sup>a</sup>	761	57	7%	573	192	34%	972	631	65%	1,506	5,421	360%	6,301
Rio Vista <sup>b</sup>	357	12	3%	190	27	14%	342	0	0%	502	1,679	334%	1,718
Suisun City <sup>a</sup>	191	16	8%	123	64	52%	256	36	14%	434	890	205%	1,006
Vacaville <sup>a</sup>	860	87	10%	629	691	110%	1,172	1,463	125%	1,975	2,165	110%	4,406
Vallejo <sup>d</sup>	690	322	47%	474	231	49%	779	4	1%	1,299	2,408	185%	2,965
Unincorporated <sup>b</sup>	500	0	0%	363	71	20%	771	0	0%	1,085	356	33%	427
<b>Total</b>	<b>3,697</b>	<b>548</b>	<b>15%</b>	<b>2,638</b>	<b>1,404</b>	<b>53%</b>	<b>4,761</b>	<b>2,314</b>	<b>49%</b>	<b>7,585</b>	<b>14,306</b>	<b>189%</b>	<b>18,572</b>

	Very Low			Low			Moderate			Above Moderate			Total Permits Issued
	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	RHNA Allocation	Permits Issued	Percent of Allocation Permitted	
<b>Sonoma County</b>													
Cloverdale <sup>a</sup>	95	104	109%	51	59	116%	128	138	108%	149	721	484%	1,022
Cotati <sup>a</sup>	113	74	65%	63	40	63%	166	59	36%	225	347	154%	520
Healdsburg <sup>a</sup>	112	76	68%	78	112	144%	171	31	18%	212	297	140%	516
Petaluma <sup>a</sup>	206	250	121%	124	201	162%	312	361	116%	502	944	188%	1,756
Rohnert Park <sup>a</sup>	401	293	73%	270	467	173%	597	546	91%	856	1,551	181%	2,857
Santa Rosa <sup>a</sup>	1,539	591	38%	970	1,338	138%	2,120	2,154	102%	3,025	4,241	140%	8,324
Sebastopol <sup>a</sup>	58	0	0%	35	5	14%	75	28	37%	106	88	83%	121
Sonoma <sup>a</sup>	146	111	76%	90	68	76%	188	66	35%	260	587	226%	832
Windsor <sup>a</sup>	430	161	37%	232	171	74%	559	33	6%	850	1,516	178%	1,881
Unincorporated <sup>a</sup>	1,311	650	50%	1,116	339	30%	1,563	317	20%	2,809	1,836	65%	3,142
<b>Total</b>	<b>4,411</b>	<b>2,310</b>	<b>52%</b>	<b>3,029</b>	<b>2,800</b>	<b>92%</b>	<b>5,879</b>	<b>3,733</b>	<b>63%</b>	<b>8,994</b>	<b>12,128</b>	<b>135%</b>	<b>20,971</b>

<b>Total Bay Area*</b>	<b>47,128</b>	<b>20,595</b>	<b>44%</b>	<b>25,085</b>	<b>18,918</b>	<b>75%</b>	<b>60,982</b>	<b>22,783</b>	<b>37%</b>	<b>97,548</b>	<b>149,663</b>	<b>153%</b>	<b>211,959</b>
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\* Data was updated in August 2007, based on corrections to the permits issued by the City of Campbell and the City of Vallejo.

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**Chester E. Martine, Jr., Public Comment on Draft Plan Bay Area  
and Environmental Impact Report Plan Bay Area Draft, page  
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**Item 1-41 of Appendix I**

**PDA Readiness Assessment,  
March 29, 2013,**

**Pages 1 through 43,**

**plus pages A-6 through A-9 of  
Appendix A “PDA Readiness Criteria”**

## Final Report

# PDA Readiness Assessment

*The Economics of Land Use*



Prepared for:

Metropolitan Transportation Commission

Prepared by:

Economic & Planning Systems, Inc.

March 29, 2013

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# 1. REPORT SUMMARY AND FINDINGS

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## Plan Bay Area Background

The Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) have prepared *Plan Bay Area*, the first integrated long-range transportation and land-use/housing plan for the San Francisco Bay Area that addresses the challenge of accommodating projected growth. *Plan Bay Area* responds to SB 375 which requires the adoption of a Sustainable Communities Strategy (SCS) to be updated every four years that aligns transportation investments with projected growth to reduce greenhouse gas emissions from cars and light-duty trucks. To meet these goals, the Plan's pattern of growth reduces the distance between jobs and housing, thereby reducing commutes. It distributes growth to areas with greater accessibility to transit, job centers, shopping, schools, parks, recreation and other amenities, while planning for environments that better support walking and biking.

*Plan Bay Area* projects that the San Francisco Bay Area will grow by over 2 million people, 1 million jobs and 660,000 housing units by 2040. Much of this growth is anticipated to be located in Priority Development Areas (PDAs), or designated areas identified by local jurisdictions to be appropriate for residential and commercial development. Approximately 80 percent of the anticipated growth for Plan Bay Area is allocated to PDAs.

The purpose of this report is to provide a deeper understanding and independent assessment of the readiness and feasibility of PDAs to accommodate the number of housing units envisioned by *Plan Bay Area*. This assessment will assist in implementation of the *Plan* today and in the future. By understanding the challenges to development across an diverse range of PDAs with varying market conditions, regional funding, policy, and advocacy efforts can be focused in areas that need it most.

As the Bay Area's first SCS, *Plan Bay Area* also acknowledges that much more needs to be done to ensure that PDAs realize their full development potential, and outlines strategies and initial legislative changes needed to support the proposed pattern of growth. This work will continue to be refined in future.

## Process of the PDA Readiness Assessment

MTC commissioned the urban economics consulting firm Economic & Planning Systems (EPS) to conduct a Development Readiness Assessment of the PDAs in relation to the new regional housing growth forecasts and other policies of *Plan Bay Area*. Building upon a Development Readiness Survey conducted by ABAG and MTC in 2010, this assessment applied new research and provided in-depth analysis on a sample of 20 representative PDAs.

The new assessment estimates the ability of the PDAs in the sample to accommodate new residential development consistent with *Plan Bay Area* residential forecasts. The report estimates the amount of housing that can be produced assuming baseline current conditions, and the increase in the number of housing units that could be produced if select key barriers to

development can be addressed by policy or financial interventions over the 30-year time horizon of *Plan Bay Area*. Five criteria were used to assess the sample set of PDAs:

- Housing capacity estimate (based on current conditions and the *Plan Bay Area* forecast).
- Existing planning and entitlement process.
- Level of community support as demonstrated by elected official approval of PDA-supportive land uses as well as history of neighborhood opposition.
- Market attractiveness.
- Infrastructure capacity, unfunded needs and financing capability.

The analysis also incorporates information gleaned from discussions with local jurisdiction staff, examination of existing local plans and policies, and interviews with developers working in the sample PDAs.

## Summary of Findings and Recommendations

**Table 1** provides a summary of the EPS Development Readiness Assessment indicating the *Plan Bay Area* housing forecast for each PDA in the sample, and the percentage of forecast housing units likely to be accommodated under current “base” conditions and “amended” conditions (if recommended policy actions are taken). Key findings of the Development Readiness Assessment are as follows:

1. The 169 PDAs<sup>1</sup> that have been designated in the Bay Area are quite diverse, reflecting seven distinct “place types” that range in size from as little as 30 acres to several thousand acres. Given their wide distribution throughout the Bay Area the PDAs also exhibit a range of market conditions, development opportunities, and development constraints.
2. Substantial development capacity exists in the PDAs given current local land use policy as applied to identified “opportunity sites” (potential development sites), but some upzoning or increase in allowable densities will be required to meet the *Plan Bay Area* growth allocations. **Table 1** indicates that, in aggregate, the current land use policies for the 20 PDAs in the sample currently represent physical capacity for 92 percent of the housing growth that has been allocated to them in *Plan Bay Area*. However, there is substantial variation among PDAs; in some cases current capacity greatly exceeds the *Plan Bay Area* growth forecast while it falls substantially short in others.
3. Overall “readiness” reflects the number of housing units EPS projects can be expected to be built in the PDA based on multiple factors, as distinct from the estimate of current physical capacity, which is simply an aggregation of allowable densities on opportunity sites per existing zoning ordinances. Also, “readiness” varies substantially among the PDAs with some

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<sup>1</sup> *Plan Bay Area’s Jobs Housing Connection Strategy* (May 2012) included 198 PDAs. A number of changes or modifications have been made since that time. At the writing of this report, the current number of PDAs is 169.

Table 1  
 Summary of PDA Readiness Assessment Results  
 PDA Readiness Assessment; EPS #12113

PDA Type	PDA	Plan Bay Area New Units 2010-2040	Current Planned Capacity		"Base" Readiness		"Amended" Readiness		Key Constraints
			Total New Housing Units based on Current Zoning and Sites (2012)	% of Allocation	New Units by 2040	% of Allocation	New Units by 2040	% of Allocation	
Regional Center	San Francisco – Downtown/Van Ness/Geary	27,139	16,846	62%	17,888	65%	21,479	79%	Limited land supply, parcel sizes and existing uses
	San Jose – North	32,400	32,000	99%	19,200	59%	25,600	79%	Policy to maintain job/housing balance
City Center	Fremont – City Center	2,896	7,943	274%	3,177	110%	4,766	165%	Ample land supply and zoning, but infrastructure deficiencies and funding
	Hayward – Downtown	3,223	5,159	160%	3,353	104%	3,869	120%	Ample capacity but constrained by market conditions, parcel sizes and existing uses
	Redwood City – Downtown	5,243	3,803	73%	1,902	36%	3,042	58%	Limited land supply, parcel sizes and existing uses
	San Rafael – Downtown	1,348	2,079	154%	1,455	108%	1,663	123%	Ample land supply and zoning, but constrained by parcel sizes and existing uses
	Santa Rosa – Downtown/Station Area	3,895	3,399	87%	2,379	61%	3,059	79%	Parcel sizes and existing uses
Suburban Center	Antioch – Hillcrest	2,287	2,500	109%	1,250	55%	1,500	66%	Unproven market for higher density, infrastructure financing
	Milpitas – Transit Area	7,080	6,136	87%	5,522	78%	6,136	87%	Parcel sizes and existing uses
	Walnut Creek – West Downtown	3,012	1,814	60%	1,451	48%	2,177	72%	Parcel sizes and existing uses
Transit Town Center	Alameda – Naval Air Station	4,010	1,935	48%	1,959	49%	3,483	87%	Density limits and infrastructure financing
	Morgan Hill – Downtown	1,419	1,243	88%	870	61%	1,243	88%	Market conditions and lack of financing assistance
	Oakland – Coliseum	6,845	11,194	164%	3,358	49%	3,918	57%	Market conditions and lack of financing assistance
	South San Francisco – Downtown	3,116	1,700	55%	1,496	48%	1,777	57%	Limited land supply, infrastructure needs, and lack of financing assistance
Urban Neighborhood	Oakland – MacArthur	5,092	3,577	70%	2,325	46%	3,130	61%	Limited land supply, parcel sizes and existing uses
Transit Neighborhood	Benicia – Downtown	929	429	46%	343	37%	429	46%	Limited land supply, parcel sizes and existing uses
	Pittsburg – Downtown	1,823	707	39%	636	35%	990	54%	Limited land supply, market conditions and lack of financing assistance
Mixed-Use Corridor	El Cerrito – San Pablo Corridor	1,015	2,147	212%	1,288	127%	1,718	169%	Ample land supply and zoning, but constrained by parcel sizes and existing uses
	San Mateo – El Camino Real	1,204	1,668	139%	1,001	83%	1,168	97%	Parcel sizes and existing uses
	Sunnyvale – El Camino Real	4,412	2,850	65%	3,192	72%	4,104	93%	Low-density zoning, parcel sizes, and existing uses
<b>TOTAL SAMPLE</b>		<b>118,388</b>	<b>109,129</b>	<b>92%</b>	<b>73,848</b>	<b>62%</b>	<b>95,249</b>	<b>80%</b>	

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expected to add units in excess of the *Plan Bay Area* forecast while others may fall well below the forecast because of the existence of a range of constraints, which will impede full development of the PDAs, including these constraints:

- Policy Constraints. Overall it appears that local planning and zoning are consistent with the uses and densities envisioned in *Plan Bay Area*, but there are cases where there are major policy impediments. Two significant examples include the City of Alameda's "Measure A" prohibition of multifamily housing development and San Jose's phasing requirement linking housing development to net new non-residential square footage in North San Jose.
- Market Constraints. While market prospects for multifamily and mixed use development have recently been and will likely remain strong in the inner Bay Area PDAs, conditions are less certain in the more outlying PDAs where more traditional suburban development continues. Market demand will also lag in the more outlying PDAs or those with unfavorable demographic or institutional conditions.
- Infrastructure Constraints. Many PDAs have substantial existing infrastructure supporting infill development; however, there are many PDAs where infrastructure is inadequate and that will require substantial public investment to improve capacity and readiness. In nearly all cases, a concerted effort to assure adequate infrastructure will be an ongoing local and regional effort.
- Site-related Constraints. While there are some vacant sites in most PDAs, much of the development capacity in the PDAs will be derived from redeveloping existing commercial land uses with new multifamily or mixed use development. Moreover, in many instances there are small parcel sizes with problematic configurations that will require parcel assembly to create adequate development sites.
- Financing Constraints. With the demise of redevelopment agency powers, local governments have limited authority and financing capacity to promote or pursue redevelopment projects by assembling land or subsidizing desired private development. Where market conditions are strong, the private sector may have adequate incentive to invest but where market conditions are weak or development costs are high, lack of redevelopment authority and public financing will impede PDA development.
- Financial Feasibility Constraints. In combination, the above policy, market, and physical constraints evident in some PDAs will make the desired multifamily and mixed use development there infeasible, particularly in the coming decade. Over time, these feasibility constraints will diminish as market conditions improve, infrastructure constraints are resolved and public and private redevelopment efforts become successful. The provision of affordable housing presents a particular financial feasibility constraint as substantial subsidies will be required in most cases to achieve the targeted levels of affordability in the PDAs.

After applying discounting factors for these types of constraints to the current planned capacity for development in each sample PDA, EPS estimates that, in aggregate, the sample PDAs are "ready" to accommodate 62 percent of the housing growth allocated to

them through 2040 in *Plan Bay Area*. This figure represents the “Base” readiness of the PDA sample shown on **Table 1**.

4. *Plan Bay Area* will specify a range of policy actions to be pursued at the local, regional, state and federal levels. As a part of the Development Readiness Assessment, a general set of such policy actions were assumed and theoretically applied to determine how such actions might improve development readiness substantially above the base “no action” case. These efforts include:
- Reinstating some form of redevelopment authority to provide jurisdictions with development financing and parcel assembly capacity.
  - Modernizing the California Environmental Quality Act (CEQA) by providing consistent standards and reducing duplication of environmental review.
  - Supporting long-term adjustment to commercial or residential tax rates to balance the financial incentives for new development.
  - Stabilizing federal funding levels for the development of housing.
  - Supporting transportation funding policies that encourage the development patterns included in *Plan Bay Area*.
  - Refining local land use policies and zoning that improves the flexibility, predictability and efficiency of land use regulations.

In addition, local governments should continue infrastructure improvement and financing efforts, and assure that related financial burdens placed on new development fall within reasonable economic limits.

EPS has estimated that these policy actions can, over time, substantially improve PDA development readiness, increasing from 62 percent of the forecast under the “base” conditions to 80 percent under the “amended” conditions, as shown in **Table 1**.

While the PDA Readiness Assessment analysis accounts for factors such as the performance of local schools, the presence of crime and environmental conditions, the scope of the analysis did not extend to recommending policies and strategies for improving these factors. Should these factors be sufficiently improved over time, PDA housing production may exceed the amounts estimated in this report.

5. *Plan Bay Area* anticipates that 20 percent of future housing growth in the region will occur beyond PDA boundaries, in “non-PDA” areas. Development of the non-PDA “greenfield” areas will face many of the same categories of constraints as identified for the PDA areas, such as the following:
- **Policy Constraints.** Capacity for substantial residential development in suburban locations in the Bay area is limited to a few areas given land use and urban growth policies adopted by the counties and cities of the Bay Area. Suburban growth areas remain in eastern Alameda County (Livermore Valley), eastern Contra Costa County, southern Santa Clara County, and the peripheries of Solano County and Sonoma County cities.

Even these areas are subject to significant policy constraints, though they may face different challenges than infill areas.

- Market Constraints. There will always be a market for suburban and rural single family housing in the Bay Area, including resale of the substantial existing inventory and modest expansion in response to market demands. However, the recent housing “bust” has shown that peripheral suburban areas have been quicker to lose their home values and slower to recover than the interior areas nearer major employment centers and along transit corridors. EPS expects consumer preferences to increasingly favor urban and/or transit-accessible areas as population, employment, and related congestion increase. This is supported by recent trends, as well as a 2009 MTC study which identified certain segments of the market likely to locate in transit-oriented developments.<sup>2</sup>
- Infrastructure and Financing Constraints. Non-PDAs typically have less existing infrastructure to accommodate new growth, and new suburban subdivisions frequently have carried significant costs to install new roadways, utility extensions, parks, schools, etc. These costs, paired with comparatively low home values in some areas with greater planned “greenfield” capacity, represent a financing obstacle for new subdivision development.

Other Non-PDA areas, such as rural development beyond growth limit lines or infill development in non-PDA built neighborhoods, are not expected to represent a major supply of future housing, irrespective of the *Plan Bay Area* forecasts.

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<sup>2</sup> MTC (2009), *Choosing Where We Live: Attracting Residents to Transit-Oriented Neighborhoods in the San Francisco Bay Area* ([http://www.mtc.ca.gov/planning/smart\\_growth/tod/5-10/Briefing\\_Book-Choosing\\_Where\\_We\\_Live.pdf](http://www.mtc.ca.gov/planning/smart_growth/tod/5-10/Briefing_Book-Choosing_Where_We_Live.pdf))

## 2. STUDY BACKGROUND

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Over the past several years, the regional agencies have been engaged in an intensive effort to create the Bay Area's first Regional Transportation Plan and Sustainable Communities Strategy as mandated by SB-375 through an intensive and interactive regional planning effort. Key components of *Plan Bay Area* include:

- Regional Growth forecast. ABAG has updated regional growth population and employment forecasts for *Plan Bay Area*. ABAG's new regional growth forecast was derived from national population growth trends, estimates of employment by industry sector, and assumptions regarding California and the Bay Area's share of national population and employment growth. EPS also understands that emphasis was placed on capturing all net new households generated by forecast job growth within the nine Bay Area counties, rather than assuming any significant number of new Bay Area employees choosing housing outside the Bay Area (such as in San Joaquin County).
- Designation of PDAs by local jurisdictions. At the core of *Plan Bay Area* are the Priority Development Areas, or places identified by local jurisdictions that are located in existing communities, have at least 20 minute transit frequencies during peak hours and are planning for residential and commercial growth. At this time there are 169 PDAs in over 60 jurisdictions in the region.
- Preparation and review of regional planning scenarios. A series of regional land use scenarios reflecting distinct geographic distributions of the regional growth forecast were prepared by ABAG. The regional growth scenarios were intended to explore how alternative future land use patterns might influence production of greenhouse gas (GHG) emissions, given the more or less equal amounts of regional population and job growth reflected in ABAG's regional growth forecasts. This process was coupled with an extensive effort of outreach and interaction with the Bay Area's cities and counties and other stakeholders soliciting comments regarding the ABAG land use scenarios.
- Selection and study of a preferred growth scenario. This interactive planning effort culminated in the creation of the *Jobs-Housing Connection Strategy*, the *Plan Bay Area* land use scenario, which was included in the *Plan Bay Area* environmental review (*Plan Bay Area Environmental Impact Report*). Notably, this was the most aggressive of all land use scenarios considered by ABAG in terms of concentrating future growth within the designated PDAs.
- Developing a new allocation framework for federal transportation funding designed to incentivize PDA development. A key component of *Plan Bay Area* implementation is the "One Bay Area Grant" (OBAG) program. In essence, the OBAG program creates a new framework for allocating federal transportation funding including the Surface Transportation Program (STP) and Congestion Mitigation Air Quality (CMAQ) funds. This allocation framework is intended to incentivize PDA development by directing federal grant funds, through the individual county Congestion Management Agencies, to PDA-serving transportation planning and capital infrastructure projects. As a part of the OBAG program, the CMAs are preparing

PDA Investment and Growth Strategies that describe how the funding will be prioritized and allocated in each county in support of PDA development.

By definition, all the PDAs are or will be served by transit and are planning for intensified growth patterns. Nonetheless, there is considerable variation among the PDAs regarding their individual market potential, development constraints, and related development capacity and feasibility (i.e., readiness for development).

This report provides an independent assessment of PDA development readiness, documenting both opportunities and constraints. As noted earlier, an initial survey of development readiness was conducted by ABAG and MTC in 2010. This updated and more comprehensive evaluation assesses the feasibility of achieving the growth pattern reflected in *Plan Bay Area* and identifies resources required and actions necessary to achieve the projected development pattern. The assessment of development readiness can guide implementation of *Plan Bay Area* by identifying feasibility constraints and providing generally applicable implementing actions and policies, defining subsequent steps by ABAG and MTC, and identifying actions and resources needed at the federal, state and local levels to improve PDA development readiness. The resulting implementation program can help achieve the land use mix and development pattern reflected in *Plan Bay Area*.

### 3. PDA DEVELOPMENT READINESS ASSESSMENT

#### Study Methodology

Development Readiness in the context of this report is defined as the likelihood that a given area (e.g., a PDA) can achieve a prescribed type and amount of development within a given time. Development readiness is influenced by a range of physical opportunities and constraints, land use regulations, market factors, and availability and capacity of physical infrastructure. In order for the development readiness assessment to be broadly applicable, it was necessary to develop evaluation criteria and methods consistent with industry-standard development planning principles. The readiness assessment process has involved multiples steps, as described below.

#### Sample Selection

The 169 PDAs are spread among each of the nine Bay Area counties, and include places as different as Downtown San Francisco and undeveloped land adjacent to the freeway in Antioch. In sum, roughly 525,000 new housing units through 2040, representing about 80 percent of the 660,000 new housing units forecast for the entire Bay Area, have been allocated in PDAs in *Plan Bay Area*.<sup>3</sup> Twenty PDAs were selected as a representative sample of the total, including a substantial proportion of the allocated housing growth but also reflecting the diversity of market and physical conditions present among the region's PDAs. The sample for this assessment includes representatives of the seven different PDA place types identified by ABAG and MTC.

PDA Type	PDA	Plan Bay Area New Units 2010-2040
Regional Center	San Francisco -- Downtown/Van Ness/Geary	27,139
	San Jose -- North	32,400
City Center	Fremont -- City Center	2,896
	Hayward -- Downtown	3,223
	Redwood City -- Downtown	5,243
	San Rafael -- Downtown	1,348
	Santa Rosa -- Downtown/Station Area	3,895
	Antioch -- Hillcrest	2,287
Suburban Center	Milpitas -- Transit Area	7,080
	Walnut Creek -- West Downtown	3,012
	Alameda -- Naval Air Station	4,010
Transit Town Center	Morgan Hill -- Downtown	1,419
	Oakland -- Coliseum	6,845
	South San Francisco -- Downtown	3,116
	Oakland -- MacArthur	5,092
Urban Neighborhood	Benicia -- Downtown	929
	Pittsburg -- Downtown	1,823
Transit Neighborhood	El Cerrito -- San Pablo Corridor	1,015
	San Mateo -- El Camino Real	1,204
	Sunnyvale -- El Camino Real	4,412
<b>Sample Total</b>		<b>118,388</b>

<sup>3</sup> Analysis is based on the allocations included in *Plan Bay Area's Jobs Housing Connection Strategy*, May 2012.

Local jurisdictions have selected their PDA place type based on characteristics that they envision for the future, not necessarily based on their current conditions. As a result, even places categorized similarly may have very different existing conditions. For example, Antioch's Hillcrest Station Area and Walnut Creek's Core are both identified as "Suburban Centers," though the Hillcrest PDA is almost wholly unimproved land while Walnut Creek's Core has a substantial existing base of employment, retail, and housing. EPS aimed to reflect this diversity so that the issues pertinent in a variety of Bay Area settings would be reflected in the sample.

### **Review of Previous Assessments**

In 2010, ABAG distributed surveys to Bay Area jurisdictions seeking information about planned PDAs. These surveys inquired about expected growth, planning documents, infrastructure issues, political circumstances, and other pertinent factors affecting the potential to develop housing and employment in the PDAs. The surveys were completed by local jurisdiction staff, at varying levels of completeness and accuracy. The completed surveys were provided to EPS by ABAG and MTC, and were reviewed as relatively recent data points and expressions of the jurisdictions' expectations for their PDAs.

### **Review of Physical and Planned Capacity**

In addition to the information provided in the 2010 surveys, EPS's subcontractor Community Design + Architecture (CD+A) reviewed current planning regulations for each of the PDAs in the sample set, including Specific Plans, General Plans, zoning documents, etc., to understand the allowable uses and densities within these PDAs. In some cases, the plans already summarized the number of housing units that could be accommodated within the subject areas. Where such plan documents did not already provide assessments of the physical capacity for growth in the PDAs, CD+A conducted an assessment of "opportunity sites" representing vacant or underutilized properties in the PDAs. This was done primarily through visual inspection of aerial photographs and/or onsite assessment of PDAs. Parcels on which development was clearly well below the allowable density were identified as having potential for development over the coming decades. For example, a site on which mixed-use development of 40+ units/acre was allowed, but on which a small retail building with surface parking currently sat, would be identified as an opportunity site. Based on this assessment and an aggregation of allowable development densities on the opportunity sites, CD+A estimated the amount of development for which there is current physical and planned capacity. **Table 2** provides a summary of CD+A's results, which was derived by assessing local jurisdiction planning documents and input from city staff as applicable.

### **Market Assessment**

To inform our understanding of local market conditions, EPS gathered basic socio-economic and real estate data for each PDA and its surrounding context (a 2-mile radius from the PDAs' centerpoints), including the following data:

**Table 2**  
**Capacity Assessment for Selected Priority Development Areas**  
**PDA Readiness Assessment; EPS #121113**  
 Community Design + Architecture, 11/19/12

County	PDA Type	JURISDICTION	KEY	PDA_NAME	Projected Unit Growth	2010 Units from Plan	2040 Units from Plan	Potential Land Availability (sq ft)	Average Density Required*	Developed Capacity Assessment (units)	Capacity Excess/Shortfall (based on average density)	Notes
Ala		Fremont	FRE2	Central Fremont	2,900	7,310	10,210	189.3	15.3	7,943	5,043	Fremont Policies are in place. Can be achieved by partially displacing some employment.
Ala		Hayward	HAY2	Downtown	3,220	2,290	5,510	66.7	46.8	5,159	1,939	Significant agglomeration of smaller parcels in downtown Hayward. Some residential displacement may be required.
SM	City Center	Redwood City	RWC1	Downtown Precise Plan Area	5,240	1,060	6,300	63.3	82.8	3,803	(1,437)	No Maximum density limit. Assume 80 du/ac based on 20 du/ac range between mixed use categories.
Martin		San Rafael	SRA1	Downtown San Rafael	1,350	2,610	3,960	96.1	14.0	2,079	729	Policy and land available. Some aggregation required. Some residential displacement may be required. The present General Plan EIR assumes only 820 new units within 1/2 mile of the station.
San		Santa Rosa	SRO1	Downtown Santa Rosa Station Area	3,900	2,220	6,130	150.0	26.0	3,399	(501)	Additional capacity can be available if Retail & Business Services designation can include residential mixed use.
CC		El Cerrito	ELC1	San Pablo Avenue Corridor	1,020	1,340	2,360	56.2	18.1	2,147	1,127	Zoning allows for growth. Need for Parcel aggregation. Some residential displacement may be required.
SM	Mixed-Use Corridor	San Mateo	SMA3	El Camino Real	1,200	880	2,080	38.7	31.0	1,668	468	North end of Hillsdale mall utilized for HSC. Assumption of HDR density on Reg Commercial classification.
SC		Sunnyvale	SUN3	El Camino Real	4,410	10,990	15,400	107.3	41.1	2,672	(1,738)	The Corridor Mixed Use designations at major intersections require higher average density designation (current 24/du/ac). And/or re-designation of commercial to corridor mixed use along stretches between major intersections.
SC		San Jose	SJO3	North San Jose	32,850	1,093	33,943	432.7	75.9	37,375	4,525	NSJ plan estimates 32,000 units on select parcels. Utilizing policy densities on same parcels + two Mobile home Parks result in listed numbers.
SF	Regional Center	San Francisco	SFO3	Downtown-Van Ness-Geary	27,140	101,520	128,660	221.0	122.8	16,846	(10,294)	City provided a "soft site" analysis identifying over 1,000 separate parcels with an average size of ~7,000 square feet. Capacity figure reflects current maximum density for such parcels.
CC		Antioch	ANT1	Hillcrest eBART Station Focus Area	2,290	160	2,450	See Note	See Note	2,500	210	Specific Plan allows to 2,500 housing units. Policy and land available for desired capacity.
SC	Suburban Center	Milpitas	MPT1	Transit Area	7,080	790	7,870	154.5	45.8	6,136	(944)	Does not include Great Mall. Includes BART station area. Policy complementary to housing intensification.
CC		Walnut Creek	WAL1	Core area including the Walnut Creek BART Station	3,010	1,520	4,530	59.0	51.0	1,814	(1,196)	Need to build at average 52 du/ac
Sol	Transit Neighborhood	Benicia	BEN1	Downtown Benicia	930	600	1,530	57	16.4	429	(501)	Considerable redevelopment and parcel aggregation required. Substantial redevelopment of SF parcels. Also may require some redesignation of land use on large mall lot at North end.
CC		Pittsburg	PIT2	Downtown Pittsburg	1,830	1,870	3,700	15.0	122.0	707	(1,123)	Will require revision of land use policy to add residential MU designation to Service Commercial areas.
Ala		Alameda	ALA1	Naval Air Station Alameda	4,010	1,460	5,470	See Note	See Note	1,935	(2,075)	Average not calculated, but capacity estimated from Staff reporting of planned capacity for developable areas. Measure A major impediment to multifamily development.
SC	Transit Town Center	Morgan Hill	MOH1	Downtown Morgan Hill	1,420	570	1,990	56.3	25.2	1,243	(177)	Downtown has no limits on Density. Utilized highest residential density as limit. Challenge will be to assimilate parcels. Some residential displacement may be required.
Ala		Oakland	OKD2	Coliseum BART Station Area	6,850	3,870	10,720	240.0	28.5	11,194	4,344	used 1/3 area of Coliseum parcel
SM		South San Francisco	SSF1	SSF Downtown	3,110	1,590	4,700	See Note	See Note	1,700	(2,574)	Numbers based on policy and ongoing planning efforts as reported by City of South San Francisco.
Ala	Urban Neighborhood	Oakland	OKD6	MacArthur Transit Village	5,090	8,820	13,910	45.3	112.4	3,577	(1,513)	Includes BART 625 units. Does not include Walgreens shopping plaza on Telegraph. Parcels > 1/2 acre calculated at higher average density. Some residential displacement may be required.

Note: \* Potential Land Availability assessed primarily on existing vacant or non residential parcels with land use designations allowing for housing.  
 \* Average Density Required indicates the average housing density required on potentially useable/reusable parcels to achieve PDA growth projection.

- Median household incomes and percentage of households earning \$100,000 or more (to understand the basic socio-economic profile as an indicator of housing demand).
- Percentage of renter households and percentage of attached or multifamily housing units (to understand the physical form of local housing).
- Number of dwelling units in 2000 from corresponding Census tracts and in 2010 from the *Plan Bay Area* data (to understand recent housing growth).
- Average and median prices per square foot for attached and multifamily housing in from 2002 through 2012 (to understand basic housing prices and trends to assess the feasibility of new construction).

This information served as the basis for understanding market demand and financial feasibility factors for new housing in and around each PDA, but was further supplemented through interviews as discussed below.

### **Interviews with Local Jurisdictions**

Having reviewed the 2010 survey materials and CD+A's assessment of planned development capacity in each PDA, EPS conducted interviews with staff from each of the jurisdictions whose PDAs were in the sample. These interviews typically involved planning staff, but in some cases also involved staff in economic development, public works, or other departments. The interviewees were asked a series of standardized questions, from which the conversations branched off to seek clarification or more information regarding locally-specific conditions and issues. The standardized questions were as follows:

#### Planning and Entitlement

1. Have there been any notable changes in the applicable land use plans in the PDA in the past two years?
2. Will it be necessary to displace existing stable residential areas to achieve plan development objectives?

#### Market and Investment Attractiveness

3. Have there been changes to the "pipeline" projects under review or construction in the PDA in the last two years? (Review or create list with project name, use types, and size).
4. What key factors within or surrounding the PDA influence attractiveness to real estate investment? (list)
5. What key factors within or surrounding the PDA create disincentives to real estate investment?

Community Support

6. Have elected officials expressed support for development in the PDA consistent with ABAG's development allocation under *Plan Bay Area's* "Jobs-Housing Connection Scenario"?
7. Has there been any organized citizen opposition to development in the PDA?
8. Have there been ballot initiatives or referenda that have limited development potential within the PDA?

Infrastructure Capacity and Needs

9. Is there adequate infrastructure capacity to meet demands of PDA development?
10. If not, are the necessary infrastructure master plans in place?

Financial Resources

11. Is there an infrastructure financing plan in place that demonstrates funding for needed infrastructure?
12. What development impact fees are required in the PDA (list and amounts)?
13. Are there major funding constraints or challenges that may limit PDA development?

EPS found the interviewees to be well-informed and forthcoming about the issues and conditions affecting development in their PDAs. EPS also found the interviewees to be thoughtful and pragmatic about the potential policy and other changes that could enhance the prospects for development in the PDAs.

**Interviews with Local Developers**

In addition to discussing conditions with jurisdictions' staff, EPS conducted interviews with developers actively engaged in housing developments in various PDAs within the sample set. While less formal than the interviews with jurisdictions, these developer interviews covered the same topics and were intended to corroborate the information gleaned thus far and/or seek opinions from real estate professionals who may have different perspectives on that information. Also, most of the developers interviewed have worked in multiple jurisdictions included in the PDA sample, and could provide cross-jurisdictional comparisons. As with the local staff interviewees, EPS found these developers to be thoughtful and well-informed regarding local policies and processes as well as market and financial considerations.

**Readiness Assessment**

Based on the findings of the preceding tasks, EPS developed readiness assessment criteria to be applied to each PDA in the sample set. These assessment criteria aimed to reflect EPS's understanding of various issues and conditions in each PDA:

- Planning and Entitlement Criteria—requirements and institutional capacity to process higher-density housing projects, including length of processing time, and whether or not

achievement of substantial densities would require displacement of or conflicts with existing residential neighborhoods.

- Community Support—whether elected officials have exhibited support for higher-density housing through PDA endorsement, project approvals, adoption of Specific Plans, etc., and whether community groups have actively supported or significantly opposed such relevant actions or projects.
- Market and Investment Attractiveness—the type and pace of recent development; the pipeline of planned development projects; general market indicators (incomes, prices, etc.); whether prices appear high enough to support new construction costs at required densities; whether parcels are large or regular enough to accommodate common construction formats; and whether other conditions may detract from consumer location preferences (e.g., poor schools, high crime, environmental contamination, etc.).
- Infrastructure Capacity, Needs, and Financing—whether existing roadways, water/wastewater, parks, and other infrastructure are adequate, need minor upgrades, or need major upgrades to accommodate new growth; whether a plan or mechanism to finance such improvements is already in place; and whether future improvements represent a significant financial burden compared to the value of future housing development.

A “generic” example of the readiness assessment model is provided as **Table 3**, with notes explaining the procedure as well as the types of judgments made by EPS. As shown, EPS has begun with the current planned capacity (Line 1) and compared that to the *Plan Bay Area* growth allocation (Line 2) to determine whether capacity is adequate or falls short (Line 3). EPS then estimates the likelihood and scale of potential capacity increases, reflecting whether and to what extent zoning changes and other regulations may increase the capacity compared to current policies (Line 4). The product thus far is the estimated planned capacity under various timeframes – through 2020, 2030, and the plan horizon year of 2040 (Line 5). From that point, EPS estimates the likely production of housing units in each timeframe by summing the coefficients of the various constraints described above (Line 6). The time-based estimates reflect EPS’s judgment of conditions that will affect the pace of development, including factors that may enhance production over time (such as expected upzoning) and others that may pose greater constraints in later years (such as the cumulative subscription of existing infrastructure capacity). In the generic example on **Table 3**, this process suggests that 1,040 of the 2,000 housing units allocated to the PDA may be expected through 2040, thus representing 52 percent of the allocated growth under *Plan Bay Area* (Lines 7, 8).

In each case, EPS constructed a “base readiness” assessment, as well as an “amended readiness” assessment. The “base readiness” reflects the current opportunities and constraints for development in the PDAs, with adjustments from existing conditions only for factors we know to be relevant based on current or recent activities – for example, an upzoning of development capacity in places where plans are being formulated. Otherwise, the “base readiness” expresses EPS’s judgment of how many housing units are likely to be developed through 2040 and in the intervening decades in each PDA.

**Table 3**  
**PDA Readiness Criteria Worksheet**  
**PDA Readiness Assessment; EPS #121113**

**PDA name: Generic PDA Example**

#	Readiness Criteria Category	#	Sub-Criterion Name	PDA Development Readiness Scoring				Notes
				Present (2012)	2020	2030	2040	
A	PDA Housing Capacity Estimate	1	Estimate of current local land use policy new housing capacity	1,000				Net new housing growth potential based on existing plans (where quantified) or application of average allowable densities to visually identified opportunity sites.
		2	Plan Bay Area new housing allocation				2,000	The increment of new housing allocated to the PDA in Plan Bay Area
		3	Capacity surplus or (shortfall)	(1,000)				Difference between estimated housing capacity (2012) and allocation
		4	Estimated increased capacity through likely changes to land use policy, including any initiative-based density restrictions (percentage change to)	0%	30%	60%		EPS has made adjustments in Base Scenario where we are aware that rezoning is already being considered, or in Amended Scenario where existing zoning allowances represent limits that can be exceeded without significant increase in visual impact (e.g., increase from 27 to 40 DU/acre but not to 100 DU/acre).
		5	Estimated gross housing capacity at each period	1,000	1,300	1,600		Calculation based on projected increase to currently allowed densities.
		6	Sum of Capacity Constraint Coefficients	0.60	0.45	0.35		Summation of constraints under Base or Amended Scenarios.
		7	EPS estimate of housing production given constraints	400	715	1,040		Calculation of potential housing production, calculated as gross housing capacity by period (#5) reduced by percentage of constraint coefficients (#6).
		8	Percentage of PDA 2040 housing allocation accommodated	20%	36%	52%		Calculation of total estimated housing production by period, divided by total net new units in Plan Bay Area allocation through 2040.

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**Table 3**  
**PDA Readiness Criteria Worksheet**  
**PDA Readiness Assessment; EPS #121113**

**PDA name: Generic PDA Example**

#	Readiness Criteria Category	#	Sub-Criterion Name	Present (2012)	PDA Development Readiness Scoring			Notes
					2020	2030	2040	
B	Planning and Entitlement Criteria	1	Displacement of existing stable residential neighborhoods		0.00	0.00	0.00	If PDA allocation or estimated capacity requires redevelopment of residential neighborhoods, EPS has considered this is a constraint on probable housing growth in the Base Scenario.  In certain cases, EPS has reduced the constraint coefficient in the Amended Scenario to reflect the potential return of Redevelopment-type powers for parcel assembly.
		2	Time required and difficulty in obtaining entitlement: institutional capacity and jurisdictional track record		0.05	0.05	0.05	If jurisdictions are regarded as particularly difficult or time-intensive political or bureaucratic environments in which to gain project entitlement, EPS has considered this a constraint in the Base Scenario.  In some cases, EPS has reduced the constraint coefficient in the Amended Scenario to reflect the possibility of enhanced project streamlining through dedicated PDA entitlement staff, reduced environmental clearance criteria, etc. If elected officials have actively opposed higher-density development projects or planning consistent with PDA allocation, EPS has considered this a constraint in the Base Scenario.  In the Amended Scenario, EPS has reduced this coefficient in outer years assuming that electeds would be more pro-density.
C	Community Support	1	Elected official support for proposed PDA use types and densities during past 3 years		0.00	0.00	0.00	If community groups have actively opposed higher-density development projects or planning consistent with PDA allocation, EPS has considered this a constraint in the Base Scenario.  In the Amended Scenario, EPS has reduced this coefficient in outer years assuming that community groups would be more pro-density.
		2	History of neighborhood opposition		0.05	0.05	0.00	

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**Table 3**  
**PDA Readiness Criteria Worksheet**  
**PDA Readiness Assessment; EPS #121113**  
**PDA name: Generic PDA Example**

Readiness #	Criteria Category	#	Sub-Criterion Name	PDA Development Readiness Scoring				Notes	
				Present (2012)	2020	2030	2040		
D	Market and Investment Attractiveness	1	History of real estate investment in PDA and surrounding city		0.05	0.00	0.00	0.00	If PDA and/or City (in certain cases) have not realized significant housing growth in the past decade, EPS has considered this a constraint in the Base Scenario. EPS has made no adjustment in the Amended Scenario for this retrospective criterion.
		2	Recent Local Development Activity		0.05	0.00	0.00	0.00	If PDA and/or City (in certain cases) does not have a substantial pipeline of housing development projects (proposed, permitted, or under construction), EPS considers this a constraint in the first time period. This constraint is not extended to the years beyond 2020, and no adjustment is made under the Amended Scenario.
		3	General Market Conditions		0.00	0.00	0.00	0.00	If PDA and/or City (in certain cases) has low incomes, low housing prices, high vacancies, demographic profiles inconsistent with higher density housing (such as comparatively few small households), limited access to job centers, etc., EPS considers this a constraint in the Base Scenario. Adjustments are made in the Amended Scenario only where such conditions are expected to be different in the future based on observable trends.
		4	Financial Feasibility Constraint		0.00	0.00	0.00	0.00	Where housing prices are low, development costs are high, or sites are limited or constrained, EPS considers this a constraint in the Base Scenario. Adjustments are made in the Amended Scenario only where such conditions are expected to be different in the future.
		5	Parcel size and configuration		0.05	0.05	0.05	0.05	Where PDA opportunity sites are generally small or oddly configured and held under numerous owners, EPS considers this a constraint in the Base Scenario, unless evidence exists that such small sites have been developed for PDA-type uses in the past. Under the Amended Scenario, EPS has reduced this constraint coefficient where property assembly for more feasible development may be achievable through re-introduction of Redevelopment-type powers.
		6	Existence of major investment disincentives		0.05	0.05	0.05	0.00	Where PDAs have conditions such as high crime, poor schools, access constraints, or environmental pollution, EPS considers this a constraint in the Base Scenario. Adjustments are made in the Amended Scenario only where such conditions are expected to be different in the future based on observable trends.

**Table 3**  
**PDA Readiness Criteria Worksheet**  
**PDA Readiness Assessment; EPS #121113**  
**PDA name: Generic PDA Example**

#	Readiness Criteria Category	#	Sub-Criterion Name	PDA Development Readiness Scoring			Notes	
				Present (2012)	2020	2030		2040
E	Infrastructure Capacity, Needs, and Financing	1	Existing infrastructure capacity		0.10	0.10	0.10	Where PDAs are known to require major upgrades to transportation, utilities, open space, and similar infrastructure to accommodate new growth, EPS has considered this a constraint in the Base Scenario. In some cases, this constraint is assumed to grow over time, as infrastructure may be nearly adequate for early phases of development while requiring more upgrades for later phases.  Adjustments are made in the Amended Scenario only where it is expected that infrastructure projects can be funded through new programs or revenue sources.
2		Is there an existing CIP funded or other infrastructure financing plan in place?		0.05	0.00	0.00	If the City has not identified an expected approach to funding required infrastructure that is still viable today (e.g., does not assume tax increment financing), EPS considers this a constraint in the Base Scenario. Generally, this constraint is assumed to be rectified through financing plans in later years, even under the Base Scenario.  In the Amended Scenario, the initial phase of development through 2020 is assumed to be bolstered through the creation of a viable financing plan in the next few years.	
3		PDA financing capacity		0.15	0.15	0.15	Where required infrastructure costs are estimated to represent significantly more than 20% of the aggregate value of new housing under the projected capacity (#5 above), EPS has considered this a constraint in the Base Scenario. In some cases, this assessment is more qualitative due to limited information regarding projected infrastructure costs.  In the Amended Scenario, these constraints are assumed to be lessened through the availability of regional funding and/or re-introduction of Redevelopment-type funding sources.	

The “amended readiness” reflects interventions that are not currently planned but, in EPS’s estimation, represent actions at the local, regional, or state level that can enhance the prospects for development in the PDAs. **Table 3** provides illustrations of the types of assumptions that EPS has included in the “amended readiness” scenarios. Most common among such enhancements is the assumption that the ability to assemble property and assist in the financing of infrastructure and buildings would be re-introduced in some meaningful way, despite the early-2012 dissolution of the Redevelopment Agencies throughout the state.

## Sample PDA Readiness Assessment Results

EPS and CD+A have produced “base” and “amended” readiness assessments for each of the 20 PDAs in the sample. The results vary widely based on the multiple factors that contribute to each area’s readiness. In aggregate, EPS has estimated that the sample PDAs have a “base readiness” to accommodate 62 percent of the growth allocated to them in *Plan Bay Area*. The various enhancements assumed under the “amended readiness” scenarios are estimated to increase the achievable growth to 80 percent of the *Plan Bay Area*-allocated housing units. The models used to evaluate each PDA are included in **Appendix A** to this report, and are summarized below.

### Regional Centers

Regional Centers are PDAs located in the most urbanized centers of the region’s major cities, and are assumed under *Plan Bay Area* to accommodate high volumes of housing growth in the coming decades. The two Regional Centers selected for this analysis, and the conditions and conclusions for each, are as follows:

- **San Francisco Downtown-Van Ness-Geary Corridors**—This PDA covers a significant portion of San Francisco’s financial, cultural, civic, retail, and tourism areas, and is already developed at high densities. Market support for housing development is strong, and infrastructure upgrades appear reasonably proportioned to the value of new growth. Moreover, zoning allowances in this area are permissive of very high densities, and EPS believes it is reasonable to project that further “upzoning” to allow higher densities may occur through 2040, as they have over the past several decades. However, the number and scale of developable sites is limited because the area is already heavily developed. San Francisco Planning Department “soft sites” analysis has identified 1,415 underutilized parcels, on which 16,846 new housing units could be developed under current regulations. These parcels comprise a total of 221 acres of land, which means that the assumed average density is 76 units per acre. The average size of these underutilized parcels is roughly 7,000 square feet, or roughly the size of a typical single family lot in a suburban context. The small parcel sizes represent the primary constraint to new housing in this PDA, and EPS estimates that the pace of new housing development will actually slow over time as the most developable sites are built first. Under the “base” scenario, EPS assumes that the City will increase the zoning capacity of this PDA by 40 percent, and estimates that 17,688 housing units can be built in this PDA through 2040. The “amended” scenario assumes that upzoning increases capacity by 50 percent rather than 40 and that regional funding can support some infrastructure requirements. EPS estimates that 21,479 units could be expected under these

conditions. These figures represent 65 and 79 percent of the *Plan Bay Area*-allocated housing growth, respectively.

- **San Jose North**—This PDA is the location of many technology industry jobs, but has also added an increasing number of multifamily housing units within its boundaries. The City's plan for North San Jose anticipates increasing densities to allow for roughly 32,000 new housing units in addition to greater numbers of higher-density employment centers. Market forces are strong and infrastructure needs are well within feasible levels. The primary constraint on housing growth in this PDA is the City's phasing policy, which caps the total number of housing units in each of four phases at 8,000 (6,400 market-rate and 1,600 affordable) until 7.0 million square feet of non-residential development is approved. The market-rate housing allocation for the first phase is already fully subscribed, but the non-residential development allocation is well below its goal. In the base scenario, EPS has estimated that this phasing restriction will limit growth to 19,200 units through 2040, or 59 percent of the *Plan Bay Area* allocation. The amended scenario assumes that the phasing restrictions are adjusted to allow housing development to continue, and is projected to yield 25,600 units through 2040, or 79 percent of the *Plan Bay Area* allocation. This amended scenario sums to nearly 950 units per year for the next 27 years – an aggressive pace that EPS believes is achievable based on this PDA's strong market position.

These two Regional Center PDAs represent over 10 percent of the total housing growth allocation for the entire region, indicating the level of concentration of housing in the most urban centers in *Plan Bay Area*. While EPS does not predict either of these PDAs will fully achieve their allocated housing growth by 2040, they do represent large, politically viable, and financially attractive opportunities to increase housing densities in support of the *Plan Bay Area* goals.

### City Centers

City Centers are PDAs in already-established secondary cities in the Bay Area. The City Center PDAs in our sample have a mixed-use character including both job centers and existing housing at various densities. The five City Centers selected for this analysis, and the conditions and conclusions for each, are as follows:

- **Fremont City Center**—This PDA encompasses Fremont's Central Business District (CBD) an increasing vital center of retail and service, office, institutional, and residential uses. Central Fremont BART Station is within the PDA. The BART extension to San Jose, expected to be operational within the next five years, will be transformational for Fremont, creating convenient transit access to the Santa Clara County employment centers. The Downtown area has an ample supply of underutilized and some vacant sites that are zoned for moderate-to-high density housing. CD+A has estimated current housing capacity to be over 7,900 units while *Plan Bay Area* allocates 2,900 units to the PDA. Substantial multifamily housing has been developed in the PDA in the past decade linked to the expanding employment base in Fremont and Santa Clara County. While the Downtown has substantial physical and policy capacity to accommodate multifamily and mixed use development that exceeds the *Plan Bay Area* allocation, utilizing this capacity will require substantial infrastructure investments given current deficiencies and service demands of the new development including structured parking, schools, transit improvements (buses), and a range of roadway improvements. In the base scenario, EPS has estimated that 3,177 new

units may be achievable by 2040, which represents 110 percent of the *Plan Bay Area* allocation to this PDA. In the amended scenario, additional regional funding is assumed for major transportation infrastructure and redevelopment-type authority and financing tools are assumed to be re-established thus enhancing the viability of new development on smaller and/or currently utilized parcels. With these enhancements, the PDA is projected to be able to accommodate as many as 4,766 new units, or 164 percent of the *Plan Bay Area* allocation.

- **Hayward Downtown**—This PDA includes Hayward’s historic “main street” areas as well as portions of commercial strip development and adjacent neighborhoods. The area has an ample supply of underutilized land that is zoned for moderate-to-high density housing – CD+A has estimated current capacity for over 5,100 units while *Plan Bay Area* allocates only 3,223 units to the PDA. Multifamily housing has been developed in the vicinity in the past decade, and a significant project within the PDA is currently in the advanced planning stage seeking approvals. Infrastructure is also largely in place, with relatively modest improvements required to enhance capacity. Constraints in this area include modest demographics and price points and the fact that many “opportunity sites” are small and/or have existing uses on them, for which achievable price points may need to escalate in order to enhance development feasibility. In the base scenario, EPS has estimated that 3,353 new units may be achievable by 2040, which actually represents 104 percent of the *Plan Bay Area* allocation to this PDA. In the amended scenario, redevelopment-type authority and financing tools are assumed to be re-established, enhancing the viability of new development on smaller and/or currently utilized parcels. The PDA is projected to be able to accommodate as many as 3,869 new units, or 120 percent of the *Plan Bay Area* allocation.
- **Redwood City Downtown**—This PDA includes Redwood City’s Downtown area which has a Caltrain Station and is the County seat for San Mateo County. The PDA has undergone redevelopment over the years, and has planning and the current “form-based” zoning that create substantial capacity for additional multifamily housing (though below the *Plan Bay Area* allocation). CD+A has estimated current capacity for over 3,800 units while *Plan Bay Area* allocates 5,240 units to the PDA, so physical capacity is a major issue. Several multifamily housing projects are currently proposed totaling nearly 500 units. Infrastructure is largely in place, with relatively modest improvements required to enhance capacity and to modernize wet utilities. Constraints in this area include the large number of institutional uses (e.g. County government buildings) and the fact that many “opportunity sites” consist of small parcels and have existing uses on them, creating a substantial cost hurdle for developers. Financial feasibility limitations will be created by the need to displace the existing uses, and by high construction costs due to the high water table and on-site parking requirements. In the base scenario, EPS has estimated that 1,902 new units may be achievable by 2040, which represents only 36 percent of the *Plan Bay Area* allocation to this PDA. In the amended scenario, redevelopment-type authority and financing tools are assumed to be re-established enhancing the viability of new development on smaller and/or currently utilized parcels. The PDA is projected to be able to accommodate 3,059 new units, or 58 percent of the *Plan Bay Area* allocation.
- **San Rafael Downtown**—This PDA encompasses the downtown area of San Rafael which has been transformed in recent years into a vital shopping, employment, and entertainment district. The PDA is served by regional bus service and is the location of a SMART train station, with train service anticipated to begin in a few years. The Downtown has planning

and current zoning which creates capacity for additional multifamily housing. Capacity is derived nearly entirely from assumed redevelopment of a limited number of underutilized properties, including some existing residential uses. Financial feasibility limitations will be created by the need to displace existing uses, and by high construction costs. Increasing flooding associated with sea level rise may also require adaptive management techniques including costly flood protection improvements (seawalls, etc.). *Plan Bay Area* allocates 1,348 new housing units to this PDA, somewhat below the 2,079-unit capacity as measured by CD+A. Under the base scenario, EPS anticipates that 1,455 housing units can be developed by 2040, or 108 percent of the *Plan Bay Area* allocation. The amended scenario assumes that redevelopment-type resources are re-introduced, allowing infrastructure financing to take advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 1,663 units by 2040, or 123 percent of the *Plan Bay Area* allocation.

- **Santa Rosa Downtown Station Area**—This PDA encompasses Downtown Santa Rosa and its SMART Station area. The Santa Rosa Station Area Specific Plan and the City's related planning efforts create substantial capacity for multifamily housing. CD+A has estimated current capacity for over 3,400 units while *Plan Bay Area* allocates 3,900 units to the PDA. In the base scenario, EPS has estimated that 2,379 new units may be achievable by 2040, which represents 61 percent of the *Plan Bay Area* allocation to this PDA. Development capacity is derived nearly entirely from redevelopment of underutilized and a few vacant properties. Constraints include current and expected market conditions and related financial feasibility limitations and the need for local infrastructure (road and utility improvements). Lack of redevelopment authority and financing capacity will likely slow the pace of parcel assembly and redevelopment activity thus limiting project feasibility. In the amended scenario, redevelopment-type authority and financing tools are assumed to be re-established enhancing the viability of new development on smaller and/or currently utilized parcels. The PDA is projected to be able to accommodate 3,059 new units, or 79 percent of the *Plan Bay Area* allocation.

### Suburban Centers

Suburban Centers are PDAs with mixed-use character surrounding existing or planned transit stations, and typically have densities similar to City Centers but featuring more recent development. The three Suburban Centers selected for this analysis, and the conditions and conclusions for each, are as follows:

- **Antioch Hillcrest eBART Station**—This PDA is mostly undeveloped land at the junction of Highway 4 and Highway 160 in eastern Contra Costa County. BART's "eBART" system's under development and will have a station in this PDA. A Specific Plan has been adopted that promotes higher-density housing and non-residential development in this area. *Plan Bay Area* allocates 2,287 new housing units to this PDA – just fewer than the 2,500 units anticipated in the Specific Plan. Major constraints in this PDA include a lack of evident market interest in multifamily housing (despite significant housing growth overall) and the significant infrastructure costs required to accommodate the planned growth. Under the base scenario, EPS anticipates that 1,250 housing units can be developed by 2040, or 55 percent of the *Plan Bay Area* allocation. The amended scenario assumes that redevelopment-type resources are re-introduced, allowing infrastructure financing to take

advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 1,500 units by 2040, but still only 66 percent of the *Plan Bay Area* allocation due to constrained market conditions in this outlying area.

- Milpitas Transit Area**—This PDA is located in central Milpitas surrounding the BART and VTA transit stations. The Transit Area Specific Plan adopted in 2008 created the planning framework to transform the area from its current largely commercial/industrial land uses to a vibrant new mixed use community, including creation of a financing plan for all the infrastructure needed to support new development. Phase 1 development, roughly half of the overall development capacity, should be developed in next 5 to 10 years as the result of six major pending “pipeline” projects. Phase 2 of the development is expected to take longer to evolve as easily redeveloped opportunity sites become increasingly scarce. *Plan Bay Area* allocates 7,080 new housing units to this PDA – more than the 6,136 units of capacity estimated by CD&A. Under the base scenario, EPS anticipates that 5,522 housing units can be developed by 2040, or 78 percent of the *Plan Bay Area* allocation. Lack of redevelopment authority and funding is expected to impede this Phase 2 development. The Amended Scenario assumes that redevelopment-type resources are re-introduced, allowing infrastructure financing to take advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 6,136 units by 2040, 87 percent of the *Plan Bay Area* allocation.
- Walnut Creek Downtown**—The Walnut Creek Downtown PDA encompasses a walkable downtown that has become a thriving shopping, employment, entertainment, and more recently, residential center during the past few decades. This new development largely replaced previously existing lower density uses including automobile dealerships and older residential and commercial uses. The location of the Walnut Creek BART Station in the Downtown is in some measure responsible for the success of the Downtown. Current zoning creates substantial capacity for multifamily housing but is below the *Plan Bay Area* allocation of 3,012 units. Actual capacity of 1,814 units as estimated by CD+A is derived nearly entirely from the assumed redevelopment of a limited number of remaining underutilized properties. Constraints are related to financial feasibility (effectively high land costs) and needs to fund local infrastructure including major roadway improvements to Ignacio Valley Road and I-680/Olympic ramps. Under the base scenario, EPS anticipates that 1,451 housing units can be developed by 2040, or 48 percent of the *Plan Bay Area* allocation. The amended scenario assumes some increases in existing permitted densities will occur as a result of an ongoing planning process and that redevelopment-type resources are re-introduced, allowing infrastructure financing to take advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 2,177 units by 2040, or 72 percent of the *Plan Bay Area* allocation.

### Transit Town Centers

Transit Town Centers are mixed-use areas that offer relatively robust transit services within urban areas, but serve a more localized population of residents and workers, rather than attracting significant patronage from beyond the local area. The four Transit Town Centers selected for this analysis, and the conditions and conclusions for each, are as follows:

- **Alameda Naval Air Station**—This PDA is primarily comprised of former military land, including Naval Air Station Alameda and the Fleet Industrial Center. Smaller segments of the area have been developed for housing, and additional housing and retail projects are nearing construction. The majority of the area, however, is the former Naval Air Station that has faced numerous challenges ranging from environmental contamination to historic resources to grossly inadequate infrastructure. EPS anticipates that market support for housing in this area will be strong, but will face feasibility challenges primarily related to infrastructure financing. Additionally, the City of Alameda has a long-standing policy (“Measure A”) limiting multifamily housing development, though EPS assumes that such policy-based limits would not persist for this PDA through 2040. Under the base scenario, EPS estimates that this area will be able to accommodate 1,959 new housing units through 2040 (49 percent of the *Plan Bay Area* allocation), constrained primarily by infrastructure financing challenges. Under the amended scenario, EPS assumes that redevelopment-type resources are re-established, which would enhance the financing resources for infrastructure and enable the development of an estimated 3,483 housing units (87 percent of the *Plan Bay Area* allocation).
- **Morgan Hill Downtown**—This PDA encompasses the downtown area of Morgan Hill, the commercial and social center of the City. Over the past several decades the City has pursued revitalization and redevelopment of the Downtown with its Redevelopment Agency and planning efforts. As a result, Downtown has capacity for additional multifamily housing and mixed use development. This capacity is derived from several City-owned properties and redevelopment of underutilized properties, all consistent with the City’s downtown mixed use zoning districts. Residential development in the Downtown is exempted from the City’s growth management ordinance. Infrastructure needed to serve additional Downtown development is largely in place. Constraints to development include a currently limited market for multi-family residential development and the limited service by regional transit (Caltrain). *Plan Bay Area* allocates 1,420 new housing units to this PDA, slightly above the 1,240-unit capacity as measured by CD+A. Under the base scenario, EPS anticipates that 870 housing units can be developed by 2040, or 61 percent of the *Plan Bay Area* allocation. The amended scenario assumes that redevelopment-type resources are re-introduced, increasing the City’s parcel assembly abilities and allowing infrastructure financing to take advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 1,243 units by 2040 using all the estimated capacity, or 88 percent of the *Plan Bay Area* allocation.
- **Oakland Coliseum BART Station Area**—This PDA abuts the East Bay’s primary current sports and entertainment complex, and offers excellent transportation connectivity with BART, Amtrak/Capitol Corridor, the Oakland Airport Connector, and Interstate 880. The continuing uncertainty regarding the future of the sports franchises represents both a constraint and an opportunity in this PDA, as the City is exploring expansive mixed-use development opportunities on the sports complex site in the event that some or all of it becomes available. With this potential land supply included, the Oakland Coliseum PDA would have more than ample capacity to fulfill the *Plan Bay Area* allocation. However, this PDA faces significant market challenges, as reflected in low income levels and housing prices in the vicinity. While housing construction has occurred in and around this PDA in the past decade, virtually all of the new units have been deeply subsidized affordable housing, for which there is ample demand. Market-rate housing projects have been proposed and pursued on BART property for many years but thus far have not advanced to construction.

The loss of redevelopment resources represents a significant challenge for this area. In the base scenario, EPS has estimated that 3,358 new housing units can be developed, representing 49 percent of the *Plan Bay Area* allocation through 2040. The amended scenario assumes that redevelopment authority enhances the financial viability of development and increases the development to 3,918 units, or 57 percent of the *Plan Bay Area* allocation.

- **South San Francisco Downtown**—This PDA is also well connected to regional transit, with a Caltrain station and BART station in the vicinity. The City has pursued revitalization of this PDA through property acquisitions and similar redevelopment-related activities, but the likely success of those actions is now in question due to the dissolution of redevelopment agencies. The City estimates that current planned capacity on opportunity sites falls well short of the *Plan Bay Area* allocation, even with densities up to 80 units per acre and a presumption that some existing residential uses are redeveloped. Moreover, the City expects that significant infrastructure upgrades will be required for virtually all systems (roadways, water/wastewater, parks, etc.), and had previously anticipated that redevelopment-based funds would assist in such investments. Under the base scenario, EPS has estimated that 1,496 new housing units would be constructed, or 48 percent of the *Plan Bay Area* allocation through 2040. Under the amended scenario, with the re-introduction of redevelopment-type resources but still a constrained supply of developable land, EPS has estimated that 1,777 units, or 57 percent of the *Plan Bay Area* allocation, would be achievable.

### Urban Neighborhood

Urban Neighborhoods are PDAs with moderate- to high-density residential uses that also feature supportive retail and employment centers, rather than being primarily commercial areas. Transit is present but not necessarily a focal point of the neighborhoods. The one Urban Neighborhood selected for this analysis, and the conditions and conclusions for it, are as follows:

- **Oakland MacArthur Transit Village**—This PDA lies north of Downtown Oakland, in an area that includes expansive health care facilities, commercial strips, and older neighborhoods undergoing significant investment and revitalization. The most significant opportunity site in this PDA is the MacArthur BART property planned for a 600+ unit transit village, but in sum, CD+A has identified only 45 acres of underutilized land with capacity for 3,577 units, or 70 percent of the units allocated in *Plan Bay Area*. Even this small supply is constrained as most parcels are relatively small and have existing uses. This limited land supply is the major constraint in this PDA, as market conditions have shown support for housing development in the vicinity and infrastructure is generally in place. Under the base scenario, EPS estimates that 2,325 new units can be developed in this PDA through 2040, or 46 percent of the *Plan Bay Area* allocation. Assuming that redevelopment-type authority and resources are re-introduced and that allowable densities are increased (though existing densities are already high at roughly 80 units per acre), the amended scenario increases the estimated unit count to 3,130, or 61 percent of the *Plan Bay Area* allocation.

## Transit Neighborhoods

Transit Neighborhoods are primarily residential areas, well served by transit, but with existing low- to moderate densities. The two Transit Neighborhoods selected for this analysis, and the conditions and conclusions for each, are as follows:

- **Benicia Downtown**—This PDA encompasses the downtown area of Benicia, currently a low-density commercial district surrounded by Benicia's residential neighborhoods. The Downtown has limited capacity for additional multifamily housing that is below the *Plan Bay Area* allocation. Capacity that does exist would likely be derived from some redevelopment of underutilized properties, including existing single family residential uses, though consistent with the City's downtown "form-based" zoning district. Constraints include a limited market for multi-family residential development and the limited access to regional transit facilities. Financial feasibility limitations will be caused by parcel assembly costs. The existing 40 foot height limit and community opposition to more intensive development may also deter some mixed use projects. *Plan Bay Area* allocates 930 new housing units to this PDA, well above the 429-unit capacity as measured by CD+A. Under the base scenario, EPS anticipates that 343 housing units can be developed by 2040, or 37 percent of the *Plan Bay Area* allocation. The amended scenario assumes that redevelopment-type resources are re-introduced, increasing the City's parcel assembly abilities and allowing infrastructure financing to take advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 429 units by 2040, or 46 percent of the *Plan Bay Area* allocation.
- **Pittsburg Downtown**—This PDA encompasses the downtown area of Pittsburg, the historical center of the City. Over the past several decades the City has pursued revitalization and redevelopment of the Downtown with its Redevelopment Agency and planning efforts. As a result, Downtown has created capacity for additional multifamily housing and mixed use development. This capacity is derived from several City-owned properties and redevelopment of underutilized properties, all consistent with the City's downtown zoning districts. Some rezoning of existing commercial properties, allowing mixed use, would expand existing capacity. Infrastructure needed to serve additional Downtown development is largely in place. Constraints to development include a currently limited market in Eastern Contra Costa County for multi-family residential development and the distance of the Downtown to planned transit service (eBART) or the existing Baypoint BART Station. *Plan Bay Area* allocates 1,823 new housing units to this PDA, well above the 700 unit capacity as measured by CD+A. Under the base scenario, EPS anticipates that 636 housing units can be developed by 2040, or 35 percent of the *Plan Bay Area* allocation. The amended scenario assumes the aforementioned rezoning and that redevelopment-type resources are re-introduced, increasing the City's parcel assembly abilities and allowing infrastructure financing to take advantage of growing tax increment in the PDA. Under this amended scenario, EPS anticipates that development may increase to 990 units by 2040 using all the estimated capacity, or 54 percent of the *Plan Bay Area* allocation.

## Mixed-Use Corridors

Mixed-Use Corridors are linear PDAs served by transit lines, and typically feature commercial development extended along a major surface roadway with residential neighborhoods flanking

these commercial strips. The three Mixed-Use Corridors selected for this analysis, and the conditions and conclusions for each, are as follows:

- **El Cerrito San Pablo Corridor**—This PDA is typical of several along the San Pablo Avenue corridor in Alameda and Contra Costa Counties. It exhibits mostly lower-intensity commercial developments with surface parking interspersed with other uses, including residential buildings. The PDA is largely developed but many parcels are underutilized by comparison to existing planning and zoning allowances. The corridor has excellent transit access afforded by the El Cerrito Plaza and El Norte BART stations, as well as frequent AC Transit bus service along San Pablo Avenue. Mixed use and multifamily development has been occurring along the corridor in the recent decade. Constraints include the need for parcel assembly and related land costs and need for major improvements to several San Pablo Avenue intersections and connections of lateral streets (e.g. Central Avenue) to I-80. CD+A has identified underutilized parcels that can support 2,150 new residential units under current zoning, double the *Plan Bay Area* allocation through 2040 of 1,020 units. While the market for housing exists and infrastructure deficiencies are manageable, the chief constraints are the small and shallow parcels with diverse ownership, which challenge the ability to construct larger and efficient housing developments. Given these constraints, EPS's base scenario estimates that 1,288 units could be built through 2040, or 126 percent of the *Plan Bay Area* allocation. If the City could assist with parcel assembly through Redevelopment-type authority and funding, and the regional transportation improvements to San Pablo Avenue can be completed, EPS's amended scenario indicates that 1,718 units may be possible, or 169 percent of the *Plan Bay Area* allocation.
- **San Mateo El Camino Real**—This PDA is typical of several along El Camino Real in San Mateo County, as it features many lower-intensity commercial developments with surface parking interspersed with other uses, including residential buildings. CD+A has identified underutilized parcels that can support 1,668 new residential units under current zoning, representing 139 percent of the *Plan Bay Area* allocation through 2040 (1,204 units). While the market for housing is strong and infrastructure is generally in place, the chief constraints are the small and shallow parcels with diverse ownership, which challenge the ability to construct larger and efficient housing developments. San Mateo also has a history of "ballot box" planning that makes amendments to heights, densities, and other development regulations difficult. Given these constraints, EPS's base scenario estimates that 1,001 units could be built through 2040, or 83 percent of the *Plan Bay Area* allocation. If the City could assist with parcel assembly through Redevelopment-type authority and funding, EPS's amended scenario suggests that 1,168 units may be possible, or 97 percent of the *Plan Bay Area* allocation.
- **Sunnyvale El Camino Real Corridor**—This PDA is similar to San Mateo's El Camino Real corridor, in that it features a mix of lower-intensity development along the major roadway, but is flanked by lower-density residential neighborhoods on either side. CD+A estimates the current capacity in this corridor to be around 2,850 units, well short of the 4,412 units allocated in *Plan Bay Area*. Because the City's "Horizon 2035" committee has already explored the possibility of upzoning in the corridor, EPS has assumed that planned capacity would be increased sometime before 2030 even under the base scenario. Moreover, market conditions are strong and infrastructure needs are relatively modest. Still, the challenges of redeveloping existing uses on small parcels are likely to constrain growth in this PDA. EPS's

base scenario estimates that 3,192 units (72 percent of the *Plan Bay Area* allocation) will be built through 2040. With the re-introduction of Redevelopment-type authority and resources and more aggressive upzoning than under the base scenario, EPS's amended scenario estimates that 4,104 unit may be built through 2040, representing 93 percent of the *Plan Bay Area* allocation.

## Overall Findings of PDA Readiness

In the sample selected for review by EPS, PDAs jointly have existing **planned capacity** (i.e., density allowed under current regulations on opportunity sites) for 92 percent of the units allocated to them in *Plan Bay Area*. Some PDAs have capacity for more units than they have been allocated, while others have less capacity. Overall, these results suggest that continued innovative planning and "upzoning" will be required in some PDAs to approach or achieve the PDA housing and employment growth levels envisioned in *Plan Bay Area* by 2040.

In general, the **planning and entitlement processes** in the PDAs appear not to represent a major constraint on growth. Most communities have been reasonably accommodating of development proposals and capable of processing them in a timely fashion, within the legal and procedural conditions relevant to CEQA requirements. However, in some communities still affected by the Great Recession<sup>4</sup> and its impact on municipal funding, planning and development, staff has been reduced and staff capacity to process applications is suboptimal. Improvements in the general economy are likely to improve these conditions, but regional funding sources to support planning staff and efforts may also be of benefit.

**Political circumstances** also do not appear to be a major constraint in the PDAs evaluated. This is not surprising, since jurisdictions that nominate PDAs must consider and support the intensification of these self-identified locations within their communities. In many cases, elected officials and community stakeholders have been supportive of actual development project applications – not just planning efforts – that are consistent with the PDA designations.

**Market conditions** vary widely among the PDAs evaluated. Some PDAs are very high-demand areas with high housing prices and a history of intensified development occurring along transit corridors and near transit stations. Others face low market demand and conditions that discourage private investment. Policy intervention has proven only so effective in addressing discouraging market factors, though continued efforts to improve quality-of-life factors such as

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<sup>4</sup> The "Great Recession" refers to the period of national economic contraction from 2007 to 2009, during which housing prices fell dramatically and unemployment rose significantly. Government finance was greatly affected during this period, as property values, consumer spending, and development declined, leading to reductions in property tax, sales tax, and development fee income.

crime, schools, and environmental conditions should continue to be a high priority.<sup>5</sup> Many of the PDAs face a shared challenge—redeveloping small, developed parcels in an infill setting. The state’s redevelopment agencies have traditionally provided tools and resources to address the complexity and cost of such redevelopment, but such resources are not currently available.

**Infrastructure quality and capacity** also varies widely among PDAs, with some requiring very limited new facilities to accommodate their allocated growth while others require extensive and expensive investments. In locations where infrastructure needs are high *and* market demands/achievable pricing are low, financing of improvements is especially problematic. Again, redevelopment agency authority and financial resources to assist in improving infrastructure to facilitate private development are no longer available.

In sum, EPS has estimated that the 20 PDAs are “ready” to accommodate 62 percent of the housing growth allocated to them in *Plan Bay Area*. This figure represents the “base” readiness, assuming that current conditions are only improved marginally by efforts known to already have been considered by the cities (for example, upzoning for increased capacity where such has been publicly contemplated if not yet completed). EPS believes the “readiness” of the 20 PDAs can be improved to at least 80 percent of their *Plan Bay Area* allocated growth through a combination of actions at the local, regional, state and federal level including, most significantly, the restoration of the originally intended authority of redevelopment agencies to assist with parcel assembly and tax-increment-based financial support for infrastructure and vertical development. This and other potential planning and policy interventions are described in the final chapter of this report.

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<sup>5</sup> Residential location decisions and financial investment decisions by both real estate professionals and consumers are complex. Studies have shown that lower crime, better schools, and improved environmental conditions are positively correlated with higher home prices—a key measure of housing demand. However, this study did not aim to provide specific recommendations to address the full spectrum of urban conditions that affect development opportunities and demand, and these three issues (crime, schools, and environmental conditions) are addressed qualitatively as potential constraints in certain locations without being the focus of policy actions recommended in this report.

## 4. *READINESS OF NON-PRIORITY DEVELOPMENT AREA LOCATIONS*

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While *Plan Bay Area* allocates most of the future housing growth in the region to Priority Development Areas, roughly 20 percent of the future housing is still assumed to be developed outside the PDAs. Moreover, it is appropriate to consider whether more housing development could more easily or feasibly be provided in non-PDA areas, given the variety of constraints identified in the analysis of 20 sample PDAs. This section of the report summarizes some of the opportunities and constraints pertaining to growth in non-PDA areas.

By definition, PDAs are designated by their jurisdictions as places well-served by transportation services and offering opportunities for mixed-use development at higher densities than are typical elsewhere in the Bay Area. The PDAs, in aggregate, represent a very small portion of the land mass of the Bay Area (roughly 5 percent), leaving many other areas as “non-PDAs.” However, much of the region outside of PDAs is policy-protected through growth management measures such as urban growth boundaries adopted by cities and counties. Examples of non-PDA areas include East Contra Costa County’s expanses of potential greenfield subdivisions, to Palo Alto’s established residential neighborhoods, to Marin and Sonoma Counties’ coastal areas.

### **Planned Capacity and Policy Constraints**

EPS and CD+A have explored the planned capacity of each of the 20 PDAs in our sample by identifying opportunity sites and applying development regulations to those sites. Non-PDAs also have finite growth potential based on planning regulations. For example, the combined residential growth capacity in Eastern Contra Costa County (Pittsburg, Bay Point, Antioch, Oakley, and Brentwood, and Discovery Bay) under current regulations sums to roughly 40,000 units.<sup>6</sup> While this capacity figure is certainly significant, these same communities added roughly 25,000 new housing units between 1990 and 2010, suggesting that even if long-term absorption rates continue without significant change, the area will approach full buildout by 2040.

Another non-PDA example is Coyote Valley, in southern San Jose. This expansive area has been held in reserve for several decades, awaiting market forces that would enable the development of the City’s stated goals of having 25,000 homes and 50,000 “industry-driving” jobs. Achieving these quantified goals would require average residential densities of roughly 30 units per acre—a high average density for essentially greenfield development.<sup>7</sup> In addition, to meet City-established development conditions for the area, Coyote Valley development must not have a negative fiscal impact on the city, and all infrastructure and facilities must be fully funded by the development. These conditions significantly add to the cost to develop the area. Moreover,

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<sup>6</sup> EPS has been working for the Contra Costa County Transportation Authority on planning and economic issues, and generated this figure through reviews of General Plans from the named communities.

<sup>7</sup> EPS was the urban economics firm employed by the City for the creation of the Coyote Valley Specific Plan from roughly 2003-2008.

stakeholders have raised numerous concerns about traffic, air quality, water quality, cultural resources, affordable housing, healthcare facilities, wildlife habitat, farmland preservation, and similar environmental and social issues. These issues and challenges are typical of efforts to develop "new towns" or full-service urban areas where facilities and services do not yet exist. By contrast, development in most PDAs benefits from some level of existing infrastructure and services, even if these are not fully adequate to accommodate the allocated growth.

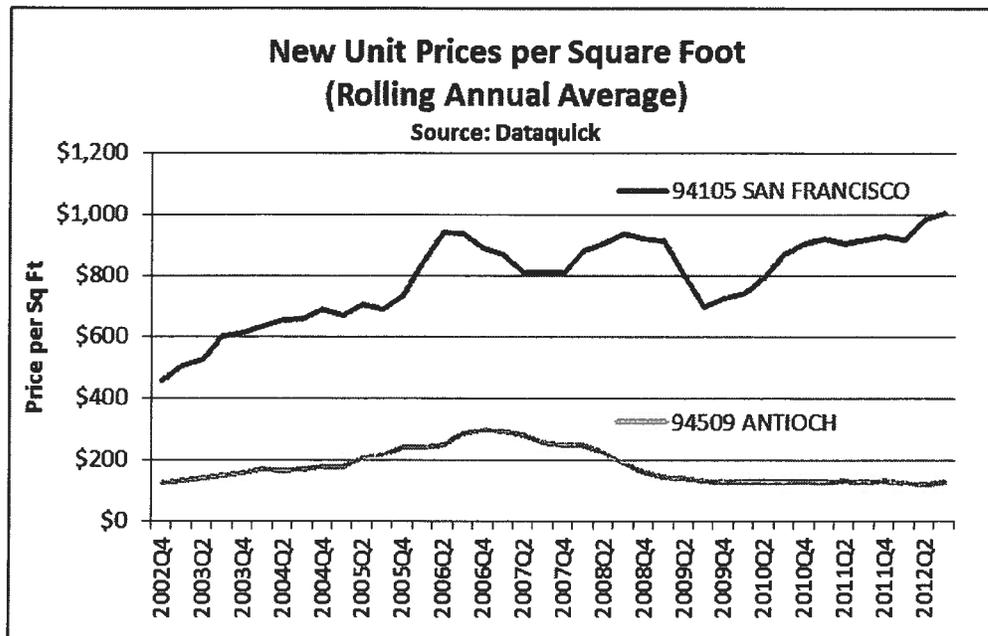
Overall, capacity for substantial suburban density residential development in the Bay Area is limited to a few areas given land use and urban growth policies adopted by the counties and cities. Significant suburban growth areas remain in eastern Alameda County (Livermore Valley), eastern Contra Costa County, southern Santa Clara County, and the peripheries of Solano County and Sonoma County cities. But as highlighted above, these areas have finite planned capacity and face many of the same challenges present in PDAs, plus other challenges that are not as prominent in most PDAs.

Other non-PDA areas such as rural development beyond growth limit lines, or infill development within non-PDA built neighborhoods, are not expected to represent a major supply of future housing.

## **Market Constraints**

There will always be a market for suburban and rural single family housing in the Bay Area, including resale of the substantial existing inventory and modest expansion in response to market demands. However, the recent housing "bust" has shown that peripheral suburban areas have been quicker to lose their home values and slower to recover than the interior areas nearer major employment centers and transit networks. EPS expects consumer preferences to follow recent trends, increasingly favoring urban and/or transit-accessible areas as population, employment, and related congestion increase.

By way of illustration, transaction records from DataQuick, a real estate data collection and management firm, show that the median price per square foot for newly constructed homes in Antioch's ZIP Code 94509 are roughly the same today as they were a decade ago, and are roughly half what they were at the peak of the market (2006). By contrast, prices in San Francisco's ZIP Code 94105 (South of Market and South Beach) have climbed dramatically in the decade and actually exceed the figures from 2006.



These figures illustrate the precipitous loss of home values since the market peak in a peripheral location requiring long commutes, and the relative stability of home values in a more transit-friendly location nearer employment centers. To the considerable extent that non-PDA areas represent housing options that are not well connected to transportation services and employment, EPS anticipates that achievable home prices will remain substantially lower, posing feasibility challenges even for the less costly (per square foot) single-family product types typical of suburban areas.

Similarly, the interior Bay Area where *Plan Bay Area* concentrates most growth has shown increased interest in multifamily housing. According to the California Department of Finance (DOF), Santa Clara County—the Bay Area’s most populous county and the expected location of roughly one-third of all new housing units allocated in *Plan Bay Area*—realized a 13.0 percent increase in multifamily housing units between 2000 and 2010, compared to a 7.8 percent increase in single-family units. Alameda County is allocated the second-most units in *Plan Bay Area*, and its multifamily housing stock also grew more quickly than its single-family stock. Just as importantly, DOF data indicate that the entire nine-county Bay Area added twice as many single-family homes as multifamily units from 2000 through 2006 (the “Housing Bubble” years). From 2007 through 2009, however, the ratio was much closer, at 1.25 new single-family homes for each new multifamily unit. These figures illustrate that higher-density housing has been prioritized by the market in expected growth areas and in periods of less “irrational exuberance” in the housing market—a trend that will be critical to the success of *Plan Bay Area*, but that also indicates a gradual shift in consumer preferences.

Even with price points and production data suggesting increased market preferences for interior locations and multifamily product types, many households—especially families with children—will continue to seek single-family homes. Development in non-PDA areas will be critical to meeting this ongoing demand for less urban housing options. But with households with children

representing only one-third of all households in the Bay Area in the 2010 Census, a substantial existing stock of single family homes (1.75 million in 2010 throughout the nine Bay Area Counties), evident consumer shifts toward higher-density product types in high-growth areas, and the continuing effects of the Great Recession (both in home supply and lending practices) demand for new single-family units in non-PDA areas is likely to be less instrumental to future regional growth than it has been in the past.

## Infrastructure and Financing Constraints

Non-PDA areas in suburban or peripheral settings typically have less existing infrastructure to accommodate new growth, and new suburban subdivisions frequently have carried significant costs to install new roadways, utility extensions, parks, schools, etc. The Coyote Valley example cited above illustrates this point. Greenfield development typically requires housing developers and/or consumers to contribute to a variety of facilities and even municipal services. These costs, paired with comparatively low home values in some areas with greater planned “greenfield” capacity, represent a financing obstacle for new subdivision development. For example, new single family development in the northeast area of the City of Fairfield is required to pay between \$65,000 and \$80,000 per unit (depending on density) for backbone infrastructure and public facilities in addition to the costs for in-tract streets and local utilities.<sup>8</sup> These figures represent a significant proportion of the potential value of new homes in this location, thus posing a feasibility challenge.

For another example, the Hillcrest Station Area in Antioch—which is actually a PDA but is similar to many greenfield subdivision projects in terms of location and infrastructure needs—requires an estimated \$140 million in infrastructure costs to support 2,500 housing units—an average of nearly \$60,000 per unit in an area where townhome prices may be expected to be below \$200,000 for the foreseeable future.<sup>9</sup> This infrastructure cost ratio represents a significant burden and feasibility challenge for new development.

Affordable housing is also more difficult to achieve in non-PDA areas. The federal Low Income Housing Tax Credit program is a major source of funding for low-, very low-, and extremely low-income housing. The program prioritizes development of rental housing (typically found in multifamily prototypes) and grants competitive preference to projects near urban services such as transit, healthcare facilities, schools, etc. Suburban greenfield development often does not provide these competitive advantages, thus constraining the ability for affordable projects in such areas to compete for these critical financial resources.

## Summary Regarding Non-PDA Development Prospects

EPS recognizes that market, political, physical, regulatory, and infrastructure conditions will vary significantly among the non-PDA areas. Given the expectations that single-family homes will continue to be in demand and that residential land will continue to be available in non-PDAs, EPS

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<sup>8</sup> EPS is the City of Fairfield’s economic consultant for the Fairfield Train Station Specific Plan.

<sup>9</sup> EPS was the City’s economic consultant for Antioch’s Hillcrest Station Area Specific Plan Financing Plan.

concludes that it is appropriate that non-PDA areas be assumed to continue to grow and be available as a source of residential property in *Plan Bay Area*. But given the *Plan Bay Area* land use patterns and transportation investments that serve the goal of reducing greenhouse gases, a forecast that allocates the majority of future housing (and regional funding) to PDAs is likely to be most appropriate.

## 5. POLICY ACTIONS TO IMPROVE DEVELOPMENT READINESS

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This section surveys 1) resources and policy actions needed to improve development readiness of the PDAs through a combination of local land use policy changes, investments, and actions; 2) regional actions such as funding PDA-supportive infrastructure by MTC funding programs (e.g. OBAG) and the respective county Congestion Management Agencies (CMA), and 3) a range of supporting state and federal actions including key legislative and regulatory changes. The need for such actions is recognized in *Plan Bay Area*, as well as in the implementation framework established by MTC and ABAG to support the establishment of a *Priority Development Area Investment and Growth Strategy* by each CMA in partnership with local jurisdictions to improve development readiness and implementation of the PDAs. The actions identified below are intended to complement these ongoing efforts.

As detailed in this report, four general factors affect development readiness:

- Market conditions and prospects will influence the type and amount of additional policy actions needed. The PDAs located where there are currently favorable market conditions and prospects typically will require less effort (application of additional policy actions) than those with poor market prospects due to their outlying location or pervasive conditions that land use and transportation regulations and funding can only partially address.
- While most PDAs in the sample analysis have land use plans and regulations consistent with *Plan Bay Area*, there is a need for continued innovation in all PDAs – new policies and forms of development regulation that achieve desired public purposes in ways that simultaneously improve incentives for, and reduce the risks of, private investment.
- Most of the PDAs will require substantial new investment in infrastructure. In some instances, funding capacity from the local government or supportable amounts from housing developers is simply not adequate to pay for this infrastructure, thus regional, state or federal funding will be required to support desired PDA development. In all cases, care will need to be taken to assure that related financial burdens placed on the private sector through local development impact fees, inclusionary housing policies, special taxes, and other development-related charges do not render desired PDA development financially infeasible.
- Most of the PDAs are largely developed and also exhibit a fragmented pattern of small parcels in independent ownership. Parcel assembly and redevelopment will be needed to achieve development objectives in virtually all PDAs. This land assembly process is time consuming, risky, and expensive and will thus represent one of the largest obstacles to achieving *Plan Bay Area* and local planning objectives.

While substantial constraints are apparent in many PDAs, it is important to recognize, as discussed earlier in this report, that the process of land-use transformation of the Bay Area is already underway and being driven by demographic, market, and local planning policies. The Great Recession has stimulated these trends in a variety of ways (e.g. shifting demand to rental housing). Cities in the West and South Bay, benefitting more recently from favorable market conditions and ongoing planning efforts, have overcome some of the constraints discussed above

to initiate projects that contribute toward greater urban infill and intensification. But the overall process of such transformation, focusing the bulk of the region's future growth to existing urban areas, will unfold over the next three decades and beyond.

The resources and actions presented in this section derive from suggestions made during this analysis through interviews with local agency staff and private developers, the experience of the EPS team with planning and implementing urban development projects, and actions identified in *Plan Bay Area* which includes a range of implementing actions. As an overarching theme to the effort needed to implement *Plan Bay Area*, there is the need for a new level of coordination among all levels of government—federal, state, regional, and local.

## Local Resources and Actions

Local governments have discretion over their local land use policy and regulation and have primary responsibility for building and maintaining major infrastructure serving PDAs (i.e., local roads, parks, sewers, etc.). Thus, they will have the primary responsibility for implementing *Plan Bay Area* by creating local land use policies and making public investments that attract the private investment necessary to ultimately draw both residents and businesses to the PDAs.

### 1. Adopting or expanding innovative land use regulations

The Development Readiness Assessment found, with a few notable exceptions, that the PDAs surveyed had recently completed specific plans and rezoning in their PDAs which are generally consistent with the *Plan Bay Area* housing and employment forecast. This is no surprise as local jurisdictions nominated their PDAs as areas of opportunity for future growth. The MTC and ABAG-sponsored PDA Planning Grant program, initiated in 2005 as the Station Area Planning Program in support of regional transit expansion, has been an effective incentive for this local planning activity. Over the past seven years MTC has funded 52 planning grants totaling over \$18.6 million. The new plans adopted by local governments as the result of the planning grants have created development capacity for over 44,000 housing units and workspace for 60,000 new jobs. Regional funding of local planning efforts will continue as a part of *Plan Bay Area* implementation and will be especially important for PDAs without completed plans (Potential PDAs) or those that need updating.

One of the key policy objectives of planning and development regulations in the PDAs will be to allow diverse development options (land use types and densities) for marketing reasons (i.e. providing a range of housing opportunities and prices) and for financial reasons (matching the costs of development with market potentials).

A number of planning and regulatory innovations in recent years have improved the flexibility, predictability, and efficiency of land use regulations. Examples of these innovations include "use-by-right" zoning districts that promote certainty for developers by clearly establishing non-discretionary use rights, form-based zoning codes that focus on the physical form of buildings instead of specific uses or density, and "incentive-based zoning" that exchanges increases in allowed density for investments in public improvements and amenities. Local jurisdictions will need to review their current regulations to determine how such innovations may improve development readiness and related private investment.

In addition, zoning requirements related to parking should be considered as part of an overall parking management program. Those PDAs with more extensive transit service should consider opportunities to reduce parking requirements without adversely affecting local traffic congestion. If supported by market preferences, this strategy can also substantially reduce the costs of new housing construction, as each structured parking space can cost tens of thousands of dollars. Centralized community parking – rather than having parking within each individual project – has also proven acceptable in certain urban areas, and may be useful where parcels are constrained and parking layouts are inefficient.

## **2. Establishing Program EIRs for all PDAs**

Under existing provisions of the California Environmental Quality Act (CEQA), a Program Environmental Impact Report (PEIR) allows for disclosure of potential environmental impacts and identifies mitigation measures, consistent with CEQA requirements, for an entire planning area (such as a PDA). As such, a PEIR can reduce the scope and depth of subsequent environmental review for projects developed pursuant to and consistent with the area plan. The Development Readiness Assessment found that a number of cities have completed such PEIRs as part of their specific planning efforts. A number of these plans have been supported by the MTC-funded PDA Planning Program, which includes funding for PEIRs. Reducing the cost and risks associated with project-related environmental review, while achieving the basic objectives of CEQA, is an important way local governments can improve certainty and feasibility of desired new development. This recommendation would be most effective if paired with State law that reduces the need for duplicative environmental reviews (see below).

## **3. Supporting and participating in redevelopment of PDAs**

In most PDAs, the majority of the new development envisioned will be built within an existing urban framework, including on existing developed sites that will need to be assembled and redeveloped. This process is challenging and comparatively expensive, because the new development must yield sufficient revenue to cover not only the cost of the development but also the “opportunity cost” of retaining a use that typically is generating positive cash flow for the existing property owner. For example, a parcel may be worth \$2 million for a new multifamily development (based on achievable building values less development costs and developer returns), but have an existing shopping center that is worth \$4 million (based on capitalized net income from the shopping center). Unless the multifamily development receives some financial assistance to make up the difference, the site is likely to remain a shopping center rather than converting to more intensive use.

This problem is one of the key reasons the state authorized local governments to establish redevelopment agencies with broad powers to assemble land and incentivize development. The elimination of this authority in California as a means to address the state’s fiscal problems was a major blow to local government capacity to financially incentivize desired development. Without reinstatement of this authority and resources, local governments will be severely disadvantaged in tackling the problems associated with redevelopment of existing urban areas.

Nonetheless, various actions can be taken even without reinstatement of redevelopment powers. Creating land use planning density incentives or bonuses (as mentioned above), sale or leasing of public lands (e.g. surface parking) for private uses (joint development), and

using Capital Improvement Programs or other public revenues to fund or subsidize infrastructure costs otherwise borne by the private sector are examples of ways cities or counties can incentivize redevelopment without express redevelopment authority.

#### **4. Expanding cooperation with the private sector**

In addition to land use planning and regulatory reforms and reinstatement of redevelopment authority, other forms of public-private partnerships (P3s) can enhance PDA readiness by increasing private investment in public-serving infrastructure. One example would be the private development and operation of structures for long-term use by public agencies (e.g. parking facilities, government buildings and facilities). There are also "concession agreements," which provide for private construction, operation and maintenance of public facilities intended for use by the general public (transit service, toll roads, bridges, etc.). The applicability of P3 agreements will vary considerably among the PDAs.

#### **5. Expanding public-public cooperation and partnerships**

In addition to "top-down" efforts to reform and coordinate the activities of the various levels of government, cooperation between existing public agencies in the PDAs can enhance development readiness in a variety of ways. In most PDAs more than one local agency is involved in providing infrastructure and public services. In addition to the city government, there are a range of local or regional special districts, the county government, and state agencies. Coordination and even formal agreements between public agencies toward specific objectives (providing needed infrastructure and services) can provide a range of benefits. Unfortunately, current practices and policies under the existing state fiscal structure – such as the allocations of property and sales tax – often place local agencies in competition with each other for diminished fiscal resources. While the state will need to consider ways to diminish this competition and conflict, there are ample opportunities and motivations for cooperation. As one example, regional parks and trail improvements provided by a county agency or a special district can enhance quality of life and development readiness of PDAs. The Iron Horse Trail in Contra Costa County is an example of this sort of cooperation. The alignment of the trail courses through a number of PDAs; further improvements (e.g. grade crossings) could enhance bicycle and pedestrian access.

#### **6. Developing PDA-specific capital improvement programs**

Cities and counties include Capital Improvement Programs (CIPs) as a part of their normal budget process. These CIPs normally include a list of capital improvements planned for construction over the next five years. Given the specific needs of PDA infrastructure it would be helpful to create PDA-specific capital improvement programs. Many PDAs have already done this as a part of their specific planning efforts – establishing an infrastructure improvement program and related financing and phasing plans. These will improve the "shovel readiness" of major improvements and put the local agency in a better position to obtain federal, state and regional funding. The PDA Investment and Growth Strategies being prepared by the individual Congestion Management Agencies (CMAs) in the Bay Area will focus on this issue.

#### **7. Establishing a comprehensive financing plan for each PDA**

Similar to area-specific CIPs, many cities have created financing plans for their PDAs as part of their Specific Plans. In other cases, where there has not been such a planning effort,

there is no overall plan for financing needed infrastructure other than that afforded by city-wide programs (development impact fees, etc.). In addition to organizing the CIP, a financing plan can identify and link funding sources, determine net funding needs, and institute special funding mechanisms as may be required such as local area development impact fees or Mello-Roos Community Facility Districts. The financing plan can also evaluate whether the financial burdens associated with infrastructure financing, affordable housing, and other development mitigation or community benefits fall within reasonable economic limits and thus do not deter desired development.

## Regional Resources and Actions

ABAG and MTC have collaborated with local agencies during the past five years to create *Plan Bay Area* in response to the state mandate created by SB-375. *Plan Bay Area* will, through its implementation, provide a focus for regional resource allocations and related implementing actions.

### 1. Pursuing Plan Bay Area Implementation and Advocacy

MTC and ABAG will engage in a host of land use and transportation advocacy efforts through *Plan Bay Area*, including these:

- Advocating for locally controlled funding to support PDA development. Development potential in PDAs can be improved by reinstating some form of tax-increment financing, as well as other redevelopment agency authorities, such as site assembly.
- Modernizing the California Environmental Quality Act (CEQA) by providing consistent standards and reducing duplication of environmental review.
- Supporting long-term adjustment to commercial or residential tax rates to balance the financial incentives for new development.
- Stabilizing federal funding levels for the development of housing.
- Supporting transportation funding policies that encourage the development patterns included in *Plan Bay Area*.

### 2. Continuing coordination with CMAs on transportation improvement funding priorities

*Plan Bay Area* includes \$340 million in federal transportation funding for planning and capital projects to be administered and distributed by the Congestion Management Agencies (CMAs) through the One Bay Area Grant (OBAG) Program, which emphasizes PDA investment. At the same time, the amount of funding allocated by the CMAs from their other resources, such as their respective sales tax measure funding or regional traffic impact fees, far exceeds the OBAG grants. Over time, as these countywide funding sources are updated or reauthorized, they could be better aligned with regional planning objectives as reflected in *Plan Bay Area*. The *PDA Investment and Growth Strategies* adopted by each of the CMAs can provide an organizational framework for this effort.

### **3. Establishing a Regional "Best Practices" Library and Forum**

Bay Area cities have been at the forefront of planning and redevelopment of existing urban areas for many years. During the past decade a substantial portion of new housing has been built in infill and intensification sites within existing urban areas. As a part of these urban intensification and redevelopment efforts, the full range of development constraints has been overcome. Collectively, a body of experience has been gained by incorporating innovative planning and regulatory approaches, public-private partnerships and other financing mechanisms for meeting infrastructure and public facility requirements, and efficient and effective approaches to environmental review. While unique strategies will be required in each PDA given their unique circumstances, it would be helpful to assemble and make generally available this body of experience and related policies, programs, regulations, and implementing measures in a web-accessible data base. A forum feature could also be added where individual jurisdictions could request information or advice from their professional colleagues.

### **4. Developing new approaches and resources for meeting affordable housing needs**

*Plan Bay Area* has established aggressive affordable housing targets throughout the Bay Area, reflecting a continuing need for housing for moderate, low and very low-income households. Analysis conducted by ABAG as part of *Plan Bay Area* preparation indicates that approximately 40 percent of Bay Area households are, and will remain through the horizon year of 2040, below moderate income.<sup>10</sup> For at least a decade, newly constructed housing in most Bay Area communities has cost more to build than could be supported by the incomes of low- and very-low income households, thus requiring subsidy from various sources (including developers through inclusionary housing requirements). These considerations suggest that of the roughly 660,000 new households in the regional forecast, some 260,000 households will not be able to afford newly constructed market-rate housing. While some fraction of these households can be accommodated in the existing housing stock, there will be the need to provide substantial affordable housing in the redeveloping PDAs. Even if only half of the new low and very low income households are accommodated in the PDAs and financial subsidies required per housing unit remain in the current range of \$100,000 or more, total costs would likely exceed \$15 billion regionwide.

Affordable housing requirements are currently expressed through implementation of the State Housing and Community Development mandated Regional Housing Needs Allocation (RHNA), a process that has been in place in recent decades throughout California linked to the mandated preparation and certification of a General Plan Housing Element. Because of the varied circumstances and policies of cities and counties and the manner in which the RHNA has been determined, there is substantial variation in city and county affordable housing policy and production.

Cities with strong affordable housing objectives have relied upon inclusionary zoning, in-lieu and/or impact fees, commercial linkage fees, and required redevelopment agency funding set-asides for housing. These local programs and resources have typically combined with cooperating non-profit housing developers that bring federal program resources, including

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<sup>10</sup> Table 2.5 of the May 16, 2012 Jobs-Housing Connection Strategy document shows 40 percent low/very low income households in 2010, and 43 percent in 2040.

the Low Income Housing Tax Credit program, to achieve housing production. Actual success of these programs at producing substantial affordable housing varies considerably from city to city. There are a range of problems that must be faced in achieving affordable housing objectives, including these:

- Controlling cost of affordable housing construction as, at the present time, it is common for affordable housing projects to actually cost more on a per unit cost basis than comparable market-rate housing.
- Keeping affordable housing costs borne by market rate developers within reasonable economic limits as inclusionary zoning and related fee programs must be internalized into private development economics. At some point, in combination with other public costs that must be internalized, these requirements will distort, deter, or eliminate potential for development otherwise desired and consistent with local plans and programs.
- Addressing the current widely varied local affordable housing programs and performance so that the burden of providing the housing is equitably distributed through the region. Examples may include allowing cities to collaboratively meet RHNA requirements (as currently practiced in Napa County), or instituting regional or sub-regional housing policies or impact fees (as seen in Sonoma County where multiple jurisdictions have adopted related linkage fee programs).

As referenced in *Plan Bay Area's Jobs Housing Connection Strategy*, ABAG could address these problems in a variety of ways, including these:

- Creating or promoting new housing funding resources including a regional housing trust fund or encouraging the state, as a part of needed fiscal reforms, to create new local funding capacity to support affordable housing programs.
- Encouraging more consistency and equity in housing policies and programs among its member cities and counties.

MTC could help to address these problems by increasing support for and investment in the region's Transit Oriented Affordable Housing (TOAH) Program. In 2011 MTC provided \$10 million as a seed investment for the TOAH fund. This investment leveraged an additional \$40 million in private capital from community development financial institutions, foundations, and private banks to create a \$50 million revolving loan fund for affordable housing developers for projects near transit in PDAs throughout the region. In January 2013, the Commission renewed its investment in TOAH with an additional \$12 million, anticipated to be leveraged by 3:1.

##### **5. Establishing new travel demand analysis frameworks that focus on multi-modal trip generation factors**

One of the most questionable aspects of environmental review under CEQA is the impact of a given project on traffic congestion, especially as it relates to projects occurring in an urban context as represented by the PDAs. Technical overstating of new vehicle trips results in an exaggerated need for traffic "mitigation measures" including new or expanded roads. Traffic engineers tend to use Institute of Transportation Engineers (ITE) vehicle trip rates, derived from a statistically-based sample of vehicle trips measured from given land uses.

The problem with this sample is that it does not typically reflect the context of the project and how this context may affect travel demand and mode choice, such as walking and biking. Caltrans has recently completed an assessment of context sensitive trip generation that can serve as a technical basis for revising existing travel demand models operated by MTC, the CMAs, and local jurisdictions.

## State Resources and Actions

The State of California through SB 375 created the statutory obligation for regional planning agencies to complete Sustainable Community Strategies in response to the state-wide goals set in AB 32 related to greenhouse gas emission reductions. This occurred at roughly the same time the state entered a fiscal crisis resulting from the Great Recession characterized by dramatic reductions in major state revenue sources without the corresponding ability to proportionately lower operating costs in the state budget. In response, the state has "realigned" revenues that would have otherwise flowed to local agencies (most notably those property taxes flowing to the state's redevelopment agencies), further weakening the fiscal resources available to local governments to promote desirable development consistent with focused growth.

To achieve the transportation and land use patterns included in *Plan Bay Area* so that the region can achieve its greenhouse gas emission reductions, there are a range of state legislative changes, resource allocation changes, and interagency coordination efforts that will be required.

### 1. Reinstating Redevelopment Authority

As noted above, loss of redevelopment authority has been a significant blow to local governments' ability to promote and participate in the type of development that is envisioned in *Plan Bay Area*. The concurrence of the state's budget crisis and the formulation of the Sustainable Communities Strategies, which will require an increase in redevelopment, was unfortunate. Pending legislation would reinstate redevelopment powers in a manner that reduces potential for abuses common under the rescinded law, and would be among the primary tools in implementing SB-375 and reaping the related benefits in GHG emissions reductions.

### 2. Update and Modernize CEQA

Ongoing efforts to modernize and update CEQA should be linked to the state's statutory objectives reflected in AB-32 and SB-375 – specifically, reforms that reduce costs and risks of planned development in PDAs while maintaining a framework to mitigate environmental impacts of new development. While CEQA reform requires state legislative actions, MTC and ABAG should join other MPOs and stakeholders around the state in seeking these reforms specifically focusing on the following topics:

- Eliminate duplicative CEQA review in cases where a federal, state or local environmental or land use law has been enacted to achieve environmental protection objectives (e.g., air and water quality, greenhouse gas emission reductions, endangered species, wetlands protections, etc.).
- Eliminate duplicative CEQA review for projects that already comply with approved plans for which an Environmental Impact Report (EIR) has already been completed, such as a certified programmatic EIR on a Specific Plan for a PDA. State agencies, local

governments and other lead agencies would continue to retain full authority to reject or condition project approvals and impose additional mitigation measures consistent with their full authority under law other than CEQA.

- Refine and tighten the CEQA lawsuit process so that:
  - a. Challenges focus on failure to comply with CEQA's procedural and substantive requirements and not on adopted environmental challenges. Emphasis should be placed on adequate notice, adequate disclosure, adequate mitigation of environmental effects not regulated by other environmental or planning law, and adequate consideration of alternatives to avoid unmitigated significant adverse impacts.
  - b. Full disclosure laws apply to the identity of CEQA litigants. CEQA's public disclosure principles could be enhanced by requiring an annual report of project compliance with required mitigation measures made electronically available to the public as part of the existing Mitigation Monitoring and Reporting Plan process.

### **3. *Creating new state infrastructure funding program for local governments pursuing SB 375 objectives***

To support the implementation of SB 375, the state could provide new funding for infrastructure required to achieve or promote implementation of the Sustainable Communities Strategies. A bond measure (similar to the special-purpose competitive funding program created by Proposition 40) could be put before the voters. The resulting funding could be administered independently or through the currently unfunded State Infrastructure Bank and further directed as a part of the *PDA Investment and Growth Strategies* prepared by the CMAs.

### **4. *Pursuing Local Government Fiscal Reform***

The structure of property taxes in California is a major obstacle to creating a balanced regional growth pattern, primarily because new housing is frequently perceived as generating more municipal service costs than municipal revenues. The current approach to taxation creates incentives to attract development that maximizes sales tax revenues, but creates a disconnect between the location of jobs, housing and transportation. In many communities, this discourages housing development and small business growth. Local governments are in need of a revenue base that is more equitable, stable, and effective. Fiscal reform efforts should support a long-term adjustment to commercial or residential tax rates to balance the financial incentives for new development.

**APPENDIX A:**  
**PDA Readiness Criteria Worksheets**



**Figure 3  
PDA Readiness Criteria Worksheet**

**PDA name: Central Fremont TASP PDA**

**Version: Amended**

#	Readiness Criteria Category	#	Sub-Criterion Name	PDA Development Readiness Scoring			Notes	
				Present (2012)	2020	2030		2040
A	PDA Housing Capacity Estimate	1	Estimate of current local land use policy new housing capacity	7,943			See "Capacity Assessment for Selected Priority Development Areas"	
		2	Plan Bay Area new housing allocation			2,900	The increase of new housing allocated to the PDA in Plan Bay Area	
		3	Capacity surplus or (shortfall)	5,043			Difference between estimated housing capacity (2012) and allocation	
		4	Estimated increased capacity through likely changes to land use policy, including any initiative-based density restrictions (percentage change to existing capacity)		0%	0%	0%	There appears to be substantial residential development capacity in Central Fremont thus there is no need to alter use or density policies. In fact, raw capacity exceeds the Plan Bay Area allocation.
		5	Estimated gross housing capacity at each period		7,943	7,943	7,943	
		6	Sum of Capacity Constraint Coefficients		0.80	0.60	0.40	
		7	EPS estimate of housing production given constraints		1,589	3,177	4,766	
		8	Percentage of PDA 2040 housing allocation accommodated		54.8%	109.6%	164.3%	
			Summary					Fremont downtown has substantial physical and policy capacity to accommodate multifamily and mixed use development that exceeds the Plan Bay Area substantially. However, utilizing this capacity will require substantial infrastructure investments given current deficiencies and service demands of the new development including structured parking, schools, transit improvements (buses), and a range of roadway improvements.

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**Figure 3  
PDA Readiness Criteria Worksheet**

**PDA name: Central Fremont TASP PDA**

**Version: Amended**

#	Readiness Criteria Category	#	Sub-Criterion Name	PDA Development Readiness Scoring				Notes
				Present (2012)	2020	2030	2040	
<b>B</b>	<b>Planning and Entitlement Criteria</b>	1	Displacement of existing stable residential neighborhoods		0.00	0.00	0.00	None of the existing residential units in Central Fremont are presumed to be redeveloped nor need to be redeveloped to achieve allocation
		2	Time required and difficulty in obtaining entitlement: institutional capacity and jurisdictional track record		0.00	0.00	0.00	The City of Fremont has good track record regarding expeditions entitlements processing
<b>C</b>	<b>Community Support</b>	1	Elected official support for proposed PDA use types and densities during past 3 years		0.00	0.00	0.00	The City of Fremont has been supportive of the <i>Plan Bay Area</i> process related to the allocations of housing units
		2	History of neighborhood opposition		0.00	0.00	0.00	There has been not neighborhood opposition to pending development proposals or the <i>Plan Bay Area</i> allocations

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**Figure 3  
PDA Readiness Criteria Worksheet**

**PDA name: Central Fremont TASP PDA**

**Version: Amended**

#	Readiness Criteria Category	#	Sub-Criterion Name	PDA Development Readiness Scoring				Notes
				Present (2012)	2020	2030	2040	
D	Market and Investment Attractiveness	1	History of real estate investment in PDA and surrounding city		0.00	0.00	0.00	While multifamily housing starts in Fremont have been limited in the past few years due to market conditions Central Fremont PDA is located in an area that shows strong future potential for multifamily uses  BART extension to San Jose will alter market dynamics by creating transit access to Silicon Valley jobs
		2	Recent Local Development Activity (pipeline)		0.00	0.00	0.00	Approximately 50 percent of the Plan Bay Area allocation is met with pending project applications in the TASP
		3	General Market Conditions		0.30	0.20	0.10	While post-Recession housing market conditions have been weak, the southern Alameda County market conditions for multifamily housing has been improving driven by improving labor market conditions and the general attractiveness of the area; these conditions are expected to continue in future decades  Market prices appear strong enough to make multifamily housing projects feasible though current credit market conditions may impede certain projects in the short term
		4	Financial Feasibility Constraint		0.00	0.00	0.00	
		5	Parcel size and configuration		0.00	0.00	0.00	Parcels included as opportunity sites in the CD+A capacity analysis are typically larger parcels currently in underutilized commercial or industrial uses that will be supplanted over time by residential and mixed use projects
		6	Existence of major investment disincentives		0.00	0.00	0.00	There are no significant investment disincentives in the Central Fremont PDA

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**Figure 3  
PDA Readiness Criteria Worksheet**

**PDA name: Central Fremont TASP PDA**

**Version: Amended**

Readiness # Criteria Category	Sub-Criterion Name	PDA Development Readiness Scoring				Notes
		Present (2012)	2020	2030	2040	
E  Infrastructure Capacity, Needs, and Financing	1 Existing infrastructure capacity		0.30	0.20	0.20	There is presently inadequate infrastructure to provide for the full Plan Bay Area Allocation, let alone the larger measured development capacity. Major deficiencies include the need for major transportation system improvements. This deficiency will be resolved over time as incremental infrastructure improvements are made.  Regional funding allocation (e.g. ACTA and OBAG) to offset cost of major infrastructure needed can reduce or eliminate this constraint.
	2 Is there an existing CIP funded or other infrastructure financing plan in place?		0.20	0.20	0.10	The City has a comprehensive Development Impact Fee program and imposes conditions on pending development applications  Local development-based sources enhanced by additional development and renewed redevelopment powers
	3 PDA financing capacity		0.00	0.00	0.00	Financing capacity has been measured as part of the Downtown Community Plan; multifamily projects were shown to meet basic feasibility criteria  Financing capacity does not address capacity to fund, in one manner or another, affordable housing inclusionary units

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**Item 3-1 of Appendix III**

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would still be legal, as per SB 375, based on the input of the EEJ stakeholders, this alternative would not reference TPPs, thus making it impossible for project sponsors to streamline. The modeling analysis for this alternative therefore did not include any benefits from CEQA streamlining to encourage development.

- **Transportation Investments:** This alternative seeks to strengthen public transit by significantly boosting service frequencies in most suburban and urban areas, other than on Muni, BART or Caltrain, and providing free transit passes to youth throughout the region. This alternative includes a reduced scope highway network which excludes all uncommitted road projects, other than maintenance projects, from the Transportation Investment Strategy. As with Alternative 1, the No Project alternative, all of the MTC Network Express Lane projects are excluded as they are considered uncommitted (VTA's Express Lane Network is a fully committed project and included in every alternative). As such, this alternative does not include the Regional Express Lanes Network, with the exception of committed projects.
- **Transportation Policies:** Most notably, this alternative includes the implementation of a vehicle miles traveled (VMT) tax to fund the expanded investments in public transit. This tax, assumed at a rate of one cent per mile on annual vehicle miles traveled within the region, would provide a substantial revenue source, while also discouraging residents from driving; exemptions from the tax would be provided for low-income households. Furthermore, the San Francisco-Oakland Bay Bridge would have an increased peak-period toll of \$8, consistent with Alternatives 3 and 4, providing additional revenue in the Transbay corridor.

**ALTERNATIVES COMPARISONS**

Table 3.1-1 provides an overview comparison of the land use policies, transportation investments, and transportation policies proposed in the five Plan Bay Area alternatives. The full list of which transportation projects are included in each alternative is provided in Appendix C.

**TABLE 3.1-1: POLICY MEASURE COMPARISON**

	<i>Alt 1 No Project</i>	<i>Alt 2 Proposed Plan</i>	<i>Alt 3 Transit Priority</i>	<i>Alt 4 Enhanced Net</i>	<i>Alt 5 Environment, Equity, and Jobs</i>
<b>LAND USE POLICIES</b>					
<b>Zoning</b>					
Existing General Plans	•				
PDA-Focused Growth		•		•	•
TPP-Focused Growth			•		•
<b>Growth Boundaries</b>					
Current Trends Continue	•				
Strict Boundaries		•	•	•	•
<b>Fees and Subsidies</b>					
No New Fees	•				
Subsidies for PDA Growth		•		•	

Part Three: Alternative and CEQA-Required Conclusions  
Chapter 3.1: Alternatives to the Proposed Plan

**TABLE 3.1-1: POLICY MEASURE COMPARISON**

	<i>Alt 1 No Project</i>	<i>Alt 2 Proposed Plan</i>	<i>Alt 3 Transit Priority</i>	<i>Alt 4 Enhanced Net</i>	<i>Alt 5 Environment, Equity, and Jobs</i>
Subsidies for Urban Core			•		
Subsidies for PDA/TPP Opportunity Areas					•
Fee on High VMT Area			•		
<b>Incentives</b>					
None	•				
OneBayArea Grants		•	•	•	•
CEQA Streamlining		•	•	•	(see table note 1)
TPP Redevelopment		•	•		•
<b>TRANSPORTATION INVESTMENTS</b>					
<b>Road Network</b>					
Committed Projects Only	•				
Preferred		•		•	
Preferred w/ Reduced Express Lanes			•		
Preferred w/o Highway Expansion or Operational Projects					•
<b>Transit Network</b>					
Committed Projects Only	•				
Preferred		•		•	
Increased Funding for BART, AC Transit			•		
Additional Service for All Major Transit Operators other than Muni, BART or Caltrain					•
<b>Climate Initiates</b>					
Regional Electric Vehicle Public Charger Network		•	•	•	•
Vehicle Buy-Back & Plug-In or Electric Vehicles Purchase Incentives		•	•	•	•
Car Sharing	•	•	•	•	•
Vanpool Incentives		•	•	•	•
Clean Vehicles Feebate		•	•	•	•

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**TABLE 3.1-1: POLICY MEASURE COMPARISON**

	<i>Alt 1 No Project</i>	<i>Alt 2 Proposed Plan</i>	<i>Alt 3 Transit Priority</i>	<i>Alt 4 Enhanced Net</i>	<i>Alt 5 Environment, Equity, and Jobs</i>
Program					
Smart Driving Strategy		•	•		•
Commuter Benefits Ordinance	•	•	•	•	•
<b>TRANSPORTATION POLICIES</b>					
<b>Road Pricing</b>					
None	•	•			
Higher Peak Toll on Bay Bridge			•	•	•
VMT Tax					•
<b>Parking Policies</b>					
Status Quo	•				
Reduced Minimums		•	•	•	•
1. Unlike Alternatives 3 and 4, Alternative 5 would discourage CEQA streamlining for TPP-eligible areas. While streamlining would still be legal, as per SB 375, based on the input of the EEJ stakeholders, the Plan would not reference TPPs, thus making it impossible for project sponsors to streamline.					

**Comparative Demographic Forecasts**

All of the alternatives, except for Alternative 4, are designed to accommodate the same population and employment in the year 2040 based on forecasts developed by ABAG, with varying locational distributions of growth.

Unlike all other alternatives, Alternative 4 has different levels of household and employment growth in the region. Compared to the proposed Plan, it includes four percent more households and one percent more jobs. This higher growth total reflects the Senate Bill 375 requirement to house the region’s entire population (i.e., provide a house for every household employed in the region).

**Table 3.1-2** displays the differences in demographics between the various alternatives. As a result of the lower levels of transit infrastructure investment and more dispersed land use pattern under the No Project alternative, the share of households with zero cars is slightly lower than the proposed Plan (nine percent versus 11 percent). Otherwise, the other three alternatives have similar car ownership rates as compared to the proposed Plan.

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Part Three: Alternative and CEQA-Required Conclusions  
 Chapter 3.1: Alternatives to the Proposed Plan

**TABLE 3.1-2: BAY AREA DEMOGRAPHIC FORECASTS (2010-2040)**

	2010	2040 Plan (Alt 2)	2040 No Project (Alt 1)	% Difference from Proposed Plan	2040 Transit Priority Focus (Alt 3)	% Difference from Proposed Plan	2040 Enhanced Network of Communities (Alt 4)	% Difference from Proposed Plan	2040 Environment, Equity, and Jobs (Alt 5)	% Difference from Proposed Plan
Total Population	7,091,000	9,196,000	9,196,000	0%	9,196,000	0%	9,535,000	+4%	9,196,000	0%
Total Employment	3,385,000	4,505,000	4,505,000	0%	4,505,000	0%	4,550,000	+1%	4,505,000	0%
Employed Residents	3,269,000	4,350,000	4,350,000	0%	4,350,000	0%	4,513,000	+4%	4,350,000	0%
Total Households	2,608,000	3,308,000	3,308,000	0%	3,308,000	0%	3,431,000	+4%	3,308,000	0%
% of Households with Zero Autos	9%	11%	9%	N/A	10%	N/A	11%	N/A	10%	N/A
% of Households with One Auto	33%	33%	33%	N/A	33%	N/A	33%	N/A	33%	N/A
% of Households with Multiple Autos	58%	56%	58%	N/A	57%	N/A	57%	N/A	57%	N/A
Average Vehicles per Household	1.78	1.75	1.81	+3%	1.76	+1%	1.77	+1%	1.77	+1%

Sources: Association of Bay Area Governments, 2012; Metropolitan Transportation Commission Travel Forecasts, 2012

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**TABLE 3.1-6: TOTAL JOBS AND JOB GROWTH BY SHARE IN PDAS**

<i>Alternative</i>	<i>Total Jobs</i>	<i>Total Jobs in PDAs</i>	<i>% Jobs in PDAs</i>	<i>New Regional Job Growth</i>	<i>New Job Growth in PDAs</i>	<i>% of New Job Growth in PDAs</i>
Year 2010 Baseline	3,385,000	1,525,415	45%	n/a	n/a	n/a
1 - No Project 2040	4,505,000	1,749,774	39%	1,120,000	224,359	20%
2 – Proposed Plan 2040	4,505,000	2,227,918	49%	1,120,000	702,503	63%
3 - Transit Priority 2040	4,505,000	1,891,757	42%	1,120,000	366,342	33%
4 – Connected 2040	4,550,000	1,971,957	43%	1,165,000	446,542	38%
5 – EEJ 2040	4,505,000	1,889,874	42%	1,120,000	364,459	33%

Source: MTC, 2013.

### Urbanized Footprint

As of 2010, the Bay Area had 786,000 acres of urbanized land, representing 17.75% of the region's land area of 4.4 million acres. The five alternatives are all projected to increase the region's urbanized footprint to varying degrees, though differences between the proposed Plan, Alternative 3, Alternative 4, and Alternative 5 are marginal. The No Project alternative is expected to convert the greatest number of acres to urbanized land as compared to the other alternatives.

- The No Project alternative would add a total of 20,702 new acres of urbanized land, which is more than twice the amount of any of the other alternatives, and would result in an urbanized footprint of 18.22% of the region's total area.
- The proposed Plan (Alternative 2) has the lowest projected increase, adding a total of 7,547 urbanized acres. This would result in an urbanized footprint of 17.92% of the region's total land area.
- Alternative 3 would add 8,113 new acres of urbanized land, increasing the urbanized footprint to 17.94% of the region's total area.
- Alternative 4 would have an impact similar to that of the proposed Plan. It would result in 7,586 new acres of urbanized land. The urbanized footprint resulting from Alternative 4 would cover 17.93% of the regions total area.
- Alternative 5 would result in an increase of 9,596 acres, increasing the urbanized footprint to 17.97% of the region's total area.

### Transportation System Capacity Increases

Table 3.1-7 presents the differences in the supply of the transportation system among the alternatives. While all of the alternatives have a heavy emphasis on maintaining and operating the existing transportation system, several alternatives identify new funding sources to boost the region's state of good repair and/or increase public transit operations beyond what is included in the proposed Plan.

- **Alternative 1 – No Project:** As the No Project alternative only includes committed projects, it does not include some of the region's most significant capacity-increasing projects, such as the Regional Express Lanes Network, BART to San Jose, and Caltrain Electrification/Frequency

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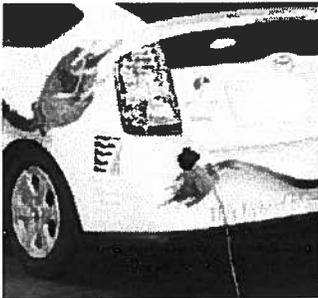
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**Bay Area 2010 Clean Air Plan,  
Final Program Environmental Impact Report,  
August 18, 2010**

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# Bay Area 2010 Clean Air Plan



## Final Program Environmental Impact Report

August 18, 2010

State Clearinghouse No. 2009082059

## PREFACE

This document constitutes the Final Program Environmental Impact Report (EIR) for the 2010 Clean Air Plan. The Draft EIR was released for a 45-day public review and comment period from March 11, 2010 to April 26, 2010. Five comment letters were received from the public. The comment letters and responses are in Appendix C of this document. Modifications to the Draft EIR have been made, due to revisions to the draft 2010 Clean Air Plan EIR, such that it is now a Final EIR. Additions to the text of the EIR are denoted using underline. Text that has been deleted is shown using ~~strike through~~.

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**CHAPTER 2: PROJECT DESCRIPTION****TABLE 2-1 BAAQMD 2010 Clean Air Plan Control Measures**

<b>Number</b>	<b>Name</b>	<b>Description</b>
SSM 16	Revise Regulation 2, Rule 2: New Source Review	Amend Reg. 2, Rule 2 to address the District's anticipated non-attainment status of the 24-hour PM2.5 National Ambient Air Quality Standard.
SSM 17	Revise Regulation 2, Rule 5: New Source Review for Air Toxics	Implement more health-protective District permitting requirements in Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants based on revisions to OEHHA risk factors and methodologies. For Priority CARE Communities, track the toxicity-weighted emissions from all sources in the identified communities.
SSM 18	Revise Air Toxics "Hot Spots" Program	Revise the District's Air Toxics Hot Spots program to incorporate more stringent risk reduction requirements from existing sources.
<b>Transportation Control Measures</b>		
TCM A-1	Improve Local and Areawide Bus Service	Improve transit by providing new Express Bus or Bus Rapid Transit on major travel corridors, funding the replacement of older and dirtier buses, and implementing Transit Priority Measures on key transit routes.
TCM A-2	Improve Local and Regional Rail Service	Improve rail service by sustaining and expanding local and regional rail services and by providing funds to maintain rail-cars, stations, and other rail capital assets.
TCM B-1	Implement Freeway Performance Initiative	Improve the performance and efficiency of freeway and arterial systems through operational improvements, including implementing the Freeway Performance Initiative, the Arterial Management Program and the Bay Area Freeway Service Patrol.
TCM B-2	Improve Transit Efficiency and Use	Improve transit efficiency and use through continued operation of 511 Transit, and full implementation of TransLink® fare payment system and the Transit Hub Signage Program.
TCM B-3	Bay Area Express Lane Network	Introduce roadway pricing on Bay Area highways through the implementation of an express lane network, also known as a High Occupancy Toll (HOT) lane network.
TCM B-4	Goods Movement Improvements and Emission Reduction Strategies	Improve goods movement and reduce emissions from diesel equipment through implementation of the Bay Area's Trade Corridors Improvement Fund (TCIF) projects and various funding programs to replace or retrofit diesel equipment.

## Bay Area Air Quality Management District Bay Area 2010 Clean Air Plan

TABLE 2-1 BAAQMD 2010 Clean Air Plan Control Measures

Number	Name	Description
TCM C-1	Support Voluntary Employer-Based Trip Reduction Program	Support voluntary employer trip-reduction programs through the implementation of the 511 Regional Rideshare Program and Congestion Management Agency rideshare programs, the Spare the Air Program, encouraging cities to adopt transit benefit ordinances, and supporting Bay Area shuttle service providers.
TCM C-2	Implement Safe Routes to Schools and Safe Routes to Transit	Facilitate safe routes to schools and transit by providing funds and working with transportation agencies, local governments, schools, and communities to implement safe access for pedestrians and cyclists.
TCM C-3	Promote Rideshare Services and Incentives	Promote rideshare services and incentives through the implementation of the 511 Regional Rideshare Program and Congestion Management Agency rideshare programs including marketing rideshare services, operating rideshare information call center and website, and providing vanpool support services.
TCM C-4	Conduct Public Outreach and Education	Educate the public about the air quality, environmental, and social benefits of carpooling, vanpooling, taking public transit, biking, walking, and telecommuting, through the Spare the Air campaign and Transportation Climate Action Campaign.
TCM C-5	Promote Smart Driving/Speed Moderation	Educate the public about the air quality and climate protection benefits of reducing high-speed driving and observing posted speed limits.
TCM D-1	Improve Bicycle Access and Facilities	Expand bicycle facilities serving transit hubs employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers.
TCM D-2	Improve Pedestrian Access and Facilities	Provide funding for projects to improve pedestrian access to transit hubs, employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers.
TCM D-3	Support Local Land Use Strategies	Promote land use patterns, policies, and infrastructure investments that support mixed-use, transit-oriented development that reduce motor vehicle dependence and facilitate walking, bicycling and transit use.
TCM E-1	Value Pricing Strategies	Test and implement value pricing (congestion pricing) on Bay Area toll bridges to manage travel demand during congested periods. Measure may also include value pricing in the City of San Francisco.

**CHAPTER 2: PROJECT DESCRIPTION**

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**TCM B-2 – Improve Transit Efficiency and Use:** This measure will improve transit efficiency and make transit more convenient for riders, through continued operation of 511 Transit, and full implementation of TransLink<sup>®</sup> fare payment system and the Transit Hub Signage Program.

**TCM B-3 - Bay Area Express Lane Network:** TCM B-3 will seek to correctly price travel demand on Bay Area highways by developing and implementing a seamless, regionally-managed Express Lane Network throughout the Bay Area and improving regional transit service. This system will offer free-flowing conditions for carpools, buses and toll payers by adjusting tolls based upon the level of congestion.

**TCM B-4 - Goods Movement Improvements and Emission Reduction Strategies:** Goods movement is a critical component of the Bay Area's economic and transportation system, and a significant contributor to air quality issues. Exposure to diesel pollution from goods movement greatly impacts the health of residents near ports, rail yards, distribution centers, and roads with high truck volumes. Investing in the Bay Area's trade corridors and continuing to offer incentives for diesel engine owners to reduce emissions will address existing air quality issues as well as help the region to prepare for continued growth in this important sector of our economy.

**TCM C-1 – Support Voluntary Employer-Based Trip Reduction Program:** This measure will support voluntary efforts by Bay Area employers to encourage their employees to use alternative commute modes, such as transit, ridesharing, bicycling, walking, telecommuting, etc.

**TCM C-2 – Implement Safe Routes to Schools and Safe Routes to Transit:** This measure will facilitate safe routes to schools and transit by providing funds and working with transportation agencies, local governments, schools, and communities to implement safe access for pedestrians and cyclists. Likely projects will include implementation of bicycle facilities, such as lanes, routes, paths, and parking, and improvements to pedestrian facilities, such as sidewalks/paths, benches, reduced street width, reduced intersection turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes and streets trees.

**TCM C-3 – Promote Rideshare Services and Incentives:** This measure will promote rideshare services and incentives through the implementation of the 511 Regional Rideshare Program, as well as local rideshare programs implemented by Congestion Management Agencies. These activities will include marketing rideshare services, operating rideshare information call center and website, and providing vanpool support services. This measure also encourages the expansion of car-sharing programs.

**TCM C-4 - Conduct Public Outreach & Education:** This measure will encourage Bay Area residents to make choices that benefit air quality by educating the public about the health effects of air pollution and the air quality benefits of choosing transportation modes that reduce motor vehicle use, such as carpooling, vanpooling, taking public

**Bay Area Air Quality Management District Bay Area 2010 Clean Air Plan**

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transit, biking, walking, and telecommuting. BAAQMD will implement this measure through the Spare the Air (STA) Every Day campaign and the Spare the Air episodic program (“STA Alerts”). In addition, MTC and BAAQMD in partnership will implement the outreach component of the Transportation Climate Action Campaign. Implementation actions include marketing and incentive programs to alert the public to the connection between air pollution and motor vehicle usage, and promoting the benefits of reducing single-occupant motor vehicle use every day, and in particular on poor air quality days when BAAQMD issues a STA Alert.

**TCM C-5 – Promote Smart Driving/Speed Moderation:** Pollutant emissions rates vary based on the speed a vehicle is traveling. The emission/speed relationship varies for each pollutant, but emission rates generally are lowest in the 30-45 mile per hour mph range. Vehicles traveling on Bay Area freeways at speeds above 65 mph emit significantly more ROG, NOx and GHGs than cars and trucks traveling at speeds between 35 and 55 mph. This measure focuses on public education to encourage drivers to observe posted speed limits and adopt other fuel efficient driving practices, supplemented by more rigorous enforcement of speed limits, especially to reduce high-speed driving on freeways.

**TCM D-1 – Improve Bicycle Access and Facilities:** TCM D-1 will expand bicycle facilities serving employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers. Typical improvements include bike lanes, routes, paths, and bicycle parking facilities. This TCM also includes improving bicycle access to transit and supporting the annual Bike to Work event.

**TCM D-2 – Improve Pedestrian Access and Facilities:** TCM D-2 will improve pedestrian facilities and encourage walking by funding projects that improve pedestrian access to transit, employment and major activity centers. Improvements may include sidewalks/paths, benches, reduced street width, reduced intersection turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes, and street trees.

**TCM D-3 – Support Local Land Use Strategies:** TCM D-3 will support and promote land use patterns, policies, and infrastructure investments that support higher density mixed-use, residential and employment development near transit in order to facilitate walking, bicycling and transit use.

**TCM E-1 - Value Pricing Strategies:** TCM E-1 will pursue implementation of value pricing strategies such as tolling on trans-bay bridges and cordon pricing recommendations from San Francisco County’s Mobility, Access, and Pricing Study.

**TCM E-2 - Parking Pricing and Management Strategies:** Parking policies and practices have a profound impact on vehicle travel and mode choice, as well as land use patterns and the quality of the built environment. Parking policies are also an important tool in implementing focused growth strategies. This control measure outlines how the Air District, in cooperation with its regional agency partners, will 1) take actions at the regional level to implement parking policies that will benefit air quality, and 2) encourage

Peter Singleton, Bay Area Citizens, Public Comment on Draft Plan Bay Area and Draft Plan Bay Area Draft Environmental Impact Report

*Peter Singleton, Director  
Bay Area Citizens  
3567 Mt. Diablo Blvd, #358  
Lafayette, CA 95459*

May 16, 2013

Metropolitan Transportation Commission  
Plan Bay Area Public Comment  
101 Eighth Street  
Oakland, CA 94607

*re: Public Comment on Draft Plan Bay Area and Draft Plan Bay Area Draft Environmental Impact Report*

Dear Metropolitan Transportation Commission,

This letter is submitted as public comment on the Draft Plan Bay Area and Draft Plan Bay Area Draft Environmental Impact Report (State Clearinghouse No. 2012062029).

I am a lifelong resident of the Bay Area, and have deep roots in California, the Bay Area, and my local community. I was born at the Stanford Hospital in Palo Alto, and have lived in and around the Menlo Park area virtually all my life. I am a graduate of local public schools, and have an undergraduate degree from Brown University in Providence, Rhode Island, an MBA from the University of California at Berkeley, and a law degree, summa cum laude, from Hastings College of the Law in San Francisco.

I am currently the Director of Bay Area Citizens, serving in a voluntary capacity. Bay Area Citizens is a nonprofit corporation that supports and protects the interests of the citizens of California in matters including land use regulation, property rights, local community control, and the environment.

Some of my most important early childhood memories are of my parents' activism in the civil rights movement in the Bay Area and nationally in the early 1960s, and I am deeply committed to a community that provides

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and filing of applications, structuring of loan fees and cash requirements, providing supplementary appraisal information, administration of the sale of GNMA bonds and lender communications. In addition, Peak was retained to act as owner's representative and consultant in the application process for Low Income Housing Tax Credits, both state and federal for multifamily properties. Peak also assisted in the solicitation of and negotiations regarding tax credit syndications with Boston Financial and Paine Webber Financial.

## **COMMUNITY AFFAIRS**

Emeritus board member of Friends of Mill Valley, a community organization working for better local government, and served on local city planning advisory committees, including the Miller Avenue Precise Plan Citizens Advisory Committee.

## **Appendix A**

Appendix A - CA PRA requests, January, 2013

**From:** Peter Singleton (petersingleton@sbcglobal.net)  
**To:** prarequest@hcd.ca.gov;  
**Date:** Thu, January 10, 2013 11:06:45 AM  
**Cc:**  
**Subject:** documents re 2014-2022 RHNA allocation, SF Bay Area

Dear State of California Department of Housing and Community Development,

I am writing to request all documents (including, but not limited to emails, memorandum, spreadsheets, correspondence, etc) related to the following:

- HCD's RHNA allocations to the nine county San Francisco Bay Area region for the 2014-2022 RHNA cycle

Please be sure to include all documents produced within HCD, received from outside consultants, agencies, cities, towns, counties, individuals, and for the period from the initial stages of deliberation to the present.

I am requesting these documents in electronic form, and also am requesting that any fee, if any, for producing these records be waived.

Thanks so much for your help with this!

Peter Singleton

**From:** Peter Singleton (petersingleton@sbcglobal.net)  
**To:** shartz@cityofnovato.org;  
**Date:** Wed, January 16, 2013 7:49:45 PM  
**Cc:**  
**Subject:** documents related to RHNA allocation

Dear Ms. Hartz,

I am hereby requesting all documents (including, but not limited to, emails, memorandum, correspondence, reports, including those internal to the City of Novato and with its consultants, and those with city, state, county, and regional persons or entities outside of Novato, and those with residents, other citizens, non-governmental organizations, or business, construction, or landowner individuals or entities, etc) related to:

- Novato's 2014-2022 Regional Housing Needs Assessment (RHNA) allocation, and
- all documents related RHNA in any fashion dated from January 1, 2010 to present.

I would appreciate these in electronic form, and if there is a fee for producing any of these documents, I hereby request that it be waived.

Thanks so much for your help!

Peter Singleton

## **Appendix B**

Judicial Watch PRA to MTC, March 13, 2013



March 13, 2013

**VIA CERTIFIED MAIL AND FACSIMILE**

Pam Grove  
Public Information Officer  
Metropolitan Transportation Commission  
101 Eighth Street  
Oakland, California 94607

**Re: California Public Records Act request**

Dear Ms. Grove:

Pursuant to the provisions of the California Public Records Act (CPRA), Cal. Gov't Code §§ 6250 *et seq.*, Judicial Watch, Inc. ("Judicial Watch") hereby requests from the Metropolitan Transportation Commission ("MTC") access to and a copy of any and all record(s) within ten (10) business days of the documents listed below. The purpose of this request is to obtain the various models, such as the land use, transportation, and financial models, used by the MTC and its partner agencies, including Association of Bay Area Governments ("ABAG"), in the development of its *Plan Bay Area* ("PBA"), as well as the code, data, documentation, and reports used for the models, including the preparation of the Environmental Impact Report ("EIR"). Judicial Watch intends the materials it receives to allow reviewers to understand the workings of the models, how MTC *et al* have calibrated and structured them, and to provide for the operation and modification of these models by interested parties on their own hardware.

Judicial Watch anticipates that the EIR will include various options or alternatives. For each such alternative, there may be separate model runs and this request should be understood to comprehend each model run for each alternative for each model.

Specifically, Judicial Watch requests:

- I. UrbanSim
  - a. The "GNU General Public License(s)" executed by MTC, and any other parties that participated in the creation of *PBA* and its components, for the use of "UrbanSim,"
  - b. The electronic code versions of UrbanSim developed by MTC and any other parties for each version of the model(s) operated by MTC.
  - c. Please identify the platform that MTC *et al* is running UrbanSim on (Windows x86 x64, Macintosh, Linux) and the configuration of the

hardware it is operated upon (if it is operated on multiple platforms, provide such information for all).

- d. Documentation of the model(s) and variants thereof, including all coefficients and variables, and justification for the values utilized in each model run.
- e. Sources of data for the transportation network, land use, etc. and timeliness of such data.
- f. Agenda for, minutes of, and technical documents associated with the meetings held of the modelers, users, and other interested parties for UrbanSim and the output model runs and e-mails and other communications between the modelers, users, and others who participated in the planning, modeling, and creation of *PBA*.

## II. Transportation

- a. The licensing agreement, or comparable document, for the transportation model utilized by MTC *et al* for production of *PBA* and its components and the EIR.
- b. The electronic code versions of the transportation model utilized by MTC and any other parties for each version of the model(s) operated by MTC.
- c. Please identify the platform that MTC *et al* is running its transportation model on and the configuration of the hardware it is operated upon (if it is operated on multiple platforms, provide such information for all).
- d. Documentation of the model(s) and variants thereof, including all coefficients and variables, and justification for the values utilized in each model run.
- e. Sources of data for the transportation network, land use, etc. and timeliness of such data.
- f. Agenda for, minutes of, and technical documents associated with the meetings held of the modelers, users, and other interested parties for the transportation model and the output model runs and e-mails and other communications between the modelers, users, and others who participated in the planning, modeling, and creation of *PBA*.

## III. Finance

- a. The financial models utilized by MTC for the preparation of *PBA*, presented in electronic format, such as Excel™ files (please provide the name and version of the software and a description of the hardware platform and operating system it runs on) and the documentation of such models.
- b. The sources of data for the financial models and justification of variables, such as growth rates for tax sources and anticipated future transportation system component capital expansion and capital renewal and replacement expenditures, operating expenses, operating revenues, and subsidies, and the documentation of the projections of revenues for the planning period.

- c. Identify sources of taxpayer revenues from Federal, State, regional, and local government sources and other revenues, such as bridge tolls and the documentation of the projections of revenues for the planning period.
- IV. Validation and Calibration – models of these types need to be validated and calibrated, which is generally performed by "predicting" the past and comparing the model outputs with the actual results. Provide documentation of the validation and calibration plan for each model, individually, including the specific model runs and time periods modeled, the metrics that were tested and the justification for their selection for this purpose, the results obtained, the margins of error produced, and the documentation that these margins of error were considered acceptable for purposes of *PBA* modeling.
  - V. Coordination of Models – When multiple models are utilized in exercises such as this, it is vital that they be closely coordinated to ensure that the logic of the overall results are internally consistent; for example, the population/demographic projections must be identical (or, at least, closely comparable) for all models and there must be sufficient revenues available to construction, operate, and maintain the transportation system proposed as outputs of the land use and transportation modeling processes. Provide documentation of the coordination plan and the work performed to achieve the objectives of the model coordination plan.
  - VI. Names and identification and contact information for those who participated in the modeling process, preparation for the modeling process, and use of its outputs:
    - a. Name
    - b. Role in the modeling/*PBA* process, including the specific model(s) each was associated with
    - c. Organization (MTC, ABAG, etc.)
    - d. Position in organization
    - e. Address
    - f. Phone number
    - g. e-mail address

(We are asking for business contact information; home address and other information is only requested if that is also the person's work location.)
  - VII. Documentation of alternatives or options that were identified in the planning process, but not included in the EIR, and the justification for why such alternatives or options were dropped from consideration in the published *PBA*.
  - VIII. Examination of Previous Planning Processes – MTC *et al* have been performing long-term regional planning processes substantially the same of the current *PBA* process for decades. Part of the preparation for any major planning/modeling activity of this type is the review of past plans, the

comparison of the projections in such plans to actual historical results, and the determination of the reasons for variances so that the current planning/modeling process can be improved to avoid past causes of variances. Produce the documentation of the processes that MTC *et al* have performed to produce "lessons learned" and how these were incorporated into the current planning/modeling process. Specifically address the following time series, the error rates observed from the various MTC plans over time, the causes of the errors, and the improvements to the current modeling process that resulted from these exercises:

- a. Population/demographics, by region within the MTC/ABAG nine-county jurisdiction (urbanized area, county, city, etc.)
- b. Regional economic trends, including *per capita*
- c. Revenue projections, including Federal, State, regional, and local tax revenues available for the purposes comprehended by the plans, toll revenues, transit fare revenues, HOT lane revenues, and other user fees
- d. Expenditure/expense projections, including capital costs of major transportation projects such as new and extended passenger rail lines, bus rapid transit lines, bridge construction/rehabilitation, highway expansion, road maintenance and recapitalization, replacement of transit vehicles and rehabilitation of fixed guideways and other major capital assets, etc.
- e. Schedule adherence for major capital projects, such as passenger rail line construction, bridge construction/rehabilitation, road recapitalization, etc.
- f. Transportation utilization projections, including vehicle miles traveled, utilization of major road links such as bridges and freeways, transit unlinked passenger trips and passenger-miles (both for each transit operator, such as BART and VTA, and for specific projects, such as BART to SFO), and transportation mode splits, including both peak period and all-day.
- g. Land use projections, specifically focusing on single-family detached vs. multiple family housing long-term time lines.
- h. Commute travel into the MTC region from outside, and *vice versa*

This request should be understood to apply to MTC itself, all contractors and consultants engaged by MTC, and all government agency partners, such as ABAG, and its contractors and consultants.

Judicial Watch specifically notifies MTC that it will accept partial production; please notify me of the availability of documents, in part or in whole, as soon as they are available.

As many of these requests will produce large volumes of documents that may be difficult to provide copies of, Judicial Watch requests to inspect these documents on site by sending reviewers. Please contact me to arrange the timing and place for such inspection(s) at (202) 646-5194 or [jaxelrod@judicialwatch.org](mailto:jaxelrod@judicialwatch.org).

For the purposes of this request, the term “Public records” includes any writing containing information relating to the conduct of the public’s business prepared, owned, used, or retained by MTC, regardless of physical form or characteristics. Cal. Gov’t Code § 6252(e).

Also for purposes of this request, the term “writing” means any handwriting, typewriting, printing, photostating, photographing, photocopying, transmitting by electronic mail or facsimile, and every other means of recording upon any tangible thin any form of communication or representation, including letters, words, pictures, sounds or symbols, or combinations thereof, and any record thereby created, regardless of the manner in which the record has been stored. Cal. Gov’t Code § 6252(g).

Within ten (10) days of receipt of this request, you are required to determine whether the request, in whole or in part, seeks copies of disclosable public records in your possession and to notify us promptly of your determination and the reasons therefore. Cal. Gov’t Code § 6253(c).

Except with respect to records exempt from disclosure by express provision of law, you are also required to make the requested records promptly available up on payment of any fees covering direct costs of duplication or any applicable statutory fees. Cal. Gov’t Code § 6253(b).

Any reasonably segregable portion of a record otherwise exempt from disclosure is required to be made available after deletion of the portions that are exempted by law. Cal. Gov’t Code § 6253(a).

Finally, Judicial Watch requests a waiver of any direct costs of duplication or statutory fees pursuant to Cal. Gov’t Code § 6253(e). Judicial Watch is a non-profit, tax-exempt 501(c)(3) educational organization dedicated to increasing public understanding of the operations of government as well as the importance of ethics and the rule of law. Judicial Watch regularly requests information from public agencies about their operations and activities and disseminates this information to the public in furtherance of its educational mission.

If you do not understand this request or any portion thereof, or if you feel you require clarification of this request or any portion thereof, please contact us immediately at 202-646-5194 or [jaxelrod@judicialwatch.org](mailto:jaxelrod@judicialwatch.org). Also for purposes of this request, the term “writing” means any handwriting, typewriting, printing, photostating, photographing, photocopying, transmitting by electronic mail or facsimile, and every other means of recording upon any tangible thin any form of communication or representation, including letters, words, pictures, sounds or symbols, or combinations thereof, and any record thereby created, regardless of the manner in which the record has been stored. Cal. Gov’t Code § 6252(g).

Sincerely,



Julie Axelrod

425 Third Street, SW, Suite 800  
Washington, DC 20024

## **Appendix C**

MTC PRA response March 25, 2013



*Amy Rein Worth, Chair*  
Cities of Contra Costa County

*Dave Cortese, Vice Chair*  
Santa Clara County

*Alicia C. Aguirre*  
Cities of San Mateo County

*Tom Asumbrado*  
U.S. Department of Housing  
and Urban Development

*Tom Bates*  
Cities of Alameda County

*David Campos*  
City and County of San Francisco

*Bill Dodd*  
Napa County and Cities

*Dorene M. Giacopini*  
U.S. Department of Transportation

*Federal D. Glover*  
Contra Costa County

*Scott Haggerty*  
Alameda County

*Aime W. Halsted*  
San Francisco Bay Conservation  
and Development Commission

*Steve Kinsey*  
Marin County and Cities

*Sann Liccardo*  
San Jose Mayor's Appointee

*Mark Lane*  
Association of Bay Area Governments

*Jake Mackenzie*  
Sonoma County and Cities

*Joe Pirzynski*  
Cities of Santa Clara County

*Jean Quan*  
Oakland Mayor's Appointee

*Bijan Sartipi*  
State Business, Transportation  
and Housing Agency

*James P. Spiering*  
Solano County and Cities

*Aubrienne J. Tissier*  
San Mateo County

*Scott Wiener*  
San Francisco Mayor's Appointee

*Steve Heminger*  
Executive Director

*Ann Flemer*  
Deputy Executive Director, Policy

*Andrew B. Frennier*  
Deputy Executive Director, Operations

March 25, 2013

**SENT VIA EMAIL AND USPS**

Ms. Julie Axelrod  
Judicial Watch  
425 Third Street SW, Suite 800  
Washington, DC 20024  
Email: [jaxelrod@judicialwatch.org](mailto:jaxelrod@judicialwatch.org)

RE: Request for Public Records

Dear Ms. Axelrod:

This letter is in response to your March 13<sup>th</sup> letter requesting records related to the development of *Plan Bay Area*.

MTC/BATA will require up to an additional 14 days to respond to your request. As permitted pursuant to Government Code Section 6253, subdivision (c), the additional time is necessary for the following reasons:

- The need to search for and collect the requested records from field facilities or other establishments that are separate from the office processing the request.
- The need to search for, collect, and appropriately examine a voluminous amount of separate and distinct records that are demanded in a single request.
- The need for consultation, which shall be conducted with all practicable speed, with another agency having substantial interest in the determination of the request or among two or more components of the agency having substantial subject matter interest therein.

If you have questions or need further assistance, please do not hesitate to contact me at [pgrove@mtc.ca.gov](mailto:pgrove@mtc.ca.gov) or 510.817.5706.

Very truly yours,

Pamela L. Grove  
Public Information Officer

/pl

## **Appendix D**

MTC PRA response April 8, 2013



Amy Rein Worth, Chair  
Cities of Contra Costa County

Dave Cortese, Vice Chair  
Santa Clara County

Alicia C. Aguirre  
Cities of San Mateo County

Tom Acumbro  
U.S. Department of Housing  
and Urban Development

Tom Bates  
Cities of Alameda County

David Campos  
City and County of San Francisco

Bill Dodd  
Napa County and Cities

Dorene M. Giucopini  
U.S. Department of Transportation

Federal D. Glover  
Contra Costa County

Scott Haggerty  
Alameda County

Anne W. Halset  
San Francisco Bay Conservation  
and Development Commission

Steve Kinsey  
Marin County and Cities

Sam Liccardo  
San Jose Mayor's Appointee

Mark Luce  
Association of Bay Area Governments

Jake Mackenzie  
Sonoma County and Cities

Joe Pirzynski  
Cities of Santa Clara County

Jenn Quan  
Oakland Mayor's Appointee

Bijun Sartipi  
State Business, Transportation  
and Housing Agency

James P. Spring  
Solano County and Cities

Adrienne J. Tissier  
San Mateo County

Scott Wiener  
San Francisco Mayor's Appointee

Steve Heninger  
Executive Director

Ann Flemer  
Deputy Executive Director, Policy

Andrew B. Fremier  
Deputy Executive Director, Operations

April 8, 2013

**SENT VIA EMAIL AND USPS**

Ms. Julie Axelrod  
Judicial Watch  
425 Third Street SW, Suite 800  
Washington, DC 20024  
Email:

RE: Request for Public Records

Dear Ms. Axelrod:

This letter is in further response to your March 13<sup>th</sup> letter requesting records related to the development of *Plan Bay Area* (PBA). The request is large and broad in scope, and we have attempted to provide you with the most thorough information possible within the confines of the California Public Records Act. If you feel we have misinterpreted a specific portion of your request, please contact us to discuss the request further. Below is a detailed response to each item.

**I. UrbanSim**

- a. *The "GNU General Public License(s)" executed by MTC, and any other parties that participated in the creation of PBA and its components, for the use of "UrbanSim,"*

**MTC procured services from the University of California, Berkeley (UC Berkeley) to perform the UrbanSim work in support of Plan Bay Area. The contract documents already exist in PDF format and, therefore, can be provided to you via CD.**

**MTC has not yet redistributed UrbanSim under a GNU General Public License.**

- b. *The electronic code versions of UrbanSim developed by MTC and any other parties for each version of the model(s) operated by MTC.*

**The electronic code versions of UrbanSim used in Plan Bay Area can be found at:  
[http://analytics.mtc.ca.gov/foswiki/Main/DataRepository\\_UrbanSim](http://analytics.mtc.ca.gov/foswiki/Main/DataRepository_UrbanSim).**

The information includes the source code, input configuration (see bay\_area\_parcel\_unit\_price.xml), invocation procedures (see log files), and the data cache.

- c. *Please identify the platform that MTC et al is running UrbanSim on (Windows x86, x64, Macintosh, Linux) and the configuration of the hardware it is operated upon (if it is operated on multiple platforms, provide such information for all).*

UrbanSim was operated on MTC's behalf at UC Berkeley. The models were run on either Ubuntu Linux 12.04 or Ubuntu Linux 11.10. The hardware on all of these machines are 64-bit Intel Xeon rack servers. Some are virtual machines running in Linux KVM. The amount of RAM in the machines varies, though it takes about 25GB of RAM to run one instance of the model.

UC Berkeley runs the models with a custom python environment built using instructions that can be found at:

<http://urbansim.org/Documentation/UrbansimOptimizedPythonEnvironment>

- d. *Documentation of the model(s) and variants thereof, including all coefficients and variables, and justification for the values utilized in each model run.*

Documentation of the UrbanSim model – which includes the model coefficient and variables – used in Plan Bay Area is available in the *Draft Technical Documentation: San Francisco Bay Area UrbanSim Application* that can be found at:

[http://analytics.mtc.ca.gov/foswiki/pub/Main/Documents/2013\\_04\\_01\\_DRAFT\\_RELEASE\\_UrbanSim\\_Documentation.pdf](http://analytics.mtc.ca.gov/foswiki/pub/Main/Documents/2013_04_01_DRAFT_RELEASE_UrbanSim_Documentation.pdf)

Documentation of the EIR application is available in a supplementary report entitled *Summary of Predicted Land Use Responses* and can be found at: <http://onebayarea.org/regional-initiatives/plan-bay-area/draft-plan-bay-area/supplementary-reports.html>

- e. *Sources of data for the transportation network, land use, etc. and timeliness of such data.*

Documentation of the EIR UrbanSim and Travel Model applications are available in supplementary reports entitled *Summary of Predicted Land Use Responses* and *Summary of Predicted Traveler Responses* and can be found at: <http://onebayarea.org/regional-initiatives/plan-bay-area/draft-plan-bay-area/supplementary-reports.html>

**Judicial Watch****March 13, 2013 Public Records Request**

- f. Agenda for, minutes of, and technical documents associated with the meetings held of the modelers, users, and other interested parties for UrbanSim and the output model runs and e-mails and other communications between the modelers, users, and others who participated in the planning, modeling, and creation of PBA.*

**Throughout the PBA EIR process, MTC met with UC Berkeley staff weekly to discuss the UrbanSim model development and application activities. The agenda for this meeting was maintained in an online Google document, which allowed both parties to add items to the agenda and for the agenda to live in a single location. The agenda was updated prior to each meeting and prior agendas were overwritten. The contents of the current Google document show the agendas for the most recent two meetings; those documents have been copied as PDF documents and can be provided to you via CD. There were no minutes produced for these meetings.**

**There are approximately 16 pages of MTC emails regarding the model development and application process which have been retained and can be provided to you at the standard MTC copying rate.**

*II. Transportation*

- a. The licensing agreement, or comparable document, for the transportation model utilized by MTC et al for production of PBA and its components and the EIR.*

**There is no agreement with a third-party that allows MTC to operate the MTC travel model; the travel model is owned by MTC and freely distributed for others to use.**

**The MTC travel model does use a variety of commercial and non-commercial software, including: Citilabs' Cube, for which MTC can provide the license; Microsoft Excel, for which MTC can provide our license; Microsoft DOS, which is distributed with Microsoft Windows, for which MTC can provide our license; open-source Java software developed by Parsons Brinckerhoff on MTC's behalf, for which a license is only needed if MTC redistributes the software, which it has not done. Licensing information for Microsoft products can be found via Microsoft's web site. The licensing agreement for Citilabs' Cube can be provided to you via CD.**

## Judicial Watch

## March 13, 2013 Public Records Request

- b. The electronic code versions of the transportation model utilized by MTC and any other parties for each version of the model(s) operated by MTC.

**The MTC travel model uses a variety of software, as noted in the previous response. As such, the “electronic code versions of the transportation model” include a variety of implementation methods, including Cube scripts, Excel spreadsheets, DOS batch scripts, and Java software. The year 2040 implementation of version 0.3 of the model can be provided to you via CD.**

- c. *Please identify the platform that MTC et al is running its transportation model on and the configuration of the hardware it is operated upon (if it is operated on multiple platforms, provide such information for all).*

**This information is available in MTC’s online model user’s guide that can be found at: <http://analytics.mtc.ca.gov/foswiki/Main/UsersGuide>**

- d. *Documentation of the model(s) and variants thereof, including all coefficients and variables, and justification for the values utilized in each model run.*

**Model coefficients and variables are available in the Travel Model One Development: Calibration and Validation Technical Report, which can be found at:**

**[http://mtcgis.mtc.ca.gov/foswiki/pub/Main/Documents/2012\\_05\\_18\\_RELEASE\\_DRAFT\\_Calibration\\_and\\_Validation.pdf](http://mtcgis.mtc.ca.gov/foswiki/pub/Main/Documents/2012_05_18_RELEASE_DRAFT_Calibration_and_Validation.pdf)**

**For the Plan Bay Area application, input variables are discussed in the *Summary of Predicted Traveler Responses* document referenced previously.**

- e. *Sources of data for the transportation network, land use, etc. and timeliness of such data.*

**As noted above, documentation of the EIR UrbanSim and Travel Model applications are available in the *Summary of Predicted Land Use Responses* and *Summary of Predicted Traveler Responses* supplementary reports.**

- f. *Agenda for, minutes of, and technical documents associated with the meetings held of the modelers, users, and other interested parties for the transportation model and the output model runs and e-mails and other communications between the modelers, users, and others who participated in the planning, modeling, and creation of PBA.*

**MTC and ABAG modeling staff meet approximately monthly with our peers in county government, state government, and public transit agencies. There are approximately 60 pages associated with the agendas and minutes for these meetings, and they can be provided to you at the standard MTC copying rate.**

There are approximately 75 pages of MTC emails regarding the Plan Bay Area modeling work which have been retained and can be provided to you at the standard MTC copying rate. These include communications between MTC employees as well as communications between MTC and consultant staff, who assisted with the project performance assessment portion of Plan Bay Area.

### *III. Finance*

- a. *The financial models utilized by MTC for the preparation of PBA, presented in electronic format, such as Excel™ files (please provide the name and version of the software and a description of the hardware platform and operating system it runs on) and the documentation of such models.*

The financial projections were prepared primarily using Microsoft Excel. (See response to Item III.b., below, for detail of these Excel spreadsheets.) The exceptions to this are the projections of 1) local street and road maintenance needs, that were prepared using the StreetSaver® pavement management system software, 2) the local bridge maintenance and replacement needs, that were prepared using the Pontis Bridge Management System software, and 3) the transit capital rehab and replacement needs, that were prepared using the Federal Transit Administration's Transit Economic Requirements Model (TERM) software. Technical and conceptual details on the financial modeling software used can be found at the following web links:

- StreetSaver® – <https://www.streetsaveronline.com/default.aspx>
- Pontis – <http://aashtowarebridge.com>
- TERM – [http://www.fta.dot.gov/about/13248\\_13251.html](http://www.fta.dot.gov/about/13248_13251.html)

- b. *The sources of data for the financial models and justification of variables, such as growth rates for tax sources and anticipated future transportation system component capital expansion and capital renewal and replacement expenditures, operating expenses, operating revenues, and subsidies, and the documentation of the projections of revenues for the planning period.*

MTC utilized third party contractors and/or consultants to prepare the maintenance needs assessments using the non-Microsoft Excel modeling software. MTC can provide Excel-based output files of the modeling results as needed. Capital maintenance and operating revenue information provided by the 109 local jurisdictions and 23 transit operators in the region are also available in Excel format. We estimate the number of pages for this documentation is approximately 600, and it can be provided at the standard MTC copying rate.

**Financial models utilizing Microsoft Excel consist of approximately seven workbooks. Each workbook contains from one to 25 tabs each. Due to the complexity and the time period of the revenue projections, the forecasts are not easily formatted into legible page ranges. Data sources for the financial models consist of several hundred pages of documents pertaining to state and federal legislation, sales tax forecasts, trends and expenditure plans, fuel prices and consumption, traffic counts, inflation, population, employment, legislation. In total, Excel model and input variable documentation is approximately 1,000 pages. While we can attempt to provide you this documentation, it will be difficult to duplicate. Due to the format and volume of the requested information on financial models, it would be most practical for this material to be viewed at MTC's offices.**

- c. Identify sources of taxpayer revenues from Federal, State, regional, and local government sources and other revenues, such as bridge tolls and the documentation of the projections of revenues for the planning period.*

**The financial models and resulting forecasts referenced herein identify all sources of taxpayer revenues from Federal, state, regional and local sources used in Plan Bay Area.**

- IV. Validation and Calibration – models of these types need to be validated and calibrated, which is generally performed by “predicting” the past and comparing the model options with the actual results. Provide documentation of the validation and calibration plan for each model, individually, including the specific model runs and time periods modeled, the metrics that were tested and the justification for their selection for this purpose, the results obtained, the margins of error produced, and the documentation that these margins of error are considered acceptable for purposes of PBA modeling.*

**Prior to beginning the financial forecasting for a planning document, staff engages in a retrospective analysis of the forecasts prepared for past efforts and their accuracy. This “back-casting” informs some of the major assumptions that are utilized in the plan such as the base revenue amounts used and the growth rate applied. In addition to past long range plans, forecasts prepared in the interim for short and/or medium range planning efforts are also evaluated in terms of accuracy and their likelihood to be predictors of long-range trends. Further, the ability to amend the long range plan every four years and the Transportation Improvement Program every two years, provides the opportunity to make updates to the financial assumptions used.**

**Non-Excel based software models used to generate the capital maintenance needs are widely used throughout the nation and on a daily basis, allowing calibration issues to be identified and addressed through their independent software development processes. MTC compares the models' output with that of prior long range plans to ensure that large discrepancies do not exist.**

**Documentation of retrospective analysis and interim projections used to inform the Plan Bay Area financial forecasts can be provided. We estimate the number of pages for this documentation is approximately 500, and it can be provided at the standard MTC copying rate.**

**A summary of the calibration and validation effort of the UrbanSim model is available in the *Draft Technical Documentation: San Francisco Bay Area UrbanSim Application* referenced earlier. The UrbanSim model was used only to (a) create alternate (to the Proposed Plan) land use scenarios for the EIR and (b) provide sub-travel-analysis-zone details for the Proposed Plan.**

**A summary of the calibration and validation effort for the travel model is available in the *Travel Model One Development: Calibration and Validation Technical Report* referenced above. Additional validation resources include an examination of the parameters used in the volume delay functions and can be found at:**

**[http://mtcgis.mtc.ca.gov/foswiki/pub/Main/Documents/2012\\_03\\_06\\_RELEASE\\_Volume\\_delay\\_functions.pdf](http://mtcgis.mtc.ca.gov/foswiki/pub/Main/Documents/2012_03_06_RELEASE_Volume_delay_functions.pdf)**

**Sensitivity testing results can be found at:**

**[http://analytics.mtc.ca.gov/foswiki/pub/Main/Documents/2013\\_03\\_18\\_DRAFT\\_Sensitivity\\_Testing.pdf](http://analytics.mtc.ca.gov/foswiki/pub/Main/Documents/2013_03_18_DRAFT_Sensitivity_Testing.pdf)**

**Additionally, MTC is in the process of validating the model to 2010 conditions. MTC can provide a guided tour of the working 2010 validation documents upon advance request.**

**Predictions of travel behavior and land development patterns, particularly those made for 25 years into the future, rely on assumptions regarding myriad uncertainties, such as the prevailing economic, political, cultural, and technological environment in the intervening years. Further, the behaviors these models attempt to simulate, such as choosing a place to live and/or work, are very complex, and developing useful models is difficult and expensive. Therefore, regardless of the validation performance for any number of historical years and/or assertions about statistical margins of error, models should be used only to inform decisions, not make them. The elected officials which serve on MTC and ABAG are capable of first understanding the inherent limitations of predicting the future generally and planning models specifically, and then weighing the evidence provided by the models against other concerns, to make decisions in the public's best interest.**

**Judicial Watch****March 13, 2013 Public Records Request**

- V. *Coordination of Models – When multiple models are utilized in exercises such as this, it is vital that they be closely coordinated to ensure that the logic of the overall results are internally consistent; for example, the populations/demographic projections must be identified (or, at least, closely comparable) for all models and there must be sufficient revenues available to construction, operate, and maintain the transportation system proposed as outputs of the land use and transportation modeling processes. Provide documentation of the coordination plan and the work performed to achieve the objectives of the model coordination plan.*

**The UrbanSim model and MTC Travel Model are integrated, i.e. land use estimates from UrbanSim are directly input to the travel model and accessibility estimates from the travel model are directly input to UrbanSim. These models are, by definition, coordinated.**

**The transportation projects coded into the travel model are a subset of those that are included in the Proposed Plan, i.e. those for which the travel model is capable of explicitly responding. A coordination plan for coding a list of projects into the travel model has not been developed.**

**The transportation revenue assumptions were presented at the May 2011 Partnership Technical Advisory Committee (PTAC) meeting and at the June 2011 MTC Joint Planning and ABAG Executive Board committee meeting. Both of these packets can be found online at MTC's meeting archive page for 2011 at: <http://www.mtc.ca.gov/meetings/archive/2011.htm>**

- VI. *Names and identification and contact information for those who participated in the modeling process, preparation for the modeling process, and use of its outputs:*
- a. *Name*
  - b. *Role in the modeling/PBA process, including the specific model(s) each was associated with*
  - c. *Organization (MTC, ABAG, etc.)*
  - d. *Position in organization*
  - e. *Address*
  - f. *Phone Number*
  - g. *e-mail address*

*(We are asking for business contact information; home address and other information is only requested if that is also the person's work location.)*

**Numerous individuals participated in the referenced activities from MTC, its consultants and other public agencies. Some of them are identified in documents referenced in this correspondence. However, we interpret this as asking MTC to compile a list specifically for this request, and we do not believe that the California Public Records Act requires MTC to do so. Please contact us to discuss this specific request further if you believe otherwise.**

## Judicial Watch

## March 13, 2013 Public Records Request

- VII. *Documentation of alternatives or options that were identified in the planning process, but not included in the EIR, and the justification for why such alternatives or options were dropped from consideration in the published PBA.*

**In the parlance of environmental planning, the process described in the request is known as scoping: in a notice of preparation, an agency announces the proposed action, as well as the alternatives under consideration, and the public then requests that alternate actions be considered. This information is included in Appendix A and Appendices B1, B2, B3 and B4 of the Draft EIR, and can be found on MTC's web site at:**

**<http://www.onebayarea.org/regional-initiatives/plan-bay-area/plan-elements/environmental-impact-report.html>.**

- VIII. *Examination of Previous Planning Processes – MTC et al have been performing long-term regional planning processes substantially the same of the current PBA process for decades. Part of the preparation for any major planning/modeling activity of this type is the review of past plans, the comparison of the projections in such plans to actual historical results, and the determination of the reasons for variances so that the current planning/modeling process can be improved to avoid past causes of variances. Produce the documentation of the processes that MTC et al have performed to produce “lessons learned” and how these were incorporated into the current planning/modeling process. Specifically address the following time series, the error rates observed from the various MTC plans over time, the causes of the errors, and the improvements to the current modeling process that resulted from these exercises:*

**The 2013 Regional Transportation Plan and Sustainable Communities Strategy mark the first time in which MTC and ABAG are generating a coordinated transportation and land use plan per the requirements of California Senate Bill 375. As such, Plan Bay Area is, in important ways, a new effort.**

**It is accurate that MTC has been doing long range transportation planning for a long time and that ABAG has been generating land use forecasts for a long time. The regulatory agencies which require MTC and ABAG to make forecasts acknowledge the difficulty of predicting the future and thus require updates be made to these forecasts at least as frequent as every four years. This allows decision makers to frequently adjust course as new evidence, including (but not limited to) evidence from analytical tools such as travel models, emerges.**

## March 13, 2013 Public Records Request

**MTC and ABAG rarely engage in systematic analysis of past predictions. Recall that transportation plans are updated every four years and programming decisions even more frequently. As such, model results for any single transportation plan only partially inform funding decisions. A thorough examination of, for example, a single transportation project, would require a review of how the project performed across each transportation plan in which it was included. Further, because model results only inform, rather than make, decisions, we would also need to examine the role the modeling information played in the decision making process (i.e., if the decision makers did not rely on model results for a particular decision, the model's performance is irrelevant).**

**MTC does not believe that a thorough investigation of the model's role in decision making as well as an assessment of the model's accuracy (beyond the extensive calibration, validation, and testing exercised done to date) on a number of dimensions through time is a prudent expense of scarce tax payer resources. That said, a number of smaller efforts have been performed that address the request as follows (per the categories of the request):**

- a. *Population/demographics, by region within the MTC/ABAG nine-county jurisdiction (urbanized areas, county, city, etc.)*

**ABAG has compared past population projects with the 1990, 2000 and 2012 Census. That information can be provided to you via a CD.**

- b. *Regional economic trends, including per capita*

**MTC has not performed this type of review.**

- c. *Revenue projections, including Federal, State, regional and local tax revenues available for the purposes comprehended by the plans, toll revenues, transit fare revenues, HOT lane revenues, and other user fees*

**The projections for Transportation 2035 can be found in the Transportation 2035 Project Notebook, which can be accessed online at:**

**[http://www.mtc.ca.gov/planning/2035\\_plan/](http://www.mtc.ca.gov/planning/2035_plan/)**

**(see supplemental reports).**

**The projections for Plan Bay Area can be found in the supplemental reports to the Draft Plan Bay Area, which are online at:**

**<http://www.onebayarea.org/regional-initiatives/plan-bay-area/draft-plan-bay-area/supplementary-reports.html>**

## March 13, 2013 Public Records Request

- d. *Expenditure/expense projections, including capital costs of major transportation projects such as new and extended passenger rail lines, bus rapid transit lines, bridge construction/rehabilitation, highway expansion, road maintenance and recapitalization, replacement of transit vehicles and rehabilitation of fixed guideways and other major capital assets, etc.*

**The projections for Transportation 2035 can be found in the Transportation 2035 Project Notebook, which can be accessed online at:**

**(see supplemental reports).**

**The projections for Plan Bay Area can be found in the supplemental reports to the Draft Plan Bay Area, which are online at:**

- e. *Schedule adherence for major capital projects, such as passenger rail line construction, bridge construction/rehabilitation, road recapitalization, etc.*

**Projects that have received funding are listed in the Transportation Improvement Program (TIP). The Draft 2013 TIP has been issued, is available online, and is scheduled to be adopted later this year. Both the Draft 2013 TIP and the 2011 TIP can be accessed online at:**

- f. *Transportation utilization projections, including vehicle miles traveled, utilization of major road links such as bridges and freeways, transit unlinked passenger trips and passenger-miles (both for each transit operator, such as BART and VTA and for specific projects, such as BART to SFO), and transportation mode splits, including both peak period and all-day.*

**MTC has not performed the type of systematic evaluation suggested; however, staff prepares transportation utilization analysis and projections on a regular basis as a part of ongoing funding, planning and monitoring activities. The Statistical Summary of Bay Area Operators (the latest version of which can be found online at ) is published annually and contains utilization, cost and revenue statistics for each transit operator. Short range transit plans prepared by operators and information provided for MTC's Transit Sustainability Project include actual and projected utilization statistics, as do operator claims for funding under MTC administered funding programs. For past long range plans and Plan Bay Area, transit operators provided utilization statistics for ongoing operations and expansion needs. The financial forecasts for past plans and for Plan Bay Area also include projected usage of the regional toll bridges. Transit operators and project sponsors are the primary source for project and route specific utilization projections.**

## Judicial Watch

## March 13, 2013 Public Records Request

- g. *Land use projections, specifically focusing on single-family detached vs. multiple family housing long-term time lines.*

**MTC has not performed this type of review.**

- h. *Commute travel into the MTC region from outside, and vice versa*

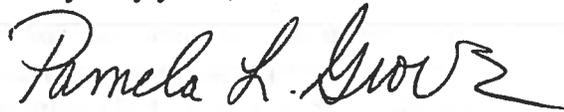
**The estimates of travel across MTC's planning boundaries that are included in the travel model are directly responsive to past trends. As such, past trends continually inform the forecasts. As an example, we can provide you with a memorandum that demonstrates how past trends are used to inform estimates of travel across the boundaries of MTC and San Joaquin Valley planning region's boundary.**

We estimate that the number of pages for documents related to Items I.f., II.f., III.b. and IV is approximately 1,250.

The records you request can be made available for your inspection and review at MTC offices upon appointment during normal work hours. We estimate it will take an additional two weeks to gather all of the documents for your review. Alternatively, MTC will copy the records for you for the direct cost of duplication of \$.25 per page, plus postage. Since you have requested electronic documents, MTC can PDF the documents for you and mail them to you via CD. The documents that need to be copied total 1,300 pages, at a copying charge of \$325.00 plus \$1.00 for the CD and \$1.39 for postage, for a total of \$326.39. MTC will copy the records, place them on a CD and mail them to you upon receipt of your check in the amount of \$326.39. We estimate it will take approximately two weeks following receipt of your check to copy the documents.

Please contact me at [pgrove@mtc.ca.gov](mailto:pgrove@mtc.ca.gov) or 510.817.5706, to schedule an inspection of the documents or to let me know if you wish to have MTC copy the documents for you.

Very truly yours,



Pamela L. Grove  
Public Information Officer

/pl

## **Appendix E**

Requests for modeling data from modeling staff, April, 2013

**From:** Peter Singleton (petersingleton@sbcglobal.net)  
**To:** MichaelR@abag.ca.gov; dory@mtc.ca.gov;  
**Date:** Wed, April 17, 2013 5:26:13 PM  
**Cc:** CClevenger@mtc.ca.gov;  
**Subject:** Re: Modeling data

Michael,

Thanks so much! I'll pick up the hard drive tomorrow afternoon or first thing Friday morning.

I'd like to chat as soon as possible. Would you have any time Monday afternoon (April 22) or Tuesday morning or afternoon?

Thanks again,

Peter

---

**From:** Michael Reilly <MichaelR@abag.ca.gov>  
**To:** David Ory <dory@mtc.ca.gov>; Peter Singleton <petersingleton@sbcglobal.net>  
**Cc:** Carolyn Clevenger <CClevenger@mtc.ca.gov>  
**Sent:** Wed, April 17, 2013 4:03:29 PM  
**Subject:** Re: Modeling data

Peter,

The hard drive is the ABAG front desk (first floor) with your name on it. If you suggest a few times, we should be able to find a time to talk next week.

Mike

Michael Kaston Reilly  
Principal Regional Research Analyst  
Association of Bay Area Governments  
MichaelR@abag.ca.gov | (510) 464-7925

>>> Peter Singleton <petersingleton@sbcglobal.net> 4/17/2013 2:01 PM >>>  
Dave, thank you! This is a great help for us.

Michael, thanks so much in advance for the modeling data on the hard drive. When you have it loaded, you can send me an email or give me a call (650-575-6330), and I will stop by and pick up the hard drive. It's not difficult for me to come by the MetroCenter, plus, the information on the hard drive is vitally important for us to be able to make informed comments on the draft Plan and draft EIR.

One thing that would be incredibly helpful for us is if we could do like we did with Dave, and that's if we could chat with you briefly in person or via the phone (with Dave, I came to the MTC offices on Monday, and we

included my associate on the phone).

Peter

---

**From:** David Ory <DOry@mtc.ca.gov>  
**To:** Peter Singleton <petersingleton@sbcglobal.net>  
**Cc:** Michael Reilly <MichaelR@abag.ca.gov>; Carolyn Clevenger <CClevenger@mtc.ca.gov>  
**Sent:** Wed, April 17, 2013 1:06:51 PM  
**Subject:** Re: Modeling data

Hello Peter,

As a follow up to our chat, you may find the following resources to be helpful:

- (a) Model user's guide: \_\_\_\_\_ ;
- (b) Calibration and validation reports/powerpoints (see version 0.3):  
\_\_\_\_\_ ;
- (c) DRAFT Sensitivity tests report: [http://analytics.mtc.ca.gov/foswiki/pub/Main/Documents/2013\\_03\\_18\\_DRAFT\\_Sensitivity\\_Testing.pdf](http://analytics.mtc.ca.gov/foswiki/pub/Main/Documents/2013_03_18_DRAFT_Sensitivity_Testing.pdf);
- (d) Technical reports from all the rounds of scenario analysis for Plan Bay Area:  
\_\_\_\_\_ ;
- (e) The walk shares file can be found in the INPUT\landuse\ folders (in each scenario separately), see the walk access buffers file ( \_\_\_\_\_ ).
- (f) The mode choice coefficients can be found in CTRAMP\model\ folders (in each scenario separately), see the TripModeChoice and ModeChoice files. An explanation of how these files work is here: \_\_\_\_\_ . These files include the assumptions about cost sensitivity, out of vehicle time sensitivity, and the free transit assumptions for scenario 5.

This email notifies you that I am passing the hard drive to Mike Reilly, who I've CC'd here (Mike: please load the same data you provided to Richard Marcantonio, et al).

Please let me know if you have any questions.

enjoy,  
dave  
510-817-5755

>>> On 4/15/2013 at 7:25 PM, in message  
<1366079141.58500.YahooMailRC@web181303.mail.ne1.yahoo.com>, Peter Singleton

<petersingleton@sbcglobal.net> wrote:

Dave,

It was great talking with you in your offices today, and having the chance to loop Tom in by phone. The conversation was a great help to us, and was the information you provided was essential to our ability to able to comment on the draft Plan and draft EIR, as well the models and answers to our questions over the next few days.

We'd also appreciate receiving the modeling data that ABAG has been working with as well. Just as you did with Public Advocates, we'd appreciate it if after you've loaded the MTC modeling data onto the hard drive, if you could pass the drive to Michael to be loaded with the ABAG modeling data. I'd also appreciate it greatly if you would provide my contact information to Michael as well (my cell is 650-575-6330), as the opportunity to chat with him just as we did today will be enormously helpful to us, and it is easy for me to stop by the MetroCenter really at any time that Michael is free.

Thanks again!

Peter

---

**From:** David Ory <DOry@mtc.ca.gov>  
**To:** petersingleton@sbcglobal.net  
**Cc:** Carolyn Clevenger <CClevenger@mtc.ca.gov>  
**Sent:** Thu, April 11, 2013 10:40:29 AM  
**Subject:** Re: Modeling data

Hello Peter,

Sure. I'm available Monday afternoon (3 pm?), am booked the rest of the week, but have more availability the week of April 22.

thanks,

dave

510-817-5755

>>> Peter Singleton 04/11/13 10:23 AM >>>

Thanks so much, Mr. Ory! I will drop off a 1TB hard drive at MTC's office tomorrow so that you have it available when you return to the office on Monday.

Is there a specific time (and number) that I can call you at, either today, tomorrow, or Monday (or better yet, my colleague who is our modeling person could call you) so that you know what information we are most interested in?

We certainly would like the full data you have already provided to other folks such as our friend Richard Marcantonio of Public Advocates, who suggested we contact you for the data in the first place, but it may be easier if one of us chatted with you first over the phone to make sure all of the available data that we are interested in was on the hard drive you produce for us. We are of course very much looking forward to receiving the data as soon as possible, as it is essential for us to provide thoughtful and informed comments on the draft Plan and draft EIR.

Peter  
650-575-6330

---

From: David Ory  
To: Peter Singleton  
Cc: Carolyn Clevenger  
Sent: Wed, April 10, 2013 3:50:07 PM  
Subject: Re: Modeling data

Hello Peter,  
Sure thing. I'll be out of the office this Thursday and Friday, but if you drop the hard drive off with the receptionist (anytime), I'll do my best to load up the travel model simulation results early next week. For your reference, the type of information available is similar to that posted for historical simulations on our Data Repository web site (e.g., [Data Repository](#)). Absent additional direction, I'll assume you'd like the year 2040 simulation files (inputs, outputs, and application scripts/software) for each of the five alternatives.

thanks,  
dave  
510-817-5755

>>> On 4/10/2013 at 2:45 PM, in message  
>>><  
>>> wrote:

>, Peter Singleton

Dear Mr. Ory,

I'm planning on filing comments on the draft Plan Bay Area, draft EIR, and associated documents, but cannot do so without access to all of the modeling data. I understand from a colleague that your department will make that data available and if we bring in a high capacity hard drive (e.g., 1T), you will copy the modeling data onto our hard drive.

Is there a convenient time I could do this, perhaps Friday of this week? I'd like to get access to the modeling data as soon as possible because of the short time frame allowed for submission of public comments.

Thank you,

Peter Singleton

..

| . .

..

## **Appendix F**

MTC's modeler, Dave Ory, response to question, May 2, 2013

**From:** David Ory (DOry@mtc.ca.gov)  
**To:** petersingleton@sbcglobal.net;  
**Date:** Thu, May 2, 2013 10:06:00 AM  
**Cc:** CClevenger@mtc.ca.gov; DVautin@mtc.ca.gov;  
**Subject:** Re: transit boardings

Hello Peter,

Just to make sure we're using these terms in the same way: we define a transit trip as a movement between activity locations (e.g., from home to work) that involves, at some point in the journey, using public transit; a transit boarding is the act of getting on a transit vehicle. Therefore, a single transit trip can involve one or more transit boardings. As for your questions:

(1) We do not use a specific factor. The simulation of the mode choice decisions includes the choice of up to 10 transit paths for each trip, a path being a way through the transit network. Traveling through a path requires, in some cases, transferring between transit services, i.e. making more than one boarding. As such, simulated travelers choose the "best" transit path for their movement, and the number of boardings is a consequence of this choice. Said another way: we simulate both transit trips and transit boardings.

In the Year 2010 simulation, we estimate 1,581,000 transit boardings, as shown in the table you reference, which corresponds to 1,179,000 trips, which implies an average transfer rate of 1.3 boardings per trip.

In the Year 2040 DRAFT Proposed Plan simulation, we estimate 3,054,000 transit boardings, as shown in the table you reference, which corresponds to 2,151,000 trips, which implies an average transfer rate of 1.4 boardings per trip.

(2) In the Year 2010 simulation, we estimate 9,476,000 transit passenger miles, which corresponds to about 6.0 miles per boarding.

In the Year 2040 DRAFT Proposed Plan simulation, we estimate 18,606,000 transit passenger miles, which corresponds to about 6.2 miles per boarding.

enjoy,  
dave  
510-817-5755

>>> On 5/1/2013 at 6:29 PM, in message  
<1367458184.6065.YahooMailRC@web181304.mail.ne1.yahoo.com>, Peter Singleton

<petersingleton@sbcglobal.net> wrote:

Dave,

A couple of questions regarding transit boardings and transit trips:

1 - Did MTC in its modeling of the draft Plan and the draft EIR, use a specific factor to convert transit boardings to transit trips. If so, of course, what is that factor, and is that documented anywhere?

Alternatively, if you didn't, based on your experience, what would be a reasonable factor to use in order to convert Bay Area transit boardings to transit trips?

2 - TABLE 2.1-12 states transit boardings. What is the estimate of transit passenger-miles that corresponds to these boardings?

Thanks so much for your help!

Peter  
650-575-6330 (cell)

## **Appendix G**

MTC Model Run 2035\_03\_84, 2013 RTP/SCS CO2 and Criteria Pollutant  
Summary Results, September 11, 2012



Plan Bay Area 2040 Final Environmental Impact Report

<b>MPG</b>	miles per gal	19.69	20.09	20.10	20.33	20.39	20.44
<b>VMT</b>	1000s miles	161,444	158,044	155,668	160,403	167,043	180,077
<b>Pavley I &amp; LCFS CO<sub>2</sub> Inventory for Passenger Vehicles Only</b>	1000s tons/day	73.06	71.66	69.82	63.08	54.56	51.51
<b>Reduction</b>	1000s tons/day	0.00	0.00	-0.27	-8.54	-20.15	-29.18
<b>% Reduction</b>	% age	0.00%	0.00%	-0.38%	-11.92%	-26.97%	-36.16%
<b>MPG</b>	miles per gal	19.69	20.09	20.18	23.09	27.92	32.02
<b>% Increase in Fuel Economy from Pavley I &amp; LCFS [for passenger fleet only]</b>	% age	0.00%	0.00%	0.38%	13.53%	36.93%	56.65%

>>> David Ory 9/10/2012 10:12 AM >>>

Hello Harold and Rupinder,

Model run 2035\_03\_084 is ready for your review. This is the first pass at Scenario 4 for the EIR.

Rupinder: Will you please inspect the highway network for bugs? (files are here: M:\Application\Model One\RTP2013\Scenarios\2035\_03\_084\OUTPUT)

Harold: Will you please generate emission estimates? (SATMODEL3 is running a model but available for your use -- as usual, close the window when you're done, but do not log off).

thanks,  
dave

## **Appendix H**

### **Pavley I + Low Carbon Fuel Standard Postprocessor Version 1.0 User's Guide**

**Pavley I + Low Carbon Fuel Standard Postprocessor  
Version 1.0**

**User's Guide**



## Table of Contents

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# Pavley I + LCFS Postprocessor – Version 1.0

## User's Guide

ARB staff has developed this tool for Metropolitan Planning Agencies (MPO) to use as they estimate the greenhouse gas reductions (GHG) from local land use strategies when those strategies are combined with California's vehicle and fuel standards. In 2007, ARB adopted the Pavley clean-car standards to reduce GHG emission from passenger vehicles. In 2009, ARB adopted a Low Carbon Fuel Standard (LCFS) to reduce the carbon intensity of vehicle fuel. Now, under SB 375, MPOs and local governments are developing plans to reduce our driving needs as our communities grow. This tool allows the MPOs to estimate how the three strategies work together to reduce emissions.

MPOs will take the information about vehicle use (e.g., miles driven and speeds) coming out of their alternative planning scenarios and use that as input to ARB's existing vehicle emission model EMFAC. The MPOs will then put the EMFAC output into this tool to estimate future GHG emissions with the Pavley and LCFS benefits. ARB will use the same tool when it sets the GHG emission reduction targets required by SB 375.

The Pavley I + LCFS Postprocessor (Version 1.0) was developed to adjust the carbon dioxide (CO<sub>2</sub>) emissions from the EMFAC 2007 Ver2.3 output to account for the reductions from the adopted Pavley I regulation and Low Carbon Fuel Standard (LCFS) on the light duty fleet – Passenger Cars [Light Duty Automobiles (LDA)], Light Duty Trucks [0 – 3,750 lbs (LDT1)], Light Duty Trucks [3,751 – 5,750 lbs (LDT1)], and Medium-Duty Trucks [5,751 – 8,500 (MDV)]. The postprocessor is designed to work as a stand-alone Microsoft Windows-based program that is applied to the EMFAC Burden output (".bdn" extension) to calculate the adjusted CO<sub>2</sub> emissions.

The Postprocessor is coded as a Microsoft® Office Excel Macro to automate the calculations. In order to make the postprocessor user friendly, a simple Visual Basic interface has been added so that users can execute the macro as a Windows program. First time users will need to install the program on their computers. Once installed, the program can be directly executed from either the Start menu or a Desktop icon for subsequent assessment. This User's Guide details the step-by-step procedure to install and execute the program.

## Background

Since the last version of EMFAC (EMFAC2007 Ver2.3) was released in 2007, it does not reflect the new regulations adopted by ARB after 2007. In particular, ARB has adopted two regulations that significantly affect the CO<sub>2</sub> emissions:

- Pavley I: A clean-car standard to reduce greenhouse gas (GHG) emissions from new passenger vehicles (LDA-MDV) from 2009 through 2016 (reduction factors are presented in Table 1)

- **Low Carbon Fuel Standard:** A fuel standard that requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020 (reduction factors are presented in Table 2)

**Table 1: Pavley I Reduction Factors**

Model Year	LDA/LDT1	LDT2/MDV
2008 and older	0.00%	0.00%
2009	0.00%	0.90%
2010	3.50%	5.20%
2011	14.40%	12.00%
2012	25.30%	18.50%
2013	27.20%	19.90%
2014	28.80%	21.00%
2015	31.70%	23.00%
2016 +	34.30%	25.10%

**Table 2: LCFS Reduction Factors\***

Calendar Year	Reduction Factor
2010	Reporting Only
2011	0.25%
2012	0.50%
2013	1.00%
2014	1.50%
2015	2.50%
2016	3.50%
2017	5.00%
2018	6.50%
2019	8.00%
2020 +	10.00%

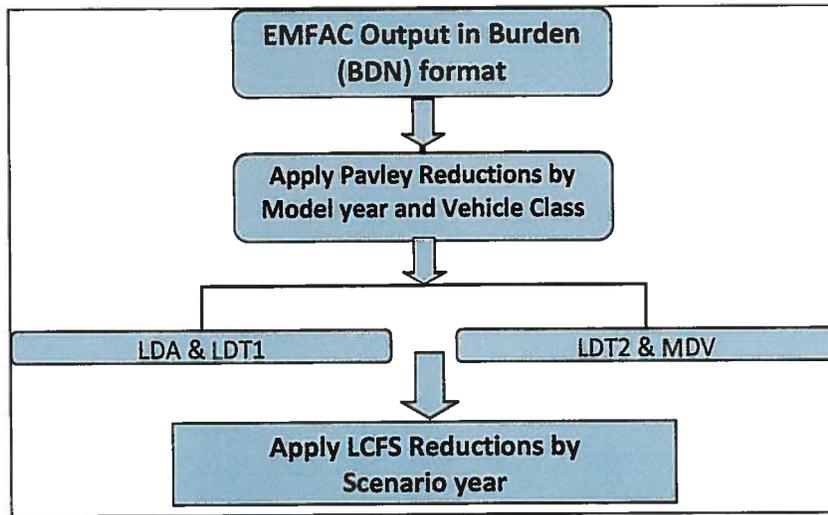
\* Based on the carbon intensity reductions required by the LCFS Regulation for transportation fuels used in California as provided from the Staff Report titled "California's Low Carbon Fuel Standard" dated October 2009.

Measured on a lifecycle basis, the carbon intensity represents the equivalent amount of carbon dioxide (CO<sub>2</sub>e) emitted from each stage of producing, transporting, and using the fuel in a motor vehicle.

### Process Flowchart

This section details the Postprocessor operation flow. The Detailed EMFAC Burden output (".bdn" extension) was selected as the input for the Postprocessor since it can provide output by vehicle model year and vehicle class, which is required for applying the Pavley factors. The Postprocessor extracts CO<sub>2</sub> emission data for passenger vehicles (LDA, LDT1, LDT2, and MDV) from the Burden output. It then applies the Pavley reduction factors to the CO<sub>2</sub> emissions by vehicle model year and vehicle class. After adjusting the CO<sub>2</sub> data for Pavley I reductions, the Postprocessor aggregates the total

CO<sub>2</sub> emissions for each vehicle class. Finally, the Low Carbon Fuel Standard reduction factors are applied to the data based on scenario/calendar year and vehicle class.



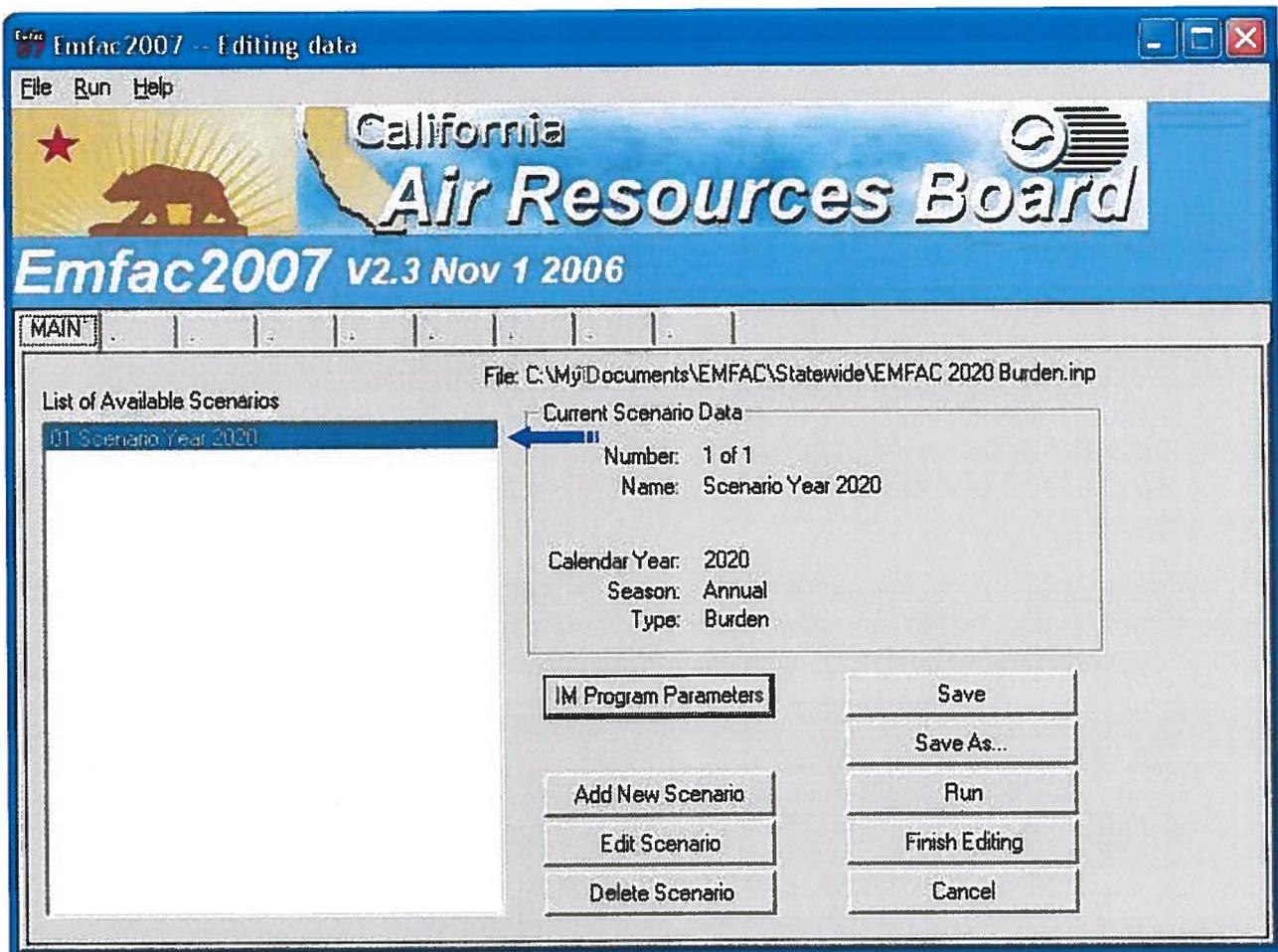
### System Requirements

The program will run on any Intel-based PC running Windows 95/Windows NT 4.0 or newer. The installation will require 1 MB of disk space for the installed files. At least 64 MB of RAM is required. The program requires Microsoft® Office Excel Version 2000 or newer to be installed on the system. Typical output files will require less than 1 MB.

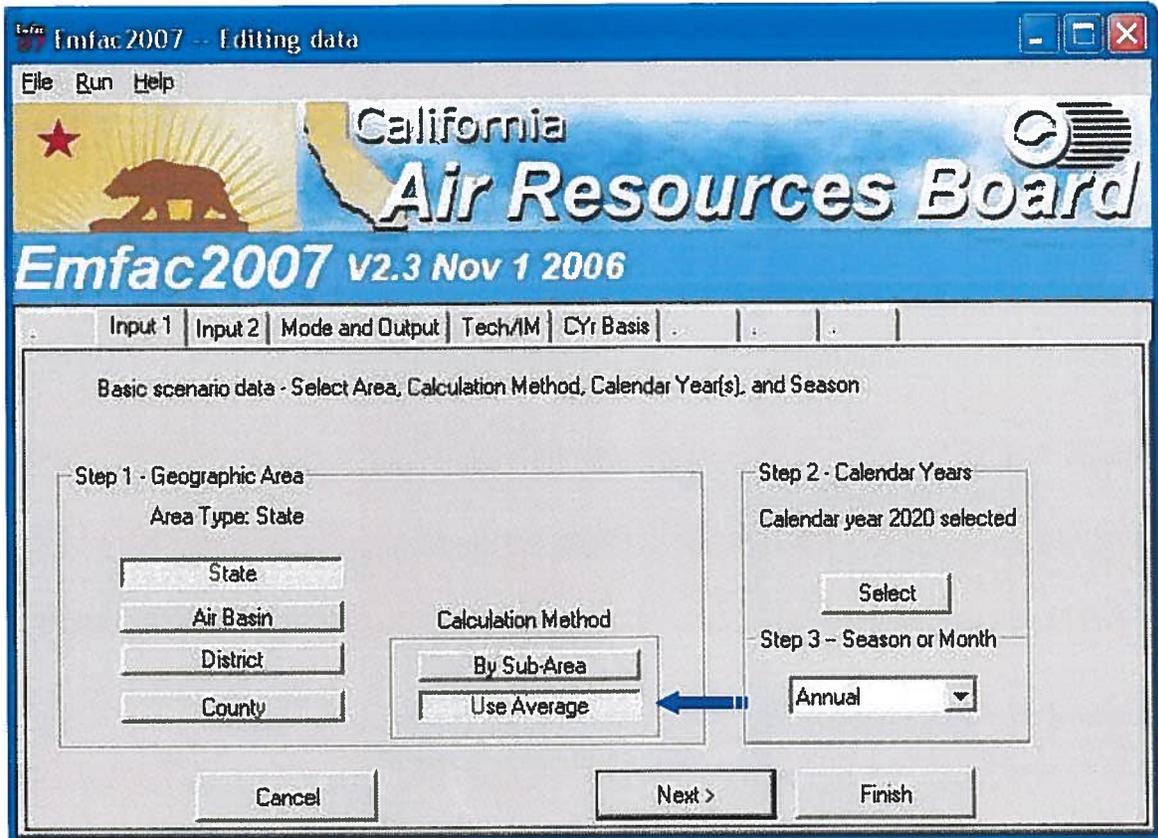
## Input Data Requirements

Before using the Postprocessor, users will need to run EMFAC and generate the appropriate output files. Users can either create an EMFAC default scenario, or use the WIS to adjust VMT and speed distribution to create a new scenario. For estimating CO<sub>2</sub> emissions for SB375 purposes, if a new scenario is created that has a different target VMT, users should directly adjust the VMT rather than change the vehicle population to achieve the target VMT. The WIS can be accessed by clicking on the “Edit Program Constants” button.

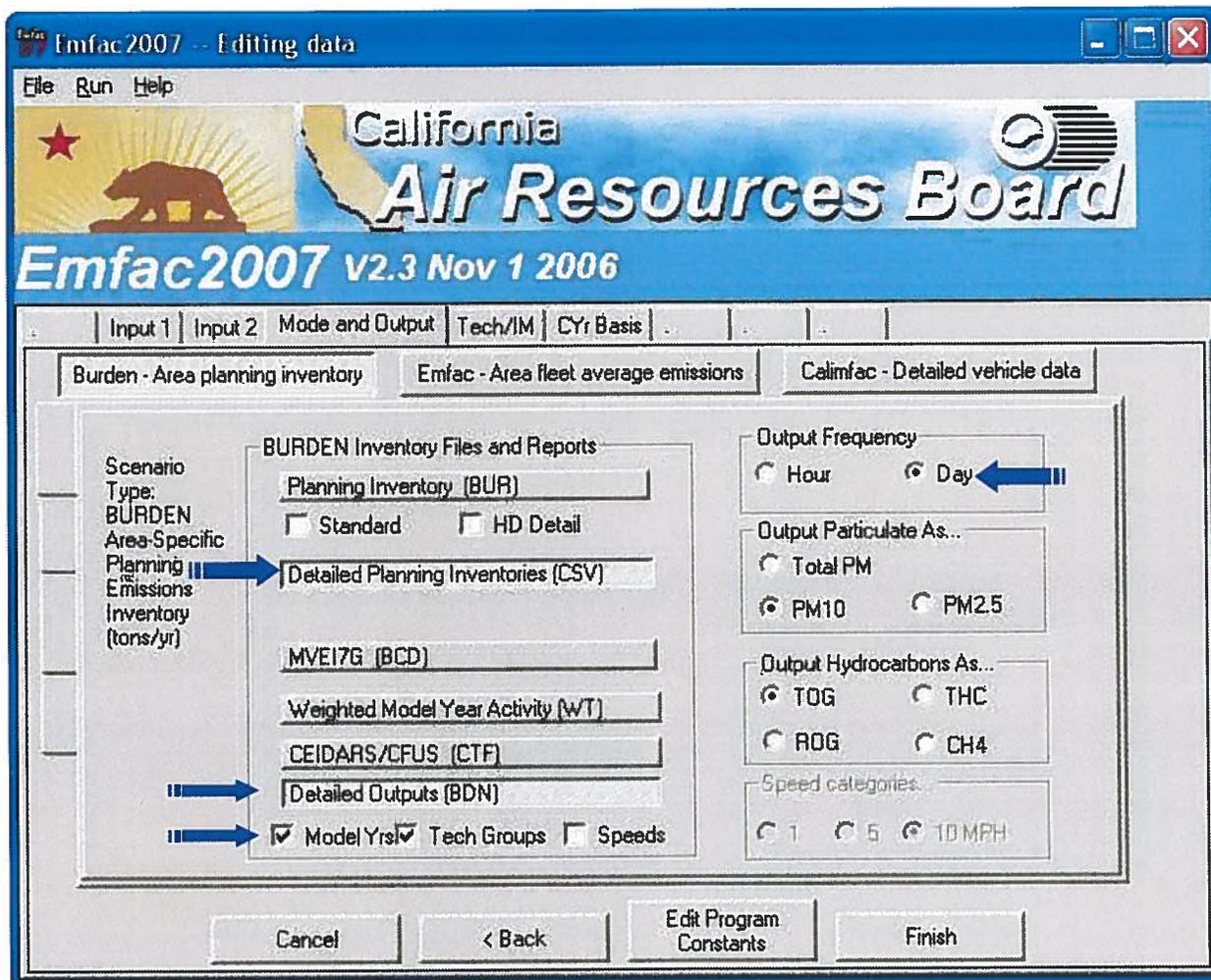
The Postprocessor can only be applied to one scenario containing one calendar year at a time. Therefore, users should create separate EMFAC model outputs for each region and calendar year scenario, and run the Postprocessor for each output separately.



Since the Sub-Area runs create multiple output scenarios in the same output file, the Postprocessor can only be applied to outputs created using "Use Average" option. For special instructions to process Sub-Area cases, please contact Jonathan Taylor at ARB [[jtaylor@arb.ca.gov](mailto:jtaylor@arb.ca.gov) – (916) 445-8699].



The Postprocessor can only be applied to an EMFAC Detailed Burden Output (files with ".bdn" extension). A Burden run can be generated by selecting the "Burden - Area Planning Inventory" option in the "Mode and Output" tab.



The following options should be selected during an EMFAC Burden run for compatibility with the Postprocessor:

- *Detailed Planning Inventories (CSV)*
- *Detailed Outputs (BDN)*
- *Model Yrs*
- *Tech Groups*
- *The Output Frequency should be checked for "Day"*

For more information regarding the EMFAC model and Burden output, refer to the EMFAC 2007 v2.3 User's Guide

<[http://www.arb.ca.gov/msei/onroad/latest\\_version.htm](http://www.arb.ca.gov/msei/onroad/latest_version.htm)>.

## Installation Procedure

The Pavley I + LCFS Postprocessor installation files are compressed in a ZIP file which is posted at <http://www.arb.ca.gov/cc/sb375/tools/postprocessor.htm>. First time users will need to download and install the files. The program can be installed by following a three-step procedure:

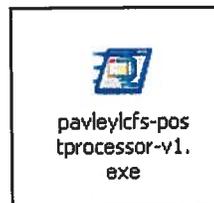
1. Download
2. Extract
3. Install

### **Step 1 – Download**

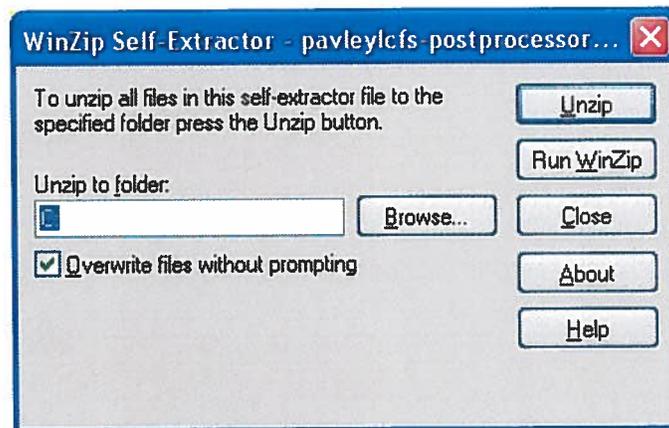
1. Go to <http://www.arb.ca.gov/cc/sb375/tools/postprocessor.htm>
2. Right-click on the “Pavley I + LCFS Postprocessor (Ver1.0) Installation File” link, and select the “Save Target As” option to save the file to the Desktop

### **Step 2 – Extraction**

1. Double click on the “pavleylcfspostprocessor-v1.exe” file to extract the files.



2. This opens up a WinZip Self-Extractor window

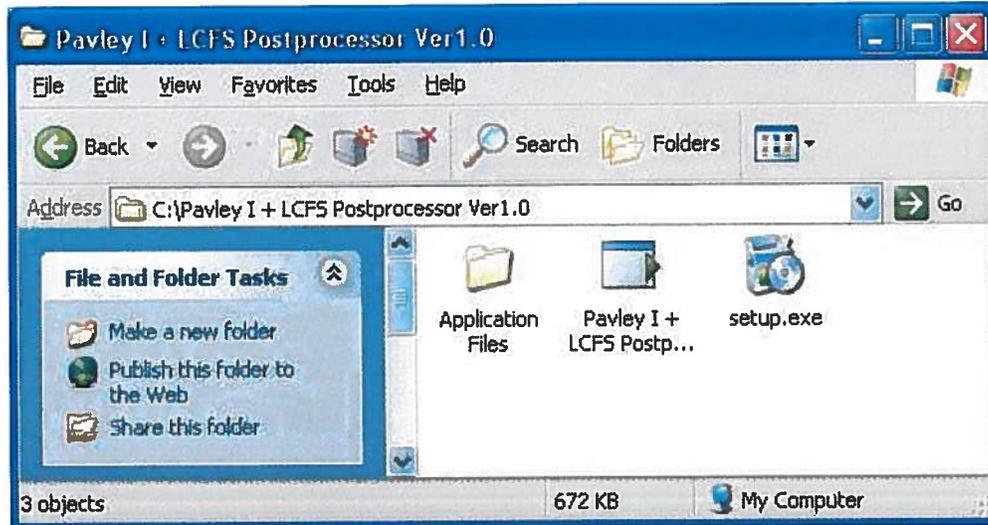


3. In the “Unzip to folder” field, select the C Drive (C:)
4. Check the “Overwrite files without prompting” option
5. Click on the Unzip button

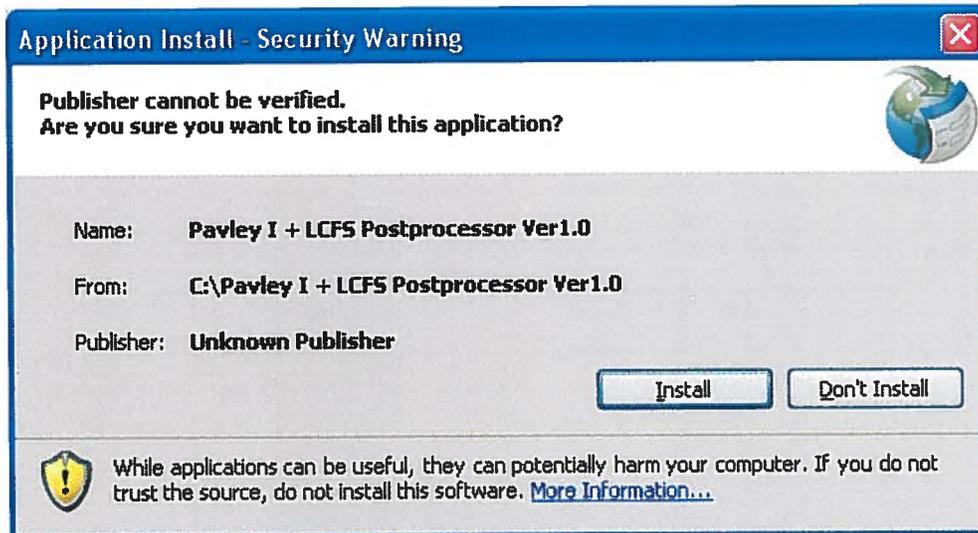
This creates a new folder on the C drive [C:\Pavley I + LCFS Postprocessor Ver1.0] which contains all the Setup files.

### **Step 3 – Installation**

1. Go to Pavley I + LCFS Postprocessor folder on the C drive [C:\Pavley I + LCFS Postprocessor Ver1.0]



2. Open the "setup.exe" file
3. Click on the "Install" button



This will install the program on the computer, and Auto-run the Postprocessor.

### **Software Removal**

The program should be removed using the Windows "Add/Remove Programs" option on the Control Panel.

## Program Execution

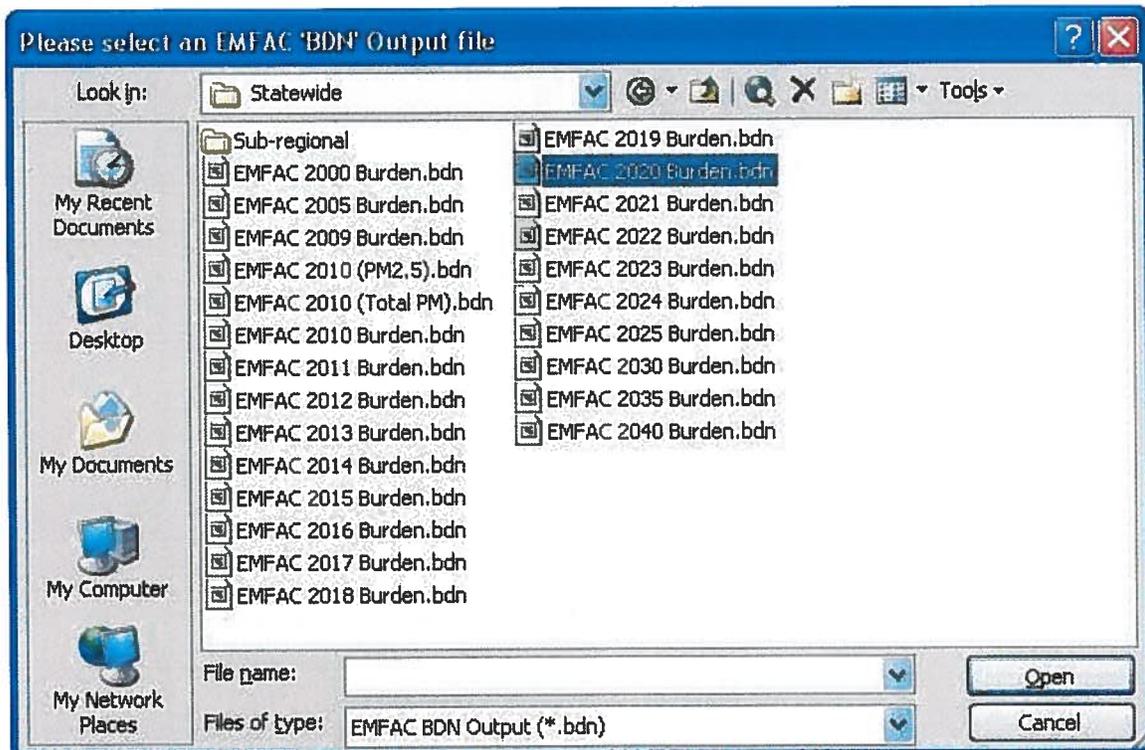
Once the program is installed on the computer, it can be executed from either of the two locations:

- "Pavley I + LCFS Postprocessor Ver1.0" Shortcut on the Desktop
- "Pavley I + LCFS Postprocessor Ver1.0" link in Start Menu (Program Files)  
 <START> / <ALL PROGRAMS> / <CARB> / Pavley I + LCFS Postprocessor Ver1.0

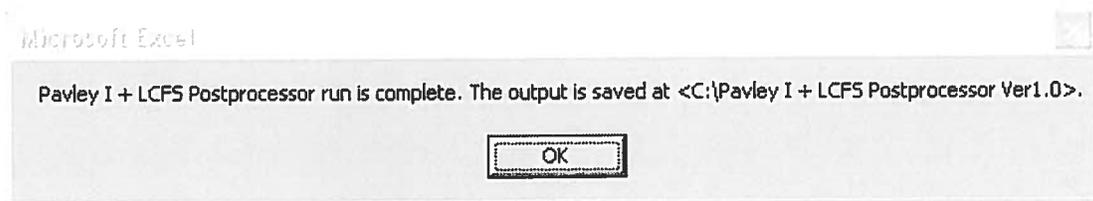


### Procedure:

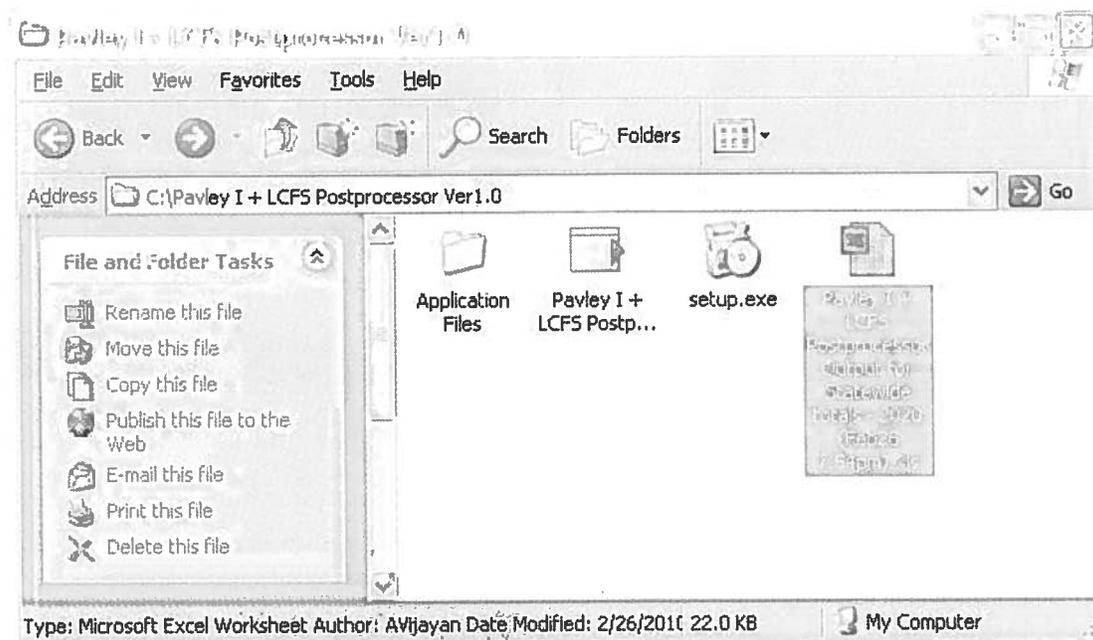
1. When the program is executed, a Microsoft Excel window opens up for selecting the input file (EMFAC 'BDN' Output). Browse to the EMFAC Burden Output (".bdn" extension), select the file, and click "Open".



2. Once the program completes processing the data, a status message is displayed indicating the location of the saved file. Click OK to continue



3. The output file is shown on the screen
4. The output is also saved as a Microsoft® Office Excel file to the C drive (<C:\Pavley I + LCFS Postprocessor Ver1.0> folder). The file is identified by the EMFAC Scenario and a time stamp. A sample output file is shown on Page 11



Pavley I + LCFS Postprocessor (Version 1.0)

**Postprocessor Output File**

(Microsoft® Office Excel File Format)

CO2 Emission Reductions from the Pavley I Regulation & the Low Carbon Fuel Standard for Statewide totals - 2020 (Scenario Year 2020)									
Vehicle Category	Vehicle Population	Weekday VMT from EMFAC (VMT/day)	Weekday CO2 Emissions from EMFAC (tons/day)	Weekday CO2 Emission Reduction from Pavley I (tons/day)	Weekday CO2 Emissions after adopting Pavley I (tons/day)	% CO2 Emission Reduction from LCFS	Weekday CO2 Emission Reduction from LCFS (tons/day)	Weekday CO2 Emissions after adopting Pavley I & LCFS (tons/day)	Annual CO2 Emissions after adopting Pavley I & LCFS (MMTCO2/year)
LDA	15,695,341	526,108,290	226,090.60	46,933.13	179,157.47	10.00%	17,915.75	161,241.72	50.76
LDT1	3,480,904	121,578,730	64,165.48	12,193.60	51,971.88	10.00%	5,197.19	46,774.69	14.72
LDT2	6,644,752	234,684,130	127,749.70	17,230.72	110,518.98	10.00%	11,051.90	99,467.09	31.31
MDV	2,953,681	105,720,040	78,133.72	10,197.36	67,936.36	10.00%	6,793.64	61,142.73	19.25
<b>Total</b>	<b>28,774,678</b>	<b>986,091,190</b>	<b>496,139.50</b>	<b>86,554.80</b>	<b>409,584.70</b>	<b>10.00%</b>	<b>40,958.47</b>	<b>368,626.23</b>	<b>116.04</b>

The Postprocessor summarizes the following datasets for the four passenger vehicle classes (LDA, LDT1, LDT2, & MDV):

- Vehicle population
- Weekday Vehicular Miles Travelled from EMFAC (VMT/day)
- Weekday CO<sub>2</sub> Emissions from EMFAC (tons/day)
- Weekday CO<sub>2</sub> Emission reductions from Pavley I (tons/day)
- Weekday CO<sub>2</sub> Emissions after adopting Pavley I (tons/day)
- % CO<sub>2</sub> Emission Reduction from LCFS
- Weekday CO<sub>2</sub> Emission Reduction from LCFS (tons/day)
- Weekday CO<sub>2</sub> Emissions after adopting Pavley I & LCFS (tons/day)
- Annual CO<sub>2</sub> Emissions after adopting Pavley I & LCFS (MMTCO<sub>2</sub>/year) – Annual emissions were calculated by multiplying Average Weekday emissions (tons/day) by 347 to account for reduced vehicle activity on weekends. The annual emissions are expressed in million metric tons.

## Contact Information

For questions regarding the Postprocessor, please contact:

**Jonathan Taylor, P.E.**

Manager, Motor Vehicles Assessments Section

California Air Resources Board

Phone: (916) 445-8699

Email – [jtaylor@arb.ca.gov](mailto:jtaylor@arb.ca.gov)

## **Appendix I**

Regional Fuel Tax worksheet, 2013 RTP Model (State and  
Federal)\_Final

**Regional Gasoline Excise Tax Forecast**

**NOTES:**

Population Share Source: 2010 Department of Finance population estimate  
 Assumes Bay Area share of gas consumption is same as population share  
 Gasoline consumption forecast is consistent with Plan Bay Area estimates

Excise Tax Rate **\$ 0.10**

CA Gasoline Consumption  
*Percent Change*  
 %MTC Pop vs. California Pop  
 Bay Area Gasoline Consumption

	2013 1	2014 2	2015 3
	12,819,190,418	12,562,768,910	12,311,476,585
	19.26%	-2.00%	-2.00%
	2,469,145,602	2,419,755,429	2,371,353,204
	19.26%	19.26%	19.26%
	<b>\$ 246,914,560</b>	<b>\$ 241,975,543</b>	<b>\$ 237,135,320</b>

County	Population Share	20-Year Total	2013	2014	2015
Alameda	21.1%	943,720,555	52,126,344	51,083,664	50,061,840
Contra Costa	14.4%	643,019,690	35,517,151	34,806,704	34,110,467
Marin	3.5%	156,193,043	8,627,313	8,454,741	8,285,621
Napa	1.9%	83,244,909	4,598,027	4,506,053	4,415,919
San Francisco	11.5%	513,008,133	28,335,971	27,769,168	27,213,703
San Mateo	10.1%	451,999,298	24,966,152	24,466,756	23,977,349
Santa Clara	25.2%	1,127,100,012	62,255,296	61,010,007	59,789,628
Santa Clara	5.7%	256,377,926	14,161,018	13,877,756	13,600,160
Sonoma	6.6%	295,597,120	16,327,288	16,000,694	15,680,633
<b>Bay Area Total</b>	<b>100.0%</b>	<b>4,470,260,687</b>	<b>\$ 246,914,560</b>	<b>\$ 241,975,543</b>	<b>\$ 237,135,320</b>

**Regional Gasoline Excise Tax**

**NOTES:**

Population Share Source: 2011  
 Assumes Bay Area share of gasoline consumption forecast

**Excise Tax Rate**

	2016	2017	2018	2019	2020	2021
	4	5	6	7	8	9
	12,065,210,847	11,823,871,147	11,587,358,951	11,355,577,695	11,128,432,745	11,165,035,690
	-2.00%	-2.00%	-2.00%	-2.00%	-2.00%	0.33%
	19.26%	19.26%	19.26%	19.26%	19.26%	19.26%
	2,323,919,166	2,277,433,948	2,231,878,571	2,187,234,436	2,143,483,315	2,150,533,526
	\$ 232,391,917	\$ 227,743,395	\$ 223,187,857	\$ 218,723,444	\$ 214,348,331	\$ 215,053,353

County	2016	2017	2018	2019	2020	2021
Alameda	49,060,456	48,079,103	47,117,379	46,174,893	45,251,260	45,400,097
Contra Costa	33,428,157	32,759,496	32,104,210	31,462,031	30,832,698	30,934,111
Marin	8,119,885	7,957,463	7,798,290	7,642,302	7,489,433	7,514,067
Napa	4,327,587	4,241,023	4,156,190	4,073,054	3,991,581	4,004,710
San Francisco	26,669,349	26,135,884	25,613,089	25,100,752	24,598,663	24,679,572
San Mateo	23,497,731	23,027,707	22,567,085	22,115,677	21,673,299	21,744,585
Santa Clara	58,593,659	57,421,614	56,273,013	55,147,387	54,044,277	54,222,036
Solano	13,328,117	13,061,515	12,800,247	12,544,204	12,293,283	12,333,718
Sonoma	15,366,974	15,059,590	14,758,354	14,463,143	14,173,838	14,220,457
<b>Bay Area Total</b>	<b>\$ 232,391,917</b>	<b>\$ 227,743,395</b>	<b>\$ 223,187,857</b>	<b>\$ 218,723,444</b>	<b>\$ 214,348,331</b>	<b>\$ 215,053,353</b>

**Regional Gasoline Excise Tax**

**NOTES:**

Population Share Source: 2010  
 Assumes Bay Area share of gasoline consumption forecasts

**Excise Tax Rate**

	2022	2023	2024	2025	2026	2027
	10	11	12	13	14	15
	11,201,759,026	11,238,603,151	11,275,568,461	11,312,655,356	11,349,864,234	11,387,195,497
	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
	19.26%	19.26%	19.26%	19.26%	19.26%	19.26%
	2,157,606,926	2,164,703,592	2,171,823,600	2,178,967,026	2,186,133,948	2,193,324,443
	\$ 215,760,693	\$ 216,470,359	\$ 217,182,360	\$ 217,896,703	\$ 218,613,395	\$ 219,332,444

County	2022	2023	2024	2025	2026	2027
Alameda	45,549,424	45,699,243	45,849,554	46,000,359	46,151,661	46,303,460
Contra Costa	31,035,858	31,137,939	31,240,356	31,343,110	31,446,201	31,549,632
Marin	7,538,782	7,563,578	7,588,455	7,613,415	7,638,456	7,663,580
Napa	4,017,882	4,031,097	4,044,356	4,057,659	4,071,005	4,084,395
San Francisco	24,760,746	24,842,188	24,923,897	25,005,875	25,088,123	25,170,641
San Mateo	21,816,106	21,887,862	21,959,855	22,032,083	22,104,550	22,177,255
Santa Clara	54,400,380	54,579,310	54,758,829	54,938,938	55,119,640	55,300,936
Solano	12,374,285	12,414,986	12,455,820	12,496,789	12,537,893	12,579,132
Sonoma	14,267,230	14,314,157	14,361,239	14,408,475	14,455,866	14,503,413
<b>Bay Area Total</b>	<b>\$ 215,760,693</b>	<b>\$ 216,470,359</b>	<b>\$ 217,182,360</b>	<b>\$ 217,896,703</b>	<b>\$ 218,613,395</b>	<b>\$ 219,332,444</b>

**Regional Gasoline Excise Tax**

**NOTES:**

Population Share Source: 2011  
 Assumes Bay Area share of gasoline consumption forecast

**Excise Tax Rate**

	2028	2029	2030	2031	2032
	16	17	18	19	20
	11,424,649,548	11,462,226,790	11,499,927,629	11,537,752,472	11,575,701,725
	0.33%	0.33%	0.33%	0.33%	0.33%
	19.26%	19.26%	19.26%	19.26%	19.26%
	2,200,538,589	2,207,776,462	2,215,038,143	2,222,323,707	2,229,633,235
	\$ 220,053,859	\$ 220,777,646	\$ 221,503,814	\$ 222,232,371	\$ 222,963,324

County	2028	2029	2030	2031	2032
Alameda	46,455,758	46,608,558	46,761,860	46,915,666	47,069,978
Contra Costa	31,653,403	31,757,516	31,861,970	31,966,769	32,071,912
Marin	7,688,787	7,714,076	7,739,449	7,764,905	7,790,445
Napa	4,097,829	4,111,307	4,124,830	4,138,397	4,152,009
Santa Francisco	25,253,431	25,336,493	25,419,828	25,503,437	25,587,322
Santa Mateo	22,250,199	22,323,383	22,396,808	22,470,474	22,544,382
Santa Clara	55,482,828	55,665,319	55,848,410	56,032,103	56,216,400
Solano	12,620,506	12,662,017	12,703,664	12,745,448	12,787,369
Sonoma	14,551,117	14,598,978	14,646,996	14,695,172	14,743,506
<b>Bay Area Total</b>	<b>\$ 220,053,859</b>	<b>\$ 220,777,646</b>	<b>\$ 221,503,814</b>	<b>\$ 222,232,371</b>	<b>\$ 222,963,324</b>

## **Appendix J**

Worksheet 2013 values - 2013 RTP Model (State and  
Federal)\_Final

Assumed Inflation: 2.2%

	<b>RTIP</b>	<b>RTIP TE</b>	<b>STP</b>
<b>2013</b>	\$ 106,304,200	\$ 25,531,000	\$ 97,364,101
<b>2014</b>	\$ 108,996,496	\$ 26,296,930	\$ 100,285,024
<b>2015</b>	\$ 115,041,262	\$ 27,085,838	\$ 103,293,575
<b>2016</b>	\$ 123,461,432	\$ 27,898,413	\$ 106,392,382
<b>2017</b>	\$ 133,169,728	\$ 28,735,365	\$ 109,584,154
<b>2018</b>	\$ 139,153,980	\$ 29,597,426	\$ 112,871,678
<b>2019</b>	\$ 155,983,160	\$ 30,485,349	\$ 116,257,828
<b>2020</b>	\$ 168,551,719	\$ 31,399,910	\$ 119,745,563
<b>2021</b>	\$ 176,177,265	\$ 32,341,907	\$ 123,337,930
<b>2022</b>	\$ 184,050,145	\$ 33,312,164	\$ 127,038,068
<b>2023</b>	\$ 192,178,386	\$ 34,311,529	\$ 130,849,210
<b>2024</b>	\$ 200,570,273	\$ 35,340,875	\$ 134,774,686
<b>2025</b>	\$ 209,234,363	\$ 36,401,101	\$ 138,817,927
<b>2026</b>	\$ 218,179,489	\$ 37,493,134	\$ 142,982,465
<b>2027</b>	\$ 227,414,769	\$ 38,617,928	\$ 147,271,939
<b>2028</b>	\$ 236,949,622	\$ 39,776,466	\$ 151,690,097
<b>2029</b>	\$ 246,793,768	\$ 40,969,760	\$ 156,240,800
<b>2030</b>	\$ 256,957,245	\$ 42,198,853	\$ 160,928,024
<b>2031</b>	\$ 267,450,417	\$ 43,464,818	\$ 165,755,865
<b>2032</b>	\$ 278,283,982	\$ 44,768,763	\$ 170,728,541
<b>2033</b>	\$ 289,468,990	\$ 46,111,826	\$ 175,850,397
<b>2034</b>	\$ 301,016,845	\$ 47,495,181	\$ 181,125,909
<b>2035</b>	\$ 312,939,324	\$ 48,920,036	\$ 186,559,686
<b>2036</b>	\$ 325,248,586	\$ 50,387,637	\$ 192,156,477
<b>2037</b>	\$ 337,957,184	\$ 51,899,266	\$ 197,921,171
<b>2038</b>	\$ 351,078,081	\$ 53,456,244	\$ 203,858,806
<b>2039</b>	\$ 364,624,657	\$ 55,059,932	\$ 209,974,570
<b>2040</b>	\$ 378,610,730	\$ 56,711,730	\$ 216,273,807

Total 2013\$  
 Total Nominal \$ 6,405,846,097 \$ 1,096,069,383 \$ 4,179,930,679  
 STP - Cycle 2 Takedown

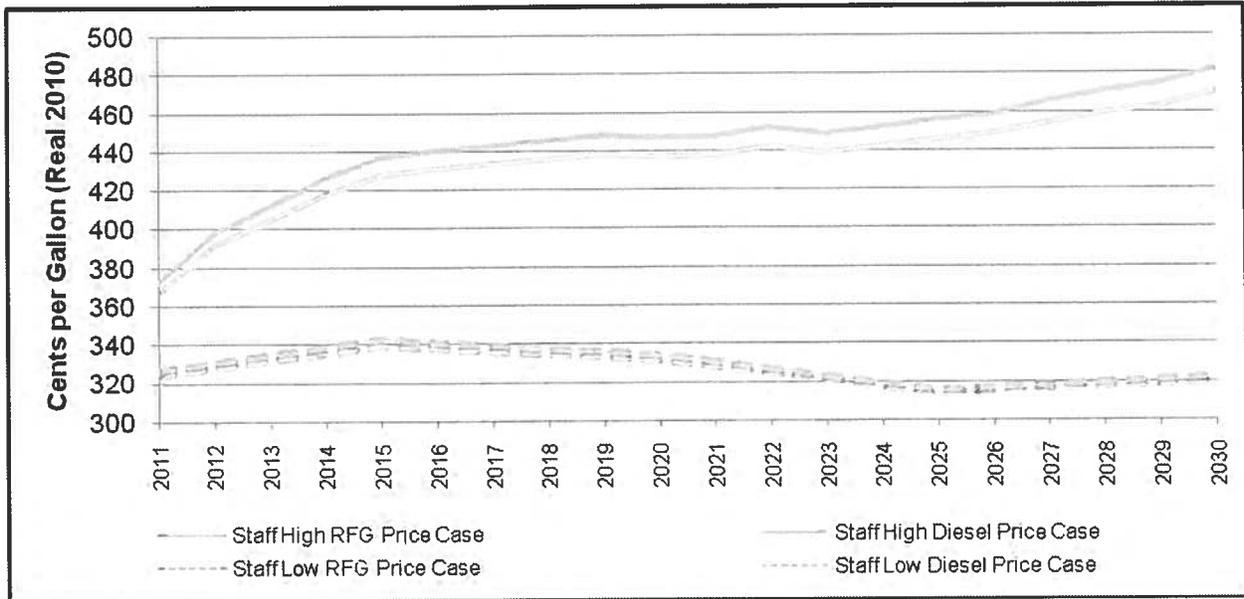
	<b>CMAQ</b>	<b>STP/CMAQ</b>	<b>De-Escalation Factor</b>	<b>RTIP</b>	<b>RTIP TE</b>
\$	88,901,345	\$ 186,265,446	1.00	106,304,200	25,531,000
\$	91,568,385	\$ 191,853,409	1.02	106,650,192	25,730,851
\$	94,315,436	\$ 197,609,011	1.04	110,192,779	25,944,289
\$	97,144,900	\$ 203,537,282	1.07	115,817,479	26,171,119
\$	100,059,247	\$ 209,643,400	1.09	122,398,647	26,411,181
\$	103,061,024	\$ 215,932,702	1.11	125,363,946	26,664,348
\$	106,152,855	\$ 222,410,683	1.13	137,794,311	26,930,520
\$	109,337,440	\$ 229,083,004	1.15	146,058,682	27,209,627
\$	112,617,564	\$ 235,955,494	1.18	149,810,599	27,501,622
\$	115,996,090	\$ 243,034,159	1.20	153,631,173	27,806,481
\$	119,475,973	\$ 250,325,183	1.22	157,523,267	28,124,204
\$	123,060,252	\$ 257,834,939	1.24	161,489,753	28,454,811
\$	126,752,060	\$ 265,569,987	1.26	165,533,515	28,798,340
\$	130,554,622	\$ 273,537,087	1.29	169,657,456	29,154,848
\$	134,471,260	\$ 281,743,199	1.31	173,864,503	29,524,410
\$	138,505,398	\$ 290,195,495	1.33	178,157,611	29,907,117
\$	142,660,560	\$ 298,901,360	1.35	182,539,769	30,303,077
\$	146,940,377	\$ 307,868,401	1.37	187,014,007	30,712,411
\$	151,348,588	\$ 317,104,453	1.40	191,583,393	31,135,257
\$	155,889,046	\$ 326,617,586	1.42	196,251,045	31,571,765
\$	160,565,717	\$ 336,416,114	1.44	201,020,132	32,022,101
\$	165,382,689	\$ 346,508,597	1.46	205,893,875	32,486,444
\$	170,344,169	\$ 356,903,855	1.48	210,875,555	32,964,984
\$	175,454,494	\$ 367,610,971	1.51	215,968,516	33,457,926
\$	180,718,129	\$ 378,639,300	1.53	221,176,168	33,965,488
\$	186,139,673	\$ 389,998,479	1.55	226,501,987	34,487,900
\$	191,723,863	\$ 401,698,434	1.57	231,949,527	35,025,402
\$	197,475,579	\$ 413,749,387	1.59	237,522,415	35,578,249
				<b>4,788,544,503</b>	<b>833,575,774</b>
\$	3,816,616,737	\$ 7,996,547,416			
		\$ 7,428,547,416			

<b>2013\$</b>		
<b>STP</b>	<b>CMAQ</b>	<b>STP/CMAQ</b>
97,364,101	88,901,345	186,265,446
98,126,247	89,597,246	187,723,492
98,940,206	90,340,456	189,280,662
99,805,236	91,130,300	190,935,536
100,720,729	91,966,219	192,686,949
101,686,197	92,847,769	194,533,966
102,701,262	93,774,607	196,475,868
103,765,653	94,746,482	198,512,135
104,879,192	95,763,234	200,642,427
106,041,793	96,824,783	202,866,576
107,253,451	97,931,126	205,184,576
108,514,240	99,082,329	207,596,569
109,824,309	100,278,528	210,102,838
111,183,876	101,519,924	212,703,800
112,593,225	102,806,774	215,399,999
114,052,705	104,139,397	218,192,102
115,562,722	105,518,166	221,080,888
117,123,744	106,943,506	224,067,249
118,736,293	108,415,894	227,152,187
120,400,945	109,935,857	230,336,803
122,118,331	111,503,970	233,622,301
123,889,130	113,120,854	237,009,985
125,714,074	114,787,176	240,501,250
127,593,942	116,503,648	244,097,590
129,529,562	118,271,027	247,800,589
131,521,810	120,090,112	251,611,922
133,571,609	121,961,745	255,533,355
135,679,929	123,886,813	259,566,742
<b>3,178,894,515</b>	<b>2,902,589,287</b>	<b>6,081,483,802</b>

## **Appendix K**

CA Energy Commission gasoline price forecast 2010-2030

Figure 6: California Gasoline and Diesel Price Cases (2010 cents per gallon)



Source: California Energy Commission

**Table 4: Retail Gasoline and Diesel Price Cases (2010 cents per gallon)**

Year	Regular Gasoline		Diesel	
	High Price	Low Price	High Price	Low Price
2011	367	324	372	327
2012	391	328	398	331
2013	404	332	412	335
2014	418	335	427	339
2015	428	339	437	343
2016	431	338	440	341
2017	433	336	443	339
2018	436	335	445	338
2019	436	333	446	336
2020	437	331	447	334
2021	438	328	447	331
2022	438	324	448	327
2023	439	321	449	323
2024	442	317	452	319
2025	446	314	456	316
2026	449	315	459	317
2027	454	316	465	318
2028	460	317	471	319
2029	463	319	475	321
2030	470	320	482	322

Source: California Energy Commission

## **Appendix L**

Regional Targets Advisory Committee Final Report pp. 16-19

should review the literature and derive the most region-appropriate elasticity values possible, including any interaction between the various factors. If completed in time, the BMP list could be used by MPOs and ARB in the target setting process.

- Within the same general timeframe, ARB should use empirical studies as one means to estimate what order of magnitude of greenhouse gas reductions are possible from various policies in California's regions in 2020 and 2035 as part of their process to complete Step 4 – the preliminary draft uniform statewide reduction targets.
- Empirical evidence should also be used to calibrate and validate regional and state travel models. As discussed elsewhere in the report, the Committee is recommending ARB seek expert consultation to, among other things, derive elasticity values from the empirical evidence, appropriate to each region, and create anticipated sensitivities for each regional model. The experts would develop a list of elasticity values, and then work collaboratively with MPOs to determine that the models are generating the right answers, given the expected values. Observations of actual behavior responses to transportation investments should continually be used to refine and recalibrate model predictions.
- Empirical evidence can also be used to estimate the magnitude of co-benefits of implementing SCSs. Many Committee members discussed the importance of making the SB 375 process transparent and understandable to the public. These co-benefits can help to engage the public in the planning process and bring to life anticipated real-world impacts of particular policies under consideration.
- It is critical to understand and account for the interdependencies between policies including synergistic (positive and negative) effects.

## 2. Use of Modeling

This section of the report summarizes Committee discussions on the use of travel demand models and other modeling methods for SB 375 target setting and implementation. In our recommendations, we emphasize the need for MPOs to make modeling data and information regarding greenhouse gas emissions available to the public in a clear and transparent manner. A network-based travel demand forecasting model allows for simulation of complex interaction among demographics, land use, development patterns, transportation, and other policy factors. A rigorously tested and validated travel demand model with well documented expert peer review will add to the credibility of greenhouse gas estimates.

In this section, “travel demand models” refers to the computer models currently in use at MPO’s for travel forecasting, ranging from relatively simple “four-step” models to more complex “four-step” models, to more sophisticated, activity-based simulation models. “Other modeling methods” refer in general to tools which either augment or replace travel demand models, and are likely to be spreadsheet-based tools.

### *Current use of Travel Demand Models*

Each of the 18 MPOs in California uses and maintains a travel demand model for development and evaluation of its RTP. If ambient air quality does not conform to federal air quality standards, the travel demand model, along with associated emissions models, is also used for evaluation of progress towards these standards in the future. All MPOs have staff assigned to maintenance and operation of their travel demand models, though at widely varying levels, and all use consultants and outside contractors to periodically update and improve their travel demand modeling tools. Given that MPOs have invested millions in travel demand models that have an integral role in land use and transportation planning to date, MPOs and ARB should leverage these long term investments by using travel demand models for SB 375 implementation.

### *Committee discussions on travel demand models*

The Committee, with assistance from ARB and MPO staff, focused on two major implementation issues with respect to the use of models:

- The potential role for models to inform target setting
- The role for models in SCS and APS development and target compliance demonstration

The range of discussion on the use of models for target setting and demonstration of target compliance was defined primarily by an acknowledgement that all MPOs employ travel modeling, with varying levels of capability. In the course of this discussion, a detailed self-assessment of travel demand models (as well as other subjects) was prepared and presented to the Committee (see Appendix A). This assessment revealed significant variations among the travel demand models in use by MPOs, both in terms of model capabilities and key assumptions used by the models. Accordingly, the Committee concluded there was a need to augment travel demand models with other methods to achieve reasonable levels of sensitivity for SB 375 implementation purposes. These other methods include:

- “Best Management Practices” or “BMPs”, wherein a comprehensive list of greenhouse gas reduction policies and practices would be assembled, and a BMP spreadsheet tool would be developed for determining the level of greenhouse gas reduction that could be achieved by implementing a particular policy or set of policies.
- “Post processor tool”, wherein MPOs would apply the tool to adjust outputs of their travel demand model such that they account for areas where the model lacks capability, or is insensitive to a particular policy or factor. The most commonly referred to post-processor in the Committee discussions was a “4D’s” post-processor (see pages 15-16), but post-processors could be developed for other non-D factors, too.

### *Recommendations on the use of models for SB 375*

Throughout its discussion, the Committee came to appreciate how complex modeling systems can be, and as a result, we recognize the vital importance of transparency in the modeling process. Within the context of improved transparency, the Committee recommends that use of travel demand models and other modeling methods for SB 375 implementation include four steps: 1) assessment and documentation of existing travel demand model capability and sensitivity; 2) incorporation of social equity factors in the target setting process to the extent modeling or “off-modeling” methodologies exist<sup>1</sup>. Social equity factors include, but are not limited to, housing and transportation affordability, displacement/gentrification, and the jobs-housing fit, 3) development of a model improvement program which is consistent with federal requirements and addresses identified modeling needs, including, if possible, housing affordability and other social equity factors, as well as the ability to quantify the full suite of co-benefits listed on page 42 by the second round of SCS/APS development; and 4) development of short range improvements and other methods to address modeling needs for first round target setting and SCS/APS development.

When applying models in target setting and/or demonstration of meeting the target, inherent modeling uncertainties due to input data quality, assumptions, existing modeling capability, and sensitivity need to be well documented.

#### *Travel model assessment and documentation*

SB 375 requires that MPOs “...disseminate the methodology, results, and key assumptions of whichever travel demand models it uses in a way that would be useable and understandable to the public.” Cal. Govt. Code § 14522.2(a). This portion of the Committee’s recommendation is intended to address this section of the bill, as well as identify areas of needed improvements to travel demand models. The travel model assessment should cover the travel demand model factors and policies identified in the “MPO Self-Assessment of Current Model Capacity and Data Collection Programs” presented to the Committee in May 2009 (Appendix A), as well as any additional factors necessary to measure a region’s job-housing fit.

If the documentation is highly technical in nature, a summary of the assessments and sensitivity testing should be prepared which would be more generally understandable by a non-technical audience.

Depending on the factor or policy, the assessment recommended in this section may include:

- Key validation statistics, showing the correspondence of the model prediction for a validation year to empirical data.
- Results of experimental sensitivity tests, wherein a single factor or variable is adjusted higher and lower from its baseline value, with the corresponding

<sup>1</sup> See, e.g. MTC’s Transportation 2035 RTP, “Equity Analysis Report for the Transportation 2035 Plan of Change in Motion”: [http://www.mtc.ca.gov/planning/2035\\_plan/equity.htm](http://www.mtc.ca.gov/planning/2035_plan/equity.htm).

changes in model output variables shown. Minimally, the outputs shown would be: total VMT; light-duty vehicle VMT total and per capita; light-duty vehicle greenhouse gas total and per capita; total person trips; person trips by automobile modes; person trips by transit modes; and person trips by bike and walk modes.

- Results of planning scenario tests, wherein the modeled results of planning scenarios are tabulated and correlated to show the overall sensitivity of the travel demand model to a combination of factors and policies included in the planning scenario.

Experimental sensitivity testing could be performed on all exogenous input variables (e.g. age, income, automobile operating costs), recognizing policy makers have little control over such variables, and for as many policy variables as are feasible given the structure and complexity of the model (e.g. transit fares, highway capacity, density, mix of use, pedestrian environment, transit proximity, etc.). The documentation of the sensitivity tests should identify the range of reasonable sensitivity based on research literature, and account for where in this range the travel demand model sensitivity falls. Ideally, the range of reasonable sensitivity to key factors and policy variables should be determined through a coordinated research synthesis and review process, the results of which would be a standard reference for all MPOs in the state.

Where results of planning scenario tests are reported, the MPO must show a correspondence between the planning scenario test results and the experimental, single factor sensitivity testing. Part of this documentation should assess the degree of interaction of factors and policies (i.e. the difference between the sum of all scenario variables taken individually, and the total change in modeled results).

The assessment and documentation should identify areas where the model lacks capacity for analysis of a factor or policy, and any factors or policy for which the model sensitivities fall outside the range of results documented in research literature.

As detailed elsewhere in this report, the Committee recommends ARB, with expert consultation, evaluate the ability of the MPO model to accurately predict the greenhouse gas impacts of implementing land use and transportation strategies. If the assessment results in changes to the self-assessment reported to the Committee in May 2009, this information should be provided to ARB staff.

#### *Model improvement program*

Based on the assessment described above, each MPO should develop a multi-year program of improvements needed to address any modeling needs, including, as applicable, incorporation of relevant housing affordability and other social equity factors. Improvements should describe the basic change which would be made to the MPO travel demand model, identify what data would be required to support the improvement, provide order-of-magnitude cost estimates, and identify any phasing issues or dependencies on other projects in the program.

## **Appendix M**

California Air Resources Board Approves Advanced Clean Car  
Rules, 20120127

**Release #:12-05**  
**Date:01/27/2012**  
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### **California Air Resources Board Approves Advanced Clean Car Rules**

*New rules will save drivers money on fuel, create jobs, cut smog and greenhouse gases, make California a world leader in clean car technology*

**LOS ANGELES** - Today the California Air Resources Board unanimously approved a package of new emissions rules for cars and light trucks through 2025.

“The California Advanced Clean Car rules will clean our air, fight climate change and provide cars that save consumers thousands of dollars at the pump,” said ARB Chairman Mary D. Nichols. “The Board’s action today will create thousands of new jobs, transforming California into the advanced car capital of the world. California is now in pole position in the race to provide next-generation ultra-clean cars to the global car market.”

The Advanced Clean Cars program combines the control of smog-causing pollutants and greenhouse gas emissions into a single coordinated package of requirements for model years 2017 through 2025. The new rules will clean up gasoline and diesel-powered cars, and deliver increasing numbers of zero-emission technologies, such as full battery electric cars, newly emerging plug-in hybrid electric vehicles and hydrogen fuel cell cars. The package will also ensure adequate fueling infrastructure is available for the increasing numbers of hydrogen fuel cell vehicles planned for deployment in California.

The Advanced Clean Cars program has been in development over the past three years and is composed of four separate, but related components. An overview of the program is included further below.

The rules are designed to preserve consumer choice while ensuring the development of a full range of environmentally superior cars from compacts to SUVs and pickups. These vehicles will continue to deliver the performance, utility and safety vehicle owners have

come to expect with significant savings thanks to reduced operating costs.

Many of the technologies that reduce climate change emissions also significantly reduce the operating costs of passenger vehicles on a month-to-month basis for consumers.

### **Benefits of Advanced Clean Cars Program:**

#### *Consumer Savings:*

- California drivers will save \$5 billion in operating costs in 2025, and \$10 billion by 2030 when more advanced cars are on the road.
- In 2025, average consumers will see nearly \$6,000 in fuel cost savings over the life of the car, nearly triple the estimated per vehicle cost. Based on typical financing for a new vehicle, savings accrue the minute the car drives off the lot.

#### *Fight Smog:*

- The rules deliver a 75 percent reduction in smog-forming emissions from new vehicles by 2025 (compared to 2014 levels).

#### *Fight Climate Change:*

- Greenhouse gas emissions from new cars will be cut 34 percent from 2016 levels.
- By 2025, greenhouse gases will be reduced by 52 million tons, the equivalent of taking 10 million cars off the road for a year.
- The package will result in a cumulative reduction of more than 870 million metric tons of greenhouse gases through 2050.

#### *Deliver Next-Generation Cars:*

- Zero-emission or plug-in hybrid vehicles will account for one in seven new cars sold in California in 2025 (15.4 percent).
- More than 1.4 million zero-emission and plug-in hybrid vehicles will be on the road in California by 2025.

#### *Create Jobs:*

- Overall savings generated by the proposed rules will result in an additional 21,000 jobs in California in 2025, rising to 37,000 in 2030.

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## **OVERVIEW: THE ADVANCED CLEAN CAR PROGRAM**

The Advanced Clean Cars program has been in development over the past three years and is composed of four separate, but related components:

### 1. *Greenhouse gas standard for cars and light trucks, model years 2017-2025*

The greenhouse gas standard approved today builds on California's first-in-the-nation standard that was later adopted in 2010 by the federal government as part of a national program. The new rules strengthen the greenhouse gas standard for 2017 models and beyond. They were developed in tandem with the federal government over the past three years, including an unprecedented joint fact-finding process with shared engineering and technical studies.

The current California program constitutes a separate set of rules with minor variations due to separate legal structures but is designed to parallel the proposed federal joint rulemaking the Obama administration announced last summer. Once the proposed federal standards are adopted, they will be deemed sufficient for compliance in California. This responds to the desire for a streamlined set of rules for new cars and light trucks and creates a single national program for manufacturers that addresses both greenhouse gas and fuel economy standards.

The new standard drops greenhouse gas emissions to 166 grams per mile, a reduction of 34 percent compared to 2016 levels. This will be achieved through existing technologies, the use of stronger and lighter materials, and more efficient drivetrains and engines.

## 2. *Reducing Smog-Forming Emissions*

California will need to reduce smog-forming pollution by an additional 75 percent from 2014 levels to help meet more stringent federal air quality standards expected in the next few years. Since California continues to have the nation's worst air quality, and has more than 26 million cars on the road, it is necessary to further reduce smog-forming pollution from cars. This regulation will drive the development of the cleanest cars yet that use diesel, gasoline, or gas-electric hybrid internal combustion engines. (Note: The above two regulations are bundled into a single document under the title "LEV III".)

## 3. *Zero Emissions Vehicle (ZEV) Regulation*

The ZEV regulation will result in over 1.4 million ZEVs on the road by 2025 (15.4 percent of new vehicle sales in that year) in order to be on track to reach the 2050 greenhouse gas reduction goal. A transitional model – the plug-in hybrid car – will play a significant role over the next 20 years, but by mid-century, 87 percent of cars on the road will need to be full zero-emission vehicles to achieve climate goals.

The ZEV regulation builds on the program in place since 1990 and is designed to rapidly increase ZEV production to early commercial volumes, establishing a sustainable and growing market for these advanced technology vehicles. This will place California on a path to reduce greenhouse gas emissions by 80 percent by 2050, a goal adopted by many nations and believed necessary to stabilize climate temperature.

## 4. *Clean Fuels Outlet*

This regulation is designed to support the commercialization of zero-emission hydrogen fuel cell vehicles planned by vehicle manufacturers by 2015, which will require increased numbers of hydrogen fueling stations. Construction of the new stations will provide a convenient fueling infrastructure, first within the major metropolitan areas, but ultimately throughout the state. The number of stations will grow as vehicle manufacturers sell more fuel cell vehicles.

For more information on Advanced Clean Cars, see:

[http://www.arb.ca.gov/msprog/consumer\\_info/advanced\\_clean\\_cars/consumer\\_acc.htm](http://www.arb.ca.gov/msprog/consumer_info/advanced_clean_cars/consumer_acc.htm)

ARB's mission is to promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy. The ARB oversees all air pollution control efforts in California to attain and maintain health based air quality standards.

## **Appendix N**

California Air Resources Board Advanced Clean Car Rules,  
Final Approval, December 31, 2012

<http://www.arb.ca.gov/regact/2012/leviiidtc12/leviiidtc12.htm>

## **LEV III GHG AND ZEV REGULATION AMENDMENTS FOR FEDERAL COMPLIANCE OPTION**

This page last reviewed December 31, 2012

### **NOTICE OF PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO THE NEW PASSENGER MOTOR VEHICLE GREENHOUSE GAS EMISSION STANDARDS FOR MODEL YEARS 2017-2025 TO PERMIT COMPLIANCE BASED ON FEDERAL GREENHOUSE GAS EMISSIONS STANDARDS AND ADDITIONAL MINOR REVISIONS TO THE LEV III AND ZEV REGULATIONS**

(November 15, 2012)

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#### **Public Comments**

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#### **FINAL APPROVAL / OAL ACTION**

**OAL approved the rulemaking and filed it with the Secretary of State on December 31, 2012. The regulation became effective on December 31, 2012.**

- Final Regulation Order - Amend sections 1900, 1956.8, 1960.1, 1961, 1961.2, 1961.3, 1962.1, 1962.2, and 1976, title 13, California Code of Regulations <file://localhost/regact/2011/lcfs2011/frooalapp.pdf> (PDF - 170K) <file://localhost/regact/2012/leviiidtc12/leviiidtc12fro.pdf>
  - California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles (PDF - 124K)
  - California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles (PDF - 21K)
  - California Non-Methane Organic Gas Test Procedures (PDF - 65K)
  - California Evaporate Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles (PDF - 17K)
  - California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines (PDF - 14K)
  - California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles (PDF - 14K)
  - California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes (PDF - 56K)
  - California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles,

in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes  
(PDF - 82K)

- Final Statement of Reasons <file://localhost/regact/2012/zev2012/zevpt1.pdf>(PDF - 107K)<http://www.arb.ca.gov/regact/2012/zev2012/fro2rev.pdf>
- Supplement to the Final Statement of Reasons (PDF - 49K)

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## ADOPTED REGULATIONS AND MATERIALS SUBMITTED TO OAL

**Posted December 7, 2012**

**The Final Rulemaking Package was filed with OAL on December 6, 2012. OAL has until January 18, 2013 to make a determination.**

Executive Order (PDF - 16K)

Final Statement of Reasons ~see revised

above~<http://www.arb.ca.gov/regact/2012/leviiidtc12/leviiidtc12fsor.pdf>

Request for Early Effective Date (PDF - 14K)

Notice of Decision (PDF - 59K)

Updated Informative Digest (PDF - 14K)<file://localhost/regact/2012/zev2012/zevpt1.pdf>

Final Regulation

Order <http://www.arb.ca.gov/regact/2012/leviiidtc12/leviiidtc12fro.pdf>~see revised

above~

- California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles ~see revised above~
- California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles ~see revised above~
- California Non-Methane Organic Gas Test Procedures ~see revised above~
- California Evaporate Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles (PDF - 17K)<file://localhost/regact/2012/zev2012/zevpt1.pdf>
- California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines <file://localhost/regact/2012/leviiidtc12/leviiidtc12fro.pdf>~see revised above~
- California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles ~see revised above~
- California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes ~see revised above~
- California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes ~see revised above~

A business or person submitting a comment to a proposed regulation or proposed amendment or repeal of a regulation or any person who specifically request it has the right to request a copy of the Final Statement of Reasons (FSOR). Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may requested from the agency contact persons, or may be obtained in electronic form from this web page.

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## HEARING ACTION AND SUPPLEMENTAL 15-DAY NOTICES

**Posted November 20, 2012**

Resolution 12-35 ([PDF - 484K](#))

- Attachment J: Staff's Suggested Modifications to the Original Proposal ([PDF - 121K](#))

**Posted November 19, 2012**

Notice of Public Availability of Modified Text and Availability of Additional Document and Information ([PDF - 27K](#))

**Deadline to Submit Public Comment has been extended to: December 5, 2012**

- Enclosure A: 15-Day Modified Regulation Order ([PDF - 132K](#))
- Enclosure B: Summary of 15-Day Changes to the Proposed Regulation Order and Incorporated Test Procedures ([PDF - 31K](#))
- Additional Document Added to the Record
  - 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards FR-2012-10-15 ([PDF - 8.24MB](#))

## PUBLIC HEARING NOTICE AND RELATED MATERIAL

**Posted September 13, 2012**

Notice of Public Hearing ([PDF - 82K](#))

Staff Report: Initial Statement of Reasons (ISOR) ([PDF - 204K](#))

- Appendix A: Proposed Regulation Order: Amendments to Sections 1900, 1956.8, 1960.1, 1961, 1961.2, and 1976, Title 13, California Regulations ([PDF - 192K](#))
- Appendix B: California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles ([PDF - 125K](#))
- Appendix C: California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles ([PDF - 21K](#))
- Appendix D: California Non-Methane Organic Gas Test Procedures ([PDF - 65K](#))
- Appendix E: California Evaporate Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles ([PDF - 11K](#))

- Appendix F: California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines ([PDF - 15K](#))
- Appendix G: California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel-Engines and Vehicles ([PDF - 16K](#))
- Appendix H: California Exhaust Emission Standards and Test Procedures for 2009 through 2017 Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes ([PDF - 57K](#))
- Appendix I: California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes ([PDF - 35K](#))
- Appendix J: List of Proposed Changes to Title 13, CCR and Incorporated Test Procedures ([PDF - 73K](#))

**Posted August 31, 2012**

A Notice of Public Hearing was filed with the Office of Administrative Law on August 31, 2012 for review and publication in the California Regulatory Notice Register on September 14, 2012.

Draft Notice of Public Hearing ~see revised Final Approved Notice above~

## **Appendix O**

Tom Rubin conformity comment

**THOMAS A. RUBIN, CPA, CMA, CMC, CIA, CGFM, CFM**  
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Metropolitan Transportation Commission  
Public Information Office  
101 Eighth St.  
Oakland, California 94607

May 3, 2013

*Re: Comments on MTC's Transportation-Air Quality Conformity Analysis for Plan Bay Area & 2013 Transportation Improvement Program*

Dear Sirs:

This letter shall serve as my comments on the Metropolitan Transportation Commission's *Transportation-Air Quality Conformity Analysis for Plan Bay Area & 2013 Transportation Improvement Program*, Draft: March 29, 2013.

To summarize my attached comments, they demonstrate conclusively that *Plan Bay Area's* (Plan) transit components will not only fail to achieve their stated objectives, but they will be counter-productive. The Plan's transit components are simply a revisiting of the Bay Area's past emphasis on expensive fixed guideway transit projects which have not increased transit ridership over the past thirty years. Rather those programs have actually *decreased* transit ridership, even as the taxpayer investment in such capital and operating costs has approximately doubled.

Given this unfortunate history, it is inconceivable that the *Plan*, through continuation and acceleration of these ill-advised programs and projects, will somehow reverse the long-term decline. Indeed, it is likely that attempts to implement the transit components of the *Plan*, besides proving fiscally impossible, will likely accelerate the decline in transit use and force more potential transit riders to automobiles. And in doing so, the *Plan's* transit components are likely to drive financially challenged residents to increase the utilization of old and poorly maintained vehicles that can easily have two to five times – or more – the carbon dioxide emissions per vehicle mile travelled of more modern automobiles, and multiples of that for other emissions, including PM<sub>10</sub> and PM<sub>2.5</sub>, NO<sub>x</sub>, CO, O<sub>3</sub>, etc.

The housing elements of the Plan, by eliminating almost all of the small remaining potential for new Bay Area residents to achieve their "American Dream" of a single family detached home in the nine Bay Area counties and attempting to force them into high-density developments, will instead drive many of them to locate outside of the Bay Area counties and commute – primarily by driving – to jobs in the Bay Area. For those jobs that remain, that is. Many employers, faced with great difficulty in attracting the types of employees they require, will continue the trend we've seen for many years of California and Bay Area employers relocating to more hospitable

areas. This trend will accelerate if the high-density housing promoted in the *Plan* is actually attempted to be implemented, as the capital and operating costs of such undesirable, but expensive, housing will require large taxpayer subsidies, making the already extremely high cost of doing business in the Bay Area far higher still. Yes, there are many people that want to live in the Bay Area, but, at some point, it is too expensive, in many ways, to attempt to do so.

The transit ridership projections of the *Plan*, as well as the cost and service provided elements, *are simply not based on reality*, as this comment letter demonstrates indisputably with long-term trend time line graphics. The idea that decades-long downward trends will somehow not only halt their declines, but immediately reverse and shift over to strong positives, is not viable on its face. Especially since the same policies and programs that led to the declines are continued in this *Plan*, and especially given that those prior policies and programs that failed to achieve their objectives were similarly sold to the public in the past with the same sorts of projections as those offered to public in this *Plan*.

I am also disappointed, but not surprised, that the *Plan* does not consider, or is there any evidence that its drafters ever considered, the most successful strategy for rapidly, and inexpensively, increasing transit utilization – reduction in fares plus improvements in quality and quantity of existing transit service, rather than extremely expensive, very long-term, major capital investments for fixed guideway transit. The three largest increases in transit ridership in the U.S. since World War II are all due to exactly this type of shift in transit service.

Unfortunately, despite what many people would like to believe, *transit in the U.S. does not use less energy, or produce fewer emissions, than current generation automobiles*, and the upcoming improvements in automotive technology will mean, by the end of the *Plan* period in 2040, the fleet of automobiles on the road will have a very significant advantage in these regards over transit. What this means is that the only way for transit to make a positive contribution to reductions in energy usage and emissions is for transit to do what it does best, serve first the transit disadvantaged, those whose alternative to transit is a very dirty car, and spend far less effort, and funds, trying to attract higher-income residents out of very clean and energy-efficient vehicles – at a far higher cost per passenger.

The tax revenue projections in the *Plan* are also deeply suspect. The model assumptions fail to fully and properly consider the effects of the State of California's Clean Car Standards for automobiles sold between 2009 and 2016, and the *Plan* inexplicably and improperly completely ignores the impact of the State of California's Advanced Clean Car Standards which were fully adopted during the analysis of the draft *Plan* and its draft EIR, and adopt in California the national CAFÉ standards beginning in 2017 that will lead to an average of 54.5 miles per gallon (MPG) for new cars sold in California beginning in 2025.

Due to this astonishing failure to produce credible and honest models for the *Plan*, sales of motor fuels are projected far too high, which means that the user fees and taxes imposed on these fuels are also significantly overstated, and thus the *Plan's* revenue projections are materially and fatally overstated. In addition, the generation of CO<sub>2</sub> is significantly overstated in the *Plan's* analysis because the quantity of fossil fuels required for a vehicle to travel one mile will be significantly less than the *Plan* anticipates—a fact that MTC and ABAG well know, but have

chosen to not disclose to the public in their analysis of the *Plan* except for those readers who have managed to dive deeply into the details, find the key discussion, and then were able to translate it from planner-speak into English.

This failure to utilize the best available data – which is based on the law of the land – means that *the conformity analysis is not based, as it must be, on reasonable assumptions*. Financially, this means that many of the projects that are included in the *Plan* will not be implemented because there will be a significant funding shortfall – which will be made worst by the Bay Area's long and sad record of significant overruns on major transportation projects, such as the East Span of the Bay Bridge, BART to SFO and San Jose, the Oakland Airport Connector, etc.

If MTC, the rest of the Bay Area transportation decision-making community, and the State of California, persist in their past patterns of funding poor projects as this *Plan* suggest they will, the increase in congestion could actually lead to significantly increase emissions to the point of overcoming the reductions in emissions from transportation technology improvements – all while ignoring more productive programs such as transit fare reductions, simple improvement to the quality and quantity of existing transit services, and adequately maintaining the roads that, even if the *Plan's* significantly overestimated projections of huge increases in transit utilization could somehow come into being, would still provide the overwhelming majority of passenger-miles in the area, as well as almost all of the local ton-miles of goods movements

These negative outcomes, which are readily apparent to anyone who studies the data and the proposals, constitute a violation of the National Ambient Air Quality Standards of the State Implementation Plan under the Clean Air Act, 42 USC 7506(c)(1)(A)-(B).

At this point in time, it is not possible to state with any degree of certainty at all what the outcome of the proposals in the *Plan* will be. The assumptions on almost every topic – fuel mileage, cost of transit, attractiveness of transit, attractiveness of high-density development, a very high population growth rate, overestimation of financial resources, and more – are so far divorced from reality that the one thing that can be stated for certain is that we do not know what the future will look like, but we do know it will not look anything like the vision portrayed in the *Plan*. The only reasonable action to take at this point is to start over – and, this time, do it right, based on the world as it exists, not the world as someone would like the world to exist.

Sincerely,

**Tom Rubin**

Thomas A. Rubin

Attachments

**COMMENTS ON**  
**THE METROPOLITAN TRANSPORTATION COMMISSION'S**  
***TRANSPORTATION-AIR QUALITY CONFORMITY ANALYSIS***  
***FOR PLAN BAY AREA &***  
***2013 TRANSPORTATION IMPROVEMENT PROGRAM***

**THE IMPACT OF FARE REDUCTION AND SERVICE IMPROVEMENT ON  
EXISTING TRANSIT SERVICE ON RIDERSHIP EXPANSION**

The Conformity Analysis does not examine the single most powerful tool available to transit agencies to improve transit utilization in mature transit regions (those where, by U.S. standards, there has been a high level of transit utilization for an extended period of time) – fare reductions, particularly those coupled with quality and quantity improvements in existing transit services, as opposed to expensive – and very slow to implement – major guideway transit projects, particularly new rail lines. Why has MTC failed to study this extremely promising, far less expensive, and far faster to implement, alternative?

Fare reductions are particularly important in air quality matters because, for the most part, they attract existing riders and marginal transit dependent riders to shift from automotive trips. Rather than attempting to attract high-income residents to leave their late model fuel-efficient and low emission automobiles at home and take transit with massive public subsidies per passenger mile and limited or no benefit environmentally, the types of riders that fare reductions and improvements to existing transit service attract are primarily those who would otherwise either not take the trip at all or – more predominantly – utilize very old, and very dirty, cars and other light duty vehicles for their trips. These vehicles, being designed to far older standards than modern vehicles and, most frequently, being very poorly maintained, can easily produce two to three times the CO<sub>2</sub> per vehicle mile travelled and dozens, often hundreds of times, the other emission factors, including PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, O<sub>3</sub>, ROG, etc. of more modern, and better maintained vehicles. In fact, it is very questionable if transit has any air quality advantages *at all* over modern light-duty vehicles<sup>1</sup>, so getting people out of junkers and taking them off the streets is really the only way that transit can make a measurable contribution to air quality. In addition, providing transit service to lower income residents for whom transit is either a necessity or a viable alternative to passenger vehicle use is a much more justifiable use of public funds than

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<sup>1</sup> Randal O'Toole for Cato Institute, *Does Rail Transit Save Energy or Reduce Greenhouse Gas Emissions?*, April 14, 2008:  
<http://www.cato.org/publications/policy-analysis/does-rail-transit-save-energy-or-reduce-greenhouse-gas-emissions>  
Thomas A. Rubin for Reason Foundation, *Does Bus Transit Reduce Greenhouse Gas Emissions?*, April 5, 2010:  
<http://reason.org/news/show/does-bus-transit-reduce-greenhouse>

massive public subsidies per passenger mile for rail or light rail for higher income residents with limited or no environmental benefits.

When fare reductions are combined with improvements in pre-existing transit service, the likely outcome will be even greater increases in transit ridership. Those improvements in pre-existing transit service include such relatively inexpensive and easily-implementable policy initiatives such as quantitative improvements such as more frequent service on existing transit lines, longer hours of service, more Saturday/Sunday/Holiday service, lengthening and route variations on existing bus lines, and new bus lines; as well as qualitative improvements, such as reduction in overcrowding, newer transit vehicles, better maintenance (which leads to fewer missed assignments and in-service breakdowns and better schedule compliance), cleaner vehicles and stations, and improved safety and security. And, in many cases, qualitative and quantitative improvements are accomplished by the same actions.

Interestingly, *while this transit service improvement option provides both far lower cost and easier to implement and faster results than the expensive initiation and expansion of rail and other guideway transit systems*, there are very few examples of this even being attempted in the American transit industry over the last several decades. *It is simply not an alternative that is even considered in long-range transportation planning* – perhaps it does not match well with the pre-conceived "solutions" of transit agency and metropolitan planning organization senior executives and governing board members. But the public as a whole bears the cost of those ill-advised and unworkable preconceived “solutions,” and the citizens who suffer the most are the lower-income, transit-dependent residents whose transit needs remain ignored and unconsidered.

What makes all of this more remarkable is that the evidence for the above is indisputable and easily discernable by anyone who wishes to inquire into what works to expand transit use cost-effectively (or into what will even expand transit use at all, regardless of the amount of public funds that are expended). The top three transit ridership expansions in the U.S. since World War II have all been, in whole or in large part, due to fare reduction/pre-existing service expansion-improvement, including:

- The 36% reduction in inflation-adjusted fare/unlinked passenger trip (UPT) that occurred for Metropolitan Transportation Authority-New York City Transit from approximately 1993 to 2007, which had a major role in producing an 81% increase in transit ridership – and which immediately followed a decline of 39% over the prior nine years, when there was a 48% increase in fare/UPT.
- The remarkable series of increases in fare/UPT and decreases in UPT, and vice versa, for the Southern California Rapid Transit District/Los Angeles County Metropolitan Transportation Authority between 1980 and 2011:
  - 1980-82 – Full adult cash fares increase from 55¢ to 65¢ to 85¢ in two years (in all cases, here and below, other fares generally move closely proportionally to the changes in cash fares) – and UPT drops 11%.
  - 1982-85 – Cash fares drop from 85¢ to 50¢, and stay there for three years – and UPT climbs over 40%.

- 1985-1996 – Cash fares return to 85¢ for 1986, then to \$1.10 for 1999 and \$1.35 for 1996 – and UPT drops 27%
- 1996-2007 – The cash fare stays at \$1.35, but the all-important \$42 monthly pass returns, along with a new \$11 weekly pass, and substantial expansions and improvements in bus service result in UPT increasing 35%.
- 2007-2011 – Reductions in bus service and increases in fares lead to a 5% reduction in UPT

## Southern California Rapid Transit District/Los Angeles County Metropolitan Transportation Authority

The Southern California Rapid Transit District (SCRTD) operated the bus transit system, and later the light rail and heavy rail systems, in Los Angeles County until the merger with the Los Angeles County Transportation Commission (LACTC) (the transportation planning and funding agency for Los Angeles County) to form the Los Angeles County Metropolitan Transportation Authority (MTA) in the first part of calendar year 1993.

Transit usage in Los Angeles over this period offers an almost unique opportunity to track the impact of fare changes and improvements in quality and quantity of transit service on transit utilization. We will track SCRTD/MTA ridership, specifically unlinked passenger trips (UPT)<sup>2</sup>, over the period 1980-2011<sup>3</sup>, as shown in the graphic following.

<sup>2</sup> Transit trips are generally reported two ways, as linked and unlinked passenger trips. To define these by example, if a rider takes a bus from his/her home to a BART station, then BART to his/her job, that is two unlinked trips and one linked trip.

As most transit agencies have had no mechanism to track linked trips, UPTs have been the established standard for reporting transit ridership for well over a century.

<sup>3</sup> Federal Transit Administration (FTA) (then Urban Mass Transportation Authority [UMTA]), *Data Tables for the 1985 National Transit Database Section 15 Report Year*,

SCRTD/Metro Section 15/National Transit Database (NTD) reports to UMTA/FTA for 1982-2002; NTD "Profiles" for Metro for subsequent years.

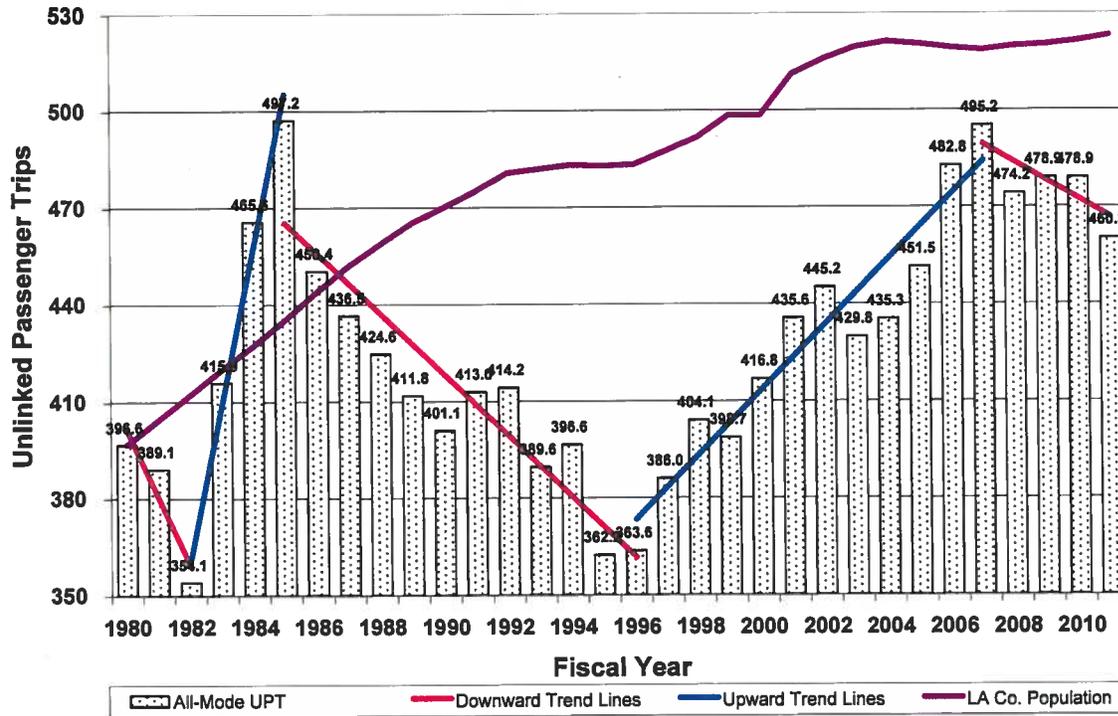
The data in the graph does not adjust for labor actions against SCRTD that shut down operations for five days in the 1983 reporting year [SCRTD/MTA have June 30 fiscal year ends], twelve days in 1995 [MTA operated approximately one third of its transit service with management personnel during this action] 33 days in 2001, and 35 days in 2004. Michael H. Cimini and Charles J. Muhl, "Los Angeles Strike Ends," *Monthly Labor Review*, Volume 114, 1994, accessed May 7, 2010:

<http://www.questia.com/googleScholar.qst;jsessionid=L1YSCghH8vwjj47ZDJf9rnzsVKTjpBbV2hM7nyLPJ8mVJI X7vLQd!1893792638!1707999068?docId=5000287759>,

Edmund D. Edelman and Daniel J.B. Mitchell, *Dealing With Public-Sector Labor Disputes: An Alternative Approach For California*, Table 3: Strikes at the Los Angeles Metropolitan Transit Authority – LAMTA (1958-1964), Southern California Rapid Transit District - SCRTD (1964-1993) and Los Angeles County Metropolitan Transportation Authority – LACMTA (1993-Present), accessed May 7, 2010:

<http://www.spa.ucla.edu/calpolicy/files05/CPO-MTA.pdf>

**LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
All-Mode Unlinked Passenger Trips 1980-2013**



- 1980-1982 – During the latter part of the 1970's, due primarily to the price and uncertain availability of motor fuel following the reaction of the Arab oil producing nations to the outcome of the 1973 Yom Kippur War between Israel, Egypt, and Syria, and the rapid influx of Hispanic immigrants who were transportation-disadvantaged, SCRTD transit ridership rose rapidly, funded primarily by the one-quarter cent sales tax authorized by the Transportation Development Act of 1971. However, funding shortfalls led to an increase in SCRTD cash fares from \$.55 for fiscal year 1980 to \$.65 for 1981 and then \$.85 in 1982, with other fares changing approximately accordingly, resulting in an 11% reduction in UPT.
- 1982-1985 – Following the passage of Proposition A<sup>4</sup>, the first (of three) half-cent sales taxes primarily for transit in Los Angeles County, in accordance with the terms of the Proposition, SCRTD adult cash fares were reduced from \$.85 from \$.50, and other fares reduced proportionately, for the three year period, 1983-85. Ridership (UPT) increased slightly over 40%, with peak period ridership up over 36%, despite vehicle revenue miles only increasing 1.5%<sup>5</sup>.
- 1985-1996 – During this period, the LACTC, again in accordance with the terms of Proposition A, ceased using part of the Proposition A funds for the SCRTD fare

<sup>4</sup> LACTC Ordinance 16, presented to the voters as Proposition A, November 1980 election, not to be confused with Proposition A of 1998, a ballot initiative presented to and passed by the Los Angeles County electorate which prohibited the utilization of local sales tax revenues for the construction of future subways.

<sup>5</sup> SCRTD Section 15 reports to UMTA, 1982 and 1985.

reduction program and shifted emphasis to planning, design and construction of rail transit (during the three years of the 50-cent fare, slightly under 20% of the total Proposition A sales tax revenues, or slightly less than the value of a 0.1% sales tax, had gone for this purpose).<sup>6</sup> Two light rail lines and part of the heavy rail system went into service during this period. As the adult cash fares increased from 50¢ in 1985 to 85¢ in 1986 to \$1.10 in 1988 and \$1.35 in 1994, SCRTD UPT declined approximately 27%.<sup>7</sup>

- 1996-2007 – As a direct result of the 1994 fare increase passed by the MTA Board – which was to include the elimination of monthly passes, which were extensively utilized by transit-dependent riders and, therefore, would have amounted to approximately a doubling of average fares<sup>8</sup> – a major Federal Title VI (discrimination in the utilization of Federal funding) legal action was filed against Metro. This produced a Consent Decree, which remained in force for approximately eleven years<sup>9</sup>. The Consent Decree (CD) required Metro to reintroduce the \$42 monthly transit pass, institute a new \$11 weekly pass, increase bus service to reduce extreme bus overcrowding, and add additional bus lines<sup>10</sup>. After eleven years of losing an average of twelve million UPT a year, the Consent Decree requirements not only immediately stopped the loss, but turned it around, producing an average annual increase of twelve million UPT annually – a 36% increase over this period. While Metro rail ridership did increase significantly during the 1996-2007, period, 58% of the added riders were bus riders and approximately 60% of the new rail riders were former bus riders<sup>11</sup>. Using the Federal Transit Administration (FTA) “new

<sup>6</sup> Author’s personal files as Chief Financial Officer of SCRTD during this period.

<sup>7</sup> *Ibid.*

During this period, through other actions of LACTC, former SCRTD transit lines with ridership of approximately ten million annual riders were transferred to other Los Angeles County transit agencies. Adjusting for these shifted riders, SCRTD ridership declined approximately 25%. (Author’s personal files.)

<sup>8</sup> LA Metro, fiscal year 1995 Budget Proposal documentation.

<sup>9</sup> *Labor/Community Strategy Center et al v Los Angeles County Metropolitan Transportation Authority et al*, [No. 94-5936 TJH (MCX)] (*L/CSC v MTA*).

<sup>10</sup> From the first year of Section 15/NTD reporting in 1979 to well into the Consent Decree period, SCRTD/Metro bus service had the highest average passenger load of any major city bus operator in the nation. As a result of the Consent Decree overcrowding reduction service, Metro average bus passenger loads fell to second highest, after NYC. *NTD*.

<sup>11</sup> National Transit Database (*NTD*)

SCRTD/LACTC/LA Metro, Environmental Impact Statements/Reports for various rail lines, comparisons of projected new transit riders to total rail riders. Such projections for all new guideway transit lines opened during this period are not available, but for those that are, and for later proposed guideway transit projects, the results are fairly consistent:

Metro Gold Line Eastside: 8,600 new riders out of 23,000 average weekday boardings, 2020 – 37%, U.S. Department of Transportation/Federal Transit Administration, *Proposed Allocation of Funds for Fiscal Year 2005—Annual Report on New Starts ("Annual Report 2005")*, "Metro Gold Line Eastside Extension" (November 2003), page A-117, accessed April 30, 2013: [http://www.fta.dot.gov/12304\\_3116.html](http://www.fta.dot.gov/12304_3116.html)

Mid-City/Exposition LRT Project: 20,400 new riders out of 43,600 average weekday boardings, 2020 – 47%, *Annual Report 2005*, "Mid-City/Exposition LRT Project," page A-261 (*ibid.*)

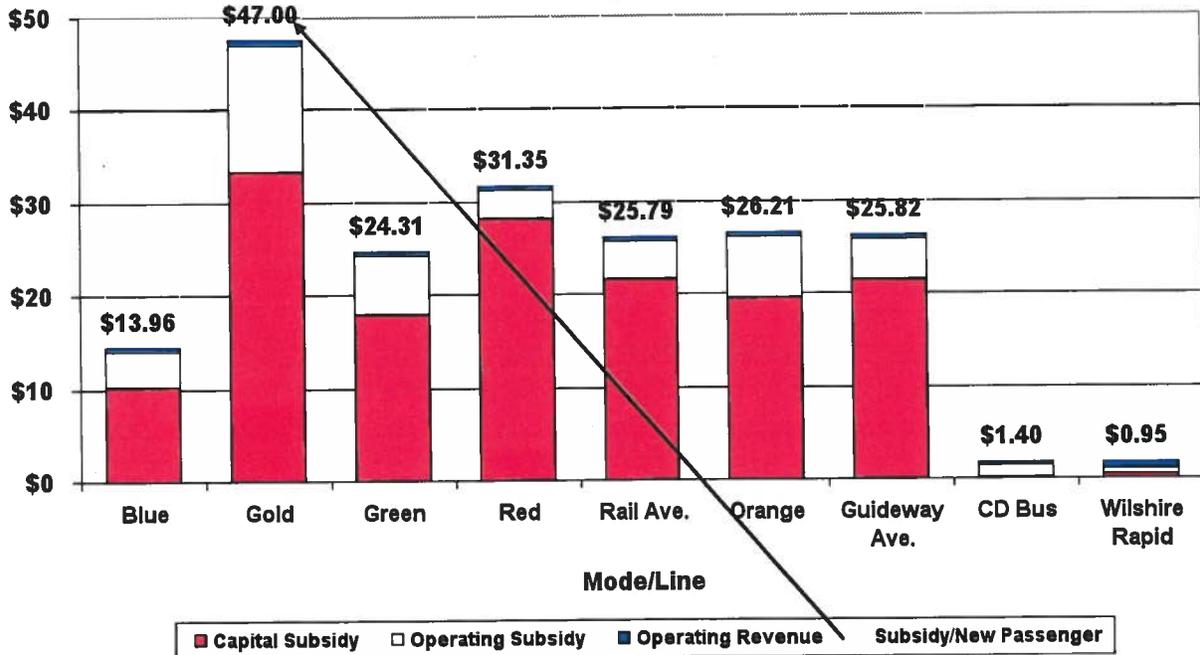
San Fernando Valley East-West Transit Corridor, 6,300 new riders out of 24,700 average weekday boardings, 2020, *Annual Report 2003* page A-295, accessed April 30, 2013: [http://www.fta.dot.gov/12304\\_2635.html](http://www.fta.dot.gov/12304_2635.html)

Regional Connector Transit Corridor, 16,460 new riders out of 88,440 average daily trips 2035 – 19%, *Annual Report 2014*, accessed April 30, 2013:

(continued)

starts” methodology for annualizing costs, the average taxpayer subsidy per new passenger, expressed in FY07 dollars, was \$1.40 for the bus riders added by the Consent Decree, vs. \$25.82 for the added guideway transit (Blue, Gold, Green, Orange and Red Line)<sup>12</sup>, a taxpayer subsidy per new passenger ratio of 1:18.4 – that is, adding transit trips via bus only required a taxpayer subsidy of 5.4% of the cost of adding transit trips via guideway transit (rail and dedicated busway surface bus rapid transit).

**MTA FY2007 CAPITAL SUBSIDY, OPERATING SUBSIDY, AND OPERATING REVENUE PER NEW PASSENGER TRIP**



The *L/CSC v MTA* Consent Decree also produced the unique situation where the question of the value of transit improvements through expensive investments in new rail transit systems vs. the value of transit improvements through inexpensive – and far more productive – improvements to the pre-existing bus system was presented to the American judicial system for an evaluation of

[http://www.fta.dot.gov/12304\\_15153.html](http://www.fta.dot.gov/12304_15153.html)

Westside Subway Extension Section 1, 7,700 new riders out of 16,800 average weekday trips 2035 – 46% (*ibid.*)

Five project totals: 59,460 new riders out of 196,540 average weekday boardings – 30%.

It should also be noted that SCRTD/MTA has had a fare policy that makes long trips on guideway transit less expensive than similar trips on express bus routes. For example, when the first new Los Angeles rail line, the Long Beach-Los Angeles Blue Line, opened in 1990-91, the end-to-end fare on the Blue Line was a "flat" fare of \$1.10 (full adult cash fare), while the comparable fare on the two express bus lines from Long Beach to downtown Los Angeles included four and five "zone" charges of \$.40 each, making the bus fare \$2.70-3.10. A model run by SCRTD at the time projected that the Blue Line ridership with the higher zone fare structure would be 47% of the ridership under the flat fare that was implemented; it was impossible to test the accuracy of the zone fare model run, but the flat fare ridership projection was within the sampling error of the actual ridership.

<sup>12</sup> "Comments of Thomas A. Rubin to the California State Assembly Select Committee on Rail Transportation," Los Angeles, April 25, 2008.

their relative values – and the judicial system found in favor of improvements to the bus system. Donald T. Bliss, Esq., former Acting General Counsel and Deputy General Counsel of the U.S. Department of Transportation, the Special Master appointed by Senior Judge Terry Hatter of the Central District of California to resolve issues related to the implementation of the Consent Decree, so found in his ruling regarding the amount of bus service that MTA would have to add to come into compliance with the load factor reduction elements of the Consent Decree<sup>13</sup>.

Although the legal question was decided by Special Master Bliss on the basis of language of the Consent Decree, the plaintiff and defendant both presented detailed arguments by their transportation experts on the transportation impacts of the Consent Decree, arguing for and against MTA actually having to live up to what was, in essence, the contract it had entered into and the court had approved. Special Master Bliss evaluated these and his ruling clearly found that the bus service improvements mandated by the Consent Decree not only were legally required, but had significant demonstrable transportation benefits over and above MTA's proposed alternative utilization of the funding required for Consent Decree compliance.<sup>14</sup>

<sup>13</sup> U.S. Department of State, Biography of Donald T. Bliss, Ambassador, International Civil Aviation Association, accessed May 10, 2010:  
<http://www.state.gov/outofdate/bios/75686.htm>

<sup>14</sup> *L/CSC v MTA*, Proceeding Before Special Master Donald T. Bliss – Memorandum Decision II And Final Order On Remedial Service Plan To Meet 1.25 And 1.20 Load Factor Target Requirements, January 12, 2004, footnote 22, page 32:

"MTA's new management apparently is not pleased with the way the Consent Decree entered into by its predecessors has been implemented. In his declaration, David Yale states that "the Consent Decree has had no benefits that could not have been achieved without the Decree, and it has diverted significant financial resources in process to questionable bus service expansions," Yale Decl. 19, which are "a poor investment of scarce public funding." Id. 17. Moreover, according to Mr. Yale, "the Consent Decree has, and will continue to have, detrimental impacts on the Regional Transportation System in Los Angeles County for many years to come." Id. 4. Without the Decree, Mr. Yale states that the MTA "would have had additional financial resources" for highway construction. Id. Mr. Yale candidly acknowledges that "the MTA has carefully developed a short range plan that balances these needs as best it can under the constraints of the Consent Decree ...." Id. (emphasis added). However, Mr. Yale continues, "any further unanticipated financial changes that are needed for the Decree will have to be undone as soon as the Decree expires in early FY 2007...." Id. (emphasis added).

"Given these views on the alleged shortcomings of the CD presented by an MTA planning official in the record of this proceeding, it is all the more imperative that the MTA commit to a specific bus capacity expansion program that will provide lasting improvements in the quality of bus service for the transit-dependent -- in accordance with the letter and spirit of the CD -- beyond the expiration of this Decree. It should be noted that Mr. Yale's views present an interesting contrast to what the MTA staff apparently wrote, at least with respect to the procurement of new buses, in a briefing for the MTA Board on the Consent Decree. The staff outlined the benefits of compliance with the Decree, including the transformation of the MTA bus fleet from "the oldest to the newest fleet of major bus companies," and stated that "MTA's new buses are worth every penny." See Declaration of Thomas A. Rubin Re Consent Decree Costs at Attachment II (Oct. 14, 2003) ("Rubin Decl. Re Consent Decree Costs") (briefing update on Consent Decree prepared by MTA staff dated September 19, 2002).

"Furthermore, the BRU and its expert, Thomas Rubin, who have been sharply critical of the MTA's implementation of the Decree, also have presented a more positive view of the benefits achieved by the Decree in improving bus service for transit-dependent riders, which is, after all, the singular purpose of the Decree. In his Declaration Re Reallocation of MTA Funds, Mr. Rubin analyzes in detail the effects of the Consent Decree, finding that in the six-year post-Consent Decree period, the MTA has gained a total of 81.6 million annual riders. Rubin Decl. Re Reallocation of Funds 23. According to Mr. Rubin, MTA ridership increased from 364 million in 1996 to 445 million in 2002, resulting in an increase in total fare revenues of \$100.5 million over the six-year period. Rubin Decl. Re Consent Decree Costs at 3. This in stark contrast to a loss of 133.6 million annual passengers over the (continued)

### New York Metropolitan Transportation Authority-New York City Transit

The New York Metropolitan Transportation Authority (NYMTA) is the overall transit planning, funding, and operating agency for most of New York City transit, responsible for New York City Transit (NYCT), the largest transit operator in the nation, as well as the Long Island Railroad, Metro-North Commuter Railroad, certain smaller – but still large by national standards – transit agencies, and the MTA Bridges and Tunnels, the former Tri-Borough Bridge and Tunnel Authority.

At the beginning of the study period in 1982, NYCT, as well as the other New York MTA transit agencies, were beginning to emerge from an intense recapitalization effort that reversed decades of underinvestment and neglect<sup>15</sup>. Significant improvements were being made in both the quality and reliability of transit service, as well as other aspects important to riders such as security, cleanliness, and graffiti reduction.

However, it appears that another major factor was the adoption by the MTA operators of more technically modern fare collection equipment, which enabled various types of multi-ride fare media including transfers and monthly passes to be used for the first time by NYCT. All MTA agencies could use the same fare media<sup>16</sup>. This caused the average fare per boarding for heavy transit users to decrease over time in constant dollar terms, even as the published single ride fares were experiencing nominal increases. The use of multi-ride fare media encouraged users to take additional rides; with these new passes there was no out-of-pocket cost for taking a bus for the half-mile from the subway station to the job site. The new equipment and fare media were implemented over a period of years, beginning with the first limited test in 1993 through

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eleven year period preceding the Consent Decree. Rubin Decl. Re Reallocation of Funds 23. Mr. Rubin also shows that, even taking into account what he views as “extremely overstated” Consent Decree expenditures per new rider, the cost per new rider -- 83% of whom are bus riders -- is still far below other transit modes. Id. 25, 26, 28. Mr. Rubin describes other benefits of the Consent Decree: “The [Consent Decree] has made great progress in reducing overcrowding, and pass-by’s, on MTA bus routes . . . MTA service has also become more reliable and the condition of MTA’s bus fleet improved substantially as the average age has decreased. The fares to ride MTA bus and rail have been kept low for MTA’s huge numbers of extremely low-income riders. The service added for CD compliance has meant shorter headways, and the reduced overcrowding has decreas[ed] running times, speeding travel for these bus riders. The Rapid Bus Program, which MTA has claimed as a [Consent Decree] cost . . . is another significant benefit for bus riders. Many new bus lines have begun service. The speed-up of bus replacement has meant cleaner air for all Los Angeles County residents .... All in all, hundreds of thousands of MTA bus and rail riders each day, and many more non-transit users, are receiving benefits in lower cost transit; a faster, higher quality, and more reliable transit experience; access to new destinations; and improved environmental quality and traffic flow – all due to the workings of the [Consent Decree].” Id. 27.

“Hopefully, these benefits are not the temporary results of a “short range plan” due to expire at the end of the Consent Decree but rather are permanent improvements in the quality of bus service that will be sustained well beyond the Decree’s expiration.”

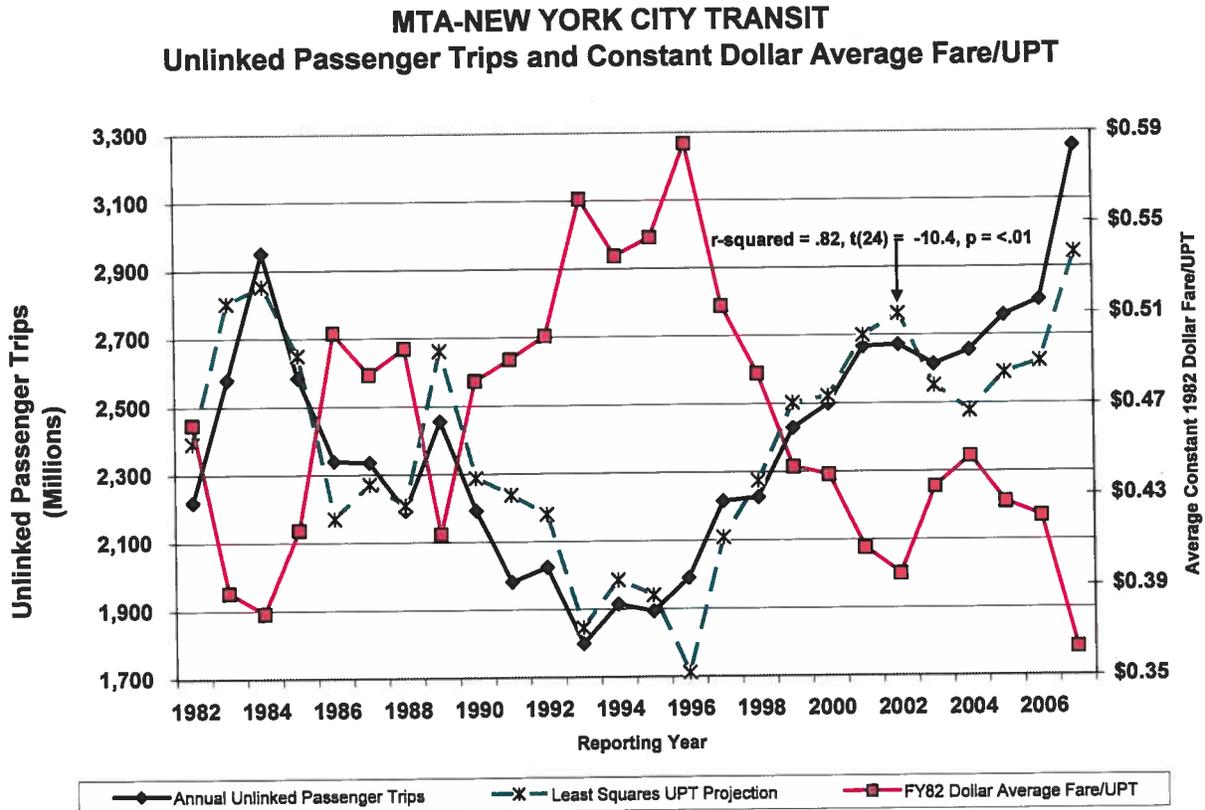
<sup>15</sup> Mark Seaman, Allison L.C. de Cerreño, and Seth English-Young, *From Rescue to Renaissance: The Achievements of the MTA Capital Program 1982-2004*, December 2004, NYU Wager Rudin Center for Transportation Policy & Management, accessed June 14, 2010:

<http://wagner.nyu.edu/news/rescue.pdf>

<sup>16</sup> *Ibid.*, pp. i, iii, iv, 1, 9, 10, 16, 17, 27, 29, 30-31, 35, and 36.

substantial completion in 1997-1999<sup>17</sup>. MTA ceased selling the world-famous subway tokens in 2003<sup>18</sup>.

The following graph shows the close relationship between average fare per boarding and unlinked passenger trips over the study period<sup>19</sup>.



Because our hypothesis is that inflation-adjusted average fares (the solid red line above) and ridership, expressed in UPT (the solid black line) have an inverse relationship – as average fare goes up, ridership goes down, and *vice versa* – the graph uses simple (ordinary least squares)

<sup>17</sup> Faison, Seth (June 2, 1993). "3,000 Subway Riders, Cards in Hand, Test New Fare System," *The New York Times*, June 2, 1993, retrieved May 14, 2010:

<http://query.nytimes.com/gst/fullpage.html?res=9F0CE7DC143BF931A35755C0A965958260>,

Seaman, de Cerreño, and English-Young, page 10,

Newman, Andy, "Hop On, Hop Off: The Unlimited Metrocard Arrives," *The New York Times*, July 3, 1998, retrieved May 14, 2010:

<http://query.nytimes.com/gst/fullpage.html?res=9B00E4DE173EF930A35754C0A96E958260>,

Williams, Monte, "Metrocard Machines' Subway Debut". *The New York Times*, January 26, 1999, retrieved May 14, 2010: <http://select.nytimes.com/gst/abstract.html?res=F10810FD395D0C758EDDA80894D1494D81>.

<sup>18</sup> Markowitz, Michael, "NYC Subway Token, 1953-2003," *Gotham Gazette*, April 28, 2003, retrieved May 14, 2010:

<http://www.gothamgazette.com/article//20030428/202/362>.

<sup>19</sup> Fare revenue and UPT from *NTD*, inflation adjustment factor is Consumer Price Index-All Urban Consumers, New York-Northern New Jersey-Long Island, NY-NY-CT-PA, Series Id: CUURA101SA0, CUUSA101SA0, accessed May 12, 2010:

<http://www.bls.gov/cpi/>

regression to project the expected UPT from the average fare (dotted green line). The statistic line above shows the "r-squared" – the coefficient of determination – of .82, which can be interpreted as the change in inflation-adjusted fare/boarding explains 82% of the change in UPT<sup>20</sup>.

Despite the good “eyeball” fit between the black and green lines above, and the high  $r^2 = .82$ , this is another example of the old adage that “correlation is not causation” – or, more properly, that while the change in fare media and price almost certainly was *a* causation, and arguably a very significant one, there were a very large number of things going on at this time that were also major influences. One interpretation, obviously somewhat simplistic, is that the improvements in the transit system infrastructure were the underlying necessary condition for the sufficient condition of the fare level decreases to be effective in generating more unlinked transit trips.

Due to the effective decrease in transit fares/boarding – and other factors – from the low point in 1993 through 2007, NYCT UPT increased 83%, or 1.231 billion boardings. *This accounted for 61% of the total national increase in transit UPT over this period a stunning indicator of (1) the lack of efficacy of transit expenditures nationwide which are generally consistent with the rail-heavy transit “investments” proposed in Plan Bay Area, and (2) the efficacy of reducing fares and increasing service quality for transit modes, especially buses, that are primarily used by transit-dependent low-income residents*<sup>21</sup>.

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<sup>20</sup> For non-statisticians, at the risk of over-simplifying, the "t" statistic, or Student's *t*-value, of -10.4, along with the 24 degrees of freedom (26 observations – 2) is used to determine that the "p" (probability) value is less than 1%, meaning that there is high likelihood that the relationship calculated is valid.

<sup>21</sup> APTA, *2010 Public Transportation Fact Book, Appendix A: Historical Tables*, Table 1, “Unlinked Passenger Trips by Mode,” accessed May 14, 2010:  
[http://apta.com/resources/statistics/Documents/FactBook/2010\\_Fact\\_Book\\_Appendix\\_A.pdf](http://apta.com/resources/statistics/Documents/FactBook/2010_Fact_Book_Appendix_A.pdf)

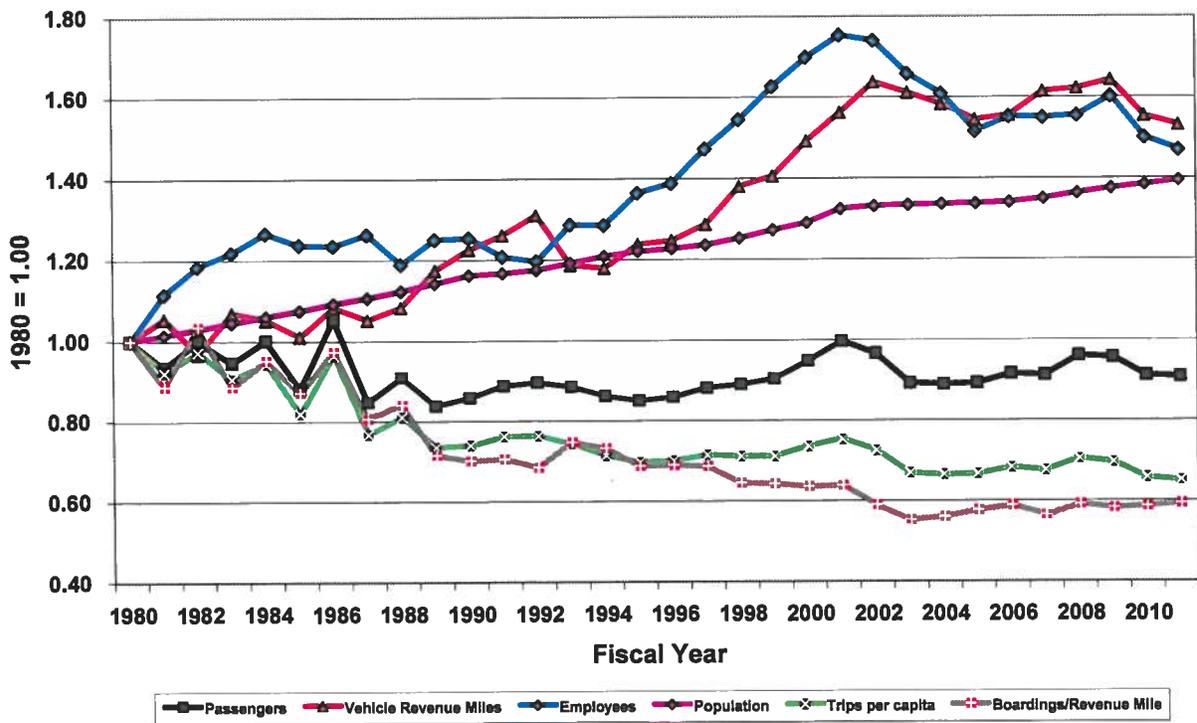
**THE TRANSIT EXPANSION PROJECTED IN THE DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE BAY AREA PLAN IS OUT OF TOUCH WITH REALITY**

**MTC Proposes a Continuation and Expansion of the Failed Policies and Programs of the Past – Yet, Remarkably, Projects in *Plan Bay Area* a Reversal of the Long Term Reduction in Transit Utilization in the Bay Area**

This and the following portions of this comment letter will focus on the way that things work in the Bay Area as a whole. While it is clear that MTC does not control everything that occurs in the Bay Area, or even the Bay Area transportation programs as a whole, it is not at all unfair to bring up the history of transportation planning, funding, construction, operation, capital renewal and modernization, and utilization in the Bay Area *in total* in making these comments. It is precisely the same political and other considerations that led to major difficulties in the past that will also make the transportation planning, funding, construction, operation, capital renewal and modernization, and utilization in the Bay Area in the future exceedingly unlikely to turn out differently than past failed efforts.

Let us begin by quantifying transit in the Bay Area over the past three-plus decades. As explained in detail in the Appendix, I have used U.S. Department of Transportation and MTC's own statistics to develop these charts:

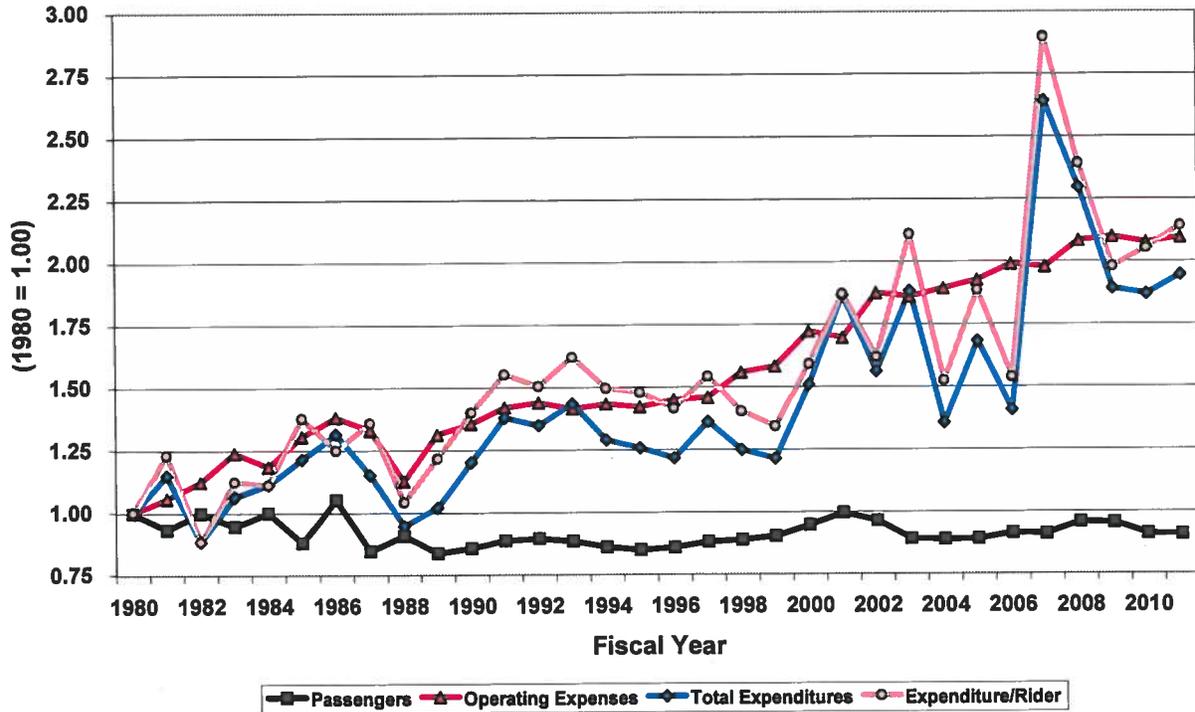
**BAY AREA TRANSIT OPERATORS  
OPERATING STATISTICS INDICES 1980-2011**



As can be easily seen in the above, during the period 1980-2011, the Bay Area (nine Bay Area counties in total) population has increased almost 40% and transit vehicle revenue miles (miles that buses, rail cars, ferries, and other transit vehicles are in service to the public) and transit

employees have increased approximately 50%, yet total transit ridership (UPT) has decreased by 9% – and, more important, UPT *per capita* has decreased 35% and boardings per vehicle revenue mile have decreased by 41%.

**BAY AREA TRANSIT OPERATORS  
FINANCIAL (Constant Dollar) INDICES 1980-2011**



*These dismal results have not been due to lack of funding – as the above chart shows, the 9% decrease in total UPT has happened even though transit operating expenses have gone up 109% and total expenditures (including capital expenditures, which can vary far more widely than operating expenses from year to year) have gone up 95%. Total expenditures per rider and per vehicle revenue hour both went up approximately 110%. As a lower share of costs are covered by transit fares and other operating revenues, the taxpayer burden has gone up even faster.*

*In sum, the record of transit in the Bay Area over the 32-year period, 1980-2011 is one of spending more and more taxpayer dollars to achieve less and less in terms of people moved.*

Now let us look at MTC projections for the year 2040, and the average annual percentage changes over that period to get us there – but, before we do, a note of explanation: *There is astonishing little data in the Plan, its published supporting documents, and even in the huge volume of documents that MTC has provided us when we asked for additional information, that sets forth the details of the Plan.* In fact, about the only data that is available is 2040 data for population, transit riders, and transit modal seat-miles, with comparable 2010 data, and total transit expenditure data for the entire plan period. We were unable to even find the inflation assumptions in the *Plan*.

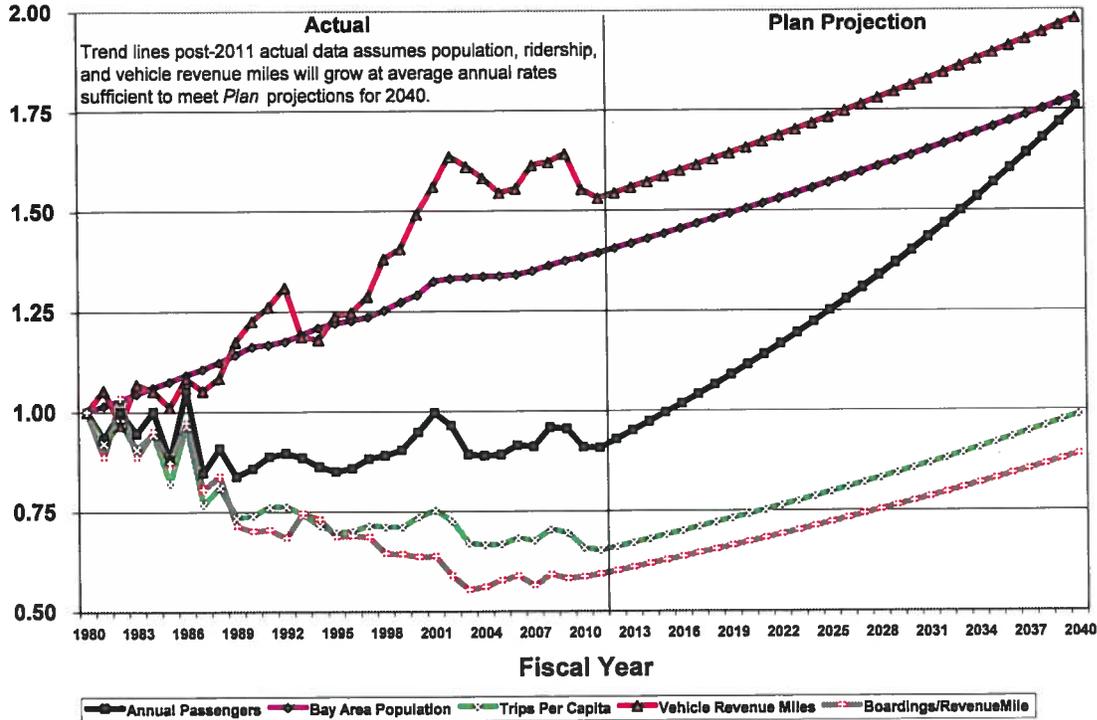
In an attempt to show the anticipated outputs of the *Plan*, as presented, I made several simplifying assumptions to prepare the graphs below:

1. I assumed that population, as well as total transit expenditures, passengers, and vehicle revenue miles would all increase at constant annual rates between the 2010 and 2040 data in the *Plan*, or from 2010 or 2011 actual data, as available.
2. I assumed a 2% annual rate of inflation, each year, during the *Plan* period, which is slightly under the actual average annual rate of inflation for the period 2001-2011, and which, based on my analysis of the various inflation factors for various types of revenues in the *Plan Financial Assumptions* that are more-or-less dependent upon inflation, appears to be close to what MTC is actually using. (and I request here that MTC disclose what inflation factors it is utilizing in the *Plan* model runs for transit operating expenses and capital expenditures.)

These assumptions undoubtedly will not reproduce the calculations that MTC has done to prepare and present the *Plan*, but, because the end points or totals for the period are fixed, they cannot be very far off, in total. For example, if population is expected to grow slower in the early years, then it must grow faster in the later years. There will undoubtedly be variations from the constant growth rates shown in the graphs from year to year but, again, in the end, they must even out. Since it is impossible to predict the future with any reasonable degree of accuracy almost thirty years out, let alone each year along the way, this methodology, while admittedly not precise, is definitely sufficiently accurate to be useful in understanding what MTC is presenting.

Starting with operating statistics:

### BAY AREA TRANSIT OPERATORS OPERATING INDICES 1980-2040



The reader of this chart cannot help but focus on the remarkable difference between what actually happened from 1980 to 2011, and what ABAG and MTC are projecting out to 2040.

Changes During Past and Projected Future Periods		
	1980-2010	2010-2040
Population	+41%	+28%
Vehicle Revenue Miles	+55%	+27%
Transit Riders	-9%	+94%
Boardings/Vehicle Revenue Mile	-41%	+50%

Population is shown growing 9,196,000 over this period, or approximately two million. While this is not inconsistent with the historical record, I believe it is overstated and is significantly above the projection of the California Department of Finance Demographic Research Unit, which utilizes a far more credible, and time-proven, methodology.

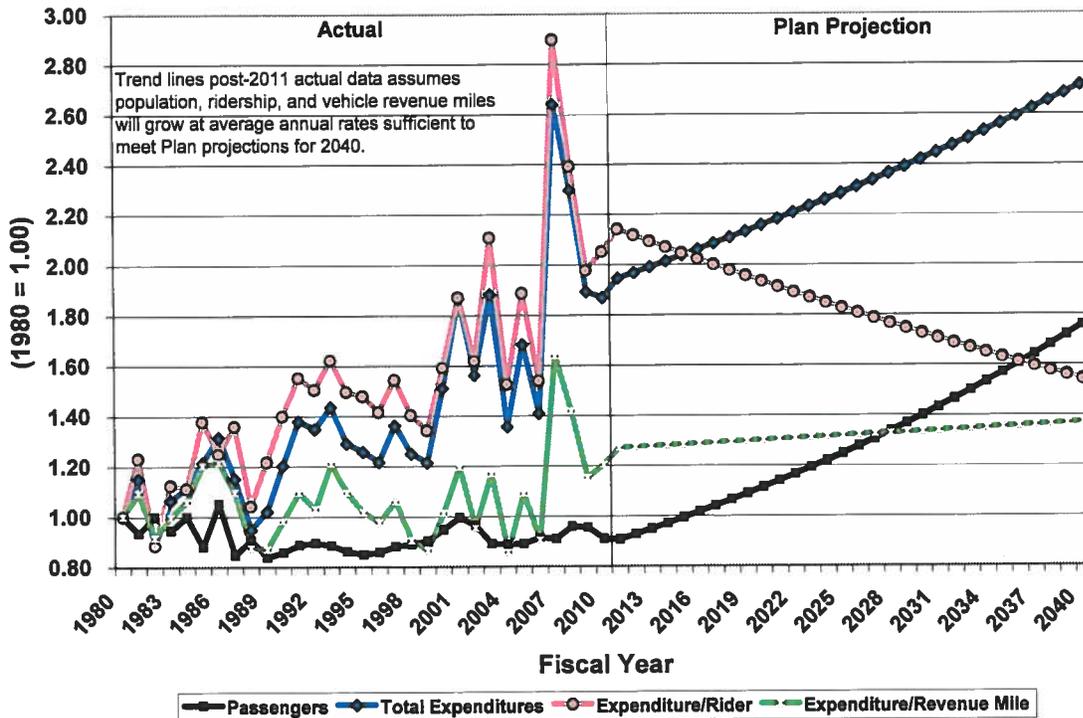
The *Plan* does not contain information on vehicle revenue miles, but does have information on transit seat-miles. I assumed that the growth in vehicle revenue miles from 2010 to 2040 would be proportional to the growth in seat-miles over this period. The increase projected over the *Plan* period is approximately half of the increase over the historical period.

Transit boardings, which dropped 9% during the historical period, are projected as increasing by 94% during the *Plan* period.

Finally, boardings per vehicle mile, which dropped 41% during the historical period, are projected to increase by 50%.

All of these statistics are questionable individually; when taken in combination, they are far more so. In particular, *the complete turn arounds from loss to gain for transit ridership and boardings/mile have nothing remotely close to a precedent in any major urban area in the U.S., and thus are not even remotely plausible, nor can any reasoned case be made that they will be achieved.*

### BAY AREA TRANSIT OPERATORS FINANCIAL (Constant Dollar) INDICES 1980-2040



Changes During Past and Projected Future Periods		
	1980-2010	2010-2040
Expenditures	+87%	+39%
Transit Riders	-9%	+94%
Expenditures/Revenue Mile	+87%	+8%
Expenditures/Boarding	+105%	-28%

No rational review of the above statistics will provide an explanation of how this combination of events could occur. The actual results from 1980-2010 show (constant dollar) expenditures increasing 87% while ridership fell 9%. In stunning contrast from these past results, which, after all, are the only objective data we have to judge the credibility of the *Plan's* projections, the authors of the *Plan* asks us to believe that from 2010 to 2040, when expenditures are projected to increase 39%, ridership will increase 94%. This is not only illogical but it is untethered to reality – particularly when one considers that, assuming rational decision-making by Bay Area transit governing board members and professionals, it must be assumed that the service that was

operating in 1980 was, for the most part, the most productive and cost-effective service that could be operated and, further, that the service that was added over the next thirty years – when vehicle revenue miles increased 55% -- was, again for the most part, the best new service that could be operated. Yet, even with these major service additions, total transit ridership decreased. Yet, somehow, by adding a bit less than half of the service (measured as a percentage) added in the earlier period, the *Plan* projects ridership increasing three-and-one-half times as fast as does the added service.

Yes, the *Plan* projects much larger increases in the modes that have larger vehicles, such as ferry and rail modes, which could be expected to explain part of this increase – if one assumes that the service will attract substantial new ridership. However, this obviously has not occurred with the added service over the past thirty years, a significant portion of which was also added in high-volume vehicles. Thus, while the logic of adding more passengers by operating more service with larger vehicles is sounds logical at first exposure, a review of what is proposed for 2010-2040 compared to what occurred during 1980-2010 paints a very different picture:

- No commuter rail service was reported to the National Transit Database (NTD), our main source of historical transit operating and financial statistics in 1980 (at the time, what is now CalTrain commuter rail service was operated by the then-Southern Pacific Railroad, which, as a private, for-profit railroad, did not report under the NTD; Altamont Commuter Express was not yet even a gleam in its founders' eyes; and Capital Corridor, which operates passenger rail service from Auburn to San Jose, is classified by the Federal Railroad Administration as inter-city rail and *not* transit rail and, therefore, does not report to NTD)<sup>22</sup>. Therefore, from 1980 to 2010, there was a 100% increase in commuter rail miles, which is significantly larger than the 58% increase for commuter rail in the DEIR<sup>23</sup>.
- BART, the only heavy rail operator in the Bay Area, increased its vehicle revenue miles 117% from 1980 to 2010, significantly larger than the 29% projected for 2010-2040.
- There are two light rail operators in the Bay Area, one of which, Santa Clara Valley Transit Authority, did not operate light rail in 1980 and the other, San Francisco MUNI, added significant service from 1980 to 2010, for a total modal increase for light rail of 160% – again, far larger than the 33% increase presented for 2010-2040.
- Two of the three Bay Area ferry service systems – those of the cities of Alameda and Vallejo – did not exist in 1980. Unfortunately, data for 1980 was not reported for the third, Golden Gate, but based on reported vehicle miles in the immediately following years, it appears that the increase in ferry vehicle revenue miles is well over 200% – far larger than the 54% increase presented for 2010-2040.
- In any case, the mass transit modes with larger vehicles were such a large percentage of the service in 2010 that there just wasn't much room for them to grow; motor bus was

<sup>22</sup> NTD 1985 – same citation for other modes in this section of "bullet" points.

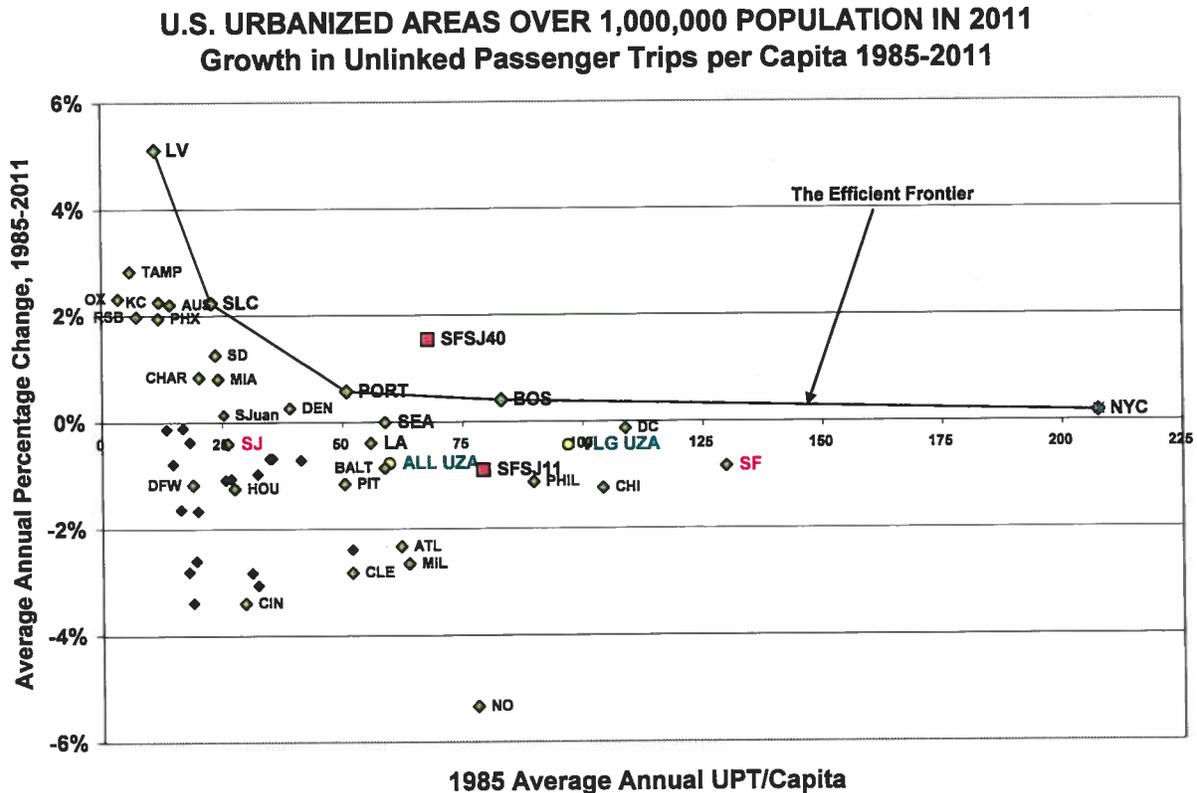
<sup>23</sup> DEIR, Table 2.1-11: Transportation System Capacity (2010-2040), page 2.1-27 – same citation for other modes in this section of "bullet" points.

The 1980-2010 increase percentages are for vehicle passenger miles; the 2010-2040 increase percentages are for seat-miles. There is little reason to believe that there will be major changes in seating/vehicle, particularly increases from 2010 to 2040.

37.1% of seat miles in 2010, decreasing to 32.4% in 2040, leaving only 4.7% of total seat miles for rail and ferry to grow through 2040<sup>24</sup>.

Let us do one more analysis of the increase in transit usage projected in the *Plan*. As a general rule, it is far more difficult to increase transit usage significantly in an urbanized area (UZA) that already has high transit usage than one that does not – as the following analysis will show.

Using data from the Texas Transportation Institute's *Urban Mobility Report 2012*<sup>25</sup> (UMR), I first calculated the average annual change in transit ridership *per capita* for the 48 urbanized areas that had a population of 1,000,000 or over during 2011. Then, I calculated the transit unlinked passenger trips *per capita* for each UZA for 1985 and 2011, calculated the percentage change over that period, and the average annual compound rate of change for each UZA over the 26-year period. Finally, I graphed the 1985 transit trips/capita and the average annual rate of change, as shown below:



As can be easily seen from the graph, the higher the initial average annual UPT/capita, the lower the rate of change over the next 26 years (the outlier at the bottom, New Orleans, suffered greatly due to the impacts of Hurricane Katrina in 2005 and the recovery in many ways, including transit, was far from complete in 2011).

<sup>24</sup> DEIR, Table 2.1-11.

<sup>25</sup> Excel™ spreadsheet, accessed May 1, 2013:

<http://mobility.tamu.edu/ums/>

Fifteen of the 48 – 31% – did show increases in transit usage per capita over this period, but most of these began the period with low transit usage. The average annual rate of change for the fifteen very large (>2,000,000 population in 2011) UZAs was a loss of .443% and, for the 33 large (1,000,000-2,000,000 population in 2011) UZAs, -.972%.

Five (Boston, Miami, New York City, Phoenix, and San Diego) of the fifteen very large UZAs (the others are Atlanta, Chicago, Dallas-Forth Worth, Detroit, Houston, Los Angeles, Philadelphia, San Francisco-Oakland, Seattle, and Washington, DC) had increases over this period. I have graphed the "efficient frontier" – the line between the entities with positive growth rates that scribes the line which no UZA exceeds.

I then plotted the *Plan's* projected change from 2010 to 2040 for the nine county Bay Area (which includes the "very large" San Francisco-Oakland and the "large" San Jose UZAs, along with several smaller ones). As can be seen, the *Plan's* projected average annual growth rate (over the thirty year period) of 1.544% is significantly higher than New York City's .146%, Boston's .408%, and Portland's .573%. To find a UZA with a higher average annual growth rate than the *Plan's* projections, one has to keep moving left on the graph to Salt Lake City – which started in 1985 with 22.8 transit trips/capita, approximately one-third of the 67.8 that the combined SFSJ area had in 2010.

This statistic, by itself, certainly does not mean that the outcome projected in the *Plan* is impossible. It does, however, show that no other large or very large U.S. UZA has accomplished anything remotely similar to what the *Plan* projects, and establishes that the likelihood of the *Plan* results being accomplished must be considered exceedingly unlikely, particularly when considered in combination with all that I have presented previously in this paper.

### Bay Area Public Transit Statistics – 1980-2011 Sources and Notes

All years are fiscal years, running July 1 to the June 30 of the subsequent year, and are expressed in terms of the ending year (fiscal year 1982-83 is referred to as 1983).

#### Operating Expenses and Non-Financial Operating Data

The source for operating expenses and non-financial operating data is the U.S. Department of Transportation, Federal Transit Administration, National Transit Database (NTD).

Although the first NTD reporting year was 1979, the data for this year was deemed unusable because several major transit operators did not report important statistics; the Alameda-Contra Costa Transit District (AC Transit) did not report employees, the San Francisco Municipal Railway (MUNI) did not report operating costs or unlinked passenger trips, and the San Francisco Bart Area Rapid Transit District (BART) did not report revenue vehicle miles or hours.

The number of reporting agencies grew significantly over time. The first few years had only six of the seven major Bay Area transit operators (besides the three mentioned above, the other three that reported from the first year were the Golden Gate Bridge, Highway and Transportation District [Golden Gate}, the San Mateo County Transit District [SamTrans], and what is now known as the Santa Clara Valley Transportation Authority [VTA]), plus the Santa Rosa City Bus and Vallejo Transit. The seventh "major," what we now know as the Peninsula Corridor Joint Powers Board, dba Caltrain, was in service at that time, but was privately operated by what was then the Southern Pacific Railroad. The first data from that system was reported to NTD for 1983, after the service began to be subsidized by the State of California prior to the transition to the current joint powers agreement ownership and operation.

Over this period, many transit agencies were either created anew or spun off from other agencies. Altamont Commuter Express (ACE) first reported service in 2002 and Alameda Ferry Service first reported in 2004. Service to areas formerly served by AC Transit that was taken over by other operators includes the Central Contra Costa Transit Authority (County Connection), which first reported in 1983, the Eastern Contra Costa Transit Authority (TriDelta), the Livermore-Amador Valley Transit Authority (LAVTA or Wheels), Union City Transit, and the Western Contra Costa Transit Authority (WestCAT).

Note that the above is not a complete list of all transit authorities included in the 2011 data, which totals 24. We suspect that some transit agencies existed, but did not report data, for some years before their first data inclusion in NTD. Also, for many of the smaller agencies, and occasionally for larger agencies, there is missing data for one or more categories in many of the early years. These data, if reported, would be minor, so we have elected to ignore the missing data, particularly as, if it was reported, it would show even larger declines in ridership and larger increases in costs than is shown in the graphics and tables I present above.

Data for 1980 through 1988 was obtained from the National Transit Database annual "hard copy" reports, summing the data for the individual transit operators from the various data tables. Beginning in 1989, the source was the *Statistical Summary of Bay Area Transit Operators*, which is published, currently annually, by the Metropolitan Transportation Commission, with each report containing five years of data, as follows:

<u>Statistical Summary Report</u>	<u>Reporting Years</u>
1988-89 through 1992-93	1989
1889-90 through 1993-94	1990-1994
1994-95 through 1998-99	1995-1996
1996-97 through 2000-01	1997-2001
2001-02 through 2008-06	2001-2006
2006-07 through 2010-11	2007-2011

From the above, the source was a table in the first part of each document, "Bay Area System – Statistical Summary."

### Capital Expenditures

While operating expense data on an actual, as-spent basis was relatively easily obtainable from NTD, obtaining actual capital expenditures was far more difficult, so we opted instead to use programmed expenditures. There are generally differences between capital budgets and capital expenditures, both in dollar value and in timing, but we believe that any inaccuracies incorporated due to this difference are relatively inconsequential for our instant purpose.

Capital expenditures were obtained from the *Transportation Improvement Programs* (TIP) published by MTC, first annually at the beginning of the study period, later bi-annually. The data in these reports varied significantly in detail and method of presentation, which led to the use of various methodologies, as detailed below, for the data. In general, while the TIPs cover various periods, generally four years, we used the first year, or years, in every case, to the extent possible, working on the general expectation that spending programmed for later years might later be adjusted. The date shown (in parenthesis) is the date of the TIP, as shown on the respective TIP cover:

- 1980 – (1979-1980): Regional Program Summary – Transit and Highway, page 3-3.
- 1981, 1982, 1983 – (1980-1981) – 1980 Transportation Improvement Program, page II (the TIPs for the following two years did not present transit capital data in an easily usable format).
- 1984 – (1984-88) – FY 1984-88 Regional Transit Capital Priorities – Summary: All Projects (no page number).
- 1985 – (1985-89) – FY 1985-89 Regional Transit Capital Priorities – Summary: All Projects, page II-13.
- 1986 – (1986-90) – FY 1986-90 Regional Transit Capital Priorities – Summary: All Projects, page II-13.



- 1987 – (1987-91) – FY 1986-90 (*sic*: the title is wrong and the data presented in the table is for 1987-1991) Regional Transit Capital Priorities – Summary: All Projects, page IV-8.
- 1988, 1989 – (1988-92) – FY 1988-92 Regional Transit Capital Priorities – Summary: All Projects, page IV-7 (the TIPs for the following year did not present transit capital data in an easily usable format).
- 1990 – (1990-94) – FY 1990-94 TIP Transit Element, page 1-4-2.
- 1991 – (1991-95) – Table 5-1: All Regional Capital Projects, page 1-5-2.
- 1992 – (1992-96) – Table 5-1: Regional Capital Projects Requiring Federal Actions, page 1-5-2.
- 1993 – (1993) – Table 5-1: Regional Capital Projects Requiring Federal Actions, page 1-5-2.
- 1994 – (1994) – Table 5-1: Regional Capital Projects Requiring Federal Actions, page 1-5-2.
- 1995, 1996, 1997, 1998, 1999 – (1995) – Table 4-1: Regional Capital Projects Requiring Federal Actions, page 1-5-2/3 (the TIPs for the following two years did not present transit capital data in an easily usable format).
- 2000 – We could not locate a table with easily usable data, so we entered an amount equal to the simple average of the two preceding and two following years.
- 2001, 2002 – (2001) – Figure 2: Programmed TIP Funds by Mode and Purpose, page 12. Beginning in 2001, expenditures were broken into six major categories, Bike/Pedestrian, Highway, Local Roads, Mass Transit, Other, and System Management. The latter two were allocated to transit according to the ratio of transit capital expenditures to total non-other/system management expenditures; for example, if transit capital expenditures were 45%, other and system management 10%, and all other 45%, then half (45%/90%) of the other and system management 10%, or 5%, was added to transit.
- 2003, 2004 – (2003) – Figure 2: Programmed TIP Funds by Mode and Purpose, page 10.
- 2005, 2006 – (2005) – Figure 2: Programmed TIP Funds by Mode and Purpose, page 20.
- 2007, 2008 – (2007) – Figure 3: Programmed TIP Funds by Mode and Purpose, page 32.
- 2009, 2010 – (2009) – Figure 3: Programmed TIP Funds by Mode and Purpose, page 32. Because this TIP does not present programmed annual expenditures, the four-year total transit capital expenditures were divided by four to produce annual amounts for the first two years of this four-year period. This is obviously not precise, but we believe it is reasonable and, if anything, is probably on the low side, as the vast majority of the prior TIPs reviewed had larger expenditures programmed for the first years than the last.
- 2011 – (2011) – Figure 3: Programmed TIP Funds by Mode and Purpose, page 32.

## Population

All historical population data is from California Department of Finance, Demographic Research Unit, reports as listed below, accessed April 26, 2013:

<http://www.dof.ca.gov/research/demographic/reports/view.php#objCollapsiblePanelEstimatesAnchor>

- 1980: E-6 County Population Estimates and Components of Change—July 1, 1970–1990

- 1981-1990: E-4 Historical Population Estimates for Cities, Counties and the State, 1981-1990,
- 1991-2000: E-4 Historical Population Estimates for Cities, Counties and the State, 1991-2000, with 1990 and 2000 Census Counts, August 2007
- 2000-2010: E-2 *California County Population Estimates and Components of Change by Year, July 1, 2000-2010*. Sacramento, California, December 2011.
- 2010-2012: E-2 *California County Population Estimates and Components of Change by Year – July 1, 2010-2012*, December 2012

The process was to sum the individual estimates for each of the nine counties for each year, as of January 1 of each year, the mid-point of each fiscal year.

Unfortunately, the DRU estimates are for various days of the year. These were adjusted as follows:

- 1980 – Simple average of the July 1, 1979 and July 1, 1980 data.
- 1981-2000 – No modification required, data presented is for January 1.
- 2001-2011 – Simple average of the July 1 data for six months prior and six months following each July 1

#### **Average Annual Rate of Change in Unlinked Passenger Trips Per Capita**

Source for this is Texas Transportation Institute, 2013 *Urban Mobility Report*, Excel™ spreadsheet – 101 Urban Areas, accessed April 27, 2013:

Population and unlinked passenger trip data for the Bay Area from DEIR, Table 2.1-10: Bay Area Demographic Forecasts (2010-2040), page 2.1-25 and Table 2.1-12, Bay Area Travel Behavior, 2010-2040, page 2.1-28.

#### **Inflation**

The inflation index used was, U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index-All urban Consumers, San Francisco-Oakland-San Jose, 1982-1984 = 100, accessed April 26, 2013 (use "Regional Resources" map and pull-down tool at right side of page below "Latest Numbers"):

Although the data above is all on a fiscal year basis, we have utilized the calendar year CPI data, primarily because the data required to calculate fiscal year CPI-U was not available prior to 1984; any distortion caused by this should be very minor.

For years after 2011, the assumed inflation is 2% annually, which is slightly less than the actual average annual rate of inflation from the above for 2001-2011.

***Plan Bay Area Transit Expenditures and Operating Statistics***

*Plan*, Table 2, "Plan Bay Area Transit Improvement Strategy (\$ in Billions)," page 68. Although this table does not explicitly state that the values are expressed in year-of-expenditure dollars, Figure 6, "Transit Operating Funding by Operator 2013-2040, YOES," does specifically identify its dollar values as "YOES" – year of expenditure dollars – and the sum of the amounts identified in the bars on Figure 6 appears to match the dollar value for Transit Operations in Table 2, thus strongly indicating that Table 2 figures are expressed in year of expenditure dollars.

*DEIR*, Table 2.1-11: Transportation System Capacity (2010-2040), page 2.1-27, has transit seat-mile data for 2010 and 2040. I assumed that the increase from 2010 to 2040 for seat miles would be proportional to the increase in vehicle revenue miles over the same period and multiplied that increase factor by the actual vehicle revenue miles from *MTC Statistical Summary* for 2010.

*DEIR*, Table 2.1-12: Bay Area Travel Behavior, 2010-2040, page 2.1-28, has daily transit boardings for 2010 and 2040. I assumed that the increase from 2010 to 2040 for daily boardings would be proportional to the increase in total annual boardings over the same period and multiplied that increase factor by the actual annual boardings from *MTC Statistical Summary* for 2010.

**TRANSIT DOES NOT USE LESS ENERGY, OR PRODUCE FEWER EMISSIONS, THAN CURRENT GENERATION AUTOMOBILES – AND AUTOMOBILES ARE GETTING BETTER WHILE TRANSIT IS NOT.**

I attach two papers (Appendix B and Appendix C, respectively), one by Randal O'Toole of Cato Foundation and one I authored, which show that transit, on a national basis, does not have any energy or emissions advantages over modern automobiles and that automobiles are getting significantly better in this regard while transit is not.

Randal O'Toole, *Does Rail Transit Save Energy or Reduce Greenhouse Gas Emissions?*, Cato Policy Study 615. April 14, 2008:

Thomas A. Rubin, *Does Bus Transit Reduce Greenhouse Gas Emissions?*, Reason Foundation, April 5, 2010:

## PROBLEMS WITH ASSUMED FUEL TAXES

According to the *Plan's* Financial Assumptions report at page 4,

"Assumptions concerning fuel price and consumption growth are consistent with the MTC travel demand model and the EMFAC 2007 forecasting software. Fuel consumption estimates reflect an assumption that the state gasoline consumption will decline at an increasing rate until 2020 and then grow slowly at a constant long-term rate. The decline in the initial years for consumption is attributable to the improvements in the fuel efficiency of the fleet as brought about by AB 1493 (Pavley), Phase 1. Fuel prices are expected to grow at approximately 8 percent annually until 2020, and at approximately 3 percent annually thereafter."

However, this utterly ignores the impact on the budget of the California Air Resources Board's (CARB) Advanced Clean Car Standards, proposed January 2012 (see Appendix D) and approved December 31, 2012 (See Appendix E). CARB's Advanced Clear Car Standards (AB 1493 (2002 Pavley), Phase 2) simply adopt the federal CAFE standards for cars sold from 2017 through 2025. CARB's AB 1493 (Pavley), Phase 2 regulations were fully adopted during the analysis period on the draft Plan and draft EIR, in fact fully three months before the draft Plan was released March 22, 2013 and draft EIR was released April 2, 2013, and were announced publicly January 27, 2012, fully 14 months before the draft Plan and draft EIR were released. ABAG and MTC have no explanation for not considering the impact of CARB's AB 1493 (Pavley) Phase 2 regulations on their budget.

Further, from MTC's attached model run dated September 12, 2012 (see Appendix F), ABAG and MTC's model that considers the impact of AB 1493 (Pavley) Phase 1 assumes that Pavley Phase 1 increases average MPG for the passenger vehicle fleet by 38.97% from 20.09 MPG in 2005 to 27.92 MPG in 2020, and further increases average MPG (just from Pavley 1 impact on the rolling over passenger vehicle fleet) by an additional 14.68% from 27.92 MPG in 2020 to 32.02 MPG in 2035.

If MTC's models assume that there will be 38.97% increase in fleet level MPG from 2010 to 2020 due to Pavley 1 regulations, and thus adjust revenues from gas taxes from 2010 to 2020 to account for the impact of Pavley 1, why, when the models project a further 14.68% increase in fleet wide MPG due to the impact of Pavley 1 from 2020 to 2035, why do they ignore that added impact of Pavley 1 on fleetwide MPG on gas tax revenues from 2020 through 2035?

These numbers add up to significant impacts on the budget. Just for the Gas Tax Subvention revenue dedicated to Local Streets and Roads, the data for all nine counties (Sheet 2 from MTC's Draft Projections 2011 12222011.xls (attached as Appendix G)) indicate a drop in gas tax revenue dedicated to local streets and roads of 16.10% from \$171.236M in FY 2011-2012 to \$143.659M in FY 2020-2021. There should have been an additional, substantial decline in gas tax revenues projected out at least to 2035 attributable purely to the increases in average MPG for the overall passenger vehicle fleet attributable to the impact of Pavley 1, rather than the projected increases shown by MTC in this spreadsheet, and by ABAG and MTC in their Financial Assumptions document addend to Plan Bay Area.

Also, state funding sources, which according to page 62 of the *Plan* are 16% of the *Plan's* overall budget, are "primarily fuel-tax based." *Plan*, page 63. Since 16% of the *Plan's* overall budget are state funding sources, and those state funding sources are primarily fuel-tax based, the impact on the *Plan's* entire budget should have been quite substantial (all things equal, state funding from gas tax revenues in the *Plan* should have dropped approximately 2.6% from FY 2011-2012 to FY 2020-2021 – the 16.10% decline seen in the spreadsheet model showing gas tax revenue allocated to local streets and roads times the 16% of the overall budget that is received from state funding sources). Thus the failure to consider the further impact of Pavley 1 MPG increases which ABAG and MTC's own internal models project at least out to 2035 substantially overstates the revenue that the *Plan* can even logically project from state funding sources, let alone reasonably project. This doesn't even consider whether any of the federal revenue sources, which are an additional 11% of the *Plan's* total revenue, *Plan*, p. 62, are tied to the number of gallons of gasoline sold in the Bay Area or California.

But the overstatement in revenues in the *Plan* is even more dramatic than the above analysis illustrates. As noted above, MTC's undisclosed models show that average fleetwide MPG will increase from 20.09 MPG in 2010 to 27.92 MPG in 2020, then further increase to 32.02 MPG in 2035, solely from the impact of Pavley Phase 1. See, for example, MTC's attached model run dated September 12, 2012 (Appendix F). But the Advanced Clean Car Standards ("Pavley Phase 2"), which California Air Resources Board announced January 27, 2012 (Appendix D), and fully adopted December 31, 2012 (Appendix E), adopts the federal 2025 CAFE standards for fleetwide MPG for passenger vehicles sold from 2017 through 2025, requiring the fleet sold in 2025 to average 54.5 MPG. Thus, the fleetwide MPG should increase by at least as much as that attributable to Pavley Phase 1 due solely to Pavley Phase 2. If the reduction in overall *Plan* revenues was approximately 2.6% from FY 2011-2012 to FY 2020-2021 (and should have been further reduced by a significant amount through at least FY 2035-2036) due solely to the impact of Pavley Phase 1, at least an additive and additional reduction of 2.6% or more in overall *Plan* revenues should have been projected beginning in FY 2017-2018 due solely to the impact of Pavley Phase 2.

Thus, any reasonable interpretation of the above should conclude that the *Plan's* overall revenues are overstated by at least 5% overall, because of the failure to continue to project out fleetwide MPG gains from Pavley Phase 1 after 2020, and the failure to consider at all the MPG gains from Pavley Phase 2.

But the *Plan's* financial models appear to have compensated for both the accounted for, and the much greater unaccounted for, impacts of Pavley 1 and Pavley 2 on fleetwide MPG and thus on the number of gallons of gasoline sold – by using extremely high gas price assumptions for 2011 through 2020 (the years the *Plan* accounts for a drop in gasoline usage due to Pavley 1), and for the period beyond 2020, the *Plan* projects continuing gas price increases higher than the *Plan* appears to be projecting as the base rate of inflation. Thus, the *Plan's* revenue model may be even more impaired than its indisputable failure to account for the vast majority of the known impact of Pavley Phase 1 and Pavley Phase 2 in reducing state (and possibly federal) gas tax revenues due to certain and easily calculable increases in fleetwide average MPG.

Hence we must ask: When faced with the need to model a reduction in gasoline usage due to Pavley Phase 1, albeit improperly limiting that consideration of reduction in gasoline usage only through 2020, did MTC select an improperly high assumption for gas price increases per year from 2010 through 2020 (and a continuing improperly high assumption for gas price increases for the remaining years of the *Plan*)?

From Worksheet Fuel Sales Tax in the attached spreadsheet (2013 RTP Model (state and federal).xls (Appendix H), the gas tax is 6.00% of the sale price of gas (with subvention to equalize the amount that would be received at that rate). During the years when ABAG and MTC have reduced their forecast for actual numbers of gallons of gasoline sold by 2.00% per year (until 2020) due to the impact of Pavley 1, ABAG and MTC's financial model projects dramatically rising gas prices of 8% annually until 2020, and 3% annually thereafter. Without any explanation for these outsized gas price increases through 2020 which are credible, independent, and corroborated, the question needs to be asked whether ABAG and MTC wanted to make up for the shortfalls in actual gallons of gas sold from Pavley 1 between the present and 2020, and as a result, assumed gas prices will increase by astronomical amounts (8%) per year between now and 2020.

And how plausible are these forecasts of astonishingly high annual increases in gasoline prices during the Plan years through 2020? During the period when gasoline use is dropping by each year in the Plan's models (2.00% per year decline between present and 2020), ABAG and MTC have the rapidest price rises (8% per year, compared with 3% per year after 2020). Does it make economic sense that declining demand is met with higher prices? No, not unless there are overriding considerations to conclude that gasoline prices will increase by exceptionally high rates per year for the entire decade. Declining demand will be met with lower prices, all things equal. While crude oil is a global commodity, its price is somewhat sensitive to local market and supply conditions, and refineries, which also contribute to retail gasoline prices have high fixed costs. Hence, all things equal, in the California market retail gasoline prices should be dropping in ABAG and MTC's financial model from 2010 through 2020 as demand is dropping, rather than increasing dramatically as ABAG and MTC have assumed.

And even the forecasts of gas price increases in the years post-2020 may be dramatically inflated. What is the explanation for projecting gasoline prices to increase by 3.3% per year from 2020 to 2040? This is more than 50% higher than what appears to be the *Plan's* assumption for base inflation (just over 2% per year). Are there credible, independent, and corroborated forecasts for gasoline price increases in California for the years from 2020-2040 that are above the projected base rate of inflation that the *Plan* relied on, and if so, why weren't these forecasts for outsized rises in retail gasoline prices disclosed in the *Plan* and its accompanying documents, as well as their source?

**MTC IGNORES THE "FISCAL CONSTRAINT" REQUIREMENT FOR TRANSPORTATION PLANS, AS WELL AS THE BAY AREA'S LONG AND CONSISTENT HISTORY OF MAJOR COST OVERRUNS, PROGRAM/PROJECT DELAYS, AND FAILURES TO ACHIEVE ANTICIPATED TRANSPORTATION RESULTS**

On page ES-6 of the Draft Environmental Impact Report, *Draft Bay Area Plan – Strategy for a Sustainable Region*, April 2013 DEIS, we have the following claim:

*"The proposed Plan includes a financially constrained transportation investment plan as required by State and federal planning regulations. [Italics added.] It includes transportation projects and programs that would be funded through existing and future revenues that are projected to be reasonably available to the region over the timeframe covered by the proposed Plan."*

On page 1.2-11 of the DEIR, we have:

"Under MAP-21, the U.S. Department of Transportation requires that metropolitan planning organizations, such as MTC, prepare long-range transportation plans and update them every four years if they are in areas designated as "nonattainment" or "maintenance" for federal air quality standards. *Plan Bay Area fulfills this requirement. [Italics added.]* Prior to enactment of MAP-21, the primary federal requirements regarding RTPs were included in the metropolitan transportation planning rules—Title 23 CFR Part 450 and 49 CFR Part 613. MAP-21 makes a number of changes to the statutes that underpin these regulations, and revisions to the regulations are expected to be made in early 2013. Key federal requirements for long range plans include:

- ...
- "RTPs must have a financially constrained element, *transportation revenue assumptions must be reasonable* [italics added], and the long range financial estimate must take into account construction-related inflation costs."

On page 1.2-12, we have:

"The RTP Guidelines adopted by the California Transportation Commission (CTC) state that the CTC cannot program projects that are not identified in the RTP. Section 65080 states that the RTP shall contain three distinct elements:

- ...
- "A **Financial Element** that summarizes the cost of implementing the projects in the RTP in a financially constrained environment."

On page 1.2-13, we have:

"Further, the TIP is also financially constrained by year (meaning that the amount of dollars programmed must not exceed the amount of dollars estimated to be available in that year)."

On page 62 of the Draft *Plan Bay Area*, we have Figure 1, "Plan Bay Area Funding: 28-Year Forecast, which shows \$14 billion, or 5%, of the total revenue from a source or sources labeled "Anticipated," which is explained as:

"Making up the remainder of the pie are state and federal revenues (mainly derived from fuel taxes), and "Anticipated" revenues, which are unspecified revenues that reasonably can be expected to become available within the plan horizon."

And on page 64 of the Draft *Plan*:

"MTC performed a retrospective analysis of projections for previous long-range plans, including a review of unexpected revenues that had come to the region but had not been anticipated or included in those projections. Over a 15-year analysis period, the San Francisco Bay Area received an annualized amount of roughly \$400 million (in 2011 dollars) from these "unanticipated" fund sources. MTC generated an estimate of these anticipated revenues by projecting the \$400 million figure forward at a 3 percent annual growth rate. These revenues are not assumed in the first five years of the plan."

The following is taken from the Federal Highway Administration "Financial Planning and Fiscal Constraint for Transportation Plans and Programs Questions & Answers"<sup>26</sup>."

**"1. What are the differences between future revenue sources that are "reasonably expected to be available" and those that are "available" or "committed?"**

"Revenue forecasts that support a Statewide Transportation Improvement Program (STIP), metropolitan transportation plan, or a metropolitan Transportation Improvement Program (TIP) may take into account new funding sources and levels of funding not currently in place, but which are "reasonably expected to be available" [see 23 CFR 450.216(m), 23 CFR 450.322(f)(10)(ii), and 23 CFR 450.324(h), respectively]. New funding sources are revenues that do not currently exist or that may require additional actions before the State DOT, MPO, or public transportation operator can commit such funding to transportation projects. In addition, future revenues may be projected based on historic trends, including consideration of past legislative or executive actions. To be considered "reasonable," the financial information and financial plans that accompany the TIP, STIP, and metropolitan transportation plan must identify strategies for

<sup>26</sup>

[http://www.fhwa.dot.gov/planning/guidfinconstr\\_qa.cfm](http://www.fhwa.dot.gov/planning/guidfinconstr_qa.cfm)

ensuring the availability of these new revenue sources in the years when they are needed for project development and implementation [see 23 CFR 450.216(m)].

"In air quality nonattainment and maintenance areas, the fiscal constraint requirements are more stringent. To support air quality planning under the Clean Air Act, as amended in 1990, the U. S. Environmental Protection Agency's transportation conformity regulations specify that an air quality conformity determination can only be made on a fiscally constrained metropolitan transportation plan and TIP in air quality nonattainment and maintenance areas consistent with DOT's metropolitan planning regulations [see 40 CFR 93.108].

"Relative to STIP/TIP development in air quality nonattainment and maintenance areas, projects included in the first two years of the STIP and TIP shall be limited to those for which funds are "available" or "committed" [see 23 CFR 450.216(m) and 23 CFR 450.324(i), respectively]. Definitions for the terms "available funds" and "committed funds" are contained in 23 CFR 450.104. Therefore, nonattainment and maintenance areas may not rely upon proposed new taxes or other new revenue sources to support projects listed in the first two years of the TIP and STIP. As such, new funding from a proposed gas tax increase, bonding, a proposed regional sales tax, or a major funding increase still under consideration would not qualify as "available" or "committed" until it has been enacted by legislation or referendum. However, for the third and fourth years, the STIP/TIP may include a project or project phase if full funding can reasonably be expected to be available for the project within the time period contemplated for its completion."

It appears that MTC has utilized the newly liberalized definition of "fiscally constrained" to add \$14 billion to the anticipated revenues. What are the details, year-by-year and source-by-source, of the "\$400 million (in 2011 dollars) from these 'unanticipated' fund sources?"

We suspect that much of these funds is from sources such as the American Relief and Recovery Act, which tend to provide funds in large "lumps," with high uncertainty as to repeatability.

While I am deferring judgment as to the propriety of the inclusion, and the prudence, of including this \$14 billion in the anticipated revenues until more specifics are provided, the overriding problem is that MTC, and Bay Area transportation projects, have had numerous examples of coming in far over anticipated budgets – particularly early planning budgets, as are many of the projects included in the *Plan*.

Some examples of such issues, and related MTC financial problems, are presented in the immediately following section. Even if one accepts that the \$14 billion of "unspecified revenues that reasonably can be expected to become available within the plan horizon" have a reasonable chance of actually coming to pass – which I do not in the absence of detailed support from MTC – these are overwhelmed by the overruns likely to occur based on MTC's and the Bay Area's historical record in this regard.

## EXAMPLES OF COST OVERRUNS, LATE DELIVERY, AND UNDERPERFORMANCE IN PAST BAY AREA TRANSIT PROJECTS

### San Francisco Bay Area Rapid Transit District Colma and SFO/Millbrae Extensions

The BART heavy rail system in the San Francisco Bay area began service in 1972. The Colma Station and Extension to San Francisco International Airport and Millbrae were the last additions opened, in 1996 and 2003, respectively. The SFO extension, 8.7 miles of track, four stations, and an operating and maintenance facility, is basically the third and final phase of a plan to extend the system to the airport (and, potentially, beyond). The one-mile extension to the Colma Station was the second, with the tail track storage line South from Daly City Station the first (not comprehended by this case study). Ridership data for these two projects, therefore, are very interrelated.

#### *Colma Extension*

This project consisted of a one-mile track extension and one new station with a bus transfer facility and a five-level, 1,400-space parking garage<sup>27</sup>. San Mateo County voters overwhelmingly approved the project in 1985, and the planning process began shortly thereafter. Between the time of the environmental impact statement (EIS) reports and the finish of the project the scope was decreased in terms of length and surface parking and was increased in terms of underground rail (up .08 miles) and elevated track (about .06 miles)<sup>28</sup>.

Estimates contained in the draft EIS (DEIS) and final EIS (FEIS) reports in terms of capital expenditures were far below the actual costs incurred as is seen in the following table. This is due principally to the changes in scope. Increased raised rail and subway sections add to cost dramatically. The full-funding grant agreement (FFGA), however, was a reliable estimation of the final capital expenditure levels.

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<sup>27</sup> San Francisco Bay Area Rapid Transit District, April 15, 1993, "BART Chronology," accessed November 8, 2010:

<http://www.bart.gov/docs/BARTHistory.pdf>

<sup>28</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 69 (available at:

[http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

**Predicted and Actual Capital Costs - BART Colma Extension<sup>29</sup>**

	Total Capital Cost (millions)				Ratio of Actual to Predicted Costs (%)		
	AA/ DEIS	FEIS	FFGA	As- Built	As- Built vs. AA/ DEIS	As- Built vs. FEIS	As- Built vs. FFGA
As Estimated	\$94.9 (1986 \$)	\$120.7 (1990 \$)	\$170.2 (1993 \$)	\$179.9	189.6%	149.1%	105.7%
Adjusted to Year of Opening (1996 \$)	\$112.5	\$130.1	\$171.6	\$179.9	159.9%	138.2%	104.9%

While ridership estimates were higher than actual ridership, they came within about 10% of the actual as built levels. It is presumed that the difference is due to service levels being 33% below what was estimated in the DEIS and FEIS. Actual operating and maintenance (O&M) costs as compared to estimated costs are considered “reasonable” by the FTA.<sup>30</sup>

Because the BART system had been operating in the San Francisco Bay Area since 1972, and because there was considerable experience in planning and building rail systems and extensions, estimates for BART Colma were quite accurate. The FTA put it this way: “This project was a one station extension of a long operating existing heavy rail system with ample data regarding the existing travel patterns. High quality data and long experience with the transit market near the extension surely helped to facilitate accurate forecasts.”<sup>31</sup> BART planners in this case were able to come within 10% of true ridership numbers and FFGA estimates were within 5% of the as-built capital cost.<sup>32</sup>

***SFO/Millbrae Extension***

This project extended the BART heavy rail system to San Francisco Airport and further South to Millbrae from the COLMA station, an addition of 8.7 miles and four stations.<sup>33</sup> This project is an example of how cost estimates often go up significantly over the course of the planning period between alternative analyses (AA), DEIS, FEIS, FFGA, and actual construction. The overall scope of this project also changed between DEIS and actual construction.

<sup>29</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 72 (available at: [http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

<sup>30</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 73 (available at: [http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

<sup>31</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 72 (available at: [http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

<sup>32</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 73 (available at: [http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

<sup>33</sup> DOT/FTA, *The Predicted and Actual Impacts of New Starts Projects – 2007*, page 131.

In 1990, a preferred alternative was selected that included a three station, 6.4 mile rail extension with a locally funded, on-airport, light rail system, and was initially expected to cost \$960 million (YOE). Three years later the DEIS was amended to take on a larger scope. The project was now expected to construct an 8.2 mile, four station extension, with a cost of \$1.11 billion (YOE). Following a June 1996 FEIS, project cost had escalated further to \$1.17 billion. This is the same amount specified in the 1997 FFGA, with a total federal New Starts obligation of \$750 million and an expected revenue date of September 30, 2001.<sup>34</sup>

Within two years expected YOE cost was \$1.51 billion and delays were expected.<sup>35</sup> One important change to the project at this time was upgrading five existing rail yards instead of buying rail vehicles. Besides this the contractor experienced delays due to weather, there was an unexpected requirement to increase the size of the aerial structures to withstand earthquakes, as well as some environmental impact mitigation requirements that were not foreseen.<sup>36</sup> When the project finally opened for revenue two years late, the cost of completion had run to \$1.55 billion. Because the amounts of Federal and State of California (\$152 million) did not increase as the project cost increased, the entire amount of the overrun – \$382 million – was paid from local sources, for a total of \$650 million (not including finance charges), over 240% of the originally projected local share of \$268 million.<sup>37</sup>

Much of the increase in cost was due to the decision to bring the line directly into the airport proper – where it connects to a people-mover to move passengers around the terminal – rather than extending the people-mover to a station on the direct line to Millbrae on the West side of the Bayshore freeway (US101). This decision also led to exceedingly clumsy operations – both the SFO and Millbrae stations are "one-way" in/out, so the operator has to shift to the other end of the train before leaving – and direct Millbrae-SFO service is no longer operated, forcing passengers with destinations at either of these stations to wait for the proper train, and longer headways for those departing these two stations.

Not only did project costs come in well over what was initially envisioned for this extension, ridership was very far below what was expected. Both the DEIS and FEIS forecasted average weekday boardings of approximately 68,000 by 2010. The first year of operations (2003) saw only 17,965 average weekday boardings. This number grew to only 26,284 by 2007 and is expected to fall far short of the 2010 forecast.<sup>38</sup> Taking the actual weekday exit numbers for 2010 and doubling them (to get an estimate of total weekday boardings) gives 29,886 boardings; approximately 44% of planning projections.<sup>39</sup>

The SFO extension is in many ways closely linked to the Colma Station extension, and it can be difficult to parse out the ridership numbers for these two projects. The predicted ridership levels

<sup>34</sup> *Ibid*, page 132, 3.

<sup>35</sup> *Ibid.*, page 132.

<sup>36</sup> *Ibid.*, page 135.

<sup>37</sup> *Ibid*, page 135.

<sup>38</sup> *Ibid.*, page 134.

<sup>39</sup> Bay Area Rapid Transit, *BART Fiscal Year Weekday Average Exits*, available at <http://www.bart.gov/docs/WeekdayExits.pdf>

for Colma according to DEIS and FEIS estimates was to be 15,200 by the year 2000.<sup>40</sup> This prediction came in about 1,500 average daily boardings over the actual numbers;<sup>41</sup> or within 10% of estimates. However, ridership at Colma dropped off significantly after the 2003 opening of the SFO extension, with only 12,664 in 2003 and dropping further to 6,974 (again, calculated by doubling the number of station exits reported) by 2010.<sup>42</sup> Apparently the SFO extension cannibalized a large portion of the Colma ridership.

Taking the projections for both the Colma and SFO/Millbrae projects together, we would expect to have well over 80,000 daily riders by 2010, but the actual reported was 36,860 (exit counts doubled), or about 46% of expectations. Because much of the Colma ridership apparently shifted to the SFO extension upon completion, the 80,000 estimate obviously double counts many of the riders that would utilize any of these stops. While we would not predict that level of ridership now, this double counting did go into the “sales pitch” used to gain public support for the projects and to obtain federal funding.

The Colma and SFO/Millbrae extensions were part of a very complex, three-county agreement brokered by the Metropolitan Transportation Commission, the metropolitan planning organization for the nine-county San Francisco Bay Area. Alameda and Contra Costa Counties in the East Bay, two of the three original BART counties (the third being the City and County of San Francisco), both wanted extensions to “their” BART lines, but their ridership projections and costs made planners believe that these lines would not meet the criteria for Federal funding at the time. The SFO extension was then believed to be the most viable candidate for Federal funding, but it was in San Mateo County, which was not only *not* a BART county, but had dropped out of the BART compact before construction began, thus freeing its residents from paying the taxes to build and operate BART. This made it politically impossible for the East Bay politicians to extend BART to SFO in a non-BART county while not extending it to the many residents of the East Bay counties that had been paying BART taxes for years without any service within miles of their homes.

The compromise that was worked out essentially said that all three counties would enact additional half-cent sales taxes for transportation (including many non-BART projects), the Bay Area would apply for FTA funding for BART to SFO/Millbrae, the San Mateo County transportation tax would, in essence, pay for part of the cost of the construction of the extensions in the East Bay and, in return, San Mateo County would not only get a BART extension largely paid for the Federal government, but would also get improvements to Caltrain, the long-running – but seriously in-need-of-capital investment – commuter rail service from San Jose to San Francisco<sup>43</sup>.

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<sup>40</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 72 (available at: [http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

<sup>41</sup> DOT/FTA, *Contractor Performance Assessment Report – 2007*, page 72 (available at: [http://fta.dot.gov/publications/publications\\_9204.html](http://fta.dot.gov/publications/publications_9204.html), accessed November 3, 2010).

<sup>42</sup> <http://www.bart.gov/docs/WeekdayExits.pdf>

<sup>43</sup> MTC Resolution 1876, "Regional Rail Agreements," March 24, 1988.

In order to make the financial plan pencil out, the assumption was that the high ridership on the SFO/Millbrae extension, coupled with the premium fare charged, would enable this portion of the BART system to operate without subsidies.

Unfortunately, the high fares and other factors acted to drive away riders – and the Millbrae Station, a joint BART/Caltrain station with across-the-platform-transfers, intended to attract Caltrain riders to shift to BART, which was presumed to offer faster and/or more convenient trips to the Market Street employment corridor in the San Francisco central business district, has not proven successful, with only 9,032 average daily boardings/deboardings (calculated as station exits doubled) in 2010<sup>44</sup>.

Interestingly, the comparatively smaller investment in improving Caltrain service – which included adding new rolling stock, extensive use of limited stop service to significantly reduce travel times, extension of service South from San Jose, and extensive bicycle storage cars – produced a major increase in Caltrain service and it appears that this is where many of the expected SFO/Millbrae riders wound up. With these service improvements, Caltrain is significantly faster to many downtown destinations from Millbrae than BART. While Caltrain does not serve Downtown directly, there are a variety of transit connections at its terminus, including a light rail line that travels under Market Street, above the BART line, while the BART service takes a wide curve to the West before heading back towards downtown San Francisco. BART service to SFO/Millbrae opened in June of 2003 and the Caltrain "Baby Bullet" service began in June of 2004, both in the last month of the agencies' fiscal years.

From 2003 to 2004, the first full year of BART service to Millbrae, Caltrain ridership dropped 1.3%, to 6,625,358 unlinked passenger trips, but the following years, after the "Baby Bullet" service began, ridership increased to 8,120,853 in 2005, 9,004,662 in 2006, 10,264,225 in 2007, 10,914,621 in 2008, and 11,359,225 in 2009 – an overall increase, 2004 to 2009, of 71%.

The increase in daily commuter rail boardings exceeded 14,000 over this period. This number is slightly under half of the total boardings and deboardings on the SFO/Colma extension, but should be regarded as a higher percentage because the Caltrain trips are "full," origin-to-destination, trips far longer than the length of the BART extensions, while many of the BART trips are only partly within the extension<sup>45</sup>.

The BART Colma/SFO/Millbrae extensions required \$1,730 million and had 35,806 daily boardings – many of which were previous BART riders who transferred to a closer station, and most of whom only traveled part of their trip on these two BART extensions – in 2009. The Caltrain Baby Bullet had capital costs of \$163 million to add 14,000 totally new riders for their entire trip – and significantly sped up the trips of many pre-existing Caltrain riders. While it is reasonable to believe that a significant portion of these 14,000 added daily Caltrain riders would have taken BART to downtown instead if the Baby Bullet service had not been implemented, it was certainly nowhere near all. Even if we add all 14,000 to the BART extension ridership, it

<sup>44</sup> <http://www.bart.gov/docs/WeekdayExits.pdf>

<sup>45</sup> National Transit Database, "Profiles" for Caltrain for years cited, accessed November 8, 2010: <http://www.ntdprogram.gov/ntdprogram/data.htm>

would amount to approximately five-eighths of the 80,000 projected riders for the two BART extensions combined (which, as noted above, may include some double-counting).

Because the SFO/Millbrae extension service was not breaking even on operating costs, the San Mateo County Transit District (SamTrans) was obligated to pay BART for the subsidies. The underperformance led to reductions in BART service levels on this extension<sup>46</sup> and SamTrans' unbudgeted costs to pay the BART subsidies had negative impacts on SamTrans riders; chiefly line cancellations, service reductions, and fare increases, although SamTrans has maintained that there is not a direct connection to the BART SFO/Millbrae extension<sup>47</sup>.

### **BART Dublin/Pleasanton and Warm Springs Extensions and Oakland Airport Connector**

There have been two county-wide transportation sales taxes approved in Alameda County in recent decades, the first in 1986 and the second in 2000.

The following is an excerpt from *Alameda County Transportation Expenditure Plan*, August 1986, prepared by the Alameda Countywide Transportation Committee, the interim entity that was established to prepare the original program of projects and funding for the monies to be raised by a fifteen-year one-half cent sales tax. This document was intended to be the primary information for voters, elected officials, and other interested parties as they prepared to make their decisions to approve or disapprove the ballot measure<sup>48</sup>:

"Project: Dublin Canyon Rail Extension/Warm Springs BART Extension  
Cost: \$565 million Sales tax contribution: \$170 million

"This project includes two parts: the Dublin Canyon Rail extension and the Warm Springs BART Extension. Dublin Canyon will consist of a rail line from the Bayfair BART station along the I-580 corridor. Whether this line will be light or heavy rail will depend on the outcome of a locally produced Alternatives Analysis addressing this corridor.

"The Warm Springs BART extension is planned to extend from the Fremont BART station to Warm Springs.

"Dublin Canyon is expected to cost \$220 million in a heavy rail configuration, and Warm Springs \$345 million. A total of \$170 million is to be allocated from sales tax revenues for the Dublin Canyon portion of this project. No sales tax

<sup>46</sup> Michael Cabanatuan, "BART's Directors Approve Plan to Trim Service to S.F. Airport," San Francisco Chronicle/SFGate.com, August 12, 2005, accessed November 8, 2010

[http://articles.sfgate.com/2005-08-12/bay-area/17384394\\_1\\_samtrans-bart-directors-blue-line](http://articles.sfgate.com/2005-08-12/bay-area/17384394_1_samtrans-bart-directors-blue-line)

<sup>47</sup> Edward Carpenter, "SamTrans Struggles with Fiscal Woes," San Francisco Examiner, July 27, 2006, accessed November 8, 2010:

[http://www.sfoxaminer.com/local/samtrans\\_struggles\\_with\\_fiscal\\_woes2006-07-27T09\\_00\\_00.html](http://www.sfoxaminer.com/local/samtrans_struggles_with_fiscal_woes2006-07-27T09_00_00.html)

<sup>48</sup> Page 5, Accessed May 2, 2013:

[http://www.alamedactc.org/files/managed/Document/7697/1986\\_MeasureB\\_Expenditure\\_Plan.pdf](http://www.alamedactc.org/files/managed/Document/7697/1986_MeasureB_Expenditure_Plan.pdf)

revenue will be allocated to the Warm Springs extension until the Dublin Canyon extension is fully funded and ready for implementation. "

The above costs are expressed in 1986 dollars (page 7). All conversions to constant dollars are made by using the U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index-Urban Consumers, for the San Francisco-Oakland-San Jose area.

Obviously, the message that anyone reading the above would take away would be that a vote for the sales tax would result in the construction of both the Dublin Canyon and Warm Springs extensions. While the document, very properly, did not mandate a specific transit mode, leaving that for the later Alternatives Analysis and follow-on process, the clear identification of the cost of heavy rail – BART – served as a clear indicator of the most likely outcome.

The Pleasanton Extension wound up costing \$514 million<sup>49</sup>. Construction was completed in 1998, so, assuming a 1996 mid-point of construction, the 1986 dollars cost was approximately \$370 million – or approximately \$150 million, or 68%, over the 1986 estimate.

The above does not include the costs of the West Dublin/Pleasanton Station, BART's first – and, to date, only – "in-fill" station (a station not added at the end of a pre-existing transit line). There is some argument that this station was to be part of the Dublin Canyon extension, but was eliminated as a cost-reduction measure. It opened 2011, at a cost of \$106 million<sup>50</sup>, including a \$20 million budget overrun and a significant delay in opening due to design/construction issues, and this was up from a \$25 million construction estimate in 2002<sup>51</sup>. If we assume a 2009 date for construction mid-point, the \$106 million would be \$53 million in 1986 dollars. If this were to be added to the extension cost above, the total would be approximately \$423 million, \$203 million, or 92%, over the 1986 cost projection that was provided to voters to guide them in making their decision to approve the transportation sales tax.

Because of the shortfall caused by the cost overrun on this extension, among other things, there was no funding in the 1986 bond issue to fund the Warm Springs extension, which had to be delayed until a new source of funding was found – an extension of the original sales tax.

The following are excerpts from "Alameda County's 20-Year Transportation Expenditure Plan," July 2000<sup>52</sup>. This document was prepared for the election that year on the extension of the sales tax authorized in 1986 and had a similar origin and purpose. All costs are in 1998 dollars (page 10):

<sup>49</sup> OPAC Consulting Engineers, "BART Dublin/Pleasanton Extension," accessed May 2, 2013:

<http://www.opacengineers.com/projects/BARTDPX>

<sup>50</sup> BART, "New West Dublin/Pleasanton Station, BART's 44<sup>th</sup>, to open February 19," January 21, 2011, accessed May 2, 2013:

<http://www.bart.gov/news/articles/2011/news20110121.aspx>

<sup>51</sup> *Hacienda Network*, "Dublin/Pleasanton BART: Changing the Tri-Valley Commute in Just Five Years," April 16, 2002, accessed May 2, 2013:

[http://www.hacienda.org/ho/nw0204\\_bart5th.html](http://www.hacienda.org/ho/nw0204_bart5th.html)

<sup>52</sup> Accessed May 2, 2013:

[http://www.alamedactc.org/files/managed/Document/8472/2000\\_Measure\\_B\\_Ballot\\_and\\_Plan.pdf](http://www.alamedactc.org/files/managed/Document/8472/2000_Measure_B_Ballot_and_Plan.pdf)

"BART Extension to South Fremont (to connect to Santa Clara County Extension)

Sales Tax Funding	\$165,500,000
Other Funding Sources	<u>\$380,800,000</u>
Project Cost	\$546,300,000" (page 12)

"BART Oakland Airport Connector

Sales Tax Funding	\$ 65,800,000
Other Funding Sources	<u>\$ 64,200,000</u>
Project Cost	\$130,300,000" (page 13)

The cost of the Warm Springs extension had gone from \$220 million in 1986 dollars to \$546.3 million 1998 dollars, which is approximately \$369 million in 1998 dollars – an increase of approximately \$149 million, or approximately 68%.

The current Alameda County Transportation Commission "Project Fact Sheet" for the BART Warm Springs Extension, March 2013<sup>53</sup>, shows a total cost of \$890 million and a mid-point of construction of approximately 2012, which would convert that cost to approximately \$412 million in 1986 dollars – an increase of approximately \$192 million, or approximately 87%, in constant 1986 dollars.

The project appears headed for revenue service in 2015 – thirty years after the Alameda County voters passed a bond issue that they were told would fund it.

From the "Project Fact Sheet" for the BART Oakland Airport Connector<sup>54</sup>, we have a total project cost of \$484.1 million. The mid-point of construction appears to be 2012, so this converts to approximately \$331 million in 1998 dollars, when a cost of \$130.1 million was given to the voters to assist them in making their decision to support the sales tax extension or not. This is an overrun of approximately \$200 million – or approximately 154%.

This expenditure will provide a fixed guideway transit system from the Oakland Airport to the nearby BART Coliseum Station, with two additional stops along the alignment, which will replace a self-supporting bus system. The Airport Connector is expected to be slightly faster and, not being subject to traffic delays, will likely offer more consistent travel times than the existing AirBART shuttle buses, but it is questionable if the fares, which are expected to double

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<sup>53</sup> Accessed May 2, 2013:

<sup>54</sup> Accessed May 2, 2013:

when the Connector opens, will cover the costs of operations and capital renewal and replacement, or if the taxpayers, or airport patrons, will have to otherwise subsidize it.

(These results may offer something of an explanation of why, after the first two Alameda County Transportation Sales Tax issues passed relatively easily, the third attempt, B1 in November 2012, failed to be approved by the required two-thirds majority.)

## **Appendix P**

Bob Silvestri comment

1 **Public Comment on Draft Bay Area Plan and Draft Bay Area Plan Draft**  
2 **Environmental Impact Report (State Clearinghouse No. 2012062029): by Robert**  
3 **Silvestri, 73 Surrey Ave. Mill Valley, CA 94941; May 15, 2013: GHG Emissions**  
4

5 This letter is submitted as public comment on the Draft Bay Area Plan and  
6 Draft Bay Area Plan Draft Environmental Impact Report (State Clearinghouse No.  
7 2012062029) regarding GHG emissions noted in the DEIR.

8 **INTRODUCTION**

9 A fundamental purpose and goal of AB32, SB375, the Sustainable  
10 Communities Strategy (SCS) and Plan Bay Area is the reduction of per capita CO2  
11 emissions / greenhouse gases (GHGs) from the use of private automobiles and  
12 light trucks by 7 percent by 2020 and by 15 percent by 2035. The Sustainable  
13 Communities Strategy requires all Metropolitan Planning Organizations (MPOs) to  
14 create transportation oriented development plans as a means of achieving those  
15 goals. In addition, SECTION 4. of SB375 states that Section 65080(b)(1)(G) of the  
16 Government Code (is amended to read) that “Prior to adopting a Sustainable  
17 Communities Strategy, the metropolitan planning organization shall quantify the  
18 reduction in greenhouse gas emissions projected to be achieved by the  
19 sustainable communities strategy and set forth the difference, if any, between  
20 the amount of that reduction and the target for the region established by the  
21 state board.”

22 After review of the Plan Bay Area document and the Alternatives (“the  
23 Plan”), and the Draft Environmental Impact Report for the proposed Plan and the  
24 Alternatives (the “DEIR”), and in particular Part Two, Chapter 2.5 *Climate Change*  
25 *and Greenhouse Gas*, and Chapter 3.1, *Alternatives to the Proposed Plan*, my  
26 findings are that the DEIR fails to adequately establish reasonably proof of the

Public Comment on Draft Bay Area Plan and Draft Bay Area Plan Draft Environmental Impact Report (State Clearinghouse No. 2012062029): submitted May 15, 2013 by Robert Silvestri, 73 Surrey Ave. Mill Valley, CA 9494: GHG emissions.

27 efficacy of the proposed Plan or the Alternatives in reducing per capita or overall  
28 greenhouse gas emissions (GHGs), to meet SCS goals, and therefore fails the  
29 technical requirements under CEQA. Furthermore, based on the more specific  
30 types of analysis demonstrated herein, my findings are that Plan Bay Area and the  
31 Alternatives will increase overall and per capita GHGs rather than decrease them.  
32 Please note the following comments to support this conclusion:

33

34 **1 – THE CLIMATE CHANGE DATA PRESENTED IN THE DEIR IS NOT RELEVANT TO**  
35 **SB375 REQUIREMENTS:**

36

37 The DEIR expends the first 41 of its 85 pages, and numerous pages  
38 thereafter, presenting a variety of statistics and theoretical projections about  
39 climate change, globally and locally, and its potential impacts. However, there is  
40 no requirement for the DEIR to establish whether climate change is or is not  
41 happening, or is or is not disputable. Therefore, all this data is irrelevant to the  
42 question of whether or not the Bay Area Plan and its Alternatives will reduce or  
43 increase GHGs and if so, by how much, specifically.

44 One needs to ask why then this data has been included. It appears that it  
45 was included to sensationalize the problem and mislead the reader to assume, by  
46 inference, that there is in fact some cause and effect between this climate change  
47 data and the proposed Plan and Alternatives, without offering any actual proof or  
48 analysis to support the proposed Plan's or Alternative's efficacy in that regard.

49 The DEIR's cite of EMFAC 2011 data or MTC's supplemental technical  
50 report, *Summary of Predicted Traveler Responses*, in support of its analysis is

Public Comment on Draft Bay Area Plan and Draft Bay Area Plan Draft Environmental Impact Report (State Clearinghouse No. 2012062029): submitted May 15, 2013 by Robert Silvestri, 73 Surrey Ave. Mill Valley, CA 9494: GHG emissions.

51 inadequate. Neither EMFAC's data nor the MTC Report is sufficiently detailed to  
52 properly draw the correct conclusions about the efficacy of the Plan or its  
53 Alternatives. Raw data and simplistic analysis are not a substitute for thorough  
54 analytical methodologies. Furthermore, basing the DEIR on previous studies that  
55 concluded that high density, transit oriented development (TOD) reduces GHGs  
56 does not constitute proof or adequate analysis to conclude that the Plan and its  
57 Alternatives reduce GHGs. In addition, the theory that high density TOD reduces  
58 GHGs has been largely discredited by recent research and to be demonstrated to  
59 be inadequate to reach the conclusions found in the DEIR. This commentary will  
60 provide the types of analysis required to reasonably analyze all the GHG impacts  
61 of the Plan.

62 CONCLUSION:

63 As will be presented in this commentary, the DEIR fails to demonstrate that  
64 the Plan or Alternatives have beneficial impacts on either per capita or overall  
65 GHG emissions in order to comply with the requirements of SB375. Further, the  
66 DEIR fails to adequately analyze GHG impacts using specific Bay Area examples  
67 and circumstances.

68

69 **2 – THE DEIR USES “STATISTICAL DATA” ON AUTO AND LIGHT TRUCK GHG**  
70 **EMISSIONS TOO SELECTIVELY TO REACH ITS CONCLUSIONS, WHICH ARE NOT**  
71 **BORNE OUT BY A MORE THOROUGH ANALYSIS:**

72

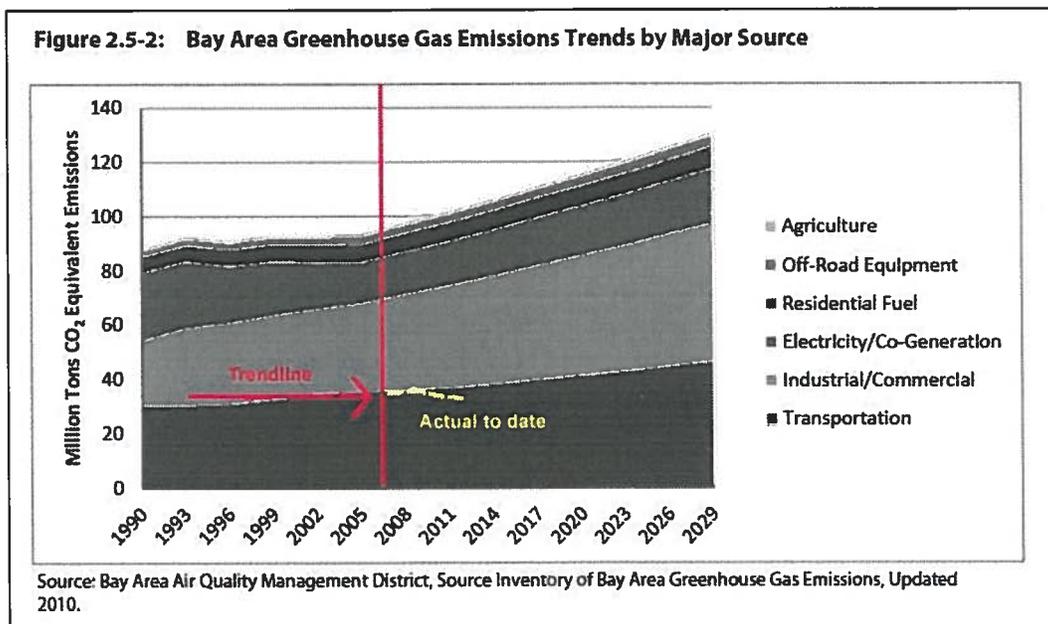
73 A fundamental goal of the Plan is to reduce per capita GHGs by reducing  
74 auto and light truck emissions. The DEIR argues that the Plan and Alternatives will

Public Comment on Draft Bay Area Plan and Draft Bay Area Plan Draft Environmental Impact Report (State Clearinghouse No. 2012062029): submitted May 15, 2013 by Robert Silvestri, 73 Surrey Ave. Mill Valley, CA 9494: GHG emissions.

75 accomplish this. To substantiate this claim the DEIR presents projections of future  
 76 GHGs from various sources, and statistical extrapolations of this assumed data to  
 77 forecast future events and trends. However, the metrics and statistical “facts”  
 78 that these prognostications are based upon appear to have been carefully “cherry  
 79 picked” from an enormous amount of available data, both past and present.  
 80 Much of the data used in the DEIR is either questionable or has been discredited  
 81 by more recent research and data. Further, to merely compile statistics based on  
 82 unexamined metrics to present a “bleak” picture of the future, and then to use  
 83 that picture as evidence to support the Plan, does not constitute a scientific  
 84 argument or proof of the Plan’s efficacy or value. However, proving the efficacy  
 85 and value of implementing the Plan is a requirement of the DEIR.

86 EXAMPLE:

87 On page 2.5-6 of the DEIR Figure 2.5-2 projects the rise in GHGs from  
 88 various economic sectors (shown below). “Transportation” is the dark area at the  
 89 bottom. These projections are extrapolated from data collected in a study that

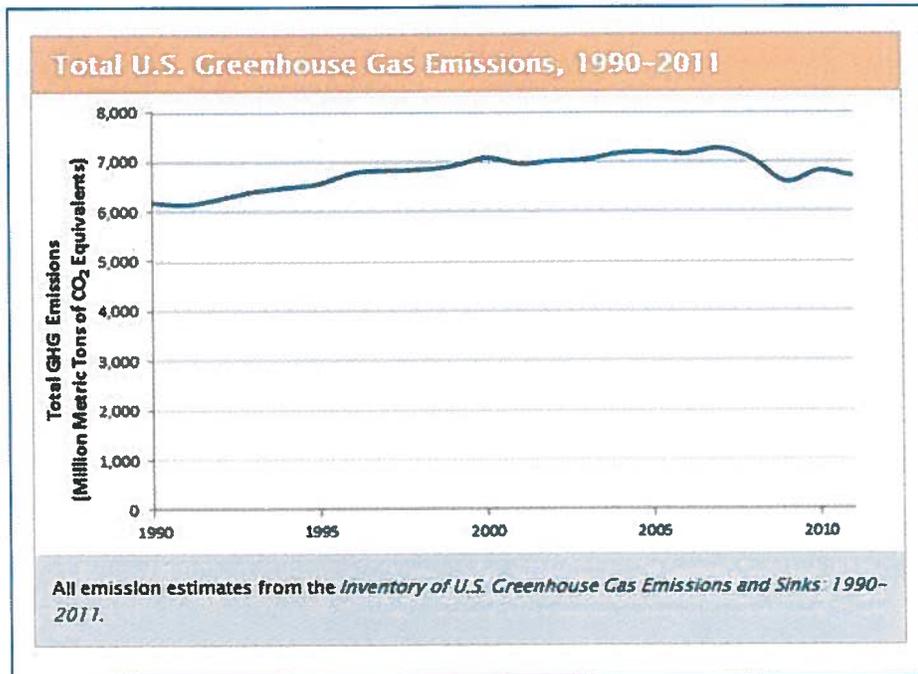


90

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91 included the years up to 2005, subsequently compiled and published in 2010.  
 92 However, the projections shown on this chart are both biased and irrelevant to  
 93 the purposes of SB375, Plan Bay Area, and the DEIR.

94 The years leading up to 2005 were arguably part of the biggest growth  
 95 boom in the history of this country (1993 to 2008), so any metrics generally based  
 96 on that are inherently distorted. In spite of this, the DEIR future projections in  
 97 Figure 2.5-2 show a straight, sloping line upwards for “transportation” from the  
 98 very day of the end of the data points that the DEIR relies on. Real data from 2005  
 99 to 2013 (shown in yellow on chart) has proven this to be false. Also, data  
 100 published since those used in the DEIR shows declining GHG emissions, as well,  
 101 including transportation. See the chart below, published by the EPA.



102  
 103 As this chart clearly shows, GHG emissions began to drop significantly after  
 104 the middle of 2008 and have been on a downward to sideways trend ever since.  
 105 However, SB375 and the Bay Area Plan are only focused on decreasing per capita

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106 GHG emissions from personal automobiles and light trucks, not the entire  
107 “transportation” sector (e.g. trains, boats, public transit, etc.). So in order to do a  
108 proper analysis, we must look at the data more closely.

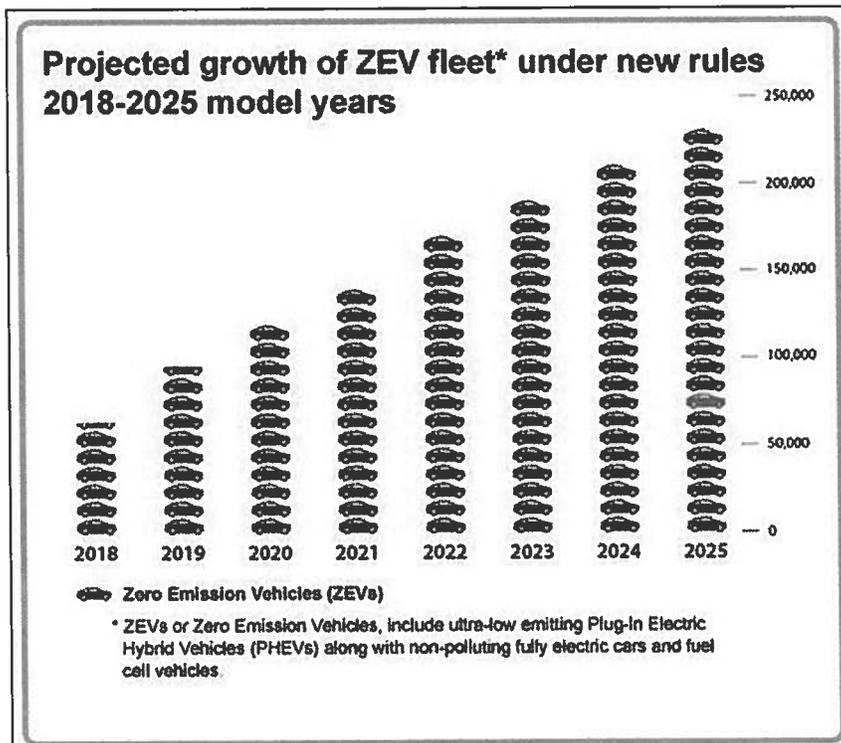
109 As chart 2.5-2 shows, GHG emissions associated with “transportation” have  
110 in fact been leveling off since the early 1990s (rate of increase decreasing or  
111 nonexistent) and not significantly increasing. However, when we look at just GHG  
112 emissions from autos and light trucks, we see that these have been trending  
113 down since 1990. For example, Figure 2.5-7 on page 2.5-58 of the DEIR shows  
114 “per capita car and light truck emissions” dramatically decreasing since 1990 out  
115 as far as 2050, directly contradicting the projections of Figure 2.5-2 (this doesn’t  
116 even include the impacts of improved vehicle technology or the new CAFE  
117 standards). Recently published data by the EPA confirms that this flat to down  
118 trend has actually continued through 2012. So it is reasonable to ask, why the  
119 DEIR consciously choose to use outdated data (Figure 2.5-2) and not include the  
120 positive effects of the new CAFE standards in its analysis.

121 The reason that GHG’s from cars and light trucks have been trending  
122 downward is the result of a host of environmental laws and GHG reduction  
123 technologies beginning to have significant effect, including the effects of  
124 improved gas mileage and improved emissions technologies, as newer models  
125 enter regular use, and it is also due to the increase in fuel prices that have begun  
126 to adjust upwards to reflect true global oil pricing: increases that bring us more in  
127 line with other nations and that are not likely to ever go down again on an  
128 inflation adjusted basis.

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129 It's also important to note that Northern California and the Pacific  
 130 Northwest has some of the highest new technology adoption rates and highest  
 131 vehicle turnover rates of anywhere in the United States, which has been  
 132 decreasing per capita GHG emissions from private auto and light truck us at a  
 133 greater rate in the Bay Area than national averages. All this has sped up the  
 134 manufacture, marketing and rapid public adoption of a wide variety of new types  
 135 of PZEV (partial zero emissions) and ZEV (zero emission) vehicles.

136 This auto industry trend is now considered permanent by the auto and light  
 137 truck industry, contradicting the fundamental arguments behind SB375 and Plan  
 138 Bay Area's future GHG projections from autos and light trucks. The U.S.  
 139 government and the EPA have recently calculated that in 2013 "up to 40 percent  
 140 of new cars sold in the US will meet California's Clean Car Program standards,"  
 141 within the time frame contemplated by Plan Bay Area (chart below by CA EPA).

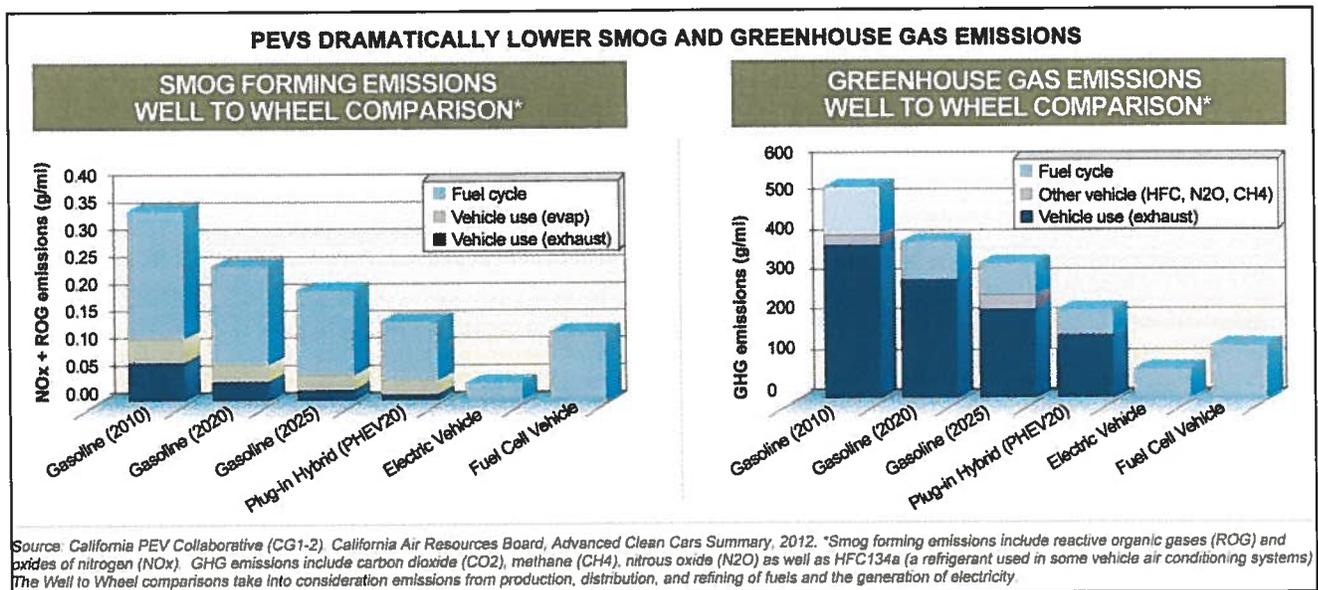


142

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143 This chart shows a projected 325% increase in ZEV vehicles (autos and light  
 144 trucks) sold in California between today and 2025. This fact, combined with the  
 145 other factors noted above, will certainly help reduce GHG emissions from autos  
 146 and light trucks in the years to come even more dramatically than shown in Figure  
 147 2.5-7. And this does not even take into account further improvements in  
 148 emissions technology being brought to market every year (to meet the new 54.5  
 149 mpg CAFE Standards) that will impact the GHG output of every type of auto and  
 150 light truck model sold in the coming decade.

151 The GHG reduction impacts of all this are quite significant because the list  
 152 of PZEV and ZEV models for sale has become larger, now including at least one  
 153 model by every major manufacturer and scores of model choices by leading  
 154 manufacturers (e.g. Ford, General Motors, Toyota, Honda, Nissan). For reference,  
 155 please note the comparative GHG emission reductions of various vehicle types  
 156 shown on the chart below (courtesy of the California PEV Collaborative and the  
 157 California Air Resources Board).



158

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159           None of this information has been properly acknowledged or factored into  
160 the DEIR's analysis and projections. In fact the DEIR even admits, on page 2.5-43,  
161 that its emissions projections are "presented without accounting for reductions in  
162 mobile source emissions that would be expected from ongoing implementation of  
163 Pavley 1 and LCFS... from these legislative requirements," even though this  
164 omission distorts the DEIR's conclusions.

165           CONCLUSION:

166           The DEIR's omission of relevant, recent data regarding the plateauing of  
167 GHG's from autos and light trucks, and the highly questionable future projections  
168 it states, reinforce the conclusion that the DEIR did not adequately examine all  
169 available information and statistics to justify its projections. This is very important  
170 since it relates directly to the main purpose of the underlying legislation (AB32  
171 and SB375) that drives the SCS process.

172           As a general comment on the Plan and its Alternatives, attempting to  
173 change human behavior and socially re-engineer society and land use based on  
174 the present design of automobiles is like trying to do that because of the design of  
175 a washer and dryer. If I proposed that, everyone would laugh. But like a washer or  
176 dryer, an automobile is just an appliance. The market understands that the most  
177 efficient use of our time, money and natural resources is to engineer a better  
178 machine (one that is fully recyclable and produces no GHGs), which it is doing and  
179 for which we need laws to continue to pressure them to do. The required  
180 technology is available to us so what actual, specific scientific evidence, research  
181 or data points does the DEIR have to support its projections of endless increases  
182 in GHG emissions from autos and light trucks, in light of compelling evidence that

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183 the exact opposite is occurring? And what evidence does the DEIR present to  
184 prove in any way that the Plan and its Alternatives will in fact have a beneficial  
185 effect on per capita GHG emissions from cars and light trucks?

186  
187 **3 – A DETAILED EXAMINATION OF ACTUAL AUTO AND LIGHT TRUCK DRIVING**  
188 **IMPACTS OF GROWTH IN MARIN COUNTY REACH THE OPPOSITE CONCLUSIONS**  
189 **OF THE DEIR, AND SHOW THAT THE PLAN WILL INCREASE GHG EMISSIONS**  
190 **RATHER THAN REDUCE GHG EMISSIONS:**

191  
192 On page 2.5-41 of the DEIR, under the title “Significant Criteria” it states  
193 that “Implementation of Plan Bay Area would have a potentially significant  
194 adverse impact if the Plan would:

195 “Criterion 1: Fail to reduce per capita passenger vehicle and light duty truck  
196 CO2 emissions by seven percent by 2020 and by 15 percent by 2035 as  
197 compared to 2005 baseline, per SB 375.

198 “Criterion 2: Result in a net increase in direct and indirect GHG emissions in  
199 2040 when compared to existing conditions.”

200  
201 Careful analysis of the potential impacts of the Plan in Marin County (used  
202 here as an example) on the use of autos and light trucks indicates that the Plan  
203 and the DEIR analysis fail objective tests on both of these Criteria.

204 In the “Method of Analysis – Greenhouse Gas Emissions” section starting  
205 on page 42 of the DEIR, states that it notes the methodology and metrics used to  
206 analyze the Plan’s Alternatives and their respective GHG impacts of cars and light

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207 trucks. However, the DEIR's analysis is superficial and inadequate, and circular,  
208 and cannot be accepted as having reached valid conclusions based only on the  
209 methods and metrics it used. Further, one cannot claim compliance with a  
210 regulation, as proof of achieving the goal of that regulation, as the DEIR attempts  
211 to do with its GHG emissions reduction outcomes.

212 EXAMPLE:

213 A detailed analysis of actual auto and light truck use in Marin County, and  
214 its potential impact of actual GHG MTCO<sub>2</sub> reductions (annual metric tons of CO<sub>2</sub>  
215 reduced), shows that the transportation and associated land development  
216 proposals espoused in the Plan will not result in any reduction in GHG emissions  
217 from auto and light truck usage, and in fact will increase overall GHG emissions  
218 and impacts in Marin County. Further, both charts shown on pages 2.5-44 and  
219 2.5-45 (Figures 2.5-5 and 2.5-6), respectively, do not have anything to do with the  
220 major components of the One Bay Area Plan, which involves the development of  
221 high density, transit oriented development (TOD) to alter personal driving of  
222 autos and light trucks.

223 ANALYSIS:

224 The stated goal of SB375 is "to reduce per capita greenhouse gas emissions  
225 (GHGs) by 15 percent by 2035." Its premise is that building high density TOD with  
226 an affordable component, will decrease driving / the use of personal autos and  
227 light trucks, and therefore reduce GHG emission and thereby have a positive  
228 effect on global warming. The statistical rationale is as follows: Section 1(a) of  
229 SB375 (restated in the DEIR) states: "The transportation sector contributes over  
230 40 percent of the greenhouse gas emissions in California. Automobiles and light

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231 trucks alone contribute almost 30 percent. The transportation sector is the single  
232 largest contributor of greenhouse gases.” This infers that SB375 and the Plan will  
233 affect 40 percent of all GHG emissions in California. This is absolutely false.

234 Per SB375 and the Sustainable Communities Strategy, and as acknowledged  
235 in the Plan and the DEIR, there are two basic legal requirements: (1) that “prior to  
236 adopting a Sustainable Communities Strategy (SCS), the Metropolitan Planning  
237 Organization (MPO) shall quantify the reduction in GHG emissions projected to be  
238 achieved.” [SB375, Section 3 (G)] and (2) that “...the MPO shall submit a  
239 description of the methodology it intends to use to estimate the GHG emissions  
240 reduced by its Sustainable Communities Strategy.” [SB375, Section 3 (I) (i)].

241

242 FALSE STATEMENTS IN THE DEIR:

243 Falsehood #1: “The transportation sector contributes over 40 percent of  
244 the greenhouse gas emissions in California,”

245 The truth is that the “40 percent” figure is a 2020 projected figure not a real  
246 measured number. The actual amount today (which itself is still estimation) is  
247 about 35 percent (Source: CA Air Resources Board: updated Oct. 2010). It seems  
248 unreasonable to base a Plan on a fabricated future guesstimate of GHG emissions  
249 to justify the Plan’s need. In any case the real number, 35 percent, is also  
250 misleading because it includes emissions from airlines, trains and trams, buses,  
251 heavy construction equipment, commercial trucking and hauling, shipping, boats,  
252 ferries, etc., *none of which* are affected by any of the Plan’s Alternatives.

253 Falsehood #2: “Automobiles and light trucks alone contribute almost 30  
254 percent.”

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255           The truth is that if you strip out the vehicles above, not affected by the  
256 Plan, you're left with about 23 percent of GHGs that can be actually contributed  
257 by personal use of automobiles and light trucks. (Source: CA Air Resources Board:  
258 updated Oct. 2010).

259           Falsehood #3: "The transportation sector is the single largest contributor of  
260 greenhouse gases."

261           In truth, according to California EPA, energy production is the number one  
262 GHG producer in California at 41 percent. Transportation is second at 35 percent.  
263 But even that is not correct because the California Air Resources Board statistics  
264 err in saying "livestock and animal breeding" is only 3 percent, but that is just a  
265 measure of total GHG tonnage from that category, not its global warming impact  
266 or "CO2 equivalency" (MTCO2e: the true scientific method of comparison).  
267 Methane gas (the majority of GHGs from livestock and breeding) is 35 times more  
268 harmful than CO2 in its global warming impact. So "livestock and breeding"  
269 actually dwarfs energy and transportation combined.

270           That aside, the question is what are the correct metrics and data points to  
271 use to arrive at accurate projections for the purposes of the DEIR?

272           Using real data only for Marin County, as a test case, the total GHG output  
273 for Marin is estimated at 2.7 million metric tons per year. With 23 percent of that  
274 from cars and light trucks which equals 621,000 metric tons of GHG per year.  
275 (Source: Bay Area Air Quality Management District; Feb 2010 Report: Source  
276 Inventory of Bay Area Greenhouse Gas Emissions).

277           However, 23 percent is misleading because much of Marin's auto and light  
278 truck usage and the associated GHG emissions will not be affected by the Plan

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279 either through public transportation improvements or high density housing,  
280 regardless of where it is built.

281 These kinds of driving include:

282 Deliveries and pickups by car, truck and van

283 Passenger vans and shuttles to private businesses and public facilities

284 Workman and building contractors transportation

285 Gardeners and home services

286 Utility service vehicles: water, power, sewer

287 City Agencies vehicles: police, fire, public works and other services

288 Health and safety vehicles

289

290 This accounts for roughly 40 percent of vehicle use in Marin. That leaves 60  
291 percent of 23 percent or 13.8 percent for personal travel. That equates to 372,600  
292 metric tons GHG (MTCO<sub>2</sub>) per year that might conceivably be positively affected  
293 by the Plan. However, 13.8 percent is still misleading because Marin County has  
294 no significant public transportation and with its geography being what it is, there  
295 are no opportunities for the traditional mass transit solutions that work well in  
296 dense "legacy" cities in the U.S (subways, surface trams, etc.).

297 65 percent of the personal driving in Marin is driving to work (Source:  
298 citydata.com).

299 This is true regardless of where we locate housing because:

300 We cannot discriminate in rentals or sales of homes based on where people  
301 work or what kind of job they have;

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302 No one can predict where they will have to go to find employment. People  
303 will go where the job is; and  
304 People don't make the decisions about where they work and where they  
305 live for the same reasons: i.e. people work where the best job opportunity  
306 is and they change that choice increasingly often. However, people choose  
307 to live where it's best for your family and lifestyle (schools, open space,  
308 amenities, etc.). There is no evidence whatsoever in any credible studies  
309 that can show that people chose where to live based on access to public  
310 transportation except in the core of urban centers like New York City,  
311 Chicago or Boston.

312  
313 This analysis leaves 35 percent of 13.8 percent or 4.83 percent for other  
314 personal driving, which equates to about 30,000 metric tons of GHGs per year  
315 that might be positively affected by the Plan. However, this 4.83 percent is still  
316 misleading because most Marin County driving is not optional because it cannot  
317 be served by public transportation, and certainly not by any public transportation  
318 contemplated in the Plan, for Marin.

319 The types of non-optional driving include:

320 Driving to lessons, soccer, schools, friends and social activities.

321 Vacations, driving to the beach or mountains, or a park, etc.

322 Driving to buy large things we cannot carry (paint, hardware, large grocery  
323 purchases, plants, clothing, equipment, etc.).

324 People shop price not location (drive to Costco, Target, etc.).

325 People have busy lives and must do multiple things in one trip.

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326           Because what you need is not nearby (i.e. people go to the doctor they  
327           need, wherever that is, not because he's next door).

328

329           So all in all only about 10 percent of people, who are not doing any of these  
330 things in Marin County, might be able to change their driving habits due to Plan  
331 Bay Area's scheme for high density housing near the highway 101 corridor. That  
332 leaves only 10 percent of 4.83 percent or 0.48 percent or 3,000 metric tons of  
333 GHGs per year could possibly be saved by SB375.

334           3,000 metric tons of GHGs per year is approximately 10<sup>th</sup> of 1 percent of all of  
335 Marin County's annual GHG output (3,000 / 2,700,000). This is a statistically  
336 insignificant savings (less than 1 percent is considered a rounding error).  
337 However, it also must be noted that these are only an estimate of those emissions  
338 that "could possibly" be influenced by the Plan, not those that will be guaranteed  
339 to be saved. In fact there is nothing being proposed in the Plan that has any  
340 possibility to significantly affect any emissions in Marin County.

341           More troubling is that the DEIR / Plan doesn't factor in or in any way  
342 adequately consider the GHG producing outcomes of more growth and  
343 development, due to MTCO2 sequestration loss, that have to be considered in  
344 weighing the costs or benefits of the Plan.

345           EXAMPLE:

346           For Marin County, careful analysis suggests that the development proposed by  
347 the Plan's Alternatives 2 through 5 will actually increase GHG emissions, not lower  
348 them. Consider the following:

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349 A typical residence produces approximately 8 metric tons of GHGs per year  
350 (estimates vary and are constantly being adjusted. This EPA estimate of 8 MTCO<sub>2</sub>  
351 is at the high end for a national average). The 2007 – 2014 RHNA cycle called for  
352 4,882 new homes in Marin (about 25 percent of which were built) and the 2014 –  
353 2022 RHNA cycle calls for 2,292 homes in Marin. This includes both market rate  
354 and affordable units. Assuming a figure of 8 MTCO<sub>2</sub>e per year, using the  
355 cumulative total of 5,954 new homes, this equates to an additional 47,632 metric  
356 tons of additional GHGs per year. This would represent an increase of 1.8 percent  
357 of the total GHG production of Marin County, presently. Comparing this to the  
358 greatest potential GHG emissions savings of the Plan (3,000 MTCO<sub>2</sub> per year)  
359 produces a net added GHGs of 44,632 MTCO<sub>2</sub> per year, not a reduction.

360 With this being calculated, the natural sequestration loss of development must  
361 now also be considered.

362 GHG SEQUESTRATION LOSS ANALYSIS:

363 The average single family residential lot size in Marin is approximately .15  
364 acres (Marin County Recorder's Office). Assuming that 20 percent of the various  
365 types of affordable units required were built at densities of 20 units per acre (the  
366 typical in-lieu required percentage) and the remainder built as single family  
367 homes, that would equate to a total loss of 774 acres of land lost (4,763 single  
368 family homes at .15 acres per home = 714 acres plus 1,191 multifamily homes at  
369 20 units per acre = 60 acres of land lost).

370 The annual carbon sequestration value of one acre of typical Marin  
371 undeveloped land (grass with some trees, not forested land) is about 1.5 MTCO<sub>2</sub>e

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372 per year. Therefore, taking 774 acres out of service equates to a negative 1,161  
373 GHGs per year.

374 Adding these two together, the net added GHGs from new development plus  
375 the loss of natural GHG sequestration of land, we arrive at a net increase in GHGs  
376 of 45,793 MTCO<sub>2</sub>e per year.

377 CONCLUSION:

378 Based on the RHNA allocations proposed, Bay Area Plan would increase GHGs  
379 produced in Marin County by 45,793 MTCO<sub>2</sub>e per year, *not* reduce GHG  
380 emissions as the DEIR claims. If the methodologies used herein are applied to  
381 other parts of the Bay Area, the results would be equal or worse. Furthermore,  
382 based on the kind of analysis demonstrated here, additional high density TOD  
383 would not only not reduce per capita or overall GHG emissions from cars and  
384 light trucks, but would actually increase GHG emissions in Marin County, as the  
385 result of producing more of the kinds of required driving noted in the above  
386 analysis, in all categories. I have not even factored this into my increased GHG  
387 analysis of the Plan. Therefore the analysis presented on pages 3.1-58 through  
388 3.1-64 are false in that actual GHG emissions will be far less than indicated.

389 What accurate and specific scientific evidence or data points does DEIR  
390 have to support the efficacy of its Plan Bay Area Alternatives in Marin County,  
391 with regard to actually reducing auto and light truck driving mileage and the  
392 resultant GHG emissions, when all required datasets are considered, as presented  
393 in the analysis above?

394 What are the impacts on the efficacy of Alternatives presented in the Plan,  
395 in achieving the goals of SB375, if all factors presented here are accurately

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396 calculated for the entire Bay Area? This example shows that the DEIR fails to  
397 specifically analyze the real impacts of the Plan in enough detail to reach realistic  
398 conclusions and therefore the DEIR GHG emissions benefit analysis must be  
399 rejected as inadequate.

400

401 **4 – GHG EMISSIONS ASSUMPTIONS USED IN THE DEIR TO CALCULATE GHG**  
402 **IMPACTS OR SAVINGS BY TYPES OF HOUSING UNITS ARE FLAWED**

403

404 Generally, the One Bay Area Plan and the DEIR make the unexamined  
405 assumption that high density, transit oriented development, and particularly  
406 multifamily housing units, produce a lower per capita MTCO<sub>2</sub>e per annum (GHG)  
407 footprint than detached single family housing, and are therefore categorically  
408 superior. For example, on page 2.5-50, the DEIR states that “This decline (in GHG  
409 emissions to meet SB375 goals) is attributable to numerous factors, most  
410 importantly the integrated land use and transportation plan in which land use  
411 pattern focuses on growth in higher density locations near transit service.” This is  
412 stated as fact but is nowhere actually proven in any conclusive way.

413 This assumption about the connection between high density TOD and GHG  
414 emissions reductions has been often repeated “Smart Growth gospel” for  
415 decades, and it has gone unchallenged in many “meta” studies on global climate  
416 change. Though it is considered “heresy” by much of the environmental  
417 community to even suggest otherwise, a close look at the original studies that  
418 support these assumptions, when compared with data from more recent  
419 evaluations, reveal that those studies were flawed and this assumption is simply

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420 not true. In fact high density TOD generally has a greater, per capita, GHG  
421 emissions footprint than single family homes.

422 This irony is due to the fact that most of the assumptions of studies that  
423 compare high density TOD to suburban single family development are biased  
424 toward a predetermined conclusion. The DEIR's unexamined acceptance of  
425 previous studies results in its faulty conclusions.

426 Most of us want to believe that scientific studies are "scientific." However,  
427 like medical studies that one day "prove" something is good for us to eat then  
428 prove that it's bad for us the next day science is unfortunately, by and large, the  
429 result of the goals of those funding the studies and the fundamental principal of  
430 "garbage in, garbage out." And in fairness, as scientific knowledge has advanced,  
431 older studies have proven to be inadequate due to faulty assumptions.

432 In the 1970's "sprawl" was an easy target for disdain for a new breed of  
433 young environmentalists who had grown up in suburbs, gone to good colleges  
434 and moved to cities where the available 24/7 access to activities better suited  
435 their lifestyle. In some ways the early environmental movement was a general  
436 attack on "white bread" suburbia and all its perceived false values and  
437 conspicuous consumption.

438 However, as much as urban centers are marvelously good economic  
439 environments and great social environments for certain demographic groups,  
440 urban development, as it exists today and as we still build it today, has yet to  
441 produce good environmental solutions. And when rated on a human health scale,  
442 urbanism also scores very poorly in human health metrics, per capita, for disease  
443 and disorders of all kinds. GHG's and air pollution in general are included in the

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444 possible reasons for that. With very few exceptions, we don't find "disease  
445 clusters" in rural or suburban areas unless a specific toxic pollutant is present, as  
446 we do with urban environments.

447 The DEIR consultants do not appear to have actually gone back to original  
448 sources or brought a skeptical eye to the datasets they employed to justify their  
449 conclusions and projections. Consider the following:

450 ANALYSIS:

451 There are five reasons why the assumptions that high density development  
452 produces lower GHG emissions on a per capita basis are false.

453 These are as follows:

- 454 1. The Definition of a "Unit" of Housing;
- 455 2. Common Areas and GHG Per Unit Calculations;
- 456 3. Urbanism's "Heat Island" and "Cold Sink" Effects;
- 457 4. Urbanism's GHG "Externalities;"
- 458 5. The Effects of Local GHG Sequestration.

459

460 Introductory Comments:

461 Many of the studies have been developed to analyze and compare the GHG  
462 output of various housing densities and living configurations. Those undertaken in  
463 the 1970's and early 1980's, particularly, were overly simplistic and led to  
464 seemingly obvious but statistically incorrect conclusions. The resultant "urban  
465 legend" about the beneficial relationship between GHG's and urbanism has  
466 become dogma. However, this conclusion is flawed.

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467 As with all “science,” one has to ask who did the study, who paid for the  
468 study, and towards what end. During the early decades of the environmental  
469 movement there was great urgency to create the EPA, pass clean air and water  
470 legislation, endangered species laws, and address variety of other issues. Climate  
471 changing GHGs were not on the radar but the environmental report card of the  
472 nation was worse than it is today. Many studies tried to show how bad things  
473 were in order to attract media and funding. They extrapolated trends that have  
474 not come true (mostly because of the legislation that was passed as a result). The  
475 five factors I’ve noted above are among the things that have taken decades to  
476 look at more carefully, and they have produced surprising results.

477  
478 The Definition of a “Unit” of Housing: functional unit vs. living unit: There  
479 are two definitions of a habitable unit. A “functional” unit means a unit that can  
480 support an average family with all those amenities that are generally considered  
481 minimum standards for habitability. It does not factor in unit size, construction  
482 method, and so on. A “living unit” includes all the requirements of a functional  
483 unit but it is adjusted for square footage size (i.e. per person per square foot of  
484 living space) and sometimes for construction type. However, many earlier studies  
485 through the 1990’s did not differentiate between these two definitions.

486 If one uses the functional unit definition to arrive at a per capita GHG  
487 calculation, it’s no surprise that high density units (which on average are smaller  
488 than single family homes) have lower energy usage and correspondingly lower  
489 GHG emissions per capita. However, as noted in *Comparing High and Low*  
490 *Residential Density: Life-Cycle Analysis of Energy Use and Greenhouse Gas*

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491 *Emissions*. J. Urban Plan. Dev., 132(1), 10–21. By Norman, J., MacLean, H., and  
492 Kennedy, C. (2006): “When the functional unit is changed to a per unit of living  
493 space basis the (beneficial) factor decreases to 1.0–1.5.” A factor of 1.0 indicates  
494 no advantage either way (and this is before the other considerations noted  
495 below).

496 Conclusion: When trying to compare the GHG output of different Plan  
497 Alternatives that include both high density and low density single family, the use  
498 of the correct definition is relevant, and in the case of all of the suburban areas in  
499 the Bay Area (e.g. Marin County) it becomes extremely relevant. The Plan does  
500 not state which definitions it is relying on in the studies used to develop the DEIR.

501  
502 Common Areas and GHG per Unit Calculations: Up until recently, very few  
503 studies correctly factored in the “pro rata share” that each unit needs to include  
504 for common spaces in a multifamily, high density building. These would include  
505 the GHG burden to heat, light, cool and otherwise make habitable common  
506 spaces such as elevators, lobbies, community rooms, laundry areas, storage areas,  
507 swimming pools and recreational areas, hallways, and all other commonly shared  
508 areas. The DEIR does not reference any studies that factor in this common area  
509 GHG burden for multifamily development, or express it in a per capita basis.

510 Conclusion: It is not arguable that correctly factoring in typical high density  
511 common areas reduces the advantages that high density development has over  
512 detached single family development when calculating GHG emissions equivalents  
513 on a per capita basis. This would have differing impacts on the outcomes of the  
514 Plan in different parts of the Bay Area: e.g. it would be very significant in

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515 calculating GHG emissions per capita in San Francisco, San Jose and Oakland, but  
516 less so in Marin, Sonoma and Napa. How does the DEIR justify its assumptions and  
517 GHG reduction conclusions since this type of analysis was not performed for the  
518 entire Plan Bay Area?

519 Urbanism's "Heat Island" and "Cold Sink" Effects: Recent studies have  
520 begun to find that dense urban cores / high density developments that have so  
521 much concrete, steel, stone and other temperature variant materials have a  
522 negative effect on energy consumption and GHG emissions. Heating and cooling  
523 effects, such as the "heat island" effect (once an urban environment gets hot, it  
524 takes more and more MTCO<sub>2</sub>e to cool it down) and the "cold sink" effect (once an  
525 urban environment gets cold, it takes more and more MTCO<sub>2</sub>e to heat it up) must  
526 now be considered for any analysis to be accurate (Note: According to the U.S.  
527 Energy Department, building operations are the biggest energy user, using 40  
528 percent of the nation's energy). More development produces more MTCO<sub>2</sub>e.

529 For example, according to a recent study done by the Lawrence Berkeley  
530 National Laboratory's Heat Island Group, about these phenomena in the city of  
531 Los Angeles, they estimated that because of the heat island effect "the demand  
532 for electric power rises nearly 2% [more] for every degree Fahrenheit the daily  
533 maximum temperature rises." The DEIR even acknowledges the effects of heat  
534 islands (page 25-21) but fails to apply its effects to its findings.

535 Conclusion: Correctly factoring in the heat island and cold sink effects  
536 would negatively alter the DEIR's analysis of the projected GHG emissions  
537 outcomes of the Plan. The DEIR does not acknowledge this required analysis in  
538 arriving at its conclusions.

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539 In Marin, for example, where over 65 percent of the County is dedicated  
540 open space, there is a natural balance of development and natural topography  
541 that acts to eliminate the heat island and cold sink effects and offer a moderate  
542 climate throughout the year. This has beneficial effects on heating and cooling  
543 energy demands and GHG emissions. How can the DEIR justify its assumptions  
544 and GHG reduction conclusions when this type of analysis has not been  
545 performed for the Plan and its Alternatives?

546

547 Urbanism's GHG "Externalities:" Proper analysis of GHG emissions  
548 externalities, or "exogenous" impacts and costs, has rarely been factored into any  
549 GHG calculation algorithms, in any studies, even those conducted by the EPA and  
550 CA EPA. The principle of external GHG impacts is simple. Everything that is  
551 required to service the habitability of development in any setting has external and  
552 largely unaccounted for "costs" that need to be factored into any per capita GHG  
553 emissions claims. Some of these would include the GHG loads required to provide  
554 fuel and energy, water, food, services such as garbage and sewage removal and  
555 treatment, and the unique demands of geographic location and micro-climates.

556 Example:

557 New York City recycles / repurposes less than 10 percent of its "trash."  
558 Marin County recycles / repurposes almost 80 percent of its waste. Marin ships it  
559 remaining trash to local landfills, at a minimum distance. NYC's trash travels  
560 thousands of miles, on average, to be dumped in landfills in the Western United  
561 States, or sorted in the South before being shipped to landfills overseas,

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562 sometimes as far as Asia. All of this has a GHG emissions cost that is not included  
563 in per capita energy consumption / GHG emissions metrics in studies or the DEIR.

564 This same principle applies to all the other categories. Power and water to  
565 major metropolitan areas takes significant energy to transport and transmission  
566 loss boosting requirements for power and water evaporation both have  
567 measurable GHG emissions burdens that must be expressed in per capita metrics,  
568 but rarely are in studies, and are certainly not factored into the DEIR. Even food  
569 transportation has a quantifiable GHG cost that is significantly higher in urban  
570 environments than it is in places like Marin, where much of our food is locally  
571 grown.

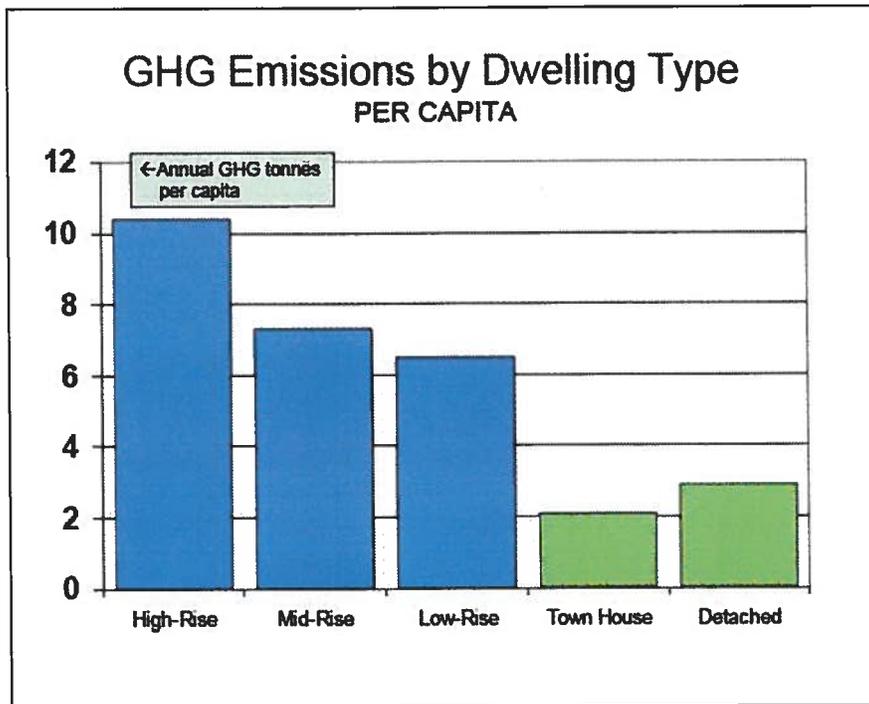
572 In addition, a recent study, *Greenhouse Gas Emissions Along the Urban-*  
573 *Rural Gradient*, by Clinton J. Andrews, published in the Journal of Environmental  
574 Planning and Management, Vol. 51, Issue 6, 2008, notes that “Reflecting their  
575 central regional roles, municipalities... have higher per-capita emissions because  
576 they host both residential and commercial buildings. Buildings in urban areas  
577 typically contribute more emissions than personal transportation” outweighing  
578 any advantages that might exist.

579 A study conducted by the Australian Conservation Foundation, *Housing*  
580 *Form in Australia and its Impacts on Greenhouse Gas Emissions* (Oct. 2007), which  
581 did attempt to factor in all of the categories of variables (living unit definition,  
582 inclusion of common areas, the heat island and cold sink effects, the type and  
583 amount of driving and vehicle trips taken, and the GHG externalities), concluded  
584 that “reducing GHG emissions is not so simple as to be achieved through the  
585 urban consolidation agenda. Indeed, there is considerable evidence to the

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586 contrary.” This study concludes that the Plan’s transportation oriented  
 587 development (TOD) approach is flawed.

588 GHG *per capita* emission estimates from the recently published Australian  
 589 Conservation Foundation Consumption Atlas, indicates virtually the opposite of  
 590 generally held perceptions. The data shows that “lower density areas, which rely  
 591 more on automobiles, tend to produce less in GHG emissions than the high  
 592 density, more public transport dependent areas that are favored by urban  
 593 consolidation policies.” Their comparative findings about residential building  
 594 types, resulting from this kind of comprehensive GHG per capita emissions  
 595 analysis is even more eye-opening (see chart below).



596  
 597 This research concludes that “low rise” high density development, the kind  
 598 that is envisioned by the Plan for Marin and many other parts of the Bay Area,  
 599 produces 2.5 times the GHG emissions of single family home development and 3

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600 times the GHG emissions of attached, single family townhouse development. High  
601 rise development produces 5 times the GHG emissions impacts of single family  
602 town homes. Even if these results were wrong by half they would still show a  
603 decided advantage to low density, suburban development.

604 Conclusion: The “facts” and metrics that form the basis of the DEIR’s  
605 conclusions about the Plan, that heavily favor high density TOD, are seriously  
606 flawed and misleading compared to any analysis that factors in all of the GHG  
607 emissions impacts of different types of factors noted herein. How can the DEIR  
608 justify its assumptions and GHG reduction conclusions in light of this information  
609 and without performing this kind of rigorous analysis in the DEIR?

610

611 The Effects of Local GHG Sequestration: The final piece of data analysis that  
612 is required to accurately assess the true GHG emissions impacts of various land  
613 use scenarios, and the Plan’s Alternatives, on a per capita basis for the entire Bay  
614 Area Region, is the calculation of what portion of GHG’s produced are sequestered  
615 locally and what portion is unaccountably “exported” to neighboring counties or  
616 regions.

617 This is relevant inquiry because all of the Plan Alternatives, except  
618 Alternative 1; *No Project*, will influence land use patterns and increase density,  
619 impacting the local MTCO<sub>2</sub>e sequestration potential of the existing ecosystems.  
620 This analysis is also relevant since the entire premise of the Plan and the DEIR is  
621 that the reduction of autos and light trucks is directly tied to transportation, land  
622 use and development patterns (i.e. their claim that high density urban  
623 development near public transportation produces superior GHG emissions

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624 reductions when compared to low density, suburban development). However,  
625 here is no evidence that local MTCO<sub>2e</sub> sequestration has been considered in the  
626 DEIR when making claims about reducing GHG emissions from autos and light  
627 trucks.

628 Furthermore, I have been unable to find a single study that combines the  
629 four other factors noted above with potential local sequestration MTCO<sub>2e</sub>  
630 variants that effect actual GHG impacts of various transportation oriented land  
631 use and development density scenarios. Yet, this data is vital to making sound  
632 planning and land use decisions and it weighs on the questionable efficacy of the  
633 Plan as described and analyzed in the DEIR.

634 Analysis:

635 Local Sequestration of Auto and Light Truck Emissions Compared in Urban  
636 and Suburban Locations (San Francisco and Marin County):

637 Automobile ownership in San Francisco County is presently 658 cars / light  
638 trucks per 1,000 people, or .66 per person. Auto ownership in Marin County is  
639 presently 756 cars / light trucks per 1,000, or .77 per person.

640 The population of San Francisco is 812,826 people. This equates to a total of  
641 536,465 vehicles in San Francisco. The population of Marin County is 255, 031.  
642 This equates to a total of 196,734 vehicles in Marin County. These totals generally  
643 match DMV registration records.

644 According to the EPA, the average American car puts out 5.2 MTCO<sub>2</sub> (metric  
645 tons of CO<sub>2</sub>) per year. As noted above, local auto sales figures would suggest that  
646 the Bay Area Region has a significantly lower average due to our early adoption of

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647 PZEV and ZEV vehicles. However, for the sake of this analysis I will use the worse-  
648 case scenario national averages.

649 Using the EPA figure, this equates to:

650 San Francisco County produces 2,789,618 MTCO<sub>2</sub> per year in GHG's from  
651 auto and light truck usage,

652 Marin County produces 1,023,022 MTCO<sub>2</sub> per year in GHG's from auto and  
653 light truck usage.

654  
655 According to the latest U.S. Census, San Francisco County, a dense urban  
656 development area has a total of 329,700 occupied housing units, of which 62,653  
657 are single family detached homes and 267,047 are multifamily units (19 percent  
658 and 81 percent, respectively).

659 Marin County, a rural and suburban, low density development area has a  
660 total of 100,650 housing units of which 63,656 are single family detached homes  
661 and 39,994 are multifamily units (63 percent and 37 percent, respectively).

662 On this per housing unit basis then, when comparing the GHG emissions  
663 from the use of autos and light trucks of San Francisco (high density urban  
664 development) and Marin County (low density rural and suburban development):

665  
666 San Francisco produces an average of 8.46 MTCO<sub>2</sub> per housing unit per year  
667 in auto GHG emissions;

668 Marin County produces an average of 10.16 MTCO<sub>2</sub> per housing unit per  
669 year in auto GHG emissions.

670

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671 Using this overly simplistic analysis based on only this one measure, one  
672 might conclude, as the DEIR apparently concludes, that dense urban development  
673 is superior to rural or suburban development with regard to auto and light truck  
674 emissions. However, that kind of analysis is inadequate to reach that conclusion.

675 *PLEASE NOTE: Keep in mind that this part of the analysis is strictly breaking*  
676 *out auto and light truck GHG emissions when compared to housing unit counts*  
677 *and not factoring in all the other considerations presented above regarding the*  
678 *effects and impacts of unit sizes, definition of what a unit is, accounting for*  
679 *common areas in multifamily high density buildings, heat island and cold sink*  
680 *effects, or GHG "externalities" that are exported to other regions, and the negative*  
681 *correlation between type of unit and GHG per capita emissions (greater density*  
682 *equals higher GHG emissions per capita).*

683 However, continuing to use this simple measurement metric, we must now  
684 apply the impacts of local MTCO<sub>2</sub> sequestration to properly compare the overall  
685 GHG impacts of urban environments to rural / suburban environments.

686 Local Sequestration Calculations:

687 San Francisco City/County covers 231.09 square miles or 147,898 acres of  
688 land. Of that approximately 10 percent is dedicated open space (mostly the land  
689 covered by Golden Gate Park, the Presidio and coastal areas and golf courses). The  
690 remainder is urban (90 percent).

691 Marin County covers 828 square miles or 529,920 acres of land. Of that  
692 approximately 65 percent is permanently dedicated open space and 15 percent is  
693 agricultural / recreational rural land. The remainder is approximately 5 percent  
694 fully developed land and 15 percent suburban.

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695           The MTCO<sub>2</sub> sequestration equivalencies for different types of land use are  
696 as follows (Sources: U.S. EPA Calculator, CA EPA, and CA Air Resources Board,  
697 which differ):

698           Forest and open vegetated land: more than 10 years old:

699           ○ 2.5 MTCO<sub>2</sub> per year per acre.

700           Agricultural / Recreational grassland:

701           ○ 1.5 MTCO<sub>2</sub> per acre.

702           Suburban land with a 40 percent lot coverage maximum:

703           ○ 1.0 MTCO<sub>2</sub> per year per acre

704           Fully developed urban landscape: minimal vegetation

705           ○ 0.2 MTCO<sub>2</sub> per year per acre

706           Comparing San Francisco County to Marin County:

707           San Francisco:

708           90 percent urban developed land: 133,108 acres at 0.2 per acre equals  
709 sequestration of 26,622 MTCO<sub>2</sub>e per year.

710           10 percent forest and open vegetated land: 14,790 acres at 2.5 per acre  
711 equals sequestration of 36,975 MTCO<sub>2</sub>e per year.

712           TOTAL San Francisco local sequestration equals 63,597MTCO<sub>2</sub>e per year.

713           Marin County:

714           65 percent forest / open land: 344,448 acres at 2.5 per acre equals  
715 sequestration of 861,120 MTCO<sub>2</sub>e per year.

716           15 percent is agricultural / recreational rural land: 79,488 acres at 1.5 per  
717 acre equals sequestration of 119,232 MTCO<sub>2</sub>e per year.

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718 15 percent suburban land: 79,488 acres at 1.0 per acre equals sequestration  
719 of 79,488 MTCO<sub>2</sub>e per year.

720 5 percent urban developed land: 26,495 acres at 0.2 per acre equals  
721 sequestration equal 5,299 MTCO<sub>2</sub>e per year

722 TOTAL Marin local sequestration equals 1,065,139 MTCO<sub>2</sub>e per year.

723 Conclusion:

724 Based on this analysis, Marin County, a rural / suburban development area  
725 that produces more GHG's per auto and light truck than San Francisco, locally  
726 sequesters more than 100 percent of its locally generated auto and light truck  
727 MTCO<sub>2</sub> emissions per year, whereas San Francisco only sequesters about 1.1  
728 percent of its locally generated auto and light truck MTCO<sub>2</sub> emissions per year.

729 This simple analysis resoundingly demonstrates that the entire premise of  
730 Plan Bay Area, the conclusions of the DEIR and the underlying premise of SB375  
731 are completely false in asserting that high density, transit oriented development  
732 categorically results in a reduction of MTCO<sub>2</sub>e emissions for personal autos and  
733 light trucks.

734 Plan Bay Area's premise only works if you ignore all the GHG's and  
735 pollutants that are "exported" from urban regions to others. And this correct  
736 analytical method indicates that the denser a place becomes the worse the  
737 balance of GHG emissions and local sequestration gets. When you now factor in  
738 the other negatives of high density building types, noted above, the effects of  
739 increasing density is decidedly negative for overall GHG emissions per capita.

740 What scientific evidence or data points does DEIR have to support the  
741 efficacy of its Plan Bay Area Alternatives, with regard to actually reducing auto

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742 and light truck driving mileage and the resultant GHG emissions, when all  
743 required datasets noted above are considered? What are the impacts on the  
744 efficacy of the Alternatives presented in the Plan, in achieving the goals of SB375,  
745 if the loss of land and the associated MTCO<sub>2</sub>e sequestration is accurately  
746 calculated? How does the DEIR account for the GHG's that it is exporting from  
747 the Bay Area to other regions due to lack of local sequestration?

748 FINAL CONCLUSIONS OF ITEM #4:

749 The various facts presented in these analysis and the resultant conclusions  
750 provide evidence, without doubt, that when all factors are considered (the  
751 impacts of unit sizes, definition of what a unit is, accounting for common areas in  
752 multifamily high density buildings, heat island and cold sink effects, unaccounted  
753 for GHG "externalities" exported to other regions, and local GHG sequestration) a  
754 suburban, single family home development, as it is found in Marin, Sonoma, Napa  
755 and other parts of the Bay Area Region is superior in reducing GHG emission on an  
756 overall basis and on a per capita basis than dense urban, TOD development found  
757 in San Francisco, Oakland and San Jose.

758 The Plan and the resultant DEIR does not acknowledge or in any way  
759 address or account for this data and findings presented here. What accurate and  
760 specific scientific evidence or data points then do the DEIR consultants have to  
761 support the efficacy of its Plan Bay Area Alternatives, with regard to actually  
762 reducing auto and light truck driving mileage and the resultant GHG emissions, if  
763 all required datasets are considered, as presented in the analysis above? How  
764 does the DEIR justify the lack of the kind of comprehensive analysis, noted herein,

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765 in arriving at its GHG emissions savings conclusions that it uses to justify Plan Bay  
766 Area?

767

768 **FINAL COMMENTS:**

769 The Bay Area Plan DEIR is without sufficient statistical or scientific basis to  
770 justify its conclusions and projections. In fact in reviewing the entire DEIR there  
771 does not appear to actually be any detailed analysis or analytical methodology  
772 provided for any of its assumptions about the relationship between TOD and GHG  
773 emissions it claims. The Alternatives described in the DEIR (aside from Alternative  
774 #) will be more economically destabilizing for small cities, are financially  
775 irresponsible in that they encourage the expenditure of large sums of taxpayer  
776 fund for no discernible benefits, and they will, overall, be environmentally  
777 harmful rather than beneficial as claimed.

778 Building more and more housing, of any type, and other kinds of  
779 development, without jobs growth first, leads to “unsustainable” communities  
780 and potential bankruptcy for small cities (e.g. Vallejo, Modesto and San  
781 Bernadino). The building methods available to us today, even with token gestures  
782 like LEED certification, do not even begin to justify the belief that more TOD  
783 development is good for the environment. The truth is that development, TOD or  
784 otherwise, particularly in counties like Marin, Sonoma and Napa, only sets in  
785 motion an endless feedback loop the drives even more development to  
786 accommodate support services and our consumption driven economy, and ever  
787 more auto and light truck use and, more importantly, more shipping, trucking and  
788 other more impactful transportation demands as a result.

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789           The basic assumptions of the Plan are fundamentally flawed and contradict  
790 the laws of supply and demand, free markets and how cities grow and survive.  
791 Most troubling is that in the end, after all the costs and burdens that the One Bay  
792 Area Plan are tallied, combined with the burdens of the HCD RHNA allocation  
793 process will impose on our communities, the Plan will not result in providing what  
794 we really need: more high quality jobs and more quality, affordable housing  
795 choices for those most in need.

796           Examination of the Plan Bay Area Plan DEIR shows that this report fails to  
797 satisfy the requirements of SB375 and the technical requirements of the DEIR  
798 under CEQA because it fails to prove that any of the Alternatives will actually  
799 achieve the goal of reducing per capita or overall GHG emission from the use of  
800 autos and light trucks.

801           The DEIR analysis makes the common error of mistaking correlation with  
802 causation. It substitutes unscientific observations and unqualified statistics for  
803 proper scientific inquiry or demonstrable facts to arrive at what appear to be  
804 predetermined conclusions that are insupportable and inaccurate.

805           The DEIR attempts to persuade readers by inference and through anecdotal  
806 evidence rather than by doing the kind of specific and direct analysis as I've  
807 presented above. And in fact the burden of proof is on those who drafted the  
808 DEIR to show why the analysis I've presented was not undertaken. The DEIR offers  
809 a "take our word for it" approach but offers no detailed calculations or formulas,  
810 of any actual proof whatsoever to prove the Plan's efficacy in meeting the goals of  
811 SB375. Its statistical data relies on studies done by its partners (MTC, BAAMQ,  
812 etc.), whose objectivity and motivations must be questioned. It seems

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813 questionable that with the breadth of studies and scientific knowledge available  
814 today to anyone wishing to do serious research, that the DEIR would choose to  
815 rely so heavily on statistical data developed by the very organizations (MTC,  
816 ABAG) who created the Plan that the DEIR is supposed to be objectively vetting.  
817 And considering how much irrelevant information has been included in the DEIR,  
818 a more cynical view would be that the DEIR is trying to “paper over” the situation  
819 and throw so much material at the reader (in excess of 1,300 pages) that the  
820 reader gives up accepts its conclusions, unchallenged.

821         Based on the evidence and kinds of analysis presented herein, the DEIR has  
822 failed to fulfill the technical requirements under CEQA, and the Plan and its  
823 Alternatives has failed to comply with the requirements and goals of AB32, SB375  
824 and the SCS in reducing per capita or overall GHG emission. The analysis I’ve  
825 presented demonstrates that the Plan and its Alternatives will increase per capita  
826 and overall GHGs rather than decrease per capita and overall GHGs, so the DEIR is  
827 both incorrect and misleading in its conclusions, and inadequate under the  
828 requirements of CEQA Guidelines.

## **Appendix Q**

DEIR section 2.2(d) Mitigation measures

### **Mitigation Measures**

Implementing agencies and/or project sponsors shall consider implementation of mitigations measures including but not limited to those identified below.

**2.2(d)** Mitigation measures that shall be considered by implementing agencies and/or project sponsors where feasible based on project-and site-specific considerations include, but are not limited to best management practices (BMPs), such as the following:

- Installation of air filtration to reduce cancer risks and PM exposure for residents, and other sensitive populations, in buildings that are in close proximity to freeways, major roadways, diesel generators, distribution centers, railyards, railroads or rail stations, and ferry terminals. Air filter devices shall be rated MERV-13 or higher. As part of implementing this measure, an ongoing maintenance plan for the building's HVAC air filtration system shall be required.
- Phasing of residential developments when proposed within 500 feet of freeways such that homes nearest the freeway are built last, if feasible.
- Sites shall be designed to locate sensitive receptors as far as possible from any freeways, roadways, diesel generators, distribution centers, and railyards. Operable windows, balconies, and building air intakes shall be located as far away from these sources as feasible. If near a distribution center, residents shall not be located immediately adjacent to a loading dock or where trucks concentrate to deliver goods.
- Limiting ground floor uses in residential or mixed-use buildings that are located within the set distance of 500 feet to a non-elevated highway or roadway. Sensitive land uses, such as residential units or day cares, shall be prohibited on the ground floor.
- Planting trees and/or vegetation between sensitive receptors and pollution source, if feasible. Trees that are best suited to trapping PM shall be planted, including one or more of the following: Pine (*Pinus nigra* var. *maritima*), Cypress (*X Cupressocyparis leylandii*), Hybrid poplar (*Populus deltoids X trichocarpa*), and Redwoods (*Sequoia sempervirens*).
- Within developments, sensitive receptors shall be separated as far away from truck activity areas, such as loading docks and delivery areas, as feasible. Loading dock shall be required electrification and all idling of heavy duty diesel trucks at these locations shall be prohibited.
- If within the project site, diesel generators that are not equipped to meet ARB's Tier 4 emission standards shall be replaced or retrofitted.
- If within the project site, emissions from diesel trucks shall be reduced through the following measures:
  - Installing electrical hook-ups for diesel trucks at loading docks.
  - Requiring trucks to use Transportation Refrigeration Units (TRU) that meet Tier 4 emission standards.
  - Requiring truck-intensive projects to use advanced exhaust technology (e.g. hybrid) or alternative fuels.
  - Prohibiting trucks from idling for more than two minutes as feasible.

## **Appendix R**

Appendix R - MTC Model Run 2040\_03\_78, 91, 2013  
RTP/SCS CO<sub>2</sub> and Criteria Pollutant Summary Results,  
November 6, 2012





Hello Harold and Rupinder,  
Two model runs are complete: 2040\_03\_078 and 2040\_03\_091. The first is a simulation of EIR Alt. #1 No Project; the second is a simulation of EIR Alt. #2 Preferred, using the UrbanSim results. Please inspect the roadway networks and generate emission estimates.  
thank you,  
dave

file:///C:/Users/pgrove/AppData/Local/Temp/XPgrpwise/515EBA15MTC-DOMAINMTC-PO1001393861131FD21515EBA15MTC-DOMAINMTC-PO20020000A71342B... 5/9/2013

## **Appendix S**

October 3, 2012 Regional Modeling Working Group meeting minutes

# MINUTES

**Regional Modeling Working Group**  
**1333 Broadway, Suite 300**  
**Oakland, CA 94612**  
**October 3, 2012**  
**10:00 am**

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## **I. Welcome/Introductions**

Chris Augenstein, VTA  
Chris Barney, SCTA  
Matt Bomberg, ACTC  
Tilly Chang, SFCTA  
Sean Co, MTC  
Phillip Cox, Caltrans  
Robert Guerrero, STA  
Eliot Hurwitz, NCTPA  
Linda Jackson, TAM  
Martin Engelmann, CCTA  
Matt Kelly, CCTA  
Valerie Knepper, MTC  
Suzanne Loosen, TAM  
Robert Macaulay, STA

Jason Munkres, ABAG  
George Naylor, VTA  
David Ory, MTC  
Michael Reilly, ABAG  
Elizabeth Sall, SFCTA  
Mark Shorett, ABAG  
Saravana Suthanthira, ACTC  
Dan Tischler, SFCTA  
Dave Vautin, MTC  
Kara Vuicich, ACTC  
Beth Walukas, ACTC  
Matthew Wilcox, NCTPA  
Hing Wong, ABAG  
Sandy Wong, C/CAG

## **II. Review of September 12, 2012 Meeting Minutes (All)**

Minutes were accepted by consensus.

## **III. Plan Bay Area EIR – UrbanSim/Travel Model One Analysis (ABAG/MTC)**

Michael Reilly (ABAG) presented preliminary model output for the No Project and Project EIR alternatives, seeking feedback on model calibration and reasonableness. At this point, the No Project alternative reflects a continued dispersal of housing and jobs to suburban and exurban areas, while the UrbanSim Project alternative focuses employment in core areas and preserves the existing housing shares. Further subsidies will be required to achieve the Jobs-Housing Connection vision of greater concentration of housing in the region's core. With regards to PDA growth, only San Francisco achieves its housing growth share targets for PDAs in the No Project alternative; all other counties will require significant policy intervention (likely subsidies) to meet the JHC vision in the Project alternative. Staff also provided some additional information about scheduled development events, also known as "pipeline" projects; these projects were coded into the model due to their relatively large size and their reliance on government intervention for construction. ABAG and MTC staff will continue their analysis of all five alternatives over the next few months.

Beth Walukas (ACTC) clarified that "pipeline" land use projects can be thought of as a "committed" land use project list. Elizabeth Sall (SFCTA) further clarified that hardcoding a project ensures it will be built, but that in UrbanSim the occupancy of the project will still be determined through the market-based mechanisms.

CMA staff had a number of questions about these scheduled developer events. Several members asked to review the “pipeline” list; Michael agreed to send out the list in the next few weeks. George Naylor (VTA) was concerned that the San Francisco projects may distort the model.

Subsidies were also a discussion item for the group. Chris Augenstein (VTA) indicated concern that while the transportation improvements are financially constrained, the land use pattern is not financially constrained; David Ory (MTC) responded that this would be a relevant topic for a future Planning Committee discussion. A discussion followed regarding the specifics of a subsidy program, how it affects the model, and how it may be implemented in the future.

There was considerable interest in model calibration and validation issues. Chris asked about the model’s margin of error, which David indicated was large at this point. Matt Bomberg (ACTC) asked whether validation testing had been performed for both supply and demand of housing units; Michael responded that that was the case. Chris, George, and Beth asked to see calibration and validation documentation; David responded that the UC Berkeley UrbanSim team is working on those documents with a target completion date of January.

Beth Walukas (ACTC) commented that CMA staff appreciated the compressed timeline faced by MTC/ABAG staff in the RTP/EIR process and development of UrbanSim and recognized that UrbanSim is a significant improvement over previous methods of devising land use scenarios. She summarized comments made by the committee and expressed the need to better understand the process and assumptions in order to be supportive of the RTP/EIR outcome and proposed that the CMAs need a chance to review (1) documentation of calibration/validation of UrbanSim, (2) the list of “pipeline” land use projects, and (3) additional information on assumed financing for subsidies to achieve project alternative land use patterns.

Several other questions were raised by meeting participants. Martin Engelmann (CCTA) wanted to understand the No Project housing growth in Brentwood, given existing market conditions; Michael responded that the currently depressed housing market is not expected to continue over the entire lifespan of the Plan. Chris and George asked about the implementation of existing general plans in UrbanSim and why zoning was changed in the Project alternative; Michael responded that the maximum zoning in city plans was used for the No Project, while upzoning was performed in the Project to support focused growth in PDAs. George wanted to know the relative impact of the urban growth boundary policy; David theorized that the growth boundary had a substantial policy impact on the Project alternative. Elizabeth Sall (SFCTA) asked about which Project land use pattern would be run through the travel model; David specified that this issue is still to be determined. Finally, Martin asked about the GHG performance of both draft alternatives; David estimated that the No Project alternative will have a GHG reduction between 3% and 5%, while the Project alternative will remain between 16% and 17%.

#### **IV. Update on Travel Model One Development (MTC)**

David Ory (MTC) distributed a handout highlighting the status of various efforts related to travel model development, including the California Household Travel Survey and the Transit On-Board Survey. Zone review meetings for the travel model supply update will be rescheduled following the release of draft zone boundaries. Saravana Suthanthira (ACTC) asked when the release is expected; David indicated that he anticipates the release sometime this winter.

#### **V. Update on Goods Movement Modeling Efforts (Caltrans)**

Phillip Cox (Caltrans) provided a brief presentation on the California Statewide Freight Forecasting Model, an on-going effort to model commodity flows. This effort, independent of the development of a statewide PECAS model, estimates flows and assigns them to freight modes and routes in Cube

– with the goal of measuring general flows in the state. David Ory (MTC) was interested in general availability of the model; Phillip stated that the model is still under development, so staff would need to work with Caltrans staff on a one-on-one basis. Robert Guerrero (STA) indicated his interest in exploring the utility of this model on the county level.

**VI. Other Business**

none

**VII. Next Meeting – November 7, 2012**

Meeting start time was changed to 9:30 AM at the request of ACTC staff.

(Note: this meeting has since been canceled.)

## **Appendix T**

PDA-List, January, 2010

## Priority Development Areas by County

Updated January 2010

### Alameda County

Alameda County: *Urban Unincorporated Area*

City of Alameda: *Naval Air Station*

City of Berkeley: *Adeline Street*

City of Berkeley: ***Downtown***

City of Berkeley: *San Pablo Avenue*

City of Berkeley: *South Shattuck*

City of Berkeley: *Telegraph Avenue*

City of Berkeley: *University Avenue*

City of Dublin: *Town Center*

City of Dublin: *Transit Center*

City of Dublin: *West Dublin BART Station*

City of Emeryville: *Mixed Use Core*

City of Fremont: *Centerville*

City of Fremont: *Central Business District*

City of Fremont: *Irvington District*

City of Hayward: *Downtown*

City of Hayward: *South Hayward BART Station*

City of Hayward: *The Cannery*

City of Livermore: *Downtown*

City of Newark: *Dumbarton Transit Area*

City of Newark: *Old Town*

City of Oakland: *Corridors & Station Areas*

City of Pleasanton: *Hacienda*

City of San Leandro: *Bay Fair BART Transit Village*

City of San Leandro: *Downtown*

City of San Leandro: *East 14th Street*

City of Union City: *Intermodal Station District*

### Contra Costa County

City of Antioch: *Hillcrest eBART Station*

City of Antioch: *Rivertown Waterfront*

City of Concord: *Community Reuse Area*

City of El Cerrito: *San Pablo Avenue*

City of Hercules: *Central Hercules*

City of Hercules: *Waterfront District*

City of Lafayette: *Downtown*

City of Martinez: *Downtown*

City of Oakley: *Downtown*

City of Oakley: *Employment Area*

City of Oakley: *Southeast Oakley*

City of Orinda: *Downtown*

City of Pinole: *Old Town Pinole*

City of Pinole: *Appian Way Corridor*

City of Pittsburg: *Downtown*

City of Pittsburg: *Railroad Avenue eBART Station*

City of Pleasant Hill: *Buskirk Avenue Corridor*

City of Pleasant Hill: *Diablo Valley College Area*

City of Richmond (with Contra Costa County):  
*North Richmond*

City of Richmond: *Central Richmond*

City of Richmond: *South Richmond*

City of San Ramon: *City Center*

City of San Ramon: *North Camino Ramon Plan Area*

City of Walnut Creek: *West Downtown*

Contra Costa County: *Contra Costa Centre*

Contra Costa County: *Downtown El Sobrante*

Contra Costa County: *Pittsburg/Bay Point BART Station*

Town of Moraga: *Moraga Center*

West Contra Costa Transportation Advisory Committee:  
*San Pablo Avenue Corridor*

### Marin County

City of San Rafael: *Downtown*

City of San Rafael: *Civic Center/North San Rafael Town Center*

Marin County: *Urbanized 101 Corridor*

### San Francisco City and County

*19th Avenue Corridor: County Line to Eucalyptus Drive  
Bayview/Hunters Point/Candlestick Point*

*Better Neighborhoods: Balboa Park/Market & Octavia*

*Downtown Neighborhoods & Transit Rich Corridors*

*Eastern Neighborhoods*

*Mission Bay*

*Port of San Francisco*

*San Francisco/San Mateo Bi-County Area (with City of  
Brisbane)*

*Transbay Terminal*

*Treasure Island*

### San Mateo County

City/County Association of Governments: *El Camino Real*

City of Brisbane (with City & County of San Francisco):  
*San Francisco/San Mateo Bi-County Area*

City of Daly City: *Bayshore Neighborhood*

City of Daly City: *Mission BART Corridor*

City of East Palo Alto: *Ravenswood Business District and 4  
Corners*

City of Menlo Park: *El Camino Real Corridor & Downtown*

City of Millbrae: *Transit Station Area*

City of Redwood City: *Downtown*

City of San Bruno: *Transit Corridors*

City of San Carlos: *Railroad Corridor*

City of San Mateo: *Downtown*

City of San Mateo: *El Camino Real*

City of San Mateo: *Rail Corridor*

City of South San Francisco: *Downtown*

\*Planned PDAs listed in Bold

**Santa Clara County**

**City of Campbell:** *Central Redevelopment Area*  
**City of Gilroy:** *Downtown*  
**City of Milpitas:** *Transit Area*  
**City of Morgan Hill:** *Downtown*  
**City of Mountain View:** *Whisman Station*  
**City of Palo Alto:** *California Avenue*  
**City of San Jose:** *Consolidated Area*  
**City of San Jose:** *Cottle Transit Village and Shopping Center*  
**City of Sunnyvale:** *Downtown & Caltrain Station*  
**City of Sunnyvale:** *El Camino Real Corridor*  
**City of Sunnyvale:** *Lawrence Station Transit Village*  
**Valley Transportation Authority:** *City Cores, Corridors & Station Areas*

**Solano County**

**City of Benicia:** *Downtown*  
**City of Fairfield:** *Downtown South*  
**City of Fairfield:** *Fairfield/Vacaville Train Station*  
**City of Fairfield:** *North Texas Street Core*  
**City of Fairfield:** *West Texas Street Gateway*  
**City of Suisun City:** *Downtown & Waterfront District*  
**City of Vacaville:** *Allison/Ulatis Area*  
**City of Vacaville:** *Downtown*  
**City of Vallejo:** *Waterfront & Downtown*

**Sonoma County**

**City of Cloverdale:** *Downtown & SMART Transit Station*  
**City of Cotati:** *Downtown & Cotati Depot*  
**City of Petaluma:** *Central Petaluma*  
**City of Rohnert Park:** *Sonoma Mountain Village*  
**City of Santa Rosa:** *Downtown Station Area*  
**City of Santa Rosa:** *Mendocino/Santa Rosa Avenue Corridor*  
**City of Santa Rosa:** *Sebastopol Road Corridor*  
**City of Sebastopol:** *Nexus Area*  
**Town of Windsor:** *Redevelopment Area*

## **Appendix U**

Cities Resist Regional Plan to Limit Sprawl, SF Public Press,  
June 13, 2012



Published on *SF Public Press* (<http://sfpublicpress.org>)

[Home](#) > Cities resist regional plan to limit sprawl

## Cities resist regional plan to limit sprawl

By [Angela Hart](#) <sup>[1]</sup>

SF Public Press

— Jun 13 2012 - 2:44pm

A high-profile effort to focus new Bay Area housing into energy-efficient transit villages is seen as unworkable even as it makes its public debut this summer, say urban planners, because regional government lacks the authority to make cities build dense urban neighborhoods. The three-decade Plan Bay Area, unveiled in May, is the product of more than two years of research on the region's demographics, economy, transportation and architecture. Proponents say "smart growth" could be the future of the Bay Area — if regional agencies had either the legal tools to enforce the grand vision or enough money to make it worthwhile for cities to participate.

[BART is just steps away from a new senior housing complex rising in West Oakland. Planners say more transit-oriented developments will discourage driving, improve street life and cool the planet. Photo by Jason Winshell / SF Public Press.](#) <sup>[2]</sup>

[A tabletop model of the Bay Meadows housing development that will rise next door to a Caltrain station in San Mateo. Photo by Jason Winshell / SF Public Press.](#) <sup>[3]</sup>

[Commuter traffic on the San Francisco-Oakland Bay. Photo by Tearsa Joy Hammock / SF Public Press.](#) <sup>[4]</sup>

Image

[Jason Winshell](#) <sup>[5]</sup>

[Tearsa Joy Hammock](#) <sup>[6]</sup>

### ***Weak regional agencies could miss pollution targets if they are unable to persuade local leaders to change***

A high-profile effort to focus new Bay Area housing into energy-efficient transit villages is seen as unworkable even as it makes its public debut this summer, say urban planners, because regional government lacks the authority to make cities build dense urban neighborhoods.

The three-decade Plan Bay Area, unveiled in May, is the product of more than two years of research on the region's demographics, economy, transportation and architecture. Proponents say "smart growth" could be the future of the Bay Area — if regional agencies had either the legal tools to enforce the grand vision or enough money to make it worthwhile for cities to participate.

But authors of the plan say that so far it remains more symbolic than realistic, because they have no recourse if cities decline to channel home building away from sprawl and into walkable and

transit-friendly areas. And local governments became less able to afford their own infrastructure projects after this year's elimination of all local redevelopment agencies in California.

Egon Terplan, regional planning director at the San Francisco Planning and Urban Research Association, admitted it might be a harsh critique, but the effort "becomes, as a planning document, kind of useless. It's more of a political document."

He said "micro-negotiations" among hundreds of local leaders have fractured the idealistic vision, as many cities scramble to toss housing growth requirements to their neighbors like hot potatoes.

## POLITICS IS LOCAL

The problem stems from the weak state laws that spurred the plan. Without real enforcement, regional agencies must seek political consensus among 110 local and county governments. And without their buy-in, the Bay Area could fail to deliver on a 2008 law requiring the state to curb per capita greenhouse gases from automobiles by 15 percent by 2035. Plan Bay Area has so far accounted for a reduction of only 9 percent.

The prospect of more money, the tool most supporters say could rescue the process from political squabbling, is fading by the month as California's budget deficit deepens.

The professional staff at regional agencies rolled out the formal plan in May. Right away, they admitted they were pessimistic about achieving their main goal: limiting uncontrolled housing construction in the suburbs by steering most new development into 200 "priority development areas" in at least 60 cities, many along transit lines.

"The resources are going to be tight, but there's no way we can carry out this level of development without some sort of replacement to redevelopment," said Miriam Chion, the No. 2 planner at the Association of Bay Area Governments, which is working with the Metropolitan Transportation Commission on the plan.

"We need to leverage some state and federal support," she said. "It's not going to be easy."

Chion said smart growth could dig the Bay Area out of the housing crisis and speed economic recovery. "Infill" development can attract jobs to the urban core, encouraging housing development and new businesses in cities.

Ken Kirkey, the association's planning director, was more sanguine about the plan's chances.

"We think it can work," he said. "It's fairly optimistic, but we think not unduly optimistic. When we look at the feedback from local governments taking on most of the growth, their concern isn't that this is a bad idea. Their primary concern is: How are we going to do this?"

He was somewhat dismissive of the public opposition over the last year, particularly from vociferous anti-planning activists. "There seems to be a lot of anger in the body of politics these days."

But the current prospects for the plan seem somewhat dimmer for another key consultant, Karen Chapple, an associate professor of city and regional planning at the University of California,

Berkeley.

"This is really a great idea, but it's just basically impossible to implement," Chapple said. "People fighting it are essentially wasting their time. Because without major change at the state and federal level, nothing is going to change."

### **PUBLIC SKEPTICISM**

Planners have become more discouraged about the plan's prospects in part because of recent resistance from conservative activists, who pack meetings across the region to denounce the plan as "authoritarian" and "social engineering."

The Association of Bay Area Governments has held dozens of community meetings since 2010, some generating more than 200 oral and written comments. A small cadre of tea party activists pushed back hard against the Plan Bay Area draft. The most outspoken call the unelected regional agencies a step toward a repressive world government.

Opponents often say they don't want their towns to look like "cookie-cutter" communities or be "forced" to live in high-rise apartments.

"It seems like it takes away some freedom, that we can't live where we want to live and work where we want to work," said one of about two-dozen irate speakers during public comment at a Plan Bay Area meeting in March. Another lamented: "They want you to think you have input, but we don't."

What many protesters do not, perhaps, realize is that regional government is so weak it cannot force cities to do much of anything. Agency officials say some town leaders refuse to enact minor zoning changes to raise permitted heights of buildings in transit corridors. So there is little danger they will start relocating residents en masse.

Association officials acknowledged in a recent report that the opposition remained a significant challenge: "They're fearful of losing local character of cities and towns."

But public opinion seems at least initially skeptical of the idea of regional planning.

Planners held four focus groups in Novato, Walnut Creek and San Francisco and conducted a survey of 1,610 residents regionwide last November through January. Fifty-one percent opposed regional planning for the Bay Area, opting instead for cities and counties to plan on their own. Forty-four percent supported a regional plan.

Support for regional planning does not necessarily correlate with city size. Big cities like Oakland and small towns such as Dixon in Solano County are eager to take more housing. But Curtis Williams, city planner in the relatively well-off city of Palo Alto, said his and other small and midsize places are already built out.

Under the climate-change legislation, all regions in the state must have a "sustainable communities strategy" to help reduce greenhouse gas emissions by getting commuters out of their cars. The Bay Area plan also aims to build enough housing in cities to accommodate all

income levels over the next 30 years.

But cities sometimes have other priorities, and many were facing steep budget cuts year after year even before state funding vanished.

Ken Moy, legal counsel for the Association of Bay Area Governments, said cities are not obliged to act in accordance with the plan. "No," he said, "the state won't come after you."

The agency enforcing the climate-change laws, the California Air Resources Board, said legal action is unlikely if cities ignore it.

"We're still in the process of working through nuts and bolts," said Dave Clergen, a spokesman for the board, which is responsible for implementing AB 32, known as the Global Warming Solutions Act, and a related Senate bill, SB 375.

"This is an ongoing process, and our goal is to get the job done, not necessarily to penalize people," Clergen said.

### HORSE TRADING

Kirkey said the problem from the start has been that each city lobbies for its own interests. To make Plan Bay Area work, regional officials need to persuade cities to think in a regional context. The best they can hope for is a negotiation: Cities that want more growth can grab it, and others can pass.

The challenge from the start was to deal with expected Bay Area population growth in a way that treated all communities equitably while preserving the environment. The state estimates that the region will need sufficient housing for 2.1 million more people by 2040 to prevent overcrowding and long commutes. That would require the creation of about 1.1 million more jobs.

The State Department of Housing and Community Development translates those numbers into housing needs, which in March it set at 660,000 new units for the region, though some elected officials who don't want that much growth say the numbers are too high.

The Association of Bay Area Governments is not actually a government body in the sense that it can pass laws or levy taxes. It is best described as a quasi-governmental group. It calls itself "part regional planning agency and part local government service provider." Each of 101 cities in the region and nine counties has one vote. Most of those cities want to lead the organization, not follow.

Chion said the combination of a grand vision and the lack of enforcement power is a recipe for coming up short: "Cities are not required to match their general plans with the regional effort. This plan provides a sense of direction for the type of development we would like to encourage. There are no consequences for cities that don't do anything."

Just because cities end up with more housing allocations from regional planners, they are not required to build it. All they have to do is zone for it. Cities can relax restrictions on building height, spacing between units, the distance from the curb and developers' ability to stack housing

on retail or commercial space — elements that separate suburbs from cities.

But city councils and county boards of supervisors have few tools to make dense building actually happen. Without market demand to spur private-sector investment, maps that take hundreds of hours to draw can end up on dusty shelves. So regional planners have to convince and cajole using economic arguments.

“There’s an inherent supply-and-demand challenge here in the Bay Area,” Kirkey said. “Then you have to look at, OK, what does this mean in terms of housing demand, and how much housing as a region can we produce.”

### **DEVELOPERS DECIDE**

That approach puts success in the hands of private developers who are more concerned about sales than innovating mixed-use developments that planners say are good for the region.

The problem has deep historical roots. Regional planners are trying to change the pattern that led to the rise of post-World War II suburbia: voracious expansion into open space far from city centers, areas that were accessible only by car. But in recent decades, cities have increasingly sought to build housing within existing urban growth boundaries, preventing encroachment into green spaces.

But with the financial woes plaguing the housing industry since 2008, few projects are getting built. A consensus has emerged among policymakers that the region does not have enough money — either public or private — to do much with the regional planning document right now.

Though the Association of Bay Area Governments barely has any money itself, it has worked with the Metropolitan Transportation Commission to create a pool of funds called One Bay Area grants. Over four years, the agencies will distribute the \$320 million fund to cities to pay for road repairs, affordable housing and programs to encourage walking or riding bikes. Another \$475 million will go to regional projects.

“It sounds like a lot of money, but when you split it up, it’s not,” Kirkey said.

The most recent financial blow came last February, when Gov. Jerry Brown killed 400 redevelopment agencies, depriving cities of hundreds of millions of dollars for infrastructure.

### **NO HOUSING WITHOUT JOBS**

When the Association of Bay Area Governments released its list of priorities in May, job growth topped the list. All other activities — housing for all income levels, infrastructure for walkable communities and environmental protection — ranked lower. “Planning in advance for job growth should result in more jobs for the economy, better neighborhoods, improved transportation choices, lesser taxes, better schools and a higher quality of life for residents,” the agency said.

But that kind of “win-win” language glosses over a key dilemma, said Terplan from the San Francisco Planning and Urban Research Association. Cities want to attract businesses because they bring in more tax dollars than does housing. But they need housing to attract workers. This

leads to a chicken-or-egg scenario: “We quite frankly can’t add a million or two million jobs unless we add lots of new housing.”

He added that the solution is not transit villages, but transit-friendly jobs. “For five or six years I’ve been hammering this point,” he said. “Lots of studies show that if your job is right near transit, particularly regional rail transit, you are more likely to take transit than if you just live near transit.”

Data show that the most job growth is expected in San Mateo, Santa Clara, Solano and Alameda counties. So those areas are the focus for Plan Bay Area housing development. Santa Clara County exemplifies the Bay Area’s comparative advantage for job growth nationally. Regional planners say Silicon Valley is becoming one of the most desirable places to live and to do business. In 30 years, Palo Alto and Sunnyvale could be even hotter job centers.

The Bay Area’s housing allocation reflects that optimism: Santa Clara’s housing stock is expected to grow by 32 percent by 2040, the fastest in the Bay Area.

Economists say that if the regional plan has any chance, it will be through encouraging business to generate the same kind of rapid expansion the area relied on for decades to support a higher-than-average standard of living.

“The region could capture another 110,000 jobs of the total national growth,” said Stephen Levy, director of the Center for the Continuing Study of the California Economy and one of Plan Bay Area’s independent researchers. “However, it’s constrained by the Bay Area’s political and economic will to produce new housing.”

But clearly the biggest challenge facing regional planners who want more smart growth housing is instilling that resolve in hundreds of dubious county supervisors and city council members, each of whom faces a restive electorate.

Terplan, the urban researcher in San Francisco, said he was saddened to see the specter of political negotiations cloud the state’s 2008 vision of environmentally friendly growth.

The idea, he said, was supposed to be about cooperation — “the region taking leadership, and saying this is where we want to go.”

But that’s not how it’s gone so far, he lamented: “It doesn’t have enough policy tools to achieve concentrated planning.”

Read full coverage of Bay Area smart growth in the [San Francisco Public Press Summer 2012 print edition](#) [7], on sale at retail outlets around San Francisco and [online](#) [8].

**Filed in:** [Land use](#) [9] [Infrastructure](#) [10] [San Francisco](#) [11] [Bay Area Smart Growth](#) [8]  
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[Metropolitan Transportation Commission](#) [15] [Plan Bay Area](#) [16] [population](#) [17] [smart growth](#)  
[18] [sprawl](#) [19] [tea party](#) [20] [urban planning](#) [21]

**Source URL:** <http://sfpublicpress.org/news/2012-06/cities-resist-regional-plan-to-limit-sprawl>

## **Appendix V**

ABAG-MTC meeting transcript, 20130308

MTC Planning Committee and ABAG Administrative Committee  
Friday, March 8, 2013  
9:30am

Audio available here:  
<http://www.mtc.ca.gov/meetings/archive/>

Video:  
<https://www.youtube.com/watch?v=AjEoIfA0h-I> [PDA Feasibility]

00:00 – 02:55  
[preliminary matters]

### **Priority Development Area (PDA) Feasibility and Readiness Assessment**

2:51 A 2:57 V 0:07 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Moving on to Item Number Five, this is the Priority Development Area, the Feasibility and Readiness Assessment. And, Therese, and Johnny, I guess you're presenting this this morning?

3:01 A 3:07 V 0:17 Y

#### **MTC Staff Member Therese Trivedi presentation**

MTC staff member Therese Trivedi:  
Good morning, commissioners and ABAG board members. I'm Therese Trivedi with MTC Planning, and I'm actually joined here with Darin Smith from the—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Oh, Darin--

#### **MTC staff member Therese Trivedi:**

The planning—I mean, the consulting firm Economic & Planning Systems, or EPS. And we are going to talk about some work that was recently completed that focused on the development readiness and feasibility of some of the PDA's in our region.

We'll be talking a little bit about the purpose behind the work, how the analysis was conducted, as well as the results, and where do those, what do those results mean for the bigger picture going forward.

3:37 A 3:43 V 0:53 Y

So, beginning with the Study Purpose. This work really evolved out of a meeting that we had with some developers and members of the business community last July. And, in that discussion, the group raised some concerns about the amount of growth, particularly

residential growth, that was projected for PDA's in Plan Bay Area—and questioning whether or not that was really feasible.

So that became the primary work scope element of this work—to really estimate the ability of the PDA's to accommodate those residential units that were projected in Plan Bay Area.

And, while that was the first component, we all know that all the PDA's are not created equally—some are better equipped than others to take on growth. And so a second element of our work plan was to really make sure that we examined policy initiatives that might be able to improve the development feasibility going forward over the 30 years of the Plan, if these were implemented. So, that was the second piece of our work.

4:41 A 4:47 V 1:57 Y

And, while PDA's are really the focus, the primary focus of the work, we did take a look at some non-PDA areas and those development constraints as well, and Darin will touch on that, further in the presentation.

But I also wanted to mention that we weren't starting from scratch with this work. Back in 2010, ABAG taking a lead, and MTC, we also did a PDA assessment, trying to get at some of the answers to these questions, and we had established some criteria that we really built on for this work here today, and that was really the basis for where we started.

And, so, I think the next slide will actually launch us into that work, and I will turn it over to Darin.

5:20 A 5:26 V 2:37 Y

**EPS presentation**

**Darin Smith, Economic & Planning Systems (EPS):**

Thank you. Darin Smith with Economic & Planning Systems. Oh, Darin Smith with Economic & Planning Systems.

We began this work in the fall, and we were not starting from scratch as Therese mentioned. Each of the jurisdictions that we've selected for review here had participated in 2010 in the assessment of the PDA's and filled out a fairly comprehensive survey, so we had a lot of baseline analysis to work from.

But we wanted to freshen that up, and also make sure that the information was sort of apples to apples among PDA's because each of the jurisdictions had filled out their own assessments with perhaps their own criteria.

6:01 A 6:07 V 3:17 Y

So we were looking specifically at a number of criteria here for what constitutes "readiness"—that is, how much of the planned development is really available or there is current capacity in the planning and other constraints. So one of the things we looked at was the housing capacity estimate—that's a physical assessment as well as a zoning and

an entitlement assessment; existing planning and entitlement process; the level of community support for the types of development implicated under the PDA allocations; the attractiveness to the market; and finally, the infrastructure capacity and needs.

And, again, we looked at the baseline readiness—that’s essentially what is, under current conditions, what could we expect to be accommodated and achieved through 2040, and then in an amended readiness analysis, we assigned certain policy actions to the future and said, okay, if you do x, y, and z—and those differ from PDA to PDA—what might be expected under those circumstances.

7:05 A 7:10 V 4:20 Y

So, we started with a selection of 20 different PDA’s. There are of course over 160 PDA’s, and we did not have the capacity to evaluate each and every one of them, so we looked for a representative sample of PDA’s—that is, geographically distributed among all nine counties, as well as being representative of the different place types—there are seven different place types in the PDA categories.

And, then we also looked for places that had the full range of potential opportunities and constraints, so even if a place like Antioch and a place like Walnut Creek might be categorized in the same way, they might have very different kinds of market and physical constraints. So we wanted to capture that entire universe of really opportunities and constraints.

7:54 A 8:00 V 5:10 Y

The first thing that we looked at in each of these 20 PDA’s was the housing capacity, and for that, we looked at the opportunity sites—in some cases, the jurisdictions themselves had already prepared plans that corresponded to the PDA’s, that said, for instance, in North San Jose, they have planned capacity for 32,000 housing units, and that is the number that has been assigned to them through the Jobs-Housing Connection allocation, and so that was one that was basically prepared for us, but we also, where that wasn’t the case, we had to identify individual opportunity sites throughout the PDA’s and assign zoning capacity to them and density capacity to them, and come up what we felt was an achievable level of development through 2040 based on the physical capacity in the current planning and zoning in place.

And we reviewed all of these assumptions with the different jurisdictions—typically the planning staff, sometimes public works and community development and other staff members from the jurisdictions.

8:59 A 9:04 V 6:14 Y

So, as we walk through this, rather than being sort of nebulous here, I do want to give an example, we looked at downtown Hayward as one of the 20 PDA’s in our sample, so in the case of downtown Hayward which is shown in that picture, we identified the opportunity sites that are highlighted in blue there and assigned zoning capacity. And in that case, we determined that the zoning capacity for sites that were underutilized or vacant actually exceeded the amount of development that is allocated to this PDA

through the year 2040. That was not always the case among the 20 PDA's in the sample, but in Hayward, that was the case.

9:39 A 9:44 V 6:54 Y

Then we looked at Planning & Entitlement Process. Typically, looking at the staff capacity, the time and the difficulty of obtaining entitlement for projects that are consistent with the PDA, Jobs-Housing Connection allocations. In Hayward's case, talking with the staff, but also talking with developers--that was another part of our assignment, was to get the opinions of developers. It was determined that Hayward did not have a major constraint in terms of processing development projects, whether it's a political or staff capacity one, Hayward seemed to be in pretty good shape. Again, that was not always the case, but that was the case in Hayward.

Another item for this category was the likelihood of residential displacement—that is, if it is required that existing residential neighborhoods or residential development are likely to be displaced to accommodate the level of development required in the PDA, we took points off for that, essentially, because we recognized that that's a very difficult thing to do politically and otherwise. Again, in Hayward's case, that was not a problem in downtown.

10:49 A 10:54 V 8:04 Y

We looked at the Level of Community Support, and of course, each of these PDA's has been identified and designated by the jurisdictions themselves, typically with a unanimous vote of the representative body—the council or board—so that typically wasn't a big problem in terms of the elected officials' support for the PDA, but we also wanted to dive in a little bit to make sure that they were walking the walk, I suppose, and that the actions at the council level actually corresponded with the ideas for the PDA, by looking at whether projects that were comparable in the scale and density required for the PDA allocation were being approved or were facing difficulties. In Hayward's case, we had a minor discount there because we recognized there was a fiscal concern. That is not uncommon throughout the Bay Area, of course—but the fiscal concern being one of interest in retail development as a fiscal generator for downtown area that was in some cases competing a little bit with the interest in housing development, and so that was a minor discount in that case.

12:05 A 12:10 V 9:20 Y

We also looked at the history of neighborhood opposition and whether there was an organized body that actively opposed higher density development or intensification of these PDA's. In Hayward's case that was not a problem but in other cases that is more of a problem.

12:25 A 12:30 V 9:40 Y

We looked at Market Attractiveness & Investment, and again, here we looked at objective criteria as well as the opinions of the local staff and active real estate developers who have done real estate investment and development in the PDA and in the

city over the past 10 years. How much development has occurred, what type of development—is it the type of development that is consistent with the PDA or is it not.

Recent local development activity. That's really talking about the pipeline—what is being pursued right now. And again, what is the scale of the pipeline that's active in the community as well as what is the type of development and the character of it. Is it higher density development that is consistent with the PDA allocation or is it primarily lower density single family housing. So that's another factor that we looked at.

The general market conditions. Here we're talking about prices and vacancies—are there, the prices really at the level where you can support new construction or are they below that; or are they significantly above that—in which case you have a lot of leg room or a lot of leeway to make things market feasible, which is the next criteria.

13:39 A 13:42 V 10:54 Y

Again, market prices versus construction costs—wanted to make sure we're not assuming a type of development that really can't be supported in that local market by existing price points.

Available parcel size and configuration. Here we're talking about the opportunity sites that we've identified. Are they large? Are they contiguous? Are they of proper dimensions to make an efficient type of development? Or as is most of the case, are they challenged by the fact that they are really—most of these PDA's are urban infill situations where there are existing uses on the sites, or the sites are, for instance, along the El Camino Real corridor and they tend to be shallow and long and that can create challenges. That's another physical capacity constraint that we were looking at for this market attractiveness, and can that be overcome.

14:32 A 14:37 V 11:47 V

And, finally, sort of a catch-all. The existence of major investment disincentives such as environmental contamination, but also including crime and schools and things of that nature, that don't necessarily show up directly in some of the other criteria that we've looked at but are certainly effective in terms of either promoting or thwarting potential attraction of residential development in a community.

And again, to use the Hayward example here, there has been substantial development in and around downtown Hayward. There is an active pipeline of new projects that are consistent in character with what the PDA's allocation is. The price points are a little challenging in Hayward. They are not as high as certainly San Francisco and other communities, and that creates a bit of a feasibility challenge that we have recognized and discounted for in terms of the future growth potential.

15:32 A 15:36 V 12:46 Y

But overall, downtown Hayward is looking pretty good in terms of these market attractiveness and investment criteria.

And finally, the Infrastructure Capacity and Needs. That is something beyond the vertical development, the buildings themselves. What is the capacity for streets and sewers and parks and schools and the whole gamut of infrastructure that is required of the, of public development. Is the capacity there? Is it, are there funding sources available to increase that capacity as needed? What is the relationship between the value of what might be built in the future versus the overall costs of development—and here there's a typical relationship that we look for, because so often, in, throughout California, private development is on the hook to fund infrastructure upgrades. We want to make sure that the level of funding that would be required of them is within the range of feasibility to allow the projects to move forward.

16:35 A 16:40 V 13:50 Y

And, again, in downtown Hayward's case, the capacity is pretty strong for the level of development that is allocated to them in the Jobs-Housing Connection.

So the Overall Results, when we looked at the sample of 20 PDA's, there were about 120,000 housing units allocated to the 20 PDA's that we looked at—that is between the years 2010 and 2040. And under the base conditions—that is, current zoning, current market conditions, current infrastructure capacity—we felt that through the year 2040, you could achieve about 62% of the allocation in the Jobs-Housing Connection.

But that if we made certain policy recommendations and implementation of those policies that we could probably get to about 80% overall, for the overall sample of 20 PDA's. And, again, it varied significantly from PDA to PDA, because we do have a lot of different conditions represented in those PDA's.

17:40 A 17:45 V 14:55 Y

But overall, again, if we take certain actions and we'll talk about what those might be, we felt that it was reasonable to project, and relatively conservatively, that 80% of the allocation to those PDA's could be achieved through the year 2040.

So, again, just to kind of highlight what some of the Development Constraints are that have informed our recommendations for policy interaction—intervention, rather. In some cases there are infrastructure deficiencies, the roadways, or sewer, or parks—things of that nature are not, don't have the capacity to support the level of development that is allocated. There's limited local government financing capacity, particularly—and this is a common theme throughout most of these PDA's—the loss of redevelopment funding and powers is a significant constraint in going forward with this because, again, we're mostly talking about infill development here that has different types of challenges in some cases than greenfield development. And the powers and financing sources from redevelopment were a major contributor to the effectuation of those development types.

18:52 A 18:57 V 15:47 Y

Lack of sufficient parcel size, again, with these mostly being infill development projects—that is a common condition, not everywhere, but in many cases that is a

challenge that assembly of parcels would help with, and that again is a power that redevelopment offered that is not currently on the table in the same way.

Local land use policy in some cases—not in Hayward’s case, but in some cases, the local land use policy was not supporting the level of zoning and intensification that is required to achieve the PDA allocations.

19:28 A 19:33 V 16:43 Y

Market demand constraints—that’s again, price points and interest on the private side, of investing here. That’s something that there are fewer things that we can do directly to affect market demand.

And then, financial limitations generally, again, that’s at the local and regional level.

So our Policy Considerations—one of the things we recommended in some cases where the zoned capacity does not meet the allocation is that upzoning basically be pursued. And in most cases when we’ve done an amended PDA readiness assessment, that upzoning has been fairly modest. We’re not talking about going from single family homes to high rises. We’re talking about one level of multi family to perhaps the next level of multi-family housing.

20:19 A 20:24 V 17:34 Y

Targeted Planning and Capital Funding is another thing that through MTC and ABAG’s work is already being pursued. Reinstating some form of redevelopment authority at the local level is absolutely something that we recommend be pursued—obviously that’s a statewide issue, but coordination on that issue is one of our strongest recommendations.

And then creating additional infrastructure funding for local governments, whether that’s through the redevelopment type powers, or ballot measures, or any number of things that can be done to enhance local funding for infrastructure. Our strong recommendations of our analysis as well.

21:02 A 21:06 V 18:16 Y

And then quickly, we did look at non-PDA’s. About 20% of the future growth in the Bay Area through the Jobs-Housing Connection is shown to be happening in areas that are not designated as Priority Development Areas. And that ranges from—that’s everything but the PDA’s, basically. The PDA’s represent about 5% of the actual land mass of the Bay Area, so non-PDA’s is 95%. But they have many constraints that are similar and in some cases even stronger than the constraints in the PDA’s, whether it’s infrastructure capacity, we’re talking about greenfield development in many cases where there is no infrastructure, so that’s a major constraint. Financing capacity, if their price points in an exterior area are considerably lower than they would be in the interior Bay Area, that’s another major constraint.

21:56 A 22:01 V 19:11 Y

So the non-PDA areas, again, have many of the same constraints—different in character, but similar in theme to what we see in the PDA area. So, in our opinion, it is not expected that but for this Jobs-Housing Connection, everything would be fine and we would get all the housing that we need in the non-PDA areas on the periphery of the Bay Area. We do think there are major constraints there that limit the amount of housing that could be expected in those areas as well.

22:30 A 22:34 V 19:44 Y

**MTC staff member Therese Trivedi:**

So, back to me. Thank you, Darin, for walking us through the work.

What I wanted to do know is talk about where we go from here. First of all, as noted in your packet, the final report will be, should be finished later this month, so there's quite a bit of detail on each of the PDA's that was included in the sample set.

But I wanted us to take a couple of steps back to see what this work—what we have learned from this work overall.

And I think because our sample set included such a range of place types and market conditions, the results really offer us a better understanding of the development challenges across all these different circumstances. And, while this might not be an earth-shattering finding, I think we clearly saw there are challenges common to most if not all of the PDA's.

But I think where that's important as we go forward with Plan Bay Area implementation, that we focus our efforts on these common challenges so that we can benefit all PDA's or most PDA's in those circumstances.

23:33 A 23:37 V 20:47 Y

And so I think you'll also see in our—in your next agenda item, that this work will also help us to focus our policy and legislative priorities as we do go forward with Plan Bay Area, so that we can really move ahead and try to improve the development feasibility of our PDA's. So I think I will close here and open it up to your comments and questions.

23:57 V 24:02 V 21:12 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

You've given us an overview of the analysis. When will the detailed analysis be available?

**MTC staff member Therese Trivedi:**

The report should be completed by the end of this month. In March.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

And I'm assuming that will be posted on our website?

**MTC staff member Therese Trivedi:**

Yes.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Okay. I really appreciate that we've gone through this exercise—this kind of a “truthing” of these PDA's. It really is a tool that we can look at as far as the feasibility goes, and so I really appreciate the work that's been done, Darin, and I didn't recognize you at first there when you sat down there, so thank you for being here.

Other committee member's comments? Yes, Mark, and then Mayor Quan? I mean, not Mark, Scott. You look so much alike.

24:41 A 24:47 V 21:58 Y

**MTC Planning Committee member and Alameda County Supervisor Scott Haggerty:**

I've been called worse, Mr. Chair, I can assure you.

I--last week I had a conference call. It was with Ms. Heller, and she was with the California Natural Resources Agency, and as I was talking to her it appeared to me that what she's really talking about is something that would fit directly within our PDA's and so when we talked, on one page, we talked about looking to try to garner other areas in which we could get some money to collaborate, and it appeared to me that this strategic growth council is actually having a solicitation of Proposition 84 Urban Greening Grant Program, and are we contacting them, because if not, I have all this information that I would give you. But it sounds like you already talked to them?

25:42 A 25:47 V 22:57 Y

**ABAG Executive Director Ezra Rapport:**

Yes, we are in touch with the Strategic Growth Council. I'd be happy to take the information and make sure we have it.

25:53 A 25:57 V 23:07 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Mayor Quan?

**MTC Planning Committee member and Oakland Mayor Jean Quan:**

So, my main question is on, you were somewhat silent on CEQA, and given that there are a lot of proposals around CEQA and how that might impact this development. Is there, can you sort of address—are there tweaks or different versions of the legislation coming that would be more beneficial to the PDA development than others?

**Consultant Darin Smith of EPS:**

We were silent in this presentation but in our report we are less so. We certainly recommend that CEQA be looked at very closely in terms of reform. Specifically, ideas to streamline development process in PDA areas is, you know, that's been promoted in the past with middling success I would say. But ways to incorporate that streamlining in PDA's and really give priority to PDA's would be a major step forward, and that can

occur through creating, from, at the local level, having plan, programmatic EIR's done in advance even within the existing CEQA realm, having programmatic EIR's done that projects can build off of and really enhance the feasibility of those investments is going to be key in that's something that can be done on the public side as opposed to the private side.

27:18 A 27:22 V 24:33 Y

But, in terms of CEQA reform itself, certainly the reach and the pervasiveness of opportunities to thwart projects through CEQA are something that is a major constraint for infill development and all development in California. We see that as something that should be addressed.

**MTC Planning Committee member and Oakland Mayor Jean Quan:**

So if there's something that we can more clearly delineate or different, without necessarily having to address the different legislation that's being proposed now, that whether the key principles or tenets that will help us move this forward in terms of Priority Development. Quite frankly I had forgotten about the ability to amass the land through foreclosure, etcetera, and I'm not sure if any of the legislation—the transit-oriented legislation is even looking at or addressing that. Because it will be difficult, I think, in some communities, or some parcels to amass that land if we haven't already, I mean, in Oakland, we've amassed some reasonable amount of land around our BART stations, for instance, but as we now go on to the transportation corridors with our BRT and other programs, I was thinking about, are we going to need to do much there to build for instance affordable housing or other things that are aligned with being transit-oriented and being “smart” in terms of climate control, so, I think that was a good point, so I thank you for that.

28:53 A 28:57 V 26:08 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Okay. Commissioner Halsted?

**MTC Planning Committee Vice Chair and San Francisco Bay Conservation and Development Commissioner Anne Halsted:**

Briefly—this is very important stuff and I'm really excited that we're moving ahead with it. San Francisco's CTA submitted a letter this week—I think it went to most of the Commission that raised some issues that they had and I don't think they're here today so I thought that maybe I should just try to get them on the table. One, is asking whether your next step will include an analysis of market rate versus affordable housing in various PDA's—I don't know whether that's an issue that's addressed, that will be addressed?

Another one of course is just looking at the differences in the region. There's a vast difference in the cost of land and distribution, etc, as well as other issues, in San Francisco versus other places in the urban corridor.

29:41 A 29:46 V 26:56 Y

A third one which they raise which rings very clear with me is the overcrowding on Muni and BART right now in the core places and how that affects the possibility of adding the greatest potential. I don't see that quite reflected in this. So, I'm just asking that in the next steps that we try to look at those and also include those in thinking about other steps, other legislative steps. So, thank you.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Okay. Jake?

**MTC Planning Committee member and Rohnert Park Councilmember Jake**

**MacKenzie:**

A very mundane question: Is there anywhere, where one can find which 20 PDA's were actually studied? I'm always curious, you know.

**MTC staff member Therese Trivedi:**

Yes, I'm sure others are as well. That will be included in the final report. We didn't obviously include that here. In your packet there is a summary by place type but you'll have to –

**MTC Planning Committee member and Rohnert Park Councilmember Jake**

**MacKenzie:**

No, no, I saw that, but I'm always digging down. Anyway, thank you. I'll look forward to the final report. Thank you, Mr. Chair.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Catherine Lyons? Catherine? Would you like to come forward?

30:46 A 30:50 V 28:02 Y

**Bay Area Council representative Catherine Lyons:**

Good morning, Catherine Lyons with the Bay Area Council. First, I think I can speak on behalf of the entire Bay Area business coalition and saying, "thank you" for listening to our concerns about this and taking this step and commissioning this analysis. I think it's really, really important work and critically important analysis that we should take into consideration, so, again, thank you very much for the work. And, just wanted to say that we're looking forward to continue working with you all with implementing the policies that you've all laid out, and, hopefully, aiding in the successful implementation of the Plan Bay Area process. So, thank you very much.

31:24 A 31:28 V 28:39 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you, Catherine. Peter Singleton. Peter?

**Bay Area Citizen Peter Singleton:**

Thank you, Mr. Chair.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Good morning.

**Bay Area citizen Peter Singleton:**

I have an overall question for the commissioners and for the executive committee members, and that is that this body or these two bodies are proposing to essentially mandate for the entire Bay Area—that's 101 cities and towns, and nine counties, and seven million people, mandate that for the next 30 years that 70 or 80% of the housing units will be in mixed-use, or at least in multi-story high density dwellings, and that most of the commercial space will be in this kind of mixed use high density transit-oriented-development as well, where over the past decades, at the express preference of the residents in the Bay Area by their own decisions is for on the order of maybe 80% of the housing to be in single family homes.

And I applaud—I think, Mr. Spering, I think you mentioned the term “truthing” and “feasibility” and I those were good words to characterize at least this study. But one thing that I don't see that's in this study—and it may be there, and I respect the work of, it's Environmental Planning and Systems, I think—I respect the work—Economic Planning and Systems, I respect the work that you guys do. One thing I don't see is a detailed study, a market study, of the existing mixed use or high density developments that have been done in the Bay Area over the past decade or so. And the reason for this, is because many of these have not performed very well. And, so what I would ask is if you haven't done a study of projects like 1001 Laurel Street in San Carlos—it's a beautiful building, it's most of a city block, it's 92 condos. They've sold most of them, although there are several on El Camino they can't sell at any price. This is four years after they've been built, and the ground floor commercial is basically empty.

33:40 A 33:44 V 30:54 Y

Same with Avalon Walnut Creek. 34,000 square feet on the ground floor. Most of that, my understanding, is it's empty.

And I think the last thing that I would say is that it seems like this body is looking at how we can correct the market failure, the seeming market failure of interest in demanding as much mixed use, high density projects as this body is proposing and planning for the Bay Area. Why not look at adapting Plan Bay Area to the needs and wants of the market, and let the market decide. And the market is simply the individual decision making of us, the residents and the businesses of the Bay Area.

And I thank you for your consideration.

34:16 A 34:21 V 31:32 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you, Peter. Thoughtful comments.

Mary Feller? Mary?

Ken, I'm going to ask you to respond to the numbers that were used there—and after I take public comments.

Go ahead, Mary.

34:31 A 34:37 V 31:48 Y

**Bay Area citizen Mary Feller:**

Hi, I'm Mary Feller. I just want to emphasize that I'm a dyed in the wool progressive Democrat, so--

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Oh, we won't hold that against you. Most people in the room will appreciate it.

**Bay Area citizen Mary Feller:**

I am not speaking for my neighborhood association today because I just found out about the meeting and there was no way to run any of this through the board, so I really want to be clear about that.

I am the immediate past land use chair of my neighborhood association in Marin County—it's unincorporated San Rafael.

35:09 A 35:13 V 32:23 Y

I have some deep concerns about the PDA process and how it was determined whether or not there was neighborhood opposition, because certainly, none of, as far as I know, none of the neighborhood associations in North San Rafael were ever contacted. And there is very big concern over the PDA around the SMART Center station. And when you talk about upzoning and saying that it's fairly modest, it's not fairly modest. What's being proposed is 60 units per acre.

And, I just have to tell you as the land use chair, it's been very frustrating dealing with the City of San Rafael. I just have to be honest and say that they literally falsified the traffic reports to get a favorable level of service around the area. We had to hire our own traffic engineer, and they're still not paying attention.

So, in San Rafael, there is a very, very high level of concern around these issues. Of course we're concerned about the constraints and the traffic, and the traffic reports which are inaccurate, the stresses on our open space, that sort of thing.

Is this the proper time to—I think it's not the proper time to address the ballot measures that you're going discuss—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

No, no, that issue is not before us, and if you could wrap up, we'd appreciate it.

**Bay Area citizen Mary Feller:**

Thank you. And the CEQA. We are really concerned about CEQA reform, because what we have noticed in our neighborhood, currently CEQA is already too weak, and the power's in the hands of the people who have, the developers who have all the big money. Trying to—for a neighborhood association to raise the money for a CEQA lawsuit is almost impossible.

So, thank you for your time.

37:15 A 37:19 V 34:30 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Okay. Thank you.

Carolyn, is it Lenert? Okay, Carolyn.

If anybody else has a speaker card, you need to turn it in right now, because we're about ready to bring it back to the Commission. Please turn it in now.

Carolyn, you're up.

**Bay Area citizen Carolyn Lenert:**

Good morning Mr. President and Executive Committee. My name is Carolyn Lenert. I'm not here as the Citizen of the Year for San Rafael, I'm not here as the Person of the Year for San Rafael, nor as the Chair of 37 homeowner associations in a coalition for North San Rafael. I have deep roots in the community, the entire zip code, 94903. Our website is 94903community.org.

So, here we are. We'd love to see more planning coming out of this organization, because our county is half green. So let's use it. Let's designate it as a destination for recreation, creativity, inspiration, and innovation. Let's not stuff people next to a freeway.

All of the research that's done, internationally and in America—the top medical universities have concluded, you put people next to a freeway, you put people next to a major artery, you double the chances of the children getting autism. You double the chances of those children having asthma.

38:32 A 38:36 V 35:48 Y

So if the development fees want to go for the lifetime care of these children, that would be appropriate. That would be a system where the consequences that are being promulgated are being borne by the people that are making the money. So, we need a system, we need a loop, go ahead and do that. But first, I'd like to see your children moving to those locations.

So, how many of you live in high density housing?

[ABAG Administrative Committee member John Gioia and Contra Costa County Supervisor answers, away from his microphone]

**Bay Area citizen Carolyn Lenert:**

Right, it's unhealthy. I'm really glad—I'd like to get your names and talk to you about the health of your children and grandchildren.

So, in Marin, it comes down to water. We follow the money, certainly, but we're following the water. And, our board of supervisors has just created an exemption for developers to apply to be exempt from letters of service for water. To be exempt for letters of service for sewerage, to be exempt from setback requirements—this is inappropriate.

39:32 A 39:37 V 36:47 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Okay—

**Bay Area citizen Carolyn Lenert:**

This is special treatment for special people. So, international standard is spoke and wheel. If there's a transit stop, you don't create a lively bustling area around it where homes are currently surrounded by open space on three sides. What you do is spoke and wheel, commercial at the stop, and then the people pick up their groceries and do their errands, and then go back out into the community.

TOD, Transit Oriented Development, is DOA. It's an inappropriate, 19th century plan. We need to all come into the 21st century, and do spoke and wheel development, away from heavy diesel, away from the particulate matter, and put people who are close in air conditioned units--

40:12 A 40:17 V 37:27 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Okay—

**Bay Area citizen Carolyn Lenert:**

part of the time.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you, Carolyn.

**Bay Area citizen Carolyn Lenert:**

So you have your work cut out for you--

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Wrap up, wrap up--

**Bay Area citizen Carolyn Lenert:**

and we'd appreciate it--

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
if you could--

**Bay Area citizen Carolyn Lenert:**

we want local control. We have deep knowledge of our communities, we love them, and this organization right now, it isn't set up in this system, or to accommodate local control utilizing our deep knowledge of our human ecosystem.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Thank you—

**Bay Area citizen Carolyn Lenert:**

Thank you, and please vote for health of our communities, and our safety.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Thank you, Carolyn.

Ken, did you just want to briefly comment—

**Bay Area citizen Carolyn Lenert:**

Could you announce how much time each speaker gets, because I didn't realize—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Three minutes.

**Bay Area citizen Carolyn Lenert:**

Ah, I didn't hear that.

**MTC Chair Jim Spering:**

I was timing you, you took—

**Bay Area citizen Carolyn Lenert:**

I know—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
your three minutes—

**Bay Area citizen Carolyn Lenert:**

I appreciate that.

Thanks for announcing it.

40:51 A 40:56 V 38:06 Y

**ABAG staffer Ken Kirkey:**

Sure, Chair Sperring.

There are a number of items to address. I'll focus on a couple of things, one—

**MTC Planning Committee Chair and Solano County Supervisor Jim Sperring:**

And be brief, if you could.

**ABAG staffer Ken Kirkey:**

Sure.

First, the Priority Development Areas are locally nominated, and I think as you're aware, that's something important to remember throughout this process.

The Jobs-Housing Connection strategy that ABAG and MTC put together involved a lot of analysis, looking at demographic trends, changing market tastes, real estate values, how a variety of factors create a basis for the forecast, and the level of growth directed toward PDA's is directed from a number of perspectives. One is that this region has set aside much of its land mass as protected open space, at the county level, not at the regional level. We have a growth management envelope in which we can grow.

We also have a transit network that is mature, and we have market trends that suggest that people both—many folks who are going to get older in the years ahead if they're fortunate, as well as younger workers want to be close to their jobs, close to transit. They want a walkable urban environment.

And, lastly, I'll say that the work that EPS did, the market readiness assessment suggests that those communities that have taken on this level of growth, that are particularly well connected by transit, that have job capacity or provide access to jobs—those are the places in the Bay Area where the values have held in recent years. And if you talk with the BIA, Urban Land Institute members, that's where they're building projects again, that's where they're filing permits again.

I think it is very much a reality based approach. I think the readiness assessment undergirds that, but relative to the next item that's coming up, there's a lot of work that needs to be done, as you know, to implement the PDA's.

42:47 A 42:51 V 40:02 Y

It has to do with redevelopment, it has to do with CEQA—a number of things that need to happen to make it possible to build in the Bay Area.

**MTC Planning Committee Chair and Solano County Supervisor Jim Sperring:**

Thank you, Ken. John, Gioia? John?

**ABAG Administrative Committee member and Contra Costa County Supervisor John Gioia:**

You know, I appreciate—I was going to ask that question about the process because I think there's a belief that ABAG and MTC develop these PDA areas on their own—and the process, and you've talked about it--you may want to talk about it more, was that these were developed by locally-elected officials in their community, and approved by the city councils. How much community input occurred, I suppose, depends on the city. In the city I live in, in Richmond—although I'm with the county, there was a fair amount of community input into the Richmond City Council's decision to recommend or nominate PDA's in its area. In the jurisdiction, unincorporated jurisdiction I represent in North Richmond, there was also actually a fair amount of community input in the locally, the local citizen's group, the municipal advisory council made recommendations on that.

So, I think, it may have differed by community, but all of these, I think it's important to note, that the locally-elected city councils in these jurisdictions were the ones that wanted these to be designated priority development areas. Not ABAG, not MTC. So, frankly, I think that for those citizens who believe that maybe some of these shouldn't be PDA's, you ought to consider taking that up with your own elected officials. All of us are locally elected. All of us come from a jurisdiction. I'm elected in west Contra Costa, by a number of residents and cities and unincorporated area. And all of these folks basically are. So I think if there's an issue about where these should continue to be, those are dialogues that should occur in each local community, with your city council members or boards of supervisors.

## **Plan Bay Area Implementation and Advocacy**

<https://www.youtube.com/watch?v=E1JOWZyCazc>

44:50 A 44:52 V 0:12 Y

### **MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

That's a good segue, we'll move into item number 6, this is the Bay Plan Area [sic – Plan Bay Area] Draft Advocacy Platform. Steve, are you going to present this—it has you and Ezra.

45:03 A 45:06 V 0:24 Y

### **MTC Executive Director Steve Heminger:**

Thank you, Mr. Chairman. We're doing a little bit of last minute coordination over here.

### **MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Alright.

### **MTC Executive Director Steve Heminger:**

Ezra and I will present this item, and it is a summary of a set of actions, and it's probably not an exhaustive list, but we wanted to give you the highlights of the work that we really need to do to implement this Plan. I think for MTC commissioners you're probably familiar with the dynamic that after we adopt a long range plan there's usually a set of people who come in at the next meeting and are looking for the check. And the fact is, our long range plan is—I have always told people—more like a fishing license than the fish. It's a way to line up priorities and establish broad policies but there's a lot of work you need to do subsequent to adoption of the plan to catch the fish.

45:57 A 46:02 V 1:20 Y

And I think in the case of this Plan that we are doing together with ABAG and that we are tackling this brand new subject together of a sustainable communities strategy, that is especially true, and it's I guess doubly especially true given the fact that in between the time the legislature adopted the statute that requires this Plan, SB 375, and now, the legislature took away one of the principal tools that we would use to comply with the law.

46:30 A 46:34 V 1:52 Y

So, what Ezra and I will present, and he'll go first, are a series of actions—advocacy actions—some of them legislative, some of them self help at the local level, some of them work that we need to do in Sacramento and Washington, that we believe are necessary, to really carry out the promise of this Plan.

And, so we'd like to present those to you today, just for your reaction. We are intending to incorporate them in the draft plan that we publish later this month. So, we'll be certainly be listening today for your reaction, and taking your guidance as we finalize that draft document, and then of course you'll have another bite at that apple once it's published.

So, Ezra—

47:20 A 47:25 V 2:43 Y

**ABAG Executive Director Ezra Rapport:**

Thank you, Steve.

We've identified four themes under which we think the Plan Bay Area could be made more feasible over time. We recognize that the loss of redevelopment put a crippling blow to infill development, and that needs to be replaced.

At one point, the state was contributing 14% of its property tax to redevelopment and if we go down to zero it's not going to bode well for infill development which is more expensive than greenfield development, and we don't have a lot of greenfield left. So, I mean, our plan is basically the re-use of land, it requires special tools for land assembly, and it requires some degree of state participation in order to manage the growth and make sure our economy continues to grow in this very important region for the state and the national government, in that the economy in the Bay Area is crucial for the tax revenues of the state, and I would argue for the United States as well. So, some investment to make sure that our economy can continue to grow is critical.

48:32 A 48:38 V 3:55 Y

With that, we identified the first point as locally-controlled funding to support PDA development. And we note that Steinberg has introduced SB 1. However, that uses the city's general fund essentially to help finance the infrastructure in that area, and the cities need their general funds for the support for services. So it's really trying to get blood from a stone, it's not a solution.

It's very difficult to talk about a solution when you're in a fiscal crisis, and we are still, in the state of California, in a fiscal crisis. But I think at some point the state will grow again, and we can talk about the positive rate of return of this type of investment—for both the local government, the county, and the state, and that some of that should be reinvested back into Priority Development Areas.

49:23 A 49:28 V 4:46 Y

One thing that's good about SB 1 is that it expands the definition of blight to include sustainable areas so I think that if we can promote that concept—that sustainability is an important investment criteria as opposed to just blight generally, then we can develop project areas and hopefully create a win-win situation for the state and local government and school districts in promoting this type of development and future tax increment growth.

Number two is the issue of entitlement efficiency. It's not just CEQA. It's a whole range of agencies that need to be able to provide permitting instructions for a neighborhood—not necessarily a project-by-project analysis.

50:09 A 50:14 V 5:31 Y

What we are hoping in this case is to capture the two benefits that are already in SB 375 but will require some additional work. One is an exemption from CEQA if certain criteria are met. And most of these criteria can be met when a PDA does a specific plan programmatic environmental review, of which about a hundred of our PDA's have done that. But whether or not they're actually able to bring each environmental condition to a level of insignificance is not known, because that's one of the criteria that you'll have to meet.

The second is that in some markets, the ability to provide affordable housing is limited, and so this requires the 20% inclusionary zoning in order to get the CEQA exemption. We don't think that's a good idea where the market is weak and there already is substantial amounts of affordable housing in the project area.

51:07 A 51:12 V 6:29 Y

So if there is already affordable housing in the project area, we don't think the 20% inclusionary should be included, because it makes these projects not feasible. So that's a tweak we'd like to see done in the CEQA exemption component of SB 375.

The second element is the idea of taking the certification that a city applies to CEQA through a different court review, if someone chooses to challenge it. That's called the Sustainable Communities Environmental Assessment—that's already in SB 375. That says that, instead of using the "fair arguments" test, which means \$2,500 and any rational argument testing any portion of the EIR gets you into discovery and a minimum nine months delay, leading to much more—is changed to the "substantial evidence" rule, which says that if the agency can provide substantial evidence, you kick the case out.

52:05 A 52:09 V 7:27 Y

It becomes much more difficult to sue on that standard, sort of like a condition of approval of a land use regulation as opposed to what we've been using for CEQA litigation standards.

So this is really, I think, a profound change, if we can get it to stick with the courts. And this also requires that we bring all the issues in the programmatic EIR to a level of insignificant. So what we're planning to do is review the environmental documents that have been submitted under these specific plans, and begin culling through those to see how many of them are eligible, and if not, what additional technical assistance might be required to bring that planning so that we can mitigate to a level of insignificance, and either adopt the exemption standard, or adopt the sustainable communities environmental assessment standard.

52:59 A 53:03 V 8:21 Y

Number three is the stabilizing of federal funding levels. That is because we do not see the level of subsidy coming from the state to be able to support very low income housing. That has traditionally been a HUD responsibility. They've done it in a variety of

different ways. We think the two programs that work best are the Home Investment Partnership and the Low Income Tax Credit and the CDBG Block Grant money.

We think this is a primary responsibility of HUD, and we do not want to see that program cut back—we need to have it increased, maybe at the expense of some other programs.

53:36 A 53:41 V 8:59 Y

And, finally, number—not finally, but, in this list of four, the fiscalization of land use, where cities are forced to seek sales tax uses, because it's the only way that they think they can support their general funds, at the expense of sort of long term infrastructure, housing and job production, is a mistake. And, it has a long history to it, with Prop[osition] 13 and then with AB 8 and, it's a very complicated subject, but we think we do need to address the fact that cities need property tax incentives in order to develop in this dense fashion—that's serving state interests for state sustainability and state managed growth—well, managed growth that serves the interest of sustainable natural resources for the state of California.

54:32 A 54:37 V 9:55 Y

The reason why we are in all these programs, and the reason why the state is so interested in developing a managed growth is that when they didn't do it, when they weren't participating, we saw a terrific sprawl, especially in southern California, a very expensive infrastructure, and utilization of high rates of water and energy, etcetera. And, the state was clearly going to be damaged severely if that continued.

So, the state has provided a series of incentives to have more growth within the urbanized areas, and that's what we're promoting, and we think it serves state interests and therefore there should be state investment.

55:09 A 55:14 V 10:31 Y

So, those are four critical themes, where there are three pieces of legislation that we would like to support. One is the documentary tax for affordable housing. That's about \$75 per real estate transfer, and it does not include new homes. It would raise about half a million—half a billion dollars throughout the state, a year, which would be divided up by region, and the monies probably would be going to HCD for a long conversation about how those would get expended. This is the manner in which 35 states fund affordable housing. So, this is a typical financing vehicle, and it requires a two-thirds vote of the legislature.

56:07 A 56:10 V 11:28 Y

The second [is the state's new cap and trade auction. It—audio only, not in video] has the potential to model the greenhouse gas benefits of sustainable development. I think on a conservative basis, there's potentially a billion dollars of revenue from this source. We know that there's other competing uses for it, that also would reduce greenhouse gases, but we think some portion should be used for SB 375 which would—is a mainstay of the legislative initiative on managing growth in California, and sustaining our economy.

56:45 A 56:46 V 12:04 Y

And, number three, is the idea of the regional agencies having the ability to put measures on the ballot. We call that the “Quality of Life Initiative.” We’re not proposing that we address any specific expenditure plan or tax plan—simply to gain authority for regional agencies to consider it, and if they did consider it, it would require another bill to go back to the legislature for approval of that particular authority, so we see a two step process in that—first the authority to do it, which can be authorized by the legislature, and the second, the tax and expenditure plan, some later date when there’s consensus and polling to prove that the measure is viable under whatever constitutional mandate requirement of voter approval, and then the actual voter approval of that.

57:42 A 57:43 V 13:01 Y

That might be an interesting tool for reinvestment in communities. So, with that, I’ll let Steve do transportation, then we’ll take questions. Thank you.

57:50 A 57:52 V 13:10 Y

**MTC Executive Director Steve Heminger:**

So, if I could ask you just to turn Attachment A over. There are three transportation ideas, although as you’ll hear, there’s quite a bit of overlap between these two subject areas, and I think that’s as it should be.

The first one mentioned here is on expanding the ability to do local self help. I think you’re all aware of how important the revenue that we generate here in the Bay Area is to our transportation system. It constitutes over two thirds of all the money we’re going to be spending over the next 30 years, and we do believe that’s the piece of the pie to concentrate on expanding.

58:30 A 58:31 V 13:49 Y

The other two, at the state and federal level, are much more problematic. And in this case, what we’re seeking from the legislature is support for lowering the vote standard at the local level from two thirds to something less. The current number that is being bandied about is 55%, which is what school bonds can pass by, and we just went through a very expensive election here in Alameda County, where only a couple of hundred votes separated defeat from victory, and any other measure or candidate receiving 66 point something something percent of the vote would--

59:14 A 59:15 V 14:36 Y

[voice in background]

66.57

**MTC Executive Director Steve Heminger:**

--be a landslide winner. In this case it was a narrow loss. And, we think that’s not the result we ought to be encouraging. The majority, or at least 55%, ought to rule.

Secondly, at the federal level, we do continue to seek, and in fact will be seeking next week, with a delegation of commissioners in Washington, some sort of steady funding

source for transportation investment that not only the Bay Area but the nation can benefit from.

The fact is, in Washington they haven't raised the gas tax since Bill Clinton was president, and what that has meant is a gradual erosion of the purchasing power of that tax, because inflation has kept apace, and because fuel efficiency has further reduced the revenue yield, and in recent years, the Congress has taken to borrowing general fund money, meaning from our kids and grandkids, to pay for today's transportation improvements.

1:00:23 A 1:00:24 V 15:41 Y

We think that ought to stop. I think the Congress has probably reached that realization as well. And what that means, then, is that we've got to muster up the courage to raise a transportation revenue source so that we don't have to keep borrowing from the general fund.

And, finally, Ezra mentioned cap and trade revenue, and we do believe that the model that Senate Bill 375 has established, of working through the metropolitan planning organizations, the councils of government in California, at the regional scale, is not only the proper model for planning, but we think it's also a good model for delivery of incentives and funding—for housing, for transportation infrastructure, for you name it.

1:01:12 A 1:11:13 V 16:30 Y

What this Plan is really about is creating communities, and communities require lots of different things to be successful—not just the right road or the right number of houses.

Let me conclude if could perhaps just by mentioning a subject that's not written down on the page, and it applies, I think, to both of these subject areas, and that is, I think to some extent, what has limited us in the past is our own imagination. We clearly need more money, we need streamlining of a lot of the procedures we go through to do both transportation and housing development, but we also have a considerable amount of authority and resources at our disposal today.

1:01:59 A 1:02:00 V 17:17 Y

And, as an example, what these two bodies did in creating the One Bay Area Grant program was not find new money—we restructured existing money. And that's always the hardest thing to do. It's always easier to change the rules when you've got some new money to talk about. It's much more difficult to change the rules in the middle of the game, because there's a lot of sense of entitlement—you know, "I always used to get this money this way, and now you're changing it."

But the fact is, I think OBAG is a promising model for restructuring, perhaps, some of the existing funding that we have, to serve the objectives of this Sustainable Communities Strategy. If you look at what OBAG means, if we continue it over the life of this Plan, it would be about 14 billion dollars of investment. The Plan as a whole includes 300 billion

dollars of investments. So clearly, we've got a considerable distance [between where OBAG leaves off, and what the rest of—audio only, not in the video] the Plan does.

Now, I don't think all of the Plan ought to be subject to the same kind of approach, but there's quite a lot of room for argument, I will say, in terms of how much of the Plan we want to use as an incentivizing mechanism to produce the kind of communities we'd like to see.

1:03:20 A 1:03:17 V 18:35 Y

So, on behalf of Ezra, that concludes our presentation of these ideas, and we very much welcome your comment and discussion.

1:03:28 A 1:03:27 V 18:44 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Okay, committee members, what I'd like to do is take the public comments and close that portion and bring it back so we can have an open discussion on that. So with that, Stephan Nestel? Stephan?

If you have a card, turn it in, because if I don't have it at the end of the public comments, we're moving on—okay, Stephan.

1:03:46 A 1:03:45 V 19:03 Y

**Bay Area citizen Stephen Nestel:**

Yes, it's "Stephen" Nestel, and--

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

--Oh, "Stephen," I'm sorry—

**Bay Area citizen Stephen Nestel:**

--I'm a citizen of Marinwood, which is in unincorporated Marin. We are one of the 101 Priority Development Areas. I only represent myself. I'm a common man. I live on a tree-lined street.

What you're doing to our community is totally wrong. You need to wake up. There needs to be jobs before there's housing. That's it.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you, Stephen. Mary Feller? Mary? You're still a Democrat and liberal?

1:04:35 A 1:04:34 V 19:52 Y

**Bay Area citizen Mary Feller:**

Yeah—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

[garbled, perhaps: Okay, I don't think any of the discussion changed that]

**Bay Area citizen Mary Feller:**

--huge Obama supporter—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

All right, go ahead, Mary--

**Bay Area citizen Mary Feller:**

--big marriage equality supporter. I'm Mary Feller.

The streamlining of CEQA--oh, boy, that profound change of "fair argument" test changed to "substantial evidence." I just have to say, oh, boy—no.

You know how I feel about that.

I really—I kind of wanted to look at this idea of changing the, what was it, the number that you need to, from 66 percent to 55 percent—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

--the voter threshold—

**Bay Area citizen Mary Feller:**

Yeah. As the member of a special district—just stepped down, a few years ago—our flood board, unfortunately, at the very, very local level, that two-thirds threshold, is pretty much the only cudgel we have, the only power that we have to keep the County of Marin doing the right thing in our flood zone.

So that's very important to us as citizens. That is where our only power is—is taxation. But I want to turn the attention to the transportation idea, very briefly. Something more positive.

1:06:01 A 1:05:59 V 21:18 Y

One of my concerns is, and I don't know if it's happening at MTC—I haven't been to the meetings, but there does, in terms of money that we need for transportation, there doesn't seem to be any conversation at Transportation Authority of Marin around tele-work. And Transportation Authority of Marin's Diane Steinhauser has actually said, "we don't know how 20% of the workers in Marin County are actually getting to work." And, I can tell you, anecdotally in my neighborhood, they're working at home, and my husband, Gordon Feller, is actually the Director of Urban Innovation at Cisco Systems, that focuses very heavily on tele-work. As you know, you may know, 40% of the workers at Cisco Systems, tele-work.

And, I think that this idea of people commuting to work is a very sort of 1950's idea, whereas if we could focus a lot more funding and attention on tele-work, which is already a huge trend—and there was just an article yesterday in the Wall Street Journal about it—you know, Yahoo, notwithstanding. I just don't know how much that's being considered,

and whether or not we really need to be raising all these taxes, or if we need to actually be re-thinking how people work.

So, thank you for your time and attention.

1:07:26 A 1:07:25 V 22:42 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you Mary. Peter Singleton? Peter? Any other speakers? This is the last card I have.

**Bay Area citizen Peter Singleton:**

Thank you, Mr. Chair.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you, Peter.

**Bay Area citizen Peter Singleton:**

I wanted to raise three things, and one is a concern about these legislative, these policy initiatives, and about ABAG and MTC going on the record as aggressively supporting these initiatives.

The second thing is embedding them in the Plan, which is yet another step that I think is worrisome, and the last one is I'd like to touch on what Mr. Rapport mentioned, is SB 1 and specifically what Mr. Rapport endorsed, which was the changed definition of blight that that legislation, proposed legislation suggests.

What the memorandum from Mr. Heminger and Mr. Rapport said is, and I'll read, "In order to make progress towards our 2040 Plan Bay Area performance targets, ABAG and MTC will need to identify key legislative advocacy objectives to secure changes in both federal and state law," and then at the end of the, this memorandum, "staff look forward to your feedback"—and that's you, our local elected officials that I'm appealing to here—"on these concepts for inclusion in the draft Plan Bay Area to be released in March of 2013"—actually March 22nd, I believe.

1:08:56 A 1:08:54 V 24:11 Y

My concern is I believe that these, these legislative initiatives effectively turn ABAG and MTC into a political action organization, and by embedding these in the Plan—and I'm urging you to not embed these in the Plan—that effectively turns the 101 cities and towns that you folks represent, their interests, into unwitting and unwilling political action organizations as well. Because once it's in the Plan, the individual cities and towns can be coerced into complying with these and endorsing these legislative initiatives.

And, I'd like to read from the ABAG bylaws, which you're governed by. This is Article I, Purpose: "The Association is organized for the purposes of establishing a permanent forum for discussion and study of legislation [sic]"—I'm sorry—"of regional and subregional problems of interest and concern to the counties and cities of the San

Francisco Bay Area, developing policies and actions, and providing services and undertaking actions addressing such problems.”

1:10:04 A 1:10:01 V 25:19 Y

I don't see in that purpose becoming a political action organization. We count on you to represent the interests of all seven million residents and all 101 cities and towns.

The last point, and I'm sure I'm running short on time, that Mr. Rapport raised, is—and I appreciate your statement about the funding for the Sustainable Communities Investment Authorities, but essentially, if you read that statute, basically what it does, it declares suburban and rural lifestyles a blight. And, I think Mr. Rapport endorsed that—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

--Just go ahead and finish

**Bay Area citizen Peter Singleton:**

--and I think it's a very, very troubling thing, for this body, either unofficially, or in the Plan to endorse a concept like that.

And, thank you for your time.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Ok. Thank you, Peter.

Jane Kramer? Jane? Then after Jane is Carolyn Lenert.

1:11:01 A 1:10:57 V 26:17 Y

**Bay Area citizen Jane Kramer:**

Okay, so we're talking about sustainable communities, and we're talking about the tradeoffs between development and CEQA rules and regs.

From my point of view, the bottom line is individual people's health. So, somewhere in that manipulation, you've got to come up with something greater than development, and greater than the CEQA rules. You've got to come up with human wellbeing, i.e., health, however you demographically, geographically map it out.

That means that planners, and people sitting at this table, need to become conversant with real medical processes. Conventional medical statistics don't count—it's a subterfuge. You've got to become conversant with ecological medicine, because that's the bottom line for the individual.

Thank you.

1:12:17 A 1:12:15 V 27:33 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Thank you. Carolyn?

Is there any other speakers?

Okay, after Carolyn, I'm going to bring it back to the committee.

1:12:27 A 1:12:24 V 27:41 Y

**Bay Area citizen Carolyn Lenert:**

Good morning, once again. Carolyn Lenert, Marin County.

Your topic is advocacy and how to be effective at promulgating your plans. You need, again, to have a feedback loop: How's that working at the local level? I'm not sure you know.

In Marin County, it included gerrymandering the people who were even notified about plans, to exclude 320 homes that were 50 feet outside of an area who are landlocked and have no other way to access anything except by going through the area. Okay, those people and their plans were, their lives were excluded from consideration. Gerrymandering is not appropriate when you're doing your planning. So, at the very fine grain of your planning efforts, is injustice.

1:13:16 A 1:13:14 V 28:32 Y

The smart train came through and they did not get a permit. The King Tides came in and they obliterated the track bed, and poured out toxins into the watershed right there. By the way, the planning was done for this Priority Development Area in ignorance of where the water flows. I spoke earlier a little bit about the deep knowledge that is in our communities. For generations, people have lived here and understand which way water flows.

The plans that are being made in the good name of the state of California and the good name of sustainability, are unsustainable. Sea level rise is not considered. Ordinary permitting processes are being ignored. Due process of law and consideration of the people who are most affected are being run over. In the name of what?

1:14:06 A 1:14:04 V 29:23 Y

In the name of all that, we have to suspect the worst. Let's plan for the best, let's hope for the best, but we're really, in Marin, planning for the worst, because of the process being used, in your good name. It's got to stop. You need to drill down and get feedback at a very local level. Do this more often, because it's unjust.

Don't put people next to cell phone tower farms. That's what's being planned in my neighborhood. It's not safe. It's not smart, it's not sustainable, it's not right. And we need all of your good attention in your communities and in mine, to address this. Address the justice and the injustice that is being put forward in the name of sustainability and in your name, and in my name.

I thank you very much.

1:14:52 A 1:14:50 V 30:09 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Okay, thank you Carolyn.

I'd like to bring it back to the committee. Joe, did you want to kick this off?

**MTC Planning Committee member and Los Gatos City Councilmember Joe Pirzynski:**

Thank you, Mr. Chair.

This is a question for Ezra. Ezra, I'd like you to talk a little further about the CEQA modernization, particularly in the area of the "fair argument" versus "substantial evidence"—Mary's not going to like this, but I think that, from the point of view of the fifteen cities and towns in Santa Clara County, we've experienced really significant pushback from certain segments of our communities. Some in more cities, a little bit more than others. But the issue really comes down to how does an individual or small group without legitimate standing have the ability to stop a project that has been approved, that seems to have very strong community buy in, particularly with environmental concerns addressed. And, yet, that project is stopped, and needs to be in some cases started over, with a good deal of impact to the community and a good deal of impact to the overall well-being of our economic life.

1:16:13 A 1:16:11 V 31:29 Y

I'm an environmentalist. I think our communities in the south Bay are very environmental, or very environmentally oriented, and yet, we seem to see this more and more in almost every project that comes forward of some great size. And so, the question we have for you is, where do we stand right now in the environmental review process being reformed? Because we've been talking about this for a long time. But would you give us kind of a sense of the current status, because I'd like to know whether we're still at the beginning, whether we're in any kind of progress whatsoever, and how do you read the tea leaves on this.

1:16:56 A 1:16:54 V 32:12 Y

**ABAG Executive Director Ezra Rapport:**

Well, the provisions that are in SB 375—that was the first substantive reform of CEQA in my career—were negotiated over two years, and were led by Tom Adams of the NRDC and Steinberg's office.

**ABAG Administrative Committee member and Contra Costa County Supervisor John Gioia:**

You want to say what these things are and not use acronyms? NRDC—

**ABAG Executive Director Ezra Rapport:**

Natural Resources Defense—

**ABAG Administrative Committee member and Contra Costa County Supervisor John Gioia:**  
Right.

**ABAG Executive Director Ezra Rapport:**

--Council. And Tom Adams, who was one of the leading founders of CEQA in the first place, and a major advocate for environmental review.

No one here is questioning the need for environmental review, and the need for full disclosure and full public debate on the merits of a project. But once that has taken place, and these environmental documents are enormous, and the city council or lead agency has certified the environmental review, then, the process allows any individual, because everybody has got standing, to, with \$2,500, to come in, make a claim that one piece of the analysis was insufficient, and under the “fair argument” test—that’s the most lenient test in the court—if they can make the slightest bit of sense, the court will take the case.

1:18:13 A 1:18:11 V 33:28 Y

Once that happens, the whole project is at risk, because the delay could mean that the financing of the project doesn’t work any more, the development cycle may be changed. It isn’t just nine months. It’s nine months plus appeal—it could be four years.

And, so, there’s another round of negotiation that has to take place with any individual that has filed. It’s a cottage industry for attorneys and some people think CEQA’s the most abused statute in the history of the world because of this feature.

So, we’ve never seen how this SCEA [Sustainable Communities Environmental Assessment] will work. It hasn’t been used yet. We want to try to use it. But we want to do it in a public way so that courts may respect it, and [respect the fact that – on audio but not in video] we’ve done environmental review through the programmatic environmental document that covers the neighborhood, and we’ve mitigated every—we, I mean, whoever the proponents, the local government has mitigated every environmental issue that has come up, to a point of insignificance, and therefore deserves to have their certification upheld. That’s the argument.

1:19:23 A 1:19:19 V 34:37 Y

And so ABAG would like to assist with technical assistance those local governments who are engaged in neighborhood planning to be able to proceed with their projects.

Now, a lot of issues have been stated about public health and that’s clearly one of the key aspects of the environmental review. Much of our medical information comes from a time when we were using very dirty fuels—lead fuels, very dirty diesel fuels, fuels that were not used in other parts of the world like Europe, and now we’re converting over to a completely different standard of fuels and diesel and filters, etcetera.

That’s going to change the health baseline for a lot of projects, and once we have a better understanding of what that might mean from a health impact—that’s part of the

disclosures that take place, and part of the choices that people make relative to whether they want to live in one of these projects or not.

1:20:20 A 1:20:16 V 35:33 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

With that, Julie, and then Dave.

**ABAG Administrative Committee member (and ABAG President-elect) and Clayton Mayor Julie Pierce:**

Thank you. I just wanted to make a couple of comments.

I agree we need to do some streamlining—modernization of the CEQA requirements, especially in light of what SB 375 allows us to do. We just need to clarify the process so that everyone understands. Nobody's trying to get out of having to do the analysis, nobody's trying to get out of doing the mitigation. But once we've identified all that, it needs to be a little tougher test before someone can just throw a monkey wrench into years and years of planning and study.

1:21:03 A 1:21:00 V 36:17 Y

So, I think that there needs to be a stronger test before that can happen, so I agree with the strategy. I also agree we need some, some better funding. Obviously, we've got to have a replacement for redevelopment funding somehow. What exactly that will wind up being—maybe it's a document recording fee that applies to everything except houses that are sold. That'll keep the realtors from coming down on our heads. That probably is an extra hurdle that we don't need to try and challenge right now.

Stabilizing the federal funding levels—if we can do that based on what we're facing in the transportation stuff. I don't know. We can be hopeful, but I'm not a 100% convinced.

And certainly the self-help has proven to be the best way for us to go, locally, for our transportation stuff, and maybe that is the case for us with implementing our plan.

I do want to say, though, I think there's a point made by our speaker, that maybe we don't include specific strategies in the Plan itself. Maybe we have the goals of what we're trying to accomplish—accomplishing local funding, accomplishing modernization of CEQA—but maybe not the absolute specifics of it. After all, this Plan is one that lasts far beyond an ordinary legislative cycle or two – in the audio, but not in the video]. And so, it may be that we want to leave the details of the legislation we're seeking out of that, and we work on that as we go through the implementation process, and that is part of how we accomplish what we've put into the Plan.

1:22:52 A 1:22:45 V 38:02 Y

So, that's something then we can have a little more discussion with our local partners about. Certainly we all need to take it back to our local jurisdictions to get feedback—it's going to be an extensive process, clearly. None of us could just unilaterally say, yes,

that's the way my whole county is willing to, to go. So, I think with that in mind, maybe we address them as goals rather than the very specific pieces of legislation in the Plan.

1:23:21 A 1:23:16 V 38:34 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Commissioner Cortese [garbled]?

**ABAG Administrative Committee member and Santa Clara County Supervisor  
Dave Cortese:**

Thank you, Mr. Chair.

Two suggestions. On Item 3, stabilize federal funding levels--the last sentence is great, from my perspective. It's something we've talked about here and at ABAG, I think in the Administrative Committee. I would add to that credit enhancement. It's something that I know the BIA has directly addressed here as a need. Does it necessarily require—I realize tax incentives can and usually are a form of credit enhancement, but there can be credit enhancement without tax incentives. HUD used to have an array of programs that basically guaranteed private lenders triple A credit ratings to put bonds out for multi-family housing.

The only reason it hasn't happened is because somebody, one of our Congresses or Presidents divested that program. It doesn't really impact the tax code per se. So just "credit enhancement" would be enough, if we can add that.

1:24:33 A 1:24:26 V 39:44 Y

And then, in terms of, I don't want to get, my, our colleague here Supervisor Gioia too fired up, but something that's come up at the ABAG Administrative Committee, and at the San Francisco Bay Restoration Authority, which is an ABAG and legislative enabled authority here that we oversee. Getting to 55% threshold on local measures, of course, is going to naturally, generally speaking, bring on board the counties and the local ROV [?], depending of course on exactly who's pushing the measure, cities or counties.

But typically, that's not a problem. When you get to try to do a regional measure, which is what transportation item number 1 also talks about, the cost of putting something on the ballot is, becomes a big issue. So, to the extent that we can simply ask or—obviously, none of these issues are really entirely in our control. But to the extent that we're going to be continuing to seek legislative relief on the two thirds threshold, somehow getting to the point where we can get some relief also on, or some reward when the region, the entire region decides to take on a measure that's going to support state priorities like SB 375. You know, there's got to be some relief on the cost of putting something on the ballot.

1:26:02 A 1:25:57 V 41:15 Y

I think—I don't want to—someone here may remember better than me, but I think when we last looked at it, SFBRA, the total cost to the nine counties of putting something on the ballot was well in excess of ten million dollars, and that—counties can no longer

absorb that individually, I'm not sure our agencies can absorb that, and as we've seen lately, private funders have a hard time—campaign committees and so forth—raising that kind of money on a regional level.

So, credit enhancement, and relief on the cost of putting regional ballot measures on the ballot.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Okay, thank you, Dave.

Commissioner Mackenzie and then Commissioner Azumbrado.

1:26:44 A 1:26:39 V 41:56 Y

**MTC Planning Committee member and Rohnert Park City Councilmember Jake Mackenzie:**

Thank you, Mr. Chair, Jake Mackenzie representing the County of Sonoma and the nine Sonoma County cities.

I happen to have spent my local government career, both as a citizen activist and as elected official helping to establish nine voter approved urban growth boundaries around the cities of Sonoma County, and I believe when we look at the particular area that I represent on this Commission, that we are well positioned to work on the implementation of SB 375.

1:27:26 A 1:27:20 V 42:38 Y

I am well reminded when that topic comes up of the debate that took place as that legislation was being discussed, and finally signed into law. There were deliberately no enforcement—the carrot versus the stick—there aren't large sticks with which to beat up either cities or counties or individual citizens. There are carrots that were promised in the legislation which involved funding of this plan that has been brought in front of us—the targets for which have been agreed by the California Air Resources Board—so I'm comfortable with the proposals that have been put in front of us by our executive directors. I believe they talk to serious problems that we have.

1:28:23 A 1:28:18 V 43:35 Y

Let me just tell a brief war story in terms of CEQA and a Walmart expansion in the City of Rohnert Park. We are in fact seeing the use of CEQA to do exactly what somebody mentioned in general, and I can tell you in specific that we are going back for a second time as the City of Rohnert Park to reissue a revised environmental impact report—and I will not speak any further of it because it's a matter which will come in front of our city council—but I am certainly sympathetic to having the discussion that's laid out in these staff notes, Mr. Chair, but it is particularly important on this matter of funding that the promise of SB 375 be realized, because that is how we're going to implement the statute.

Thank you.

1:29:24 A 1:29:18 V 44:36 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**  
Commissioner Azumbrado--

MTC Planning Committee and HUD official Tom Azumbrado:  
Yeah, Tom Azumbrado—

--then Commissioner Bates.

**MTC Planning Committee member and HUD official Tom Azumbrado:**

Actually, in response to credit enhancement, there is ongoing discussion about what government sponsored entities should take place, and if Fannie and Freddie should be separate, but my shop, which is four states, we did \$1.3 billion worth of credit enhancement this last year for multi-family, and nationwide, HUD-FHA did \$13 billion. So there's actually, since the financial collapse, we've done in multi-family rental housing about 40 billion nationwide. So, it's actually a thriving situation right now—credit enhancement.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Okay. Commissioner Bates?

1:30:04 A 1:29:59 V 45:18 Y

**MTC Planning Committee member and Berkeley mayor Tom Bates:**

Thank you very much, Tom Bates, representing the cities of Alameda County. First of all, I want to make a comment, general comment that I think that what's before us in Attachment A, the land use strategies—the four items are appropriate and we definitely should move forward with them.

1:30:23 A 1:30:15 V 45:33 Y

The first one--the locally controlled funding to support PDA's. There is of course legislation that's pending—I just want to call people's attention to Senate Bill 513, which is basically a clean up of what was done last, a couple of years ago in SB 310, which establishes infrastructure financing districts. And the cleanup, I think will eliminate a lot of the problems that have hindered the use of that. And what it would do in essence is that local governments could form these districts, and in the formation of the district, they would require a vote of right now the law says of both of the residents and the property owner. So it's now going to be modified—at least attempt to modify just to be the property owners because they're the ones, and then the assessed valuation increase that occurs in that district, the current law says, they shall negotiate with the various districts, when in reality, what we're really talking about is just using the city's portion of the new increase in the assessed valuation. And, by using that, you can bond that to make the kinds of improvements that you want to make in that district. So you can do the public improvements that are necessary to move forward, and it gets paid for by the increased growth.

1:31:40 A 1:31:35 V 46:53 Y

So, actually, it's an interesting bill, and a bill that, also there's one other modification which has been controversial, and it maybe more difficult—which is it lowers the percentage that you have to do on low income housing from 20% set aside to 10. And the reason is, what we have found in our own dist-in my area, Berkeley, is that we now charge a fee for, when a builder comes in and wants to build, we charge a fee that they have to build, they have to provide us money for the set aside for us to use to build low income housing.

1:32:17 A 1:32:11 V 47:28 Y

And what's happened is, that people are not doing that—they're taking the 10% state density bonus. In some ways that's better, because it means it gets actually built, it gets built in the unit, but, so the thing, the thought was there's no reason to have the 20% in there.

The CEQA stuff, I think is, I was interested in, particularly in Ezra's comments, and I was trying to understand why we can't use that now—he indicated to me, maybe he'd like to elaborate, but we have to adopt an SCS before we can actually avail ourselves of that opportunity which he describes as making that finding, so maybe he could elaborate a little bit more on that.

Stabilizing the federal funding, I agree with Julie. We can hope, but I don't think it's going to happen.

1:33:02 A 1:32:56 V 48:13 Y

And I would love at the end of my comments if somebody on the staff would comment about how we're going to “fiscalize” land use—I don't know how that works. But I'd like to understand what that means, and how that works.

[voice in the background, sounds like MTC Planning Committee member and Rohnert Park City Councilmember Jake Mackenzie]

I'll be happy to tell you--

**MTC Planning Committee member and Berkeley mayor Tom Bates:**

Okay, good, if you can do that, that would be great. And, then, lastly, I just wanted to point out that there are a number of bills that lower the level to 55%, and later today in the legislative committee of MTC, there's a proposal to support the Hancock bill which basically lowers it for everything, rather than—because what's happened is everybody's put in a thing for 55% for libraries, the streets, so the idea is, okay, let's just do the whole thing. So, we'll take a vote of the people and that would be the case.

And, then, I just wanted to make a comment about the people who are here today and reiterate what John Gioia said—you know, you may not like what we're doing here at the level, the regional level, but, you know, it all comes to the locals, the locals make these decisions. And if you don't like what we're doing, you know, you may not like it, but your real fight is with your locals, your locals determine the PDA's, your locals determine the land use issues. We don't determine them. We set policies and guidelines

and we try to implement things that we think are important for the future, but we don't decide what's going to happen in Marin or Solano or any of these other places. It's up to your local representatives.

1:34:28 A 1:34:21 V 49:39 Y

So, Mr. Chair, through the chair, if we could have maybe Ezra elaborate a little bit—

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Yes. Ezra, are you—

**MTC Planning Committee member and Berkeley mayor Tom Bates:**

--and maybe someone can explain how you fiscalize. Thanks.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Okay.

1:34:38 A 1:34:37 V 49:56 Y

**ABAG Executive Director Ezra Rapport:**

Yes. Once the ABAG and MTC approve the final Sustainable Communities Strategy, and that will be in June or July of this year, this standard can come into effect. Now it does, it also includes, by the way, a streamlining of time in that you can do, make all your findings through an initial study. You don't have to go through anything more than that and a 30 day notice, 30 day circulation.

But it all depends on the quality of the environmental document that you're tiering off. So, that's where we at ABAG want to be of assistance to local governments so that we can work on that.

As far as fiscalization, Jake, did you want to make a comment on that because I'd--

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Before--

**MTC Planning Committee member and Rohnert Park City Councilmember Jake Mackenzie:**

The Chair's anxious that I not make a comment--

**ABAG Executive Director Ezra Rapport:**

Oh, is that right, okay, well--

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

But I think it's important that since it's your statement, that you should clarify it.

**ABAG Executive Director Ezra Rapport:**

Yes. Before Proposition 13, when there really was local control over cities' fiscal health, and as we see around the country, cities could raise property taxes when they have special projects to incorporate.

Prop 13 stifled the ability of cities to utilize the property tax as a mechanism for self-funding. And, as a result, there has been much more of a dependency on sales tax. And sales tax is produced in retail, bulk retail, with low-paying jobs, but takes up a lot of land, but is considered very desirable because it funds city services.

1:36:32 A 1:36:25 V 51:43 Y

So, we've taken a lot of land that could have been used for purposes that were more sustainable, or people would agree would be better land uses for the city, and we've converted them into competitive sales tax projects that produce no economic development for the state—because they'd be in one place or another—and this pattern of dependency on sales tax, which is really a very small amount, it's only one percent of the sales tax--the city only gets one percent of the sales tax—has distorted the land market substantially. So what we're trying to do is re-think this. This is not a new thought and no one has been able to overcome it, is that there's a whole series of funding swaps that occurred after Proposition 13 under what's called AB 8. It involves the cities, the counties, and the school districts and the state. And what we need is a win-win situation so that when funding, when increment levels get high enough, and people are willing to see that there's a positive rate of return over the long term for these districts, they might be willing to come to the table and recognize this problem, and reward cities for their growth at a higher level than we have today. And, also, if financing districts are going to take up the city's general fund, that would leave the city without the resources to service those areas.

1:37:55 A 1:37:50 V 53:08 Y

So I don't consider that to be a viable solution. It needs more of a commitment.

But while we've cut schools, and we've cut public education and higher education, it's not the time to be talking about long term economic development. Those cuts have to get restored, and we need a growing California again.

**MTC Planning Committee Chair and Solano County Supervisor Jim Spring:**

Ok, go ahead, John, I'm trying to wrap up so we can—

1:38:19 A 1:38:14 V 53:32 Y

**ABAG Administrative Committee member and Contra Costa County Supervisor John Gioia:**

So, two comments real quickly. One is, I think it's important to note that these strategies here are designed to help and empower the local communities achieve their objectives. All of those PDA's that we have, you know, came to us, as we've said, from locally-elected officials who stand before their voters like we do, every four years. And, in their wisdom, after listening to their community, they said to us, this is where we would like to see development occur in our community. We didn't say that.

But what we are trying to do is create the tools to allow them to achieve that vision, which may be hard to do. So anyone who—I think what may happen over time, there will be communities that will continue to have that same vision, and others who may change their vision. That happens in the democratic process, they may say, gee, we don't think this should be a PDA any longer.

1:39:22 A 1:39:16 V 54:34 Y

So, there's nothing to prevent them from making that decision in the future.

The other thing, I'll say, is some folks talked about health, and I'm, the person that mentioned it, I think, left, which I think is too bad because I—would be nice to hear this. A number of the folks sitting around this table like Mayor Bates, Supervisor Haggerty, Spering, Supervisor Mar, and myself, also serve on the Air District. And the Air District actually came up with some guidelines on how to address the issue of considering health when you look at new development. While there may be disagreement about whether that should be in CEQA or not, there was clearly, I think, pretty strong feeling that looking at health is a valid issue.

1:40:09 A 1:40:03 V 55:20 Y

So that mechanism does exist. So, as this moves forward, and I think we'll have to continue to fine tune this as this moves forward, that health issues, there's already a way for some of the health issues to get considered as part of the PDA development process going forward, because, another regional agency with those of us wearing a different hat, actually spent a lot of time discussing that and passing that policy, so, I just wanted to note that—that there is some consideration of health within the context of what the Air District policies have been.

1:40:42 A 1:40:37 V 55:55 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**  
Mayor Quan?

**MTC Planning Committee member and Oakland Mayor Jean Quan:**

So, I'll make this quick. I want to just speak directly to Ezra's question about the 20% and, in SB 1, and that whole issue. I think that the key thing would be flexibility, so, for the first time in Oakland's history, we actually have some communities saying, okay, we want affordable housing, but we have a high percentage of affordable housing already in our neighborhood, so can you disperse it in other parts of the city, and so I want that flexibility--so, for instance, Chinatown, and the Lake Merritt Project Plan. We actually have a pretty—because we have fought for a long time for good affordable housing for immigrants in this area—they're saying, could we have some workforce housing, or even some middle class housing, to balance out the economy of this neighborhood.

1:41:30 A 1:41:25 V 56:43 Y

And, so, I want that flexibility, and also because the state took away our administrative fund in recent rulings for affordable housing so they said, okay, you can have affordable

housing but you can't have any staff to administrate it. Well, the City of Oakland, we're talking about 30, 40 projects, and that's a big hit to my general fund, if they don't provide a way to fund that staff, we may almost just give it back to somebody, and the Housing Authority doesn't want it either, and so somewhere in this deal the actual cost of administering affordable housing projects has to be looked at.

And in terms of Marin County and other people—quite frankly, if you don't want your money, I would take it, I feel it's sort of like the Medicare fight. It's like, I think what we're trying to do is as an ABAG, in particular, we talked about everybody should have—if we're going to take the higher density of the housing, and in fact we will take the higher density of low income people, that has a long lasting impact, but every neighborhood and every city should have some capacity to take—we shouldn't ghetto-ize and segregate poor people, and so that there should be affordable housing throughout the Bay Area and some cities like Walnut Creek have stepped up really well and built mixed-use and mixed income housing, and I think that's the kind of society we want. I don't want poor segregated either in Oakland or in terms of the whole Bay Area, just concentrated in Oakland, and, nor would I like, within the city, for them to be just concentrated in some neighborhoods because it leads to high crime and inequity. Just like in some days, back in, you look at back in the history of Oakland, it was Black History Month, I heard so many stories that no black people were able to work on the other side of Broadway. And if we don't, we're not careful about how we do our affordable housing, you do the same kind of de facto segregation, and so, the flexibility is absolutely critical.

And, I'd like to move the question because I have to go.

1:43:28 A 1:43:23 V 58:40 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Well, there is no question before us, but it—Jake, if you could just wrap it up and—

1:43:36 A 1:43:31 V 58:48 Y

**MTC Planning Committee member and Rohnert Park City Councilmember Jake Mackenzie:**

Brevity being the soul of wit, Mr. Chair, I offer a tour up and down US 101 between Petaluma through Rohnert Park and up to Santa Rosa where currently we have a Target in Rohnert Park which brings in part of that sales tax that Executive Director Rapport mentioned, which is over 33% of the city's general fund budget. Petaluma has resented this, and so now you will find next to the 101 freeway in Petaluma, a new Target being built. And Santa Rosa, to the north of us, jealous also of that sales tax revenue, is about to start building a Target at the north end of Santa Rosa—so, that is fiscalization of land use writ large and clear.

Thank you, Mr. Chair.

1:44:20 A 1:44:14 V 59:32 Y

**MTC Planning Committee Chair and Solano County Supervisor Jim Spering:**

Just real quickly. I agree with Julie Pierce on putting out the very specific recommendations. I like them being more general. I would say, “local controlled funding to support PDA’s” because this is a very fluid process, and some of the things that are being recommended could be changed, but I like all four of the categories and the three on the other side. But I’d like them—if we’re going to embed them in the Plan, I feel that they should be general.

I’m concerned about the cap and trade—you know, we kind of have a conflict here. We’re trying to use the money for affordable housing, use it for transportation. I think that money should be used to clean up the air, what it was originally intended for. But you’re going to see a lot of people knocking on that door to get into that funding mechanism.

1:45:01 A 1:44:57 V 1:00:16 Y

The regional taxing authority—that certainly needs a lot more discussion--how that is implemented, and, but I think it is certainly a worthy goal, something to look at.

And, real fast, on the fiscalization of land, I would rather have language that talks about a balanced regional growth pattern, that talks about both revenues and housing. Most communities as they start to change their zoning, they look at the impact it has on your ability to provide housing, or future revenues. And, so, the local jurisdictions are kind of going through that, and I think that’s a pretty good model to use in the region, and with that, I have no speaker cards, and unless staff has anything to respond, I’m going to adjourn the meeting. This meeting’s adjourned. Thank you.

1:45:45 A 1:45:39 V 1:01:02 Y

## **Appendix W**

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smart  [smahrt]

**verb (used without object)**

- to be a source of sharp, local, and usually superficial pain, as a wound.
- to be the cause of a sharp, stinging pain, as an irritating application, a blow, etc.
- to feel a sharp, stinging pain, as in a wound.
- to suffer keenly from wounded feelings: *She smarted under their criticism.*
- to feel shame or remorse or to suffer in punishment or in return for something.

Relevant Questions

**verb (used with object)**

- to cause a sharp pain to or in.

**00:10**

**Smart is one of our favorite verbs. So is hornswoogle. Does it mean:**

- to swindle, cheat, hoodwink, or hoax.
- to introduce subtleties into or argue subtly about.

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**adjective, smart-er, smart-est.**

- quick or prompt in action, as persons.
- having or showing quick intelligence or ready mental capability: *a smart student.*
- shrewd or sharp, as a person in dealing with others or as in business dealings: *a smart businessman.*
- clever, witty, or readily effective, as a speaker, speech, rejoinder, etc.
- dashing or impressively neat or trim in appearance, as persons, dress, etc.

**adverb**

- in a smart manner; smartly.

**noun**

- a sharp local pain, usually superficial, as from a wound, blow, or sting.
- keen mental suffering, as from wounded feelings, affliction, grievous loss, etc.
- smarts**, *Slang.* intelligence; common sense: *He never had the smarts to use his opportunities.*

**Origin:**

before 1050; (v.) Middle English *smerten*, Old English *-smeortan* (only in the compound *fyrsmeorrende* painful like fire), cognate with Old High German *smerzan* (German *schmerzen*); (adj.) Middle English *smerte*,

Example sentences

Consumers can already get hold of many publications on smartphones and e-readers.

The show is smartenough to test the waters of outrage but not brazen enough to

The sun was hot and smartpeople were taking a siesta in hammocks on shaded

Many studies show the environmental benefits of smartgrowth.

Use Dictionary.com faster without ads >>

Related Words

- |           |           |
|-----------|-----------|
| whack     | sting     |
| smart mob | titivate  |
| smart set | trig      |
| smart-ass | acute     |
| smartish  | adjective |
| spruce    | anger     |
| MORE      |           |

Slang

- |                 |              |
|-----------------|--------------|
| get smart       | smart money  |
| one smart apple | smart mouth  |
| smart cookie    | smarty-pants |
| smart guy       | street smart |
| smart money     |              |

Matching Quote

"...the promise of automation seemed to exert a magnetic force, a seduction that promised to fulfill a dream of perfect control and heal egos wounded by their needs for certainty. The dream contains the image of "people serving a smart machine," but in the shadow of the dream, human beings have lost the experience of critical judgment that would allow them to no longer simply respond but to know better than, to question, to say no."

Shoshana Zuboff

## **Appendix X**

sustainable definition, dictionary.com


**Related Searches**

Sustainable design  
Sustainable living  
Sustainable resource...  
Sustainable agricult...  
Sustainable architec...  
Concepts of sustaina...  
Sustainable food  
Sustainable society

**Nearby Words**

suspiciously  
suspiciousness  
spirals  
suspension  
suspense  
susquehanna  
susquehanna riv...  
suss  
suss laws  
suss out  
suss so out  
suss.  
sussed  
sussex  
sussex spaniel  
sussex universi...  
sussex-spaniel  
sussexite  
sustain  
sustainability  
sustainable  
sustainable agr...  
sustainable dev...  
sustainable liv...  
sustainable-agr...  
sustained  
sustained relea...  
sustained yield  
sustained-actio...  
sustained-relea...  
sustained-yield  
sustainably  
sustainedreleas...  
sustainedyield  
sustainer  
sustaining  
sustaining peda...  
sustaining prog...  
sustaining-peda...  
sustaining-prog...  
sustainingly

**Synonyms**

transport  
encounter  
withstand  
transfer  
continue  
validate  
buttress  
[MORE](#)

**sustainable**[Use Sustainable in a sentence](#)

Ads

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Driving Global Change by Reducing Our Environmental Impact.

**sus-tain-a-ble** [suh-stey-nuh-buh l]**adjective**

1. capable of being supported or upheld, as by having its weight borne from below.
2. pertaining to a system that maintains its own viability by using techniques that allow for continual reuse: *sustainable agriculture*. *Aquaculture is a sustainable alternative to overfishing.*
3. able to be maintained or kept going, as an action or process: *a sustainable negotiation between the two countries.*
4. able to be confirmed or upheld: *a sustainable decision.*
5. able to be supported as with the basic necessities or sufficient funds: *a sustainable life.*

**Relevant Questions****Origin:****sustain** + **-able****Related forms****sus-tain-a-bil-i-ty**, **noun****non-sus-tain-a-ble**, **adjective****non-sus-tain-a-bil-i-ty**, **noun****un-sus-tain-a-ble**, **adjective**

Dictionary.com Unabridged

Based on the Random House Dictionary, © Random House, Inc. 2013.

[Cite This Source](#) | [Link To Sustainable](#)

**Sustainable is always a great word to know. 00:10**  
**So is bezoar. Does it mean:**

- a calculus or concretion found in the stomach or intestines of certain animals, esp. ruminants, formerly reputed to be an effective remedy for poison.
- a scrap or morsel of food left at a meal.

[LEARN MORE UNUSUAL WORDS WITH WORD DYNAMO...](#)**World English Dictionary**

Collins

**sustainable** (səˈsteɪnəbəl) [?](#)**—adj**

1. capable of being sustained
2. (of economic development, energy sources, etc) capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage: *sustainable development*
3. (of economic growth) non-inflationary

Collins English Dictionary - Complete & Unabridged 10th Edition  
2009 © William Collins Sons & Co. Ltd. 1979, 1986 © HarperCollins  
Publishers 1998, 2000, 2003, 2005, 2006, 2007, 2009

[Cite This Source](#)**Example sentences**High savings were **sustainable** when the population was younger, wealthy, and

But the government will be careful about reversing stimulus measures until it

Eating meat does not cause global warming if it is done in a **sustainable** way.Fashion and furniture mainstays are manufacturing products using **sustainable**[Use Dictionary.com faster without ads >>](#)**Related Words**

agnostic	sustain
sustain	<a href="#">MORE</a>

**Quote Of The Day**

"A person taking stock in middle age is like an artist or composer looking at an unfinished..."

-Harry S. Broudy

[MORE](#)

## **Appendix Y**

fraudulent definition, [dictionary.com](https://www.dictionary.com)



**Related Searches**

- Fraudulent checks
- Fraudulent companies
- Fraudulent misrepres...
- Check fraud victim
- Sample fraudulent ch...
- Punishment for fraud...
- Fraud
- Deceitful

**Nearby Words**

- fratrage
- fratricidal
- fratricelli
- fratricidal
- fratricide
- fratry
- frau
- fraud
- fraud fully
- fraud in fact
- fraud in law
- fraud in the fa...
- fraud in the in...
- fraud squad
- fraud-fully
- fraudful
- fraudless
- fraudster
- fraudulence
- fraudulency
- fraudulent**
- fraudulent sche...
- fraudulently
- frauen
- frauenfeld
- fraughan
- fraught
- fraught with
- fraughtage
- fraughtest
- fraulein
- fraunhofer
- fraunhofer gese...
- fraunhofer line...
- fraunhofer-line...
- fravashi
- frawzey
- fraxa
- fraxin
- fraxinella
- fraxinus

**Synonyms**

- treacherous
- counterfeit
- duplicitous
- dishonest
- deceitful
- spurious
- criminal
- MORE

**fraudulent** [Use Fraudulent in a sentence](#)

Ads  
**Stock Fraud Lawyer**  
[www.stockfraudrecovery.com/](http://www.stockfraudrecovery.com/)  
 Do You Have An Investment Related Claim? We Can Help. Call Us Today!  
**Instant Fraud Records**  
[www.instantcheckmate.com/](http://www.instantcheckmate.com/)  
 Find The Truth About Anyone. View Fraud Records In Seconds.

**fraud-u-lent** [fraw-juh-luh nt]

- adjective**
1. characterized by, involving, or proceeding from **fraud**, as actions, enterprise, methods, or gains: *a fraudulent scheme to evade taxes.*
  2. given to or using **fraud**, as a person; cheating; dishonest.

**Origin:**  
 1375-1425; late Middle English < Latin *fraudulentus*. See **fraud**, **-ulent**

**Related forms**  
**fraud·u·lence, fraud·u·len·cy, noun**  
**fraud·u·lent·ly, adverb**  
**non·fraud·u·lence, noun**  
**non·fraud·u·len·cy, noun**  
**non·fraud·u·lent, adjective**

**Synonyms**  
 1, 2. deceitful, deceptive, crooked, underhanded.

Dictionary.com Unabridged  
 Based on the Random House Dictionary, © Random House, Inc. 2013.  
[Cite This Source](#) | [Link To fraudulent](#)

**Relevant Questions**

**Fraudulent is an SAT word you need to know. 00:10**  
**So is quackery. Does it mean:**

- deceitfulness in speech or conduct; speaking or acting in two different ways concerning the same matter with intent to deceive; double-dealing.**
- practice or methods of a fraudulent pretender**

**LEARN MORE SAT WORDS WITH WORD DYNAMO...**

**World English Dictionary**

Collins

**fraudulent** (ˈfrɔːdʒələnt)

- adj**
1. acting with or having the intent to deceive
  2. relating to or proceeding from fraud or dishonest action

[C15: from Latin *fraudulentus* deceitful]

**'fraudulence**

**—n**

**'fraudulency**

**—n**

**Example sentences**

- The bank later called to report the checks were **fraudulent** and forged.
- It was later retracted and may have been **fraudulent**
- Barely a month goes by without some newly uncovered **fraudulent** image making it
- The research was later discovered to be **fraudulent** however, and the journal

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**Related Words**

- |               |                |
|---------------|----------------|
| quack         | crooked        |
| bill of goods | frame-up       |
| blue-sky law  | hustler        |
| bogus         | identity theft |
| cheat         | imposture      |
| collusion     | misredemption  |
| MORE          |                |

**Matching Quote**

*"Just imagine for a moment what life in this country might have been if women had been properly represented in Congress. Would a Congress where women in all their diversity were represented tolerate the countless laws now on the books that discriminate against women in all phases of their lives? Would a Congress with adequate representation of women have allowed this country to reach the 1970s without a national health care system? Would it have permitted this country to rank fourteenth in infant mortality among the developed nations of the world? Would it have allowed the situation we now have in which thousands of kids grow up without decent care because their working mothers have no place to leave them? Would such a Congress condone the continued butchering of*

## **Appendix Z**

fraud definition, dictionary.com



Related Searches

- Types of fraud
- Fraud companies
- List of different ty...
- Internet fraud
- Credit card fraud
- Check fraud
- Identity fraud
- Social security disa...

Nearby Words

- fraternation
- fraterni'sation
- fraterni'zation
- fraternisation
- fraternise
- fraterniser
- fraternity
- fraternity hous...
- fraternity-hous...
- fraternization
- fraternize
- fraternizer
- fratery
- fratrage
- fratri'cidal
- fratricelli
- fratricidal
- fratricide
- fratry
- frau
- fraud
- fraud fully
- fraud in fact
- fraud in law
- fraud in the fa...
- fraud in the in...
- fraud squad
- fraud-fully
- fraudful
- fraudless
- fraudster
- fraudulence
- fraudulency
- fraudulent
- fraudulent sche...
- fraudulently
- frauen
- frauenfeld
- fraughan
- fraught
- fraught with

Synonyms

- counterfeit
- charlatan
- treachery
- duplicity
- extortion
- blackmail
- chicanery
- [MORE](#)

fraud

[Use Fraud in a sentence](#)

Ads

**Stop zeus fraud**  
[www.trusteer.com/free-white-paper](http://www.trusteer.com/free-white-paper)  
 how does zeus bypass your security? Get our free white paper

**Investment Fraud Attorney**  
[www.stockfraudrecovery.com/](http://www.stockfraudrecovery.com/)  
 Claims Against Your Financial Advisor? We Can Help. Call Us Today

fraud [frawd]

noun

1. deceit, trickery, sharp practice, or **breach** of confidence, perpetrated for profit or to gain some unfair or dishonest advantage.
2. a particular instance of such deceit or trickery: *mail fraud*; *election frauds*.
3. any deception, trickery, or humbug: *That diet book is a fraud and a waste of time*.
4. a person who makes deceitful pretenses; sham; poseur.

Origin:

1300-50; Middle English *fraude* < Old French < Medieval Latin *fraud-* (stem of *fraus*) deceit, injury

Related forms

- fraud·ful**, *adjective*
- fraud·ful·ly**, *adverb*
- an·ti·fraud**, *adjective*
- pre·fraud**, *noun*

Synonyms

1. See **deceit**.
3. wile, hoax.

Dictionary.com Unabridged  
 Based on the Random House Dictionary, © Random House, Inc. 2013.  
[Cite This Source](#) | [Link To fraud](#)

Relevant Questions

**Fraud is always a great word to know.** 00:10  
 So is interrobang. Does it mean:

- a printed punctuation mark (?), available only in some typefaces, designed to combine the question mark (?) and the exclamation point (!), indicating a mixture of query and interjection, as after a rhetorical question.
- a gadget; dingus; thingumbob.

[LEARN MORE UNUSUAL WORDS WITH WORD DYNAMO...](#)

World English Dictionary

Collins

fraud (frɔ:d)

—n

1. deliberate deception, trickery, or cheating intended to gain an advantage
2. an act or instance of such deception
3. something false or spurious: *his explanation was a fraud*
4. *informal* a person who acts in a false or deceitful way

[C14: from Old French *fraude*, from Latin *fraus* deception]

Example sentences

Surely if he's marketing his rubbish with false claims of medical efficacy he's

Social media is changing how state and local government elections are covered,

And the ability to restrict information is worse than a license to commit

For a hundred years that has been an almost unbroken record of **fraudand**

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Related Words

- duplicity
- cheat
- deceit
- fraudulent
- honor
- mulct
- apatite
- barratry
- biter
- bona fides
- charlatan
- check

[MORE](#)

Matching Quote

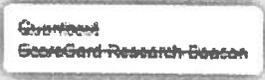
*"The debt was the most sacred obligation incurred during the war. It was by no means the largest in amount. We do not haggle with those who lent us money. We should not with those who gave health and blood and life. If doors are opened to **fraud**, contrive to close them. But don't deny the obligation, or scold at its performance."*

-Rutherford Birchard Hayes

[MORE](#)

## **Appendix AA**

deceit definition, [dictionary.com](http://dictionary.com)



Related Searches

- Deceit quotes
- Deceit lying decepti...
- Reasons for deceit
- Stories of deceit
- Big rube love's dece...
- Verbal deceit
- Deceit harmful
- Big rube poems

Nearby Words

- decayable
- decayless
- decca
- deccan
- deccan hemp
- deccan-hemp
- deccapodal
- deccen
- decd
- decd.
- decdesign
- decdns
- dece
- decease
- deceased
- deceased person
- decede
- decendent
- decendent estate
- decendent-estate
- deceit**
- deceit fully
- deceit fulness
- deceit-fully
- deceit-fulness
- deceitful
- deceitfully
- deceitfulness
- deceitless
- deceiva'bility
- deceivability
- deceivable
- deceivableness
- deceivably
- deceive
- deceiver
- deceiving
- deceivingly
- deceler'ation
- decelerate
- deceleration

Synonyms

- subterfuge
- deception
- duplicity
- stratagem
- hypocrisy
- chicanery
- treachery
- MORE

deceit

Use Deceit in a sentence

de·ceit [dih·seet]

noun

- the act or practice of deceiving; concealment or distortion of the truth for the purpose of misleading; duplicity; fraud; cheating; *Once she exposed their deceit, no one ever trusted them again.*
- an act or device intended to deceive; trick; stratagem.
- the quality of being deceitful; duplicity; falseness; *a man full of deceit.*

Origin:

1225-75; Middle English *deceite* < Anglo-French, Old French, noun use of feminine of *deceit*, past participle of *deceivre* to deceive

Related forms

non·de·ceit, noun

Synonyms

1. deception, dissimulation. 1, 3. DECEIT, GUILF, HYPOCRISY, DUPLICITY, FRAUD, TRICKERY refer either to practices designed to mislead or to the qualities that produce those practices. DECEIT is the quality that prompts intentional concealment or perversion of truth for the purpose of misleading: *honest and without deceit*. The quality of GUILF leads to craftiness in the use of deceit: *using guile and trickery to attain one's ends*. HYPOCRISY is the pretense of possessing qualities of sincerity, goodness, devotion, etc.: *It was sheer hypocrisy for him to go to church*. DUPLICITY is the form of deceitfulness that leads one to give two impressions, either or both of which may be false: *the duplicity of a spy working for two governments*. FRAUD refers usually to the practice of subtle deceit or duplicity by which one may derive benefit at another's expense: *an advertiser convicted of fraud*. TRICKERY is the quality that leads to the use of tricks and habitual deception: *notorious for his trickery in business deals*.

Antonyms

3. honesty, sincerity.

Dictionary.com Unabridged

Based on the Random House Dictionary, © Random House, Inc. 2013

[Cite This Source](#) | [Link To deceit](#)

Relevant Questions

Deceit is a GRE word you need to know. 00:10  
 So is delirious. Does it mean:

TO LOWER IN DEGREE OR QUALITY

wild with excitement, enthusiasm, etc.:

LEARN MORE GRE WORDS WITH WORD DYNAMO...

World English Dictionary

Collins

deceit (dɪˈsi:t)

—n

- the act or practice of deceiving
- a statement, act, or device intended to mislead; fraud; trick
- a tendency to deceive

[C13: from Old French *deceite*, from *deceivre* to deceive]

Collins English Dictionary - Complete & Unabridged 10th Edition

Example sentences

Ayres and others are also working on technological solutions that would prevent

Certainly there was no evidence of **deceitor** fraud or dishonesty or what have

Fraud, **deceit** or malice had not then meddled themselves with plainness and

But this coupling has always been something of a convenient political **deceit**

Want deceit ad-free? Click here!

Related Words

- duplicity
- fraud
- honor
- apalite
- artifice
- artless
- MORE
- bilk
- catch
- conceit
- conspiracy
- cunning
- deceitful

Matching Quote

"Excessive courtesy must contain **deceit**."

-unknown author

MORE

---

## ***Curriculum Vitae***

***John A. Charles, Jr.***

### **Employment**

- 2004-present – President and CEO, Cascade Policy Institute
- 1997-2004 – Environmental Policy Director, Cascade Policy Institute
- 1980-1996 – Executive Director, Oregon Environmental Council
- 1977-1979 – Executive Assistant, Environmental Defense Fund, New York, NY

### **Education**

- 1990 – MPA, Portland State University
- 1977 – BA, University of Pittsburgh

### **Selected papers and presentations**

***Portland's Eastside Light Rail Line: A 25-year Retrospective***, presentation to the NW Transportation Conference, Corvallis OR, February 2012.

***Transit-Oriented Development in Portland: Comparing the Vision with Reality***, presentation to the TRB Transportation, Planning, Land Use, Air Quality conference, San Antonio, May 2011.

***Portland's Westside MAX: Comparing the Vision with Reality***, keynote presentation to the NW Transportation Conference, Corvallis, OR, February 2010.

***Mandatory Markets vs. Voluntary Markets: What's the Difference?***, presentation to the Carbon Credits CLE seminar, March 9, 2009, Seattle.

***Economic Impacts of Cap-and-Trade***, presentation to *The Business of Forest Carbon* seminar, Stoel Rives LLP, Tacoma, WA, October 2008.

***Money for Nothing: Carbon Cartels and the Rise of a Phantom Industry***, *Brainstorm NW*, April 2008.

***Environmental Benefits of Market-Based Road Pricing***, plenary presentation to the International Bridge, Tunnel and Turnpike Association, Orlando, April 2008.

***The Mythical World of Transit Oriented Development: Orenco Station*** (with Michael Barton, Ph.D.), Cascade Policy Institute, 2003.

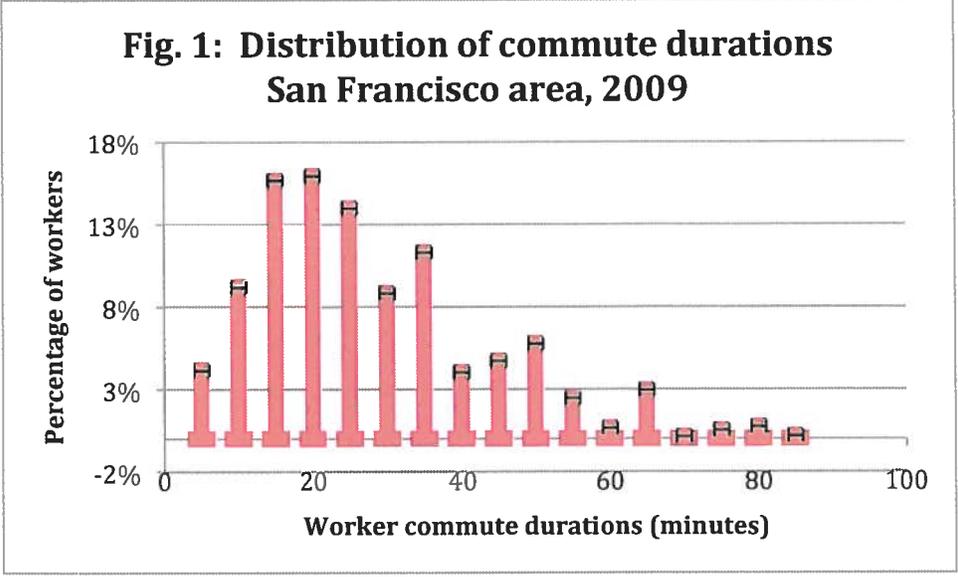
***Ditching the Doctrine: The Church of Urban Planning***, *Oregonian*, December 8, 2002.

***Daydream Believers: Portland's Plan for North Macadam***, *Brainstorm NW*, September 2002.

***Congestion Pricing is Inevitable***, guest editorial, *Innovation Briefs*, March 2001.

***Lessons from the Portland Experience***, in *A Guide to Smart Growth*, Utt and Shaw, Ed., Heritage Foundation and PERC, 2000, pp. 119-134.

**Fig. 1: Distribution of commute durations  
San Francisco area, 2009**



BLANK

BLANK

810

Table 1: Urban Area Population Densities (per Square Mile)

Urban Area	1950	1960	1970	1980	1990	2000	2010	1950-2010	1960-2010	1970-2010	1980-2010	1990-2010	2000-2010	Increased UZA density in most recent decade
Atlanta, GA	4,783	3,122	2,694	1,782	1,897	1,783	1,707	-64.3%	-45.3%	-36.6%	-4.2%	-10.0%	-4.3%	
Austin, TX	3,886	3,667	3,070	2,695	2,059	2,836	2,605	-33.0%	-29.0%	-15.1%	-3.3%	26.5%	-8.2%	
Baltimore, MD	7,645	6,450	5,097	3,356	3,187	3,040	3,073	-59.8%	-52.4%	-39.7%	-8.4%	-3.6%	1.1%	↑
Birmingham, AL	4,406	3,318	2,480	1,777	1,559	1,694	1,414	-67.9%	-57.4%	-43.0%	-20.4%	-9.3%	-16.5%	
Boston, MA--NH--RI	6,472	4,676	3,995	3,126	3,114	2,323	2,232	-65.5%	-52.3%	-44.1%	-28.6%	-28.3%	-3.9%	
Buffalo, NY	7,276	6,588	5,079	3,767	3,336	2,662	2,463	-66.1%	-62.6%	-51.5%	-34.6%	-26.2%	-7.5%	
Charlotte, NC--SC	4,029	2,838	2,632	1,847	1,884	1,745	1,685	-58.2%	-40.6%	-36.0%	-8.8%	-10.6%	-3.4%	
Chicago, IL--IN	6,951	6,207	5,258	4,526	4,285	3,913	3,524	-49.3%	-43.2%	-33.0%	-22.1%	-17.8%	-9.9%	
Cincinnati, OH--KY--IN	5,568	4,107	3,316	2,674	2,367	2,237	2,063	-63.0%	-49.8%	-37.8%	-22.9%	-12.9%	-7.8%	
Cleveland, OH	4,613	3,041	3,034	2,785	2,637	2,762	2,307	-50.0%	-24.1%	-24.0%	-17.2%	-12.5%	-16.5%	
Columbus, OH	6,738	4,255	3,362	2,734	2,739	2,847	2,680	-60.2%	-37.0%	-20.3%	-2.0%	-2.2%	-5.9%	
Dallas--Fort Worth, TX	3,263	1,560	1,882	1,915	2,216	2,947	2,879	-11.8%	84.6%	52.9%	50.3%	29.9%	-2.3%	
Denver, CO	4,752	4,814	3,573	3,080	3,307	3,978	3,554	-25.2%	-26.2%	-0.5%	15.4%	7.5%	-10.6%	
Detroit, MI	6,506	5,107	4,554	3,648	3,304	3,095	2,793	-57.1%	-45.3%	-38.7%	-23.5%	-15.5%	-9.8%	
Hartford, CT	5,679	2,916	3,550	2,452	2,266	1,817	1,791	-68.5%	-38.6%	-49.5%	-26.9%	-20.9%	-1.4%	

Houston, TX	2,596	2,645	3,113	2,299	2,466	2,952	2,978	14.7%	12.6%	-4.3%	29.5%	20.8%	0.9%	↑
Indianapolis, IN	5,516	4,407	2,152	1,931	1,951	2,204	2,108	-61.8%	-52.2%	-2.1%	9.2%	8.0%	-4.4%	
Jacksonville, FL	4,745	3,360	1,510	1,387	1,453	2,146	2,008	-57.7%	-40.2%	33.0%	44.8%	38.3%	-6.4%	
Kansas City, MO— KS	4,685	3,266	2,320	1,864	1,673	2,332	2,242	-52.2%	-31.4%	-3.4%	20.2%	34.0%	-3.9%	
Los Angeles, CA	4,589	4,736	5,312	5,188	5,800	7,068	6,999	52.5%	47.8%	31.8%	34.9%	20.7%	-1.0%	
Louisville, KY	7,045	4,463	3,519	2,916	2,668	2,210	2,040	-71.0%	-54.3%	-42.0%	-30.0%	-23.5%	-7.7%	
Memphis, TN--MS-- AR	3,691	3,494	3,388	2,618	2,419	2,430	2,132	-42.2%	-39.0%	-37.1%	-18.6%	-11.9%	-12.3%	
Miami, FL	3,923	4,661	4,710	4,729	5,425	4,408	4,442	13.2%	-4.7%	-5.7%	-6.1%	-18.1%	0.8%	↑
Milwaukee, WI	8,127	2,934	2,740	2,433	2,395	2,688	2,523	-69.0%	-14.0%	-7.9%	3.7%	5.4%	-6.1%	
Minneapolis--St. Paul, MN--WI	4,273	2,096	2,359	1,824	1,957	2,672	2,594	-39.3%	23.8%	10.0%	42.2%	32.6%	-2.9%	
Nashville, TN	4,796	2,690	1,302	1,254	1,186	1,740	1,721	-64.1%	-36.0%	32.1%	37.2%	45.0%	-1.1%	
New Orleans, LA	2,973	3,165	5,228	4,687	3,852	5,096	3,579	20.4%	13.1%	-31.5%	-23.6%	-7.1%	-29.8%	
New York, NY-NJ- CT	9,813	7,460	6,683	5,552	5,407	5,309	5,319	-45.8%	-28.7%	-20.4%	-4.2%	-1.6%	0.2%	↑
Oklahoma City, OK	4,104	1,114	1,711	1,501	1,212	2,320	2,098	-48.9%	88.3%	22.6%	39.8%	73.1%	-9.6%	
Orlando, FL	2,920	2,597	2,311	1,849	2,246	2,554	2,527	-13.5%	-2.7%	9.4%	36.7%	12.5%	-1.1%	
Philadelphia, PA-- NJ--DE--MD	9,365	6,089	5,347	4,051	3,627	2,862	2,746	-70.7%	-54.9%	-48.6%	-32.2%	-24.3%	-4.0%	
Phoenix, AZ	3,927	2,226	2,224	2,348	2,707	3,638	3,165	-19.4%	42.2%	42.3%	34.8%	16.9%	-13.0%	
Pittsburgh, PA	6,035	3,436	3,097	2,539	2,157	2,058	1,915	-68.3%	-44.3%	-38.2%	-24.5%	-11.2%	-6.9%	

Portland, OR--WA	4,500	3,396	3,090	2,940	3,021	3,340	3,528	-21.6%	3.9%	14.2%	20.0%	16.8%	5.6%	↑
Providence, RI--MA	4,077	3,511	3,258	2,823	2,829	2,331	2,185	-46.4%	-37.8%	-32.9%	-22.6%	-22.8%	-6.3%	↑
Raleigh, NC	5,750	2,765	2,141	2,071	1,739	1,691	1,708	-70.3%	-38.2%	-20.2%	-17.5%	-1.8%	1.0%	↑
Richmond, VA	5,375	3,742	2,876	1,960	1,947	1,878	1,937	-64.0%	-48.2%	-32.6%	-1.2%	-0.5%	3.1%	↑
Riverside--San Bernardino, CA	2,230	2,237	1,884	1,964	2,543	3,431	3,546	59.1%	58.6%	88.2%	80.6%	39.4%	3.4%	↑
Rochester, NY	6,292	4,363	4,116	3,015	2,818	2,353	2,221	-64.7%	-49.1%	-46.1%	-26.3%	-21.2%	-5.6%	↑
Sacramento, CA	5,048	3,373	2,524	2,863	3,284	3,775	3,660	-27.5%	8.5%	45.0%	27.8%	11.4%	-3.1%	
Salt Lake City, UT	2,987	2,664	2,603	22,467	3,106	3,844	3,675	23.0%	37.9%	41.2%	-83.6%	18.3%	-4.4%	
San Antonio, TX	5,000	3,344	3,466	2,669	2,578	3,255	2,945	-41.1%	-11.9%	-15.1%	10.3%	14.2%	-9.5%	
San Diego, CA	3,256	3,029	3,144	2,789	3,403	3,419	4,037	24.0%	33.3%	28.4%	44.8%	18.6%	18.1%	↑
San Francisco--Oakland, CA	7,045	4,250	4,388	4,009	4,153	6,127	6,266	-11.1%	47.4%	42.8%	56.3%	50.9%	2.3%	↑
San Jose, CA	2,885	2,704	3,700	3,816	4,246	5,915	5,820	101.7%	115.2%	57.3%	52.5%	37.1%	-1.6%	
Seattle, WA	5,057	3,630	2,998	3,283	2,966	2,843	3,028	-40.1%	-16.6%	1.0%	-7.8%	2.1%	6.5%	↑
St. Louis, MO--IL	6,145	5,164	4,085	3,097	2,674	2,507	2,329	-62.1%	-54.9%	-43.0%	-24.8%	-12.9%	-7.1%	
Tampa--St. Petersburg, FL	2,267	2,876	2,966	2,567	2,629	2,571	2,552	12.6%	-11.3%	-14.0%	-0.6%	-3.0%	-0.8%	
Virginia Beach--Norfolk, VA	6,210	4,661	2,234	1,842	1,992	2,645	2,793	-55.0%	-40.1%	25.0%	51.6%	40.2%	5.6%	↑
Washington, DC--VA--MD	7,230	5,302	5,012	3,424	3,559	3,400	3,470	-52.0%	-34.5%	-30.8%	1.4%	-2.5%	2.1%	↑
<b>Total</b>	<b>5,959</b>	<b>4,244</b>	<b>3,852</b>	<b>3,203</b>	<b>3,164</b>	<b>3,289</b>	<b>3,122</b>	<b>-47.6%</b>	<b>-26.4%</b>	<b>-18.9%</b>	<b>-2.5%</b>	<b>-1.3%</b>	<b>-5.1%</b>	
<b>Change</b>		<b>2,237</b>	<b>2,683</b>	<b>1,115</b>	<b>2,889</b>	<b>4,130</b>	<b>2,139</b>							

Source: Census Bureau data

**Table 2: Bay Area PUMAs, selected variables, 2009**

County	MSA	2009 PUMA_POP	PUMA_ Land_Area (sq km)	2009_PUMA_ Pop_Density	2009_PUMA_ Mean journey- to-work trip times	2009_PUMA Emp_ Pop_Ratio
Sonoma County	Santa Rosa-Petaluma, CA Metropolitan Statistical Area	181,285	3,503.8	51.7	25.7	71.8
Sonoma County	Santa Rosa-Petaluma, CA Metropolitan Statistical Area	117,077	344.4	339.9	28.1	75.3
Sonoma County	Santa Rosa-Petaluma, CA Metropolitan Statistical Area	173,713	233.0	745.5	23.5	70.2
Marin County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	108,079	1,217.9	88.7	30.8	78.0
Marin County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	142,380	129.7	1,098.1	27.1	71.6
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	151,973	24.6	6,182.0	29.1	75.4
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	107,654	11.5	9,325.6	26.5	76.6
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	112,545	14.3	7,878.7	27.9	70.3
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	117,747	10.5	11,181.8	29.0	81.5
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	102,237	15.1	6,772.7	32.5	72.7
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	110,109	23.0	4,786.0	28.8	75.3
San Francisco County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	113,310	22.4	5,068.6	29.3	69.9
San Mateo County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	137,849	65.8	2,095.7	26.6	74.2
San Mateo County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	117,606	67.4	1,744.3	24.8	77.0
San Mateo County	San Francisco-Oakland- Fremont, CA Metropolitan Statistical Area	101,580	48.9	2,077.1	24.9	75.0
San Mateo County	San Francisco-Oakland-	116,018	742.8	156.2	26.1	78.0

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	Fremont, CA Metropolitan Statistical Area					
San Mateo County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	122,659	81.4	1,507.4	24.1	73.3
San Mateo County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	123,051	154.6	795.8	23.8	68.5
Napa County	Napa, CA Metropolitan Statistical Area	134,630	1,938.3	69.5	24.1	72.6
Solano County	Vallejo-Fairfield, CA Metropolitan Statistical Area	142,467	178.8	797.0	31.5	69.3
Solano County	Vallejo-Fairfield, CA Metropolitan Statistical Area	136,705	543.5	251.5	26.8	65.9
Solano County	Vallejo-Fairfield, CA Metropolitan Statistical Area	127,994	1,405.8	91.0	26.8	61.7
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	137,119	67.3	2,037.9	30.2	68.0
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	126,459	215.4	587.0	33.8	70.7
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	105,676	127.8	827.0	26.5	76.5
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	151,586	239.5	632.9	26.3	70.2
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	120,757	457.6	263.9	32.1	71.6
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	127,092	253.5	501.3	28.5	73.4
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	115,138	95.1	1,210.2	33.8	62.5
Contra Costa County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	157,206	397.8	395.2	38.9	68.0
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	118,977	31.7	3,747.4	26.1	61.2
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	152,377	40.3	3,781.8	26.6	70.4
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	132,608	71.4	1,857.7	28.2	76.8
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	138,371	24.0	5,759.5	28.1	59.8

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Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	157,446	80.3	1,961.3	28.1	72.3
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	126,285	150.1	841.2	26.2	70.5
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	146,824	150.9	972.7	28.7	69.0
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	136,370	176.6	772.0	29.2	73.3
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	183,336	112.6	1,628.7	29.1	73.0
Alameda County	San Francisco-Oakland-Fremont, CA Metropolitan Statistical Area	199,022	1,076.0	185.0	30.4	73.2
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	192,045	248.4	773.2	20.6	72.6
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	138,619	44.0	3,149.6	23.3	76.4
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	121,359	121.6	998.2	20.5	75.6
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	137,004	68.1	2,012.8	21.6	71.8
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	112,187	74.3	1,510.2	26.6	68.4
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	115,968	2,152.8	53.9	28.2	71.4
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	128,074	263.6	485.9	24.0	68.6
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	128,541	38.9	3,306.5	22.7	74.2
Santa Clara County	San Jose-Sunnyvale-Santa Clara, CA Metropolitan Statistical Area	119,327	39.4	3,028.5	20.5	70.5
Santa Clara County	San Jose-Sunnyvale-	162,414	52.2	3,109.6	24.5	72.5

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	Santa Clara, CA Metropolitan Statistical Area					
Santa Clara County	San Jose-Sunnyvale- Santa Clara, CA Metropolitan Statistical Area	103,967	33.2	3,133.1	27.5	73.8
Santa Clara County	San Jose-Sunnyvale- Santa Clara, CA Metropolitan Statistical Area	113,156	98.0	1,155.0	27.8	69.0
Santa Clara County	San Jose-Sunnyvale- Santa Clara, CA Metropolitan Statistical Area	109,549	85.3	1,284.8	28.2	72.8
Santa Clara County	San Jose-Sunnyvale- Santa Clara, CA Metropolitan Statistical Area	102,755	21.4	4,800.2	22.3	66.9
	<b>Total</b>	7,116,282	17,887	119,869		
	<b>Mean</b>	131,783	331	2,220	27.2	71.6
	<b>Standard Deviation</b>	23403	634	2468	3.5	4.3
	<b>Coefficient of Variation</b>	0.18	1.92	1.11	0.13	0.06

## **PETER GORDON**

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### **Curriculum Vitae**

**Peter Gordon** is a Professor in the University of Southern California's Sol Price School of Policy. Gordon was elected a Fellow of the Regional Science Association International in 2009. He was also 2012 President of the Western Regional Science Association.

Gordon's research interests are in applied urban economics. Gordon and his colleagues have developed various economic impact models which they apply to the study of the effects of infrastructure investments or disruptions from natural events or terrorist attacks. In addition, he continues to be interested in urban structure and economic growth along with the associated policy implications.

Peter Gordon has published in most of the major urban planning, urban transportation and regional science journals. His recent papers are at [www-rcf.usc.edu/~pgordon](http://www-rcf.usc.edu/~pgordon). He has consulted for local, state and federal agencies, the World Bank, the United Nations and various private groups. Gordon received the Ph.D. from the University of Pennsylvania in 1971.

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### **EDUCATION**

1971	Ph.D. Regional Science University of Pennsylvania
1967	MA Economics University of Southern California
1965	BA Economics University of California, Los Angeles

### **PREVIOUS PROFESSIONAL AND ACADEMIC EXPERIENCE**

Professor of Economics, 1989-2004  
Director, Master of Real Estate Development Program, 1999-2004, 2009-2010  
Dean, School of Urban and Regional Planning, 1992 - 94  
Associate Dean, School of Urban and Regional Planning, 1987 - 92; 1994 - 96  
Director of Research, The Planning Institute, 1982 - 92  
Associate Professor, Urban and Regional Planning and Economics, 1977 - 89  
Assistant Professor, Urban and Regional Planning and Economics, 1971 - 77

## RESEARCH AND SCHOLARSHIP (since 2000)

### Books

*Global Business and the Terrorist Threat* (Co-editor with H.W. Richardson and J.E. Moore II) Cheltenham: Edward Elgar, 2009.

*Natural Disaster Analysis after Hurricane Katrina* (Co-editor with H.W. Richardson and J.E. Moore II). Cheltenham: Edward Elgar, 2008.

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*The Voluntary City: Choice, Community and Civil Society*, (Co-editor with D. T. Beito and A. Tabarrok). Ann Arbor: the University of Michigan Press, 2002.

### Journal Articles and Book Chapters

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DECENTRALIZED EMPLOYMENT AND THE TRANSFORMATION  
OF THE AMERICAN CITY

Edward L. Glaeser  
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Decentralized Employment and the Transformation of the American City

Edward L. Glaeser and Matthew E. Kahn

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**ABSTRACT**

This paper examines the decentralization of employment using zip code data on employment by industry. Most American cities are decentralized—on average less than 16 percent of employment in metropolitan areas is within a three mile radius of the city center. In decentralized cities, the classic stylized facts of urban economics (i.e. prices fall with distance to the city center, commute times rise with distance and poverty falls with distance) no longer hold. Decentralization is most common in manufacturing and least common in services. The human capital level of an industry predicts its centralization, but the dominant factor explaining decentralization is the residential preferences of workers. Political borders also impact employment density which suggests that local government policies significantly influence the location of industry.

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## I. Introduction

In 1899, Adna Weber began his masterpiece on urban growth in the 19<sup>th</sup> century by writing that, "the most remarkable social phenomenon of the present century is the concentration of population in cities." One hundred years later, the evolution of cities is still among the most interesting and important of social phenomena. America is in the midst of an urban transformation so profound that it is changing completely the spatial organization of economic activity. In 1900, urban America lived and worked in high density communities that allowed most people to travel with their own feet. By the middle of the century, the stereotypical city still had a dense urban core where people worked, but the majority of urban residents lived in suburban communities and commuted by cars. At the dawn of the 21<sup>st</sup> century, jobs have followed workers and America is increasingly a national of moderate density, edge-cities (using Joel Garreau's, 1992, terminology).

The data document a truly massive change in the American city. In 1940, only one of the ten largest cities in the U.S. had a population density below 10,000 people per square mile (Los Angeles). In 1990, population density levels are below 7,500 people per square mile in seven out of the ten largest cities. Cities of the past were built at higher densities because, after all, in 1920, cars were rare.<sup>1</sup> Even in 1960, only 64 percent of the population drove to work. In 1990, 86.5 percent of Americans drive to work. In 1940, the overwhelming number of urban jobs appear to have been close to the city center. In 1996, in the average metropolitan area only 16 percent of jobs are within 3 miles of the central business district. The dense, walking city of the 19<sup>th</sup> century has been replaced by the medium density, driving city of today.

This decentralization of the American city proceeded in two waves. First, people moved their residences to the suburbs. This flight of urban workers to the suburbs started in the late 19<sup>th</sup> century with the first commuter trains and streetcars (Warner, 1975). The

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<sup>1</sup> According to the 1995 Highway Statistics Summary, US Department of Transportation, in 1920 the ratio of cars to households was .33.

introduction of the mass produced automobile democratized the suburbs and led to a massive reshaping of the urban landscape. But as late as 1960, 63 percent of jobs were in the central city and 51 percent of metropolitan area population lived in the suburbs (Mieszkowski and Mills 1993). People lived at low densities, but they worked at high densities.

In 2000, people both live and work in the suburbs. This paper is focused on the second wave of urban sprawl: the decentralization of employment. First, we document basic facts about the decentralization of employment. In 1996, we find that across the United States, the average metropolitan area is remarkably decentralized.<sup>2</sup> The median employee works eight miles from the city center and the median resident lives nine miles from the city center. New York City is apparently the only major metropolitan area that really has a monocentric employment structure (the median employee in New York works only three miles from the city center). Chicago, for example, is almost as decentralized as Los Angeles. Across cities, we show that the correlation between city age and decentralization is surprisingly weak, and that regional patterns are less extreme than is often thought. The Northeast and the Midwest have many areas that are just as decentralized as the South and the West.

We use cross-industry variation to try and understand what drives the suburbanization of industry.<sup>3</sup> We examine four reasons why firms choose particular locations: 1) land costs, 2) access to ideas, 3) access to workers, and 4) transport cost savings for inputs and outputs. This framework re-emphasizes the fact that cities exist to save transport costs for goods, for people, and for ideas (Glaeser 1998).

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<sup>2</sup> There is no generally accepted, rigorous definition of decentralization. We would like to compare these figures against some existing historical, or international norm. However, our zip code level data is not available prior to 1994, and no international equivalents exist (to our knowledge). We take 100 percent centralization as a benchmark, and feel quite comfortable thinking of metropolitan areas that have less than one-quarter of their employment within three miles of their central business district as being decentralized.

<sup>3</sup> Carlino (1985) using a county level data set concludes that manufacturing suburbanization has led to the decentralization of people and non-manufacturing industries. Cooke (1983) concludes that both agglomeration economies and economizing on transportation costs help explain manufacturing suburbanization in Cincinnati.

We use a number of (admittedly weak) proxies for land use to test whether industries that use more land tend to suburbanize. Industries with higher electricity usage (a possible proxy for land use) are more likely to decentralize. Manufacturing industries, which are generally more land intensive, are also more likely to decentralize.

Our best test of the importance of idea flows in dense urban centers is to examine whether skill-intensive industries are less likely to decentralize. Indeed, the relative centralization of skilled industries appears to be a fairly robust phenomenon. Industries with more skilled workers- which we see as a measure of the intellectual intensity of the industry- and industries where workers use computers- also a proxy for intellectual intensity- are more likely to locate in the city center. This finding is particularly surprising since high human capital workers are more likely to suburbanize, and this would naturally induce high human capital industries to suburbanize as well.<sup>4</sup>

One piece of evidence, which suggests that firms suburbanize to get access to workers is that industries, whose workers are more likely to suburbanize are more likely to suburbanize their employment. To address one endogeneity problem with this result- perhaps firms that are more likely to suburbanize for exogenous reasons choose to hire more suburbanized workers- we use cross-city, cross-industry data. In particular, we ask whether industries whose national employment patterns suggest that they are particularly likely to suburbanize in a given city do indeed suburbanize more than the norm of either that city or their industry. This appears to be the case. We also find, across metropolitan areas, that places that were more suburbanized in population in 1969, had faster decentralization of employment between 1969 and 1997. Jobs have followed people.

Our final goal was to investigate the role of government in the location of employment. Following the methodology of Holmes (1998), and our own prior work on cities (Glaeser, Kahn and Rappaport, 2000), we look at whether there are political boundary effects on employment, holding distance from the city center constant. While significant boundary

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<sup>4</sup> The fact that firms with workers in the suburbs to locate in the suburbs is driven by industries with older workers and workers with families, not industries with high human capital workers.

effects show up in most metropolitan areas, they are sometimes positive and sometimes negative. There appear to be two patterns of government-employment relationships across U.S. MSAs. In some cities, there is a pro-central city bias which appears to come about because relatively rich suburbs fight to stop employment growth in their areas. On the other hand, some central cities tax businesses so much that they drive them away. We have attempted to create a categorization across metropolitan areas of these different types of cities.

This paper has two main conclusions about the decentralization of industry in America. First, worker residential preferences appear to be extremely important. If spatial patterns in the past were dictated mainly by the productivity advantages of particular locales for firms, spatial patterns now seem to be driven as much by consumption advantages experienced by workers. Second, the primary force fighting decentralization seems to be the urban advantage in speeding the flow of ideas. Our proxies for idea-intensiveness are the most reliable predictors of centralization.

Section II presents basic facts on the level of decentralization of population within the U.S. Section III presents a theoretical framework for thinking about the causes of heterogeneity in decentralization across industries and metropolitan areas. Section IV tests the basic implications of that framework.

## **II. Basic Facts**

Before discussing our analytical framework, we begin with a set of stylized facts about the decentralization of urban jobs. We have two sources of data. The first source is county level data on population and employment by major industries from the Department of Commerce Regional Economic Information System (REIS) CD-ROM. This data is useful primarily because it can be used to provide us with a time series on the decentralization of employment. Our second source of data contains employment information at the zip code level for every metropolitan area zip code in the United States in 1996. Most of our empirical work will rely on this zip code level information.

### *Data Description*

The U.S. Department of Commerce's Zip Code Business Patterns 1996 data provides firm counts by firm employment size by four digit SIC level by zip code.<sup>5</sup> The Zip Code Business Patterns data are extracted from the Standard Statistical Establishments List, a file of all known single and multi-establishment companies maintained and updated by the Bureau of the Census. The data set identifies 10,556 zip codes within 335 metropolitan areas. There are 454 three digit SIC industries identified (by the 1987 classifications). Most of the nation's economic activity is covered in this series. Data are excluded for self-employed persons, domestic service workers, railroad employees, agricultural production workers, and most government employees.

We locate each zip code to determine whether it lies within a MSA and what is its distance from the MSA's Central Business District (CBD). The locations of the CBDs are given by the 1982 Economic Censuses Geographic Reference Manual, which identifies the CBDs by tract number. The data source for each zip code's distance from the CBD is found in Chua (1999).<sup>6</sup> While zip codes are not ideal geography (due to their unusual shapes), they do offer the opportunity to study within MSA variation in economic activity.

### *Basic Facts*

Figure 1 shows the cumulative distribution of population and employment by distance from the central business district across the United States as a whole. The figure illustrates the fact that 25 percent of employees work within three miles of their

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<sup>5</sup> Taking the midpoint of employment within each size category and using an employment level of 1200 for firms that are top coded at 1000, we calculate a zip code's total employment by SIC code. We aggregate industry employment up to the three digit SIC level.

<sup>6</sup> The GIS (geographic information systems) software package ArcView is used to calculate the distance from the centroid of each ZIP code to the centroid of the corresponding CBD. ZIP code centroid data are from the *ESRI Data and Maps* CD-ROM (Environmental Systems Research Institute, Inc., 1999) and the MARBLE geocorrelation engine ([www.ciesin.org](http://www.ciesin.org)).

metropolitan area center and 20 percent of people live within three miles of the city center.

Figure 1 makes two points. First, most metropolitan employees work more than five miles from the city center. On average, the monocentric model is a fairly poor approximation for the reality of American cities. Second, while employment is slightly more centralized than population, the difference is not that large. Basically, population and employment track each other well.

Figure 2 examines the employment decentralization for the three largest metropolitan areas: New York City, Los Angeles and Chicago. New York City is one city that truly does fit the monocentric model. A full 50 percent of New York's employment works within three miles of the city center (Wall Street).<sup>7</sup> Several factors help to explain the centralization of New York City. First, New York's geography makes sprawl particularly difficult. The Wall Street area is surrounded on three sides by water. As such, access is difficult and as the city grew, it could only spread in one direction without crossing water.<sup>8</sup> Second, New York's primary industry, financial services, is both extremely information intensive and not a large consumer of land. The older New York industries (textiles, publishing) that had less need for up-to-the-minute knowledge and greater need for land have spread. Indeed, the difficult period in New York City from 1970 to 1990 reflected the disruptions caused by the exodus of those older industries. Third, New York is an older city and its infrastructure was built for higher density levels.

Los Angeles is often viewed as the paradigmatic sprawl city (Giuliano and Small 1991). It takes going out 11 miles from the central city of Los Angeles to find as large a share of employment as New York has within three miles. Los Angeles differs in industrial mix (it is one of the few large cities that have a larger share of employment in manufacturing

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<sup>7</sup> As we do throughout the paper, we are here examining primary metropolitan statistical areas. We consider the consolidated metropolitan statistical area (CMSA) just too large to use meaningfully. However, there is no question that the measured centralization of New York City would decline if we looked at CMSAs.

than does the U.S. as a whole). Los Angeles' port still has large, land-intensive employers. While Los Angeles does have knowledge-intensive employers, they are less in need of immediate information flows than finance. Los Angeles really came of age in the car era, so its infrastructure is aimed at lower density living. Finally, Los Angeles doesn't have the same natural barriers as New York City which would prevent the spread of population.

The surprise for us was Chicago, which is the third line on the graph. We had expected Chicago to resemble New York City or at least to lie half way between the Los Angeles and New York models. While there is slightly more employment centralization in Chicago than in Los Angeles, Chicago looks more like L.A. than it looks like New York City. When we plotted similar graphs for other cities, we were consistently amazed at the extent to which the employment patterns in other American metropolitan areas resembled those of Los Angeles far more than they resembled monocentric New York. This can be seen by comparing the L.A. and Chicago curves with those for the United States in Figure 1.

Our third figure shows the time series for centralization. As we do not have zip code data on employment for any time period prior to 1994, we are forced to use more standard county level measures to document the trends in centralization. The data source is the Department of Commerce Regional Economic Information System (REIS) CD-ROM. We use the share of employment and population working in the largest county of consolidated metropolitan areas from 1950 to 1990. This is a crude measure of centralization, but it still shows the basic pattern of declining centralization. In some sense, the surprise to us was not the amount of increasing decentralization. The fact that more than 50 percent of metropolitan area employment was outside of the largest county even in 1950 was startling. There are two possible interpretations of this fact. First, cities in 1950 may not have been monocentric even then. Second, Consolidated

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<sup>8</sup> While we wish we could do more work on geography throughout this paper, data limitations restrict our ability to do much on this topic. We simply acknowledge that topography is clearly important and a pressing topic for future research.

Metropolitan Statistical Areas may have contained several smaller monocentric cities in 1950.

### *Our Regression Approach*

There are many summary measures that can capture the degree of employment centralization. For example, we have already discussed measures such as the share of employment with a three, or ten mile distance from the city center, and the distance between the median employee and the city center. However, for much of our work, we will use coefficients from the following zip code level regression:

$$(1) \quad \text{Log} \left( \frac{\text{Employment}}{\text{Square Mile}} \right) = \alpha_{MSA} + \beta * \text{Distance from CBD} + \varepsilon ,$$

using our zip code data, where  $\alpha_{MSA}$  is a MSA specific fixed effect. These density regressions are fairly standard in the literature (see DiPasquale and Wheaton, 1996) and is justified by an exponential density function (i.e.,  $Density = e^{-\beta * distance}$ ). In some cases where there are zero values for many zip codes (i.e., the industry-city regressions), we work with one plus job density. The exponential density is justified in the population density literature by a power utility function. In the employment context, it can be justified by a Cobb-Douglas production function with land as an input. Generally, we run these regressions with metropolitan area fixed effects to account for higher employment densities in some metropolitan areas. If we run this employment regression for the entire United States (including the MSA fixed effects), we find an estimate of  $\beta$  of  $-0.091$  with a standard error of  $0.001$ .<sup>9</sup> If we run the population gradient regression for the entire United States and include MSA fixed effects, we find an estimate of  $\beta$  of  $-0.076$  with a standard error of  $0.001$ .

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<sup>9</sup> The MSA fixed effects allow some cities to have greater average density than others. If we did not include these fixed effects, the estimate of  $\beta$  would be  $-0.058$ . The lower coefficient results from the fact that cities which are lower density, on average, are also, on average, smaller geographically.

*Decentralization across Metropolitan Areas and Regions*

We are not primarily interested in a single nationwide measure of employment decentralization. Our goal is to have measures that will enable us to compare across metropolitan areas and industries.<sup>10</sup> To accomplish this aim, we estimate equation (1) separately for each MSA. Thus, each MSA has a separate intercept (which is close to the MSA fixed effect in the nationwide regression) and an MSA slope—which will be our measure of centralization. In general, there is a relationship between the MSA slope and the MSA intercept- the correlation is  $-0.67$ . This means that in denser cities employment is more centralized.

Our regression-based measure is not the only possible measure of employment decentralization. For example, Chua (1999) uses the share of employment within a 3-mile ring of the city center. Other possible measures include the share of employment within 10 miles of the city center, and the median distance between the city center and employees. While there are cases when one measure is theoretically preferable to another, generally there is not an overwhelming case for any particular measure. Ideally, the measures would all be highly correlated, but as Table 1a shows, correlations are far from perfect. As a result, we will generally show results both for the 3-mile ring employment share and for our basic elasticity measure.

Using either of these two measures, there is a striking degree of heterogeneity in the degree of centralization across metropolitan areas. Some cities have positive gradients, meaning that employment is generally larger away from the city center. Other MSAs are highly centralized. Figure 4 shows the histogram of our estimates. A typical standard error for one of these estimates is 0.03—thus most of our estimates are significantly different from zero and many are significantly different from each other.

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<sup>10</sup> A number of studies have measured employment decentralization in specific cities such as Houston (Mieszkowski and Smith 1991), Los Angeles (Giuliano and Small 1991), and Chicago (McMillen and McDonald 1998). Macauley (1985) reports evidence of the flattening of population, employment and manufacturing gradients for 18 cities between 1940 and 1980.

Table 2 documents the heterogeneity of employment decentralization across regions. The first four columns show the mean value of four different measures of centralization by region. The rest of the table shows the five least and most centralized cities within each region. We show our basic regression measure of  $\beta$  (see equation (1)), median distance to employee, and the share of employees within 3 mile and 10 mile distances. These measures have all been weighted by MSA population. It is very clear that the least centralized region is the Midwest. By every measure, it has the highest degree of employment sprawl. Its largest cities, such as Detroit and Chicago, are extremely decentralized. The South is clearly the second most decentralized region. This ranking holds up using all of our measures.

The most surprising element of the table is that by one of our measures, the West is the most centralized region, and by three of our measures it is second only to the East in centralization. Given the perception of some observers that the cities of the West are the most sprawled, it is surprising the West comes out as the most centralized region (at least by one of our measures). It is not surprising that the East is centralized. Of course, the East also has primary metropolitan statistical areas, such as Nassau, Long Island, which are decentralized. Naturally, if we used consolidated statistical metropolitan areas, some of these areas would be included in the more centralized, larger CMSAs.

#### *Decentralization across Industries*

There is also remarkable heterogeneity across industries. Substantial sprawl is ubiquitous, and there is a great deal of mass close to flat employment gradients, While some industries have remained quite concentrated. Figure 5 plots two industries that are at the extremes. Commercial banking is one of the most concentrated industries. About 50 percent of the employment in this industry lies within five miles of the city center. We suspect that this centralization may even have increased over time as deregulation of branch banking rules made it possible for large central city banks to expand elsewhere in the metropolitan area. Commercial banking uses little land and a great deal of information, so we are not surprised that it is one of the most centralized industries.

“Carpets and rugs” is an industry at the other extreme. This is a low human capital industry that does involve physical infrastructure. It is among the least centralized of industries. Two-thirds of the industry works more than ten miles from the city center. Much of our empirical work in the rest of the paper will use cross-industry differences in centralization to understand what are the important forces that explain centralization

Our regression methodology can also be used to compare the levels of urban centralization across industries more rigorously. In this case, we estimate separate versions of equation (1) for each industry. Again, in each industry-specific regression we allow separate MSA fixed effects. In this case, the MSA fixed effect captures different employment densities in each industry in each MSA. One issue with this estimation is that in a large number of zip codes, there is zero industry employment. This censoring is clearly problematic and standard Tobit techniques will not handle it adequately (because they will still treat each zero observation identically, which will lead to estimating excessive flatness of employment densities).<sup>11</sup>

Figure 6 gives a histogram of estimated decentralization coefficients across 3-digit industries. A typical standard error for these regressions is 0.001, so many of these coefficients are different statistically. The large number of basically zero coefficients is interesting, and appears to be robust to many alternative specifications of the equation.

In Table 1b, we show the correlation between 3-digit SIC specific estimates of equation (1) with the share of a 3-digit industry’s total employment across all MSAs that is located in the inner three miles of the MSA and the share located in the inner ten miles of the MSA. These correlations are often low. Again, this low correlation supports our parallel

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<sup>11</sup> To study the robustness of our SIC estimates of equation (1), we aggregated zip code employment by .5 mile rings. Thus, if the typical CBD’s outer areas are 30 miles from the CBD then we construct 60 data points per industry. Estimating an employment gradient for this “aggregated data”, we found the OLS gradient to be highly correlated with our estimates of equation (1). For a study that estimates separate equations for the probability that a geographical area contains employment and the level of employment conditional that employment is greater than zero see McMillen and McDonald (1998).

use of both the regression-based measures and the share of employment within a three mile ring of the city center.

Table 3 shows the ten least and most centralized industries. Business and consumer services are highly represented among the most centralized industries. This connects with the work of Kolko (1998) who documented the extent to which high transport costs in services appears to keep them in the highest density areas. The least centralized industries tend to be connected with natural resources. Interestingly, there is no industry with a significant positive density gradient, while there are metropolitan areas with such positive gradients.

### *Rethinking the Monocentric Model*

Among the most important consequences of the decentralization of employment is that the traditional monocentric model is becoming an increasing poor representation for the decentralized world (for a detailed discussion see Anas, Arnott and Small 1998). While there have been many critics of the monocentric models for decade, these criticisms have become more justified over time. We now look at three features of monocentric models and ask about the connection between these features and the decentralization of employment.

The first great triumph of the monocentric model is its ability to explain why housing prices decline with distance from the city center. Alonso's (1962) masterpiece illustrated how lower housing prices must compensate residents for the pains of commuting. But if jobs are decentralized, then commuting times may not decline with distance from the city center. As such, a second feature of the monocentric model is that commute times should rise with distance from the CBD. Again, we expect the distance-commute time relationship to disappear in decentralized metropolitan areas.

A final element of the monocentric model is that several versions of the model predict that the poor will live in the central city (Wheaton 1977). The classic version of the

model argues that this comes about because of great demand for land among the rich. Other versions (see Gin and Sonstelie 1981, or Glaeser, Kahn and Rappaport, 2000) argue that this connection comes about because the poor use time-intensive public transportation. We examine whether the relationship between poverty and proximity to the CBD is weaker in decentralized cities.

To examine the first implication of the monocentric model—housing prices decline with distance from the city center—we begin by estimating a standard housing price gradient regression for each metropolitan area:

$$(2) \text{Log}(\text{Median Housing Price}) = \gamma_{MSA} + \chi_{MSA} * \text{Distance from CBD}$$

We are regressing the logarithm of home price at the zip code level on distance from the CBD and the coefficient  $\chi_{MSA}$  is meant to capture the extent to which poverty falls with distance from the city center. We then plot this estimated  $\chi_{MSA}$  coefficient against the MSA level employment density gradient (from estimating equation (1)) in Figure 7.<sup>12</sup> Figure 7 shows the relationship between the slope of employment density on distance from CBD and the slope of housing price on distance from CBD. There is a strong and statistically significant positive connection between the two measures. In metropolitan areas where employment is centralized, housing prices decline with distance from the CBD. In decentralized metropolitan areas, this decline is much milder. Interestingly, even in cities where the employment gradient is flat, housing prices still decline with distance. Presumably this gradient reflects the consumer advantages of the city center (see Glaeser, Kolko and Saiz, 2001).

To test the second implication of the monocentric model- commute times rise with distance from the city center- we begin by regressing median commute time (again, at the zip code level) on the distance from the city center for each metropolitan area:

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<sup>12</sup> The data source for all demographic data at the zip code level is the 1990 Census of Population and Housing.

$$(3) \text{Log(Average Commute Time)} = \theta_{MSA} + \delta_{MSA} * \text{Distance from CBD} .$$

Average commute times come from the 1990 Census of Population and Housing's zip code residential file. For each zip code, the data set reports summary statistics for the residents who live there. The estimated coefficient  $\delta_{MSA}$  reflects the extent to which commuting times rise with distance from the city center.<sup>13</sup>

In Figure 8, we look at the relationship between these estimated coefficients and our estimates of the employment density-distance from CBD. This figure shows the relationship between the slope of employment density on distance from CBD and the slope of commute times on distance from CBD. The graph indicates that in decentralized metropolitan areas, commute times barely rise with distance from the CBD (as in Gordon, Kumar and Richardson 1991). Naturally, when the jobs are in the suburbs, people in the suburbs have shorter commutes.

To separate whether sprawl has different effects on travel speed and distance, we use the 1995 National Personal Transportation Survey (NPTS). The 1995 NPTS is a nationally representative data set of over 20,000 households. It includes detailed information on worker commuting patterns. In Table 4, we present three OLS regressions. For each commuter who lives in a metropolitan area, we construct this commuter's miles per hour, one way travel time in minutes, and distance commuting. We regress the log of these three dependent variables on MSA fixed effects and the log of the population density at the census block where the respondent lives. Unfortunately, we do not know the distance to city center in this data set. However, we do know population density of the census block where the person lives, which serves as a rough proxy for degree of suburbanization. The three regressions in Table 4 show that across the U.S. as a whole, people in low density areas commute much longer distances but do so at much faster speeds. Kahn (2000) shows that vehicle mileage is much lower in denser metropolitan areas. The net effect is a mild negative connection between travel time and density. This suggests that in the previous graph, the low commute time—distance from CBD

relationship in many cities combines the fact that in the suburbs, people are driving much further, much faster.

The final implication of the classic monocentric model is that income will be higher in the suburbs than in the city center. To see whether this fact is weaker in decentralized cities, we begin by estimating a regression (like equations (2) and (3)) where we regress median household income in each zip code on distance from the city center. Median household income by zip code is reported in the 1990 Census of Population and Housing zip code file. We compare across metropolitan areas and ask whether the connection between home prices and distance from CBD disappears in decentralized metropolitan areas. Figure 9 shows the relationship between this measure of the centralization of household income and our basic decentralization of employment measure. We find that in more decentralized cities, poverty is also more decentralized. This connection suggests that the poor may not be completely stuck in central cities and when the jobs are in the suburbs, they are also more likely to be in the suburbs.

A final question about the monocentric model is whether we should model edge cities as polycentric, or just diffuse. Several authors (Henderson and Mitra, 1994, Small and Song 1994) have put forth a polycentric view of edge cities. If these authors are right, we should appropriately model sprawled cities as just having multiple employment centers. We can then use the standard AMM model for thinking about patterns around these cities. An alternative view is that the patterns of employment in the suburbs bear no resemblance to patterns in the city center. According to this view, suburban employment is much more decentralized, and a better model posits that employment is spread evenly throughout the suburbs. Many policy analyses that hinge on the monocentric model (for example the location of the poor) need to be rethought if suburban employment is really not centered at all.<sup>14</sup>

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<sup>13</sup> Our key results are unchanged if we weight the regressions by zip code population.

<sup>14</sup> For example, we might think that suburban employment may lead to pockets of poverty surrounding suburban employment centers if there are indeed such centers. However, if suburban employment is sufficiently decentralized this seems unlikely.

To examine this question, we consider the amount of employment concentration in the most dense zip codes of the inner and outer areas of the city. To be precise, we first split each metropolitan area into an inner and an outer ring using the median distance from the CBD as the dividing line. We then sort zip codes by density and ask how much employment, in the inner and outer rings, was located in the most dense zip codes. Specifically, we summed up employment (going from densest to least dense zip codes) until we had included enough zip codes to account for five percent of the land area of the metropolitan area as a whole. Thus, we are considering the same land area in the inner and outer rings, and asking whether the densest zip codes in the outer ring are anywhere near as dense as the zip codes in the inner ring.

Table 5 shows the shares of population and jobs in these densest areas of the inner and outer rings of metropolitan areas. In 21 metropolitan areas, there are at least twice as many jobs in the central city centers than in the suburban centers. In many cities, the ratio of jobs in the central cities zip codes to jobs in the suburban zip codes is more than three. The ratios for population are generally smaller. This table clearly illustrates these two facts. First, there are some metropolitan areas (Detroit, Los Angeles, Tampa) where there are suburban centers which really do look like their central cities. On the other hand, in the vast majority of metropolitan areas, suburban employment is much more dispersed than central city employment. On the whole, we think that suburban employment is best thought of as being decentralized, not polycentered. This may help us to understand why suburban poverty is much less centralized (see footnote 12).

### **III. The Basic Theory of Decentralized Employment**

We think of the decentralization of employment as the result of an economic equilibrium where firms and workers balance the benefits of density against density's costs. In this essay, we focus on the decisions of firms, but we think of workers as simultaneously making location choices. One pervasive question is whether the decentralization of firms is primarily a response to the demand of workers for suburban lifestyles or whether firms would have moved into suburbs on their own. This question is important because it helps

us to understand whether cities should fight for employment by worrying about the productivity of employers or about the quality of life of employees.<sup>15</sup>

Arguably, the greatest theoretical achievement of urban economics is the Alonso-Muth-Mills framework for analyzing household location decisions within a metropolitan area (see Brueckner's 1987, particularly elegant synthesis). In this model, consumers choose their proximity to the city center trading high land prices against shorter commute times. In reality, at least two other sets of factors influence the location decision of consumers. Cities or suburbs may have amenities (attractive scenery, unsafe streets) which attract or repel consumers (see Brueckner, Thisse and Zenou, 1998). Political boundaries and public goods provision will also influence the locations of households.<sup>16</sup> The location of households thus comes from the interplay of commuting times, home prices and the demand for land, non-government locational amenities and government. We believe that the dominant force explaining the rise in suburbanization since 1900 is the automobile, but other authors emphasize different factors. Margo (1992) attributes much importance to rising incomes that increase demand for low density dwellings. Gyourko and Voith (1999) point to government policies which favor suburban living. Mills (1992) argues that big city problems drive much of modern suburbanization.

While the location decisions of households have been studied extensively, the location decisions of firms have not. Several papers on decentralized employment looked at population patterns when firms were distributed in multiple locations within a city (e.g., White (1976, 1988), Ross and Yinger 1995). More recent work (e.g., Henderson and Mitra, 1996) has taken the location decision of firms more seriously and thought about the relative advantages of a central versus edge locale.

Decentralization of employment is the result of firms deciding that locating in the lower density urban fringe is more profitable than locating in the city center. Profits of firms can be written as:

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<sup>15</sup> Elsewhere, one of us has argued that the future of cities lies in their ability to become attractive havens for consumers (Glaeser, Kolko and Saiz, 2001).

$$(4) \quad P(i) * A(i) * f(L, X) - W(i) * L - C(i) * X + e(j, i)$$

where  $P(i)$  is a location-specific price net of transport costs,  $A(i)$  is location-specific productivity,  $f(L, X)$  is a space indifferent production function in labor and a vector of other inputs  $X$ ,  $W(i)$  is a location specific wage, and  $C(i)$  is a vector of location-specific other inputs. The term  $e(j, i)$  refers to a firm-location specific error term to capture heterogeneity across firm-location matches, with cumulative distribution function  $F(e)$ .

For simplicity, we just take the levels of  $X$  and  $L$  as fixed—this means that employment per firm is fixed and overall employment density moves only with the number of firms. Thus the overall level of employment in industry  $j$  in location  $i$  will be:

$$(5) \quad L * (1 - F(P(i) * A(i) * f(L, X) - W(i) * L - C(i) * X)),$$

Employment will be a function of 1) local prices of the final good and transport costs, 2) local productivity differences, 3) local labor supply, and 4) the cost of local inputs, especially land. If we believe that local productivity differences are tied primarily to local knowledge, then this grouping comes down to which locations have advantages in transport costs for goods, people, and ideas.

Which of these forces are likely to differ between cities and suburbs? Big cities may have some advantages in transport costs and prices of goods. They are large markets, and high density facilitates the access of customers (as in Krugman 1991). Also, many cities were built around ports or other transport hubs which also will attract high transport cost goods. However, the suburbs may have better access to highways and transportation infrastructure. Many of the most famous edge cities are strongly connected to these highways, for example the Rt. 128 corridor in Boston. As such, even if transport costs are an important determinant of location, we cannot say a priori whether cities or suburbs will particularly appeal to high transport cost industries.

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<sup>16</sup> Glaeser, Kahn and Rappaport (2000) argue that the poor may disproportionately locate in central cities because suburban governments cater to the rich and big city governments cater to the poor.

We will have four tests of the role of transport costs. First, we will look at whether industries that produce goods with a higher weight per dollar value are more likely to suburbanize. This just looks whether an increase in transport costs leads to suburbanization or centralization. Second, we will look at services versus manufacturing with the idea that services have higher transport costs. Even though services often have weightless products (e.g., haircuts), they require the provider and the consumer to be in the same physical place and this raises transport costs. Third, we will look at the extent to which across industries, goods are shipped abroad. Fourth, we will look at the extent to which industries whose customers are particularly centralized are themselves more centralized. The importance of this effect may differ across industries if some industries are likely to locate near customers and others are more likely to locate near suppliers.

A second possibility is that cities and suburbs differ in productivity, at least for some industries. One possible reason for greater urban productivity is that cities speed the flow of ideas. If firms in cities have access to more knowledge than firms in suburbs, then this will create an urban productivity advantage. Testing for the importance of intellectual spillovers is notoriously difficult. However, we expect that the demand for these spillovers will be higher in industries in which, 1) employees have higher levels of human capital, and 2) workers are more likely to use computers. We will therefore test whether high human capital and high computer use industries are more likely locate in the urban center.

The third factor that should influence the urban centralization of firms is the location of workers and the wages that they demand in the urban core relative to the fringe. This is a difficult phenomenon to test, because the location of workers is surely endogenous. Just as firms locate to be close to workers, workers locate to be close to firms. Indeed, one can imagine a situation with multiple equilibria. In one equilibrium, firms locate downtown and workers crowd near them. In another equilibrium, firms decentralize and workers locate in suburbs. One interpretation of the urban transformation is that firms and workers are just moving from one equilibrium to another. Of course, it is foolish to

believe that the edge city equilibrium could have existed in a world without automobiles, but once automobiles are widespread then both equilibria may exist simultaneously.

The mutual causality between firm and worker location makes its particularly hard to try to isolate causal factors in employment decentralization. Despite a heroic effort by Thurston and Yezer (1994), who rely on the timing of decentralization to identify causality, it is still quite difficult to estimate whether jobs are following people or vice versa.<sup>17</sup> We have three approaches to this issue. First, will look at whether there is more suburbanization in industries where workers are predicted to suburbanize based on their demographics. Then we examine the decentralization of industries in cities where suburban location is particularly common among the types of workers that these industries generally hire nationwide. Finally, we will look at whether employment growth has followed population suburbanization in the time series across metropolitan areas.

#### **IV. Explaining Decentralization across MSAs**

Now we return to our empirical work and test the hypotheses about employment sprawl discussed in the previous section. First, we examine the correlates of sprawl at the MSA level. Second, we consider the correlates of decentralized employment across three-digit industries.

##### *Population and Employment*

One question that will recur throughout this paper is the extent to which the suburbanization of employment is driven primarily by the suburbanization of jobs. Figure 10 graphs employment-distance density gradients on population-distance density gradients across metropolitan areas. There is a strikingly positive relationship. Cities that have decentralized populations have decentralized employment. The correlation between these two measures is .79. Of course, this connection does not suggest any

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<sup>17</sup> For another example of time series identification methods see Greenwood and Stock (1990).

causality, but the closeness of the two measures does suggest that it is difficult to think of the decentralization of employment without considering the decentralization of population.

Table 6 asks whether there are any cities with decentralized employment which do not have decentralized population. To answer this question, we regress the employment density-distance gradient on the population density-distance gradient (as in Figure 10) and then examine the residuals. Our goal is to show cities that appear to be particularly centralized or decentralized in their employment over and above the extent predicted by the suburbanization of population in the city.

The table shows an interesting set of outliers. Las Vegas, which is fairly centralized along both dimensions, has a surprisingly high level of population centralization. The regression predicts that employment will generally be more centralized than population, but for Las Vegas, that is not the case. The other extreme is Chattanooga, Tennessee, where employment is much more centralized than population. In most cases employment and population go together, and we are driven to believe that the connection between the two types of decentralization is extremely strong.

#### *City Age and Decentralization*

A second preliminary hypothesis is that heterogeneity across metropolitan areas occurs only because some cities were built earlier than others. This theory argues that decentralization of employment is inevitable and that the only reason centralized cities exist is that they were built in an era before automobiles. Figure 11 shows the connection between the age of the city (measured as years since incorporation of the largest city) and our measure of decentralization. There is a connection—older cities are more centralized—but the connection is surprisingly weak. This is also true when we use alternative measures of city age (e.g., the first year it hit some population mark). The pattern shown by Figure 11 is that all of our oldest cities (over 200 years) are reasonably centralized, and all of our newest cities (under 60 years) are reasonably decentralized.

However, in the range between 60 and 200 years old (which includes most cities) there is considerable heterogeneity. There is clearly a connection between age and decentralization, but it does not suggest a deterministic relationship where age determines centralization.

While overall city age is not correlated with city decentralization, cities with newer suburbs are more decentralized. This is not surprising. After all, one hundred years ago, centralization was ubiquitous. The cities that have decentralized have almost by definition grown along their edges. Figure 12 shows this fact. We first regress the age of the housing stock on the distance from the city center for each metropolitan area. Cities with a high value for this parameter have large gaps between the age of their central cities and the age of the suburbs. We find that cities where this gap is largest are those which have had the most decentralization of employment. There is no question that decentralized employment required recent construction and urban change, but much of this urban change occurred in metropolitan areas with relatively old central cities. Thus, there is no guarantee that the older cities will not decentralize.

*Table 7—Cross MSA Regressions*

In Table 7, we look at the determinants of MSA concentration. We use two measures. First, we use our employment density-distance gradient in regressions (1)-(3). In these regressions, the dependent variable is itself the estimated slope from a first stage regression where employment density is regressed on distance from CBD. Our second dependent variable (used in regressions (4)-(6)) is the share of employment more than three miles from the CBD. Most of our results are consistent across the two measures of decentralization.

Regressions (1) and (4) show our basic control variables. The first three variables are region dummies; the omitted region is the Northeast. The Midwest is generally the most decentralized region when there are few other controls. We interpret the coefficient of .043 in regression (1) as meaning that, on average, employment density falls 4.3 percent

more with each mile from the CBD in the Northeast than it does in the Midwest. The coefficient of .035 in regression (4) can be interpreted as meaning that 3.5 percentage points of the metropolitan area's employment lies within a 3-mile radius of the city center in the Northeast than in the Midwest. The West and the Northeast are the most centralized regions.

In all of our regressions, we also control for city age, metropolitan area population and the land area of the metropolitan area. Older cities are weakly more centralized. As discussed above, we are surprised by the weakness of the age effect. MSA population is positively correlated with centralization, and metropolitan land area is negatively correlated with centralization in regression (1) and positively correlated with centralization in regression (4). The land area variables are generally insignificant. The MSA population coefficient means that as metropolitan area doubles 2.5 percent more of the metropolitan area's population lives outside of the three mile inner ring. More populous metropolitan areas appear to be more decentralized.

Regressions (2) and (5) show our demographic and industry controls. The demographics have weak effects that occasionally flip between our two specifications. The industry controls are extremely powerful. The share of the labor force in manufacturing strongly predicts decentralization and the share of the labor force in services strongly predicts centralization. As discussed above, we interpret these results as suggesting that manufacturing is a land intensive good with low transport costs, which is sensibly located in low density areas. Services have higher transport costs and therefore, locate in high density areas that are close to consumers.

Our final regressions, (3) and (6), control for the number of political jurisdictions in each metropolitan area. We hypothesize that places with more fragmentation would see more decentralization for Tiebout-like reasons. Some firms might decentralize to be in a different political jurisdiction (and presumably receive a different bundle of public goods) in cities that are politically fragmented. In single government cities, there would be little gains from decentralization. Indeed, this seems to be the case. As the number of

jurisdictions in a metropolitan area doubles, the share of people working outside of the three mile ring rises by 6.3 percentage points. There seems to be some evidence for some political roots of decentralization and we will return to evidence on politics and decentralization later on.

## V. Explaining Employment Decentralization across Industries

We now switch to explaining the level of decentralization across industries. Our key dependent variable will be the employment density—distance elasticity estimated above using equation (1). In this case, first stage regressions were run at the industry level where employment density (across all urban zip codes) was regressed on distance from CBD and metropolitan area (industry specific) fixed effects. In Tables 8a and 8b, we look across industries at the determinants of industry level employment decentralization. In Table 8a, the dependent variable is an estimate of equation (1) for a specific three digit SIC industry. There are 439 observations, one for each 3 digit industry in our database. Table 8a shows results using our density-distance gradient and table 8b gives results using the share of workers outside of the 3-mile ring surrounding the metropolitan area.<sup>18</sup>

Regression (1) in each table shows our three basic variables. The first variable is a worker national suburbanization index. This index is created by first estimating a linear probability model using the 1990 Census of Population and Housing micro data where we predict the probability that a household head with given demographics lives in the suburbs:

$$(6) \quad I_{Suburbs,i} = \sum_j \beta_j X_{j,i} + \varepsilon_i,$$

where  $I_{Suburbs,i}$  is an indicator variable that takes on a value of one if person “i” lives in a suburb, and  $X_{j,i}$  reflects characteristic  $j$  of worker  $i$ . Then we use the values of  $\beta_j$

estimated from this micro-regression in combination with the average values of each characteristic for each industry,  $k$ , denoted  $\hat{X}_{j,k}$ . These industry averages come from the 1990 Census as well. We then form  $\sum_j \beta_j \hat{X}_{j,k}$  as the predicted suburbanization index for each industry.

A second variable is meant to capture the degree to which an industry's suppliers are located in the suburbs. We use the Bureau of Economic Analysis's *Commodity by Industry Direct Requirements, 1992 Benchmark* matrix for 97 two digit SIC industries. For each industry, we calculate the share of total inputs it purchases from every other industry. Then we use the 1996 Zip Code Employment File to calculate its "national suburbanization rate". This is defined as the share of national jobs located more than ten miles from a metropolitan area's CBD. We calculate the average national suburbanization of its input suppliers for each industry. As we discuss below, we also calculate the input supplier suburbanization index by MSA/SIC. Intuitively, the input supplier index is high if an industry purchases most of its inputs in production from industries that are concentrated in the suburbs. More formally we compute:

$$(7) \text{ Input Suburbanization} = \sum_j \varpi_k^i s_k,$$

where  $\varpi_k^i$  is the share of industry  $i$ 's inputs which are bought from industry  $k$  and  $s_k$  is the share of industry  $k$ 's workers that are themselves suburbanized. In practice, we are missing data on this variable for many industries. We have dealt with this by setting this value to the mean level of the index for the missing data points and including a dummy variable to indicate when their data was missing.

A third basic variable is a dummy variable that equals one if the industry is in manufacturing and zero otherwise. As we saw in the previous table, there appears to be a

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<sup>18</sup> To test for robustness, we have estimated these regressions by combining employment across metropolitan areas within .5 mile rings and then estimating density-distance gradients with this aggregate. These results are quite similar to estimates found using the unadjusted zip code data.

strong connection between manufacturing and decentralization. Our fourth basic control is average firm size. This variable comes from the 1996 Zip Code Employment file. As discussed by Chinitz (1961), dense cities may have a comparative advantage in providing inputs for non-vertically integrated firms. Alternatively, firm size may be capturing something about the degree of entrepreneurship and it may be that dense urban areas both help in the creation of new ideas (which would create a connection between smaller, newer firms and dense urban centers).

In Tables 8a and 8b, the variables generally have the expected signs. Manufacturing industries are much more likely to locate outside of the three mile ring and they have much flatter employment density-distance gradients. The magnitude of the manufacturing dummy is noticeably smaller here than in Table 7. One possible reason for this discrepancy is that the impact of manufacturing on urban form is not just limited to the suburbanization of those firms in manufacturing. Other related industries that share inputs (including labor) or that buy or sell to manufacturers may also suburbanize in high manufacturing cities. This cross-industry effect might explain why the MSA level coefficients on manufacturing are higher than the industry level coefficients on manufacturing.

The worker suburbanization index has a large effect on decentralization employment. Predicted worker suburbanization is the best predictor of industry suburbanization across all the regressions-- this is the first important fact in the table. The magnitude in Table 8b suggests that for each worker who is predicted to suburbanize in residence, .86 workers are predicted to work outside of the three mile inner ring. Of course, the causality of this relationship is not obvious. Firms that have a comparative advantage in suburbanizing would be likely to hire workers who are also likely to suburbanize.

The effects on suburbanization of inputs are less robust. In the first regressions of Table 8a, it appears that the input suburbanization measure is as important as the worker suburbanization measure. However, in the latter regressions of that table and in Table 8b, the effects of input suburbanization disappear. We are left believing that there remains

considerable uncertainty about the importance of input location in driving the suburbanization of industry.

Finally, we do not see the expected firm size effect. There is no significant relationship across our entire sample between firm size and central urban location. Furthermore, it appears (weakly) that bigger firms are slightly more likely to locate within the central city.

In regressions (2) of both tables, we examine the impact of human capital variables that are meant to get at the intellectual intensity of each industry. This addresses the possibility that firms are staying in central cities to exploit the comparative advantage that dense areas have in the transfer of ideas. Regression (2) of Table 8a shows that increases in both high school and college education strongly increases the degree to which firms are centralized. In Table 8b, we find that there is a strong, positive effect of college education on locating inside the inner ring, but industries with more high school graduates (who do not finish college) are less likely to urbanize. This suggests a non-monotonic relationship where the central industries have both the most skilled and the least skilled workers.

Figure 13 shows this relationship graphically by illustrating how centralization of employment rises with the education level of the industry. In this figure, the only exception is that the industries who use many high school dropouts are particularly likely to centralize. This may be because those workers are more likely to live in urban centers (as in Glaeser, Kahn and Rappaport, 2000).

In regression (3) we look at the share of industry employees using computers.<sup>19</sup> In this case, there is a weak effect that is statistically insignificant in 8a and statistically significant in 8b. It again seems that the more intellectually intensive industries are more likely to centralize. This is the second important fact from these tables: variables that relate to human capital or intellectual content predict centralization. We see this and the

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<sup>19</sup> The data source is the U.S Census web page.

human capital results as evidence for the view that central cities do specialize in idea-intensive industries.

Regressions (4)-(7) use data that is only available for manufacturing industries. As such, we are forced to use a smaller sample of three-digit manufacturing industries and to drop the manufacturing dummy from our regressions. There are three major changes in our control variables. First, the importance of worker location becomes even stronger. It seems that manufacturing firms, more than other firms, may be strongly driven by worker location (see also Dumais, Ellison and Glaeser, 1997, for evidence on this). Second, as mentioned earlier, the effect of input suburbanization changes signs. Third, the firm size coefficient switches and becomes significant in both tables. Now we see the expected Chinitz effect where larger firms have less to gain from dense cities. Further work will be needed to understand why this effect appears only to work in manufacturing.

Regression (4) in each table examine our foremost measure of transport costs: dollar value per pound of output.<sup>20</sup> If goods weigh little (per dollar value of output), then they are easy to transport. If they weight more, then they are harder to transport. As these goods are rarely sold directly to consumers (and particularly rare to consumers in the production locale), we expect the heavy products to locate away from the city center where they have better access to transportation hubs. This is what we find. Industries with higher transport costs are more likely to suburbanize their employment. This supports the view that urban advantage in reducing transport costs has become reasonably weak.

In regression (5), we look at whether or not the good is exported.<sup>21</sup> Goods that are exported presumably have little value in being close to the urban market and much value in getting easy access to the highway network. As such, they were predicted to be

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<sup>20</sup>The 1972 Census of Transportation provides information on the median value of output per pound of output by industry.

<sup>21</sup> Export is constructed using data from the NBER web page. Feenstra (1997) has posted data on U.S imports and exports in 1992. Bartelsman and Gray (1996) have produced the NBER productivity data base. We use their information on industry value added. Combining the two data sets allows us to construct

suburbanized and that seems to be the case in Table 8a. In Table 8b, the coefficient goes in the same direction, but it is not significant. The third interesting fact from this table is that there is some evidence that exporting and having high transport cost products leads to decentralized employment, yet this evidence is not all that compelling.

We do not have land use at the industry level. It is possible to get expenditures on real estate. Unfortunately these are often highest in industries that locate in central cities and use little actual space. Instead, we will use energy expenditure as a proxy for physical space. Table 8a shows that those industries with more energy per dollar of output are more likely to suburbanize. Table 8b shows an insignificant result in the opposite direction. Regression (7) puts all three variables in together. In Table 8a, the only significant variable remaining is exported production. In Table 8b, none of the last three variables are significant.

In Table 9, we pursue two of these facts a little further. Here we examine density-distance gradients that are industry-MSA specific. A unit of observation is the gradient of a particular industry in a particular metropolitan area, e.g., steel in Pittsburgh. In other words, we estimate:

$$(8) \beta_{MSA,IND} = \alpha_{MSA}^1 + \alpha_{IND}^2 + \sum_z \phi_z X_{MSA,IND}^z + \varepsilon_{MSA,IND},$$

where  $\beta_{MSA,IND}$  is the slope of employment density on distance from CBD first estimated in an MSA-specific, industry-specific version of equation (1). In all of our second stage regressions, we include both MSA-fixed effects and industry-fixed effects ( $\alpha_{MSA}^1$  and  $\alpha_{IND}^1$  respectively), so that all results need to be considered relative to industry-MSA average. Our goal is to estimate the impact of MSA/industry specific explanatory variables (denoted  $X_{MSA,IND}^z$ ). We have omitted MSA-industry pairs where more than 90 percent of all zip codes have zero employment.

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the share of industry output that is exported. This variable can only be constructed for manufacturing

We include MSA fixed effects, and some form of industry fixed effects. Thus, we will no longer be interested in general industry or general MSA characteristics. Rather, we focus on the interaction between particular industry and MSA features.

In our first two regressions of Table 9, we examine the suburban population index and the suburban input supplier index in more detail. To generate this suburban index, we first estimate separate versions of the household suburbanization probability model for each MSA. For each MSA we have separate OLS coefficients which predict suburbanization. For example, in some MSAs, older workers may all suburbanize. In others, there will be more older workers still living in the central city. We then, as before, interact the coefficients from this regression with the average characteristics for the industry as a whole in the United States. Thus, for each metropolitan area-industry pair we can estimate a separate probability of suburbanization based on the suburbanization proclivity of the MSA as a whole and the industrial characteristics of the industry outside of the MSA.<sup>22</sup>

In principle, this will address some of the endogeneity discussed above. Recall that the primary endogeneity issue is that firms that decentralize for exogenous reasons will be more likely employ workers from the suburbs. In this case, we use industries that are more likely to hire certain types of workers at the national level and are particularly likely to suburbanize in cities where those workers are suburbanized. Since we are controlling for industry and city fixed effects, we are only looking at the extent to unusual suburbanization of particular types of workers in a given city raises the suburbanization of industries that are likely to hire those sort of workers. Our basic assumption is that each city is small relative to total industry employment (so that the particular

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industries. Energy is the expenditure on energy inputs per dollar of value added.

<sup>22</sup> To construct the worker suburbanization index, we use the 1990 Census of Population and Housing to calculate who is the “average” worker for each 3 digit industry using the national sample. In particular, we calculate the share of each industry’s workers who are black, high school graduates, college graduates, and their average age. Define industry  $j$ ’s worker demographic vector as  $X(j)$ . We use the Census data to estimate a linear probability model by MSA of household suburbanization. Define MSA  $m$ ’s estimated coefficients as  $B(m)$ . The suburbanization index for demographic group  $j$  living in MSA  $m$  is then  $B(m)*X(j)$ .

suburbanization patterns of that city will not drive the suburbanization of nationwide industry) and that each industry is small relative to total city employment (so that the industries suburbanization within that city will not drive the suburbanization of city-wide population).

We also estimate separate input supplier suburbanization measures for each metropolitan area as well. In this case, we take the nationwide input-output matrices and interact them with the extent to which other industries in that metropolitan area suburbanize. Thus, we use the extent to which industry a's input suppliers (based on nationwide measures) are disproportionately suburbanized in metropolitan area b.

We show the results using employment-density regressions in regressions (1)-(2) in Table 9. As usual, the dependent variable comes from a first stage regression where employment density is regressed on distance from CBD for each MSA—industry pair. The regressions include different levels of SIC fixed effects. These SIC fixed effects serve to eliminate a relationship that might exist because the employment in the nation as a whole might respond to the degree to which the industry is suburbanized. We show results for two digit and three digit SIC codes. Both variables are significant in both specifications with plausible magnitudes. On the whole, we see this as further evidence for the importance of employee residential demand in driving the decentralization of industry.

In regressions (3) and (4), we rerun the regressions using share of employment outside of three miles of the city center. Again, the results are significant and the magnitudes are plausible. This supports the importance of workers suburbanization in driving the suburbanization of firms. This also suggests that input linkages may be important as well.

Table 10 presents one final piece of evidence on the relationship between job and worker location. This table attempts to exploit the timing of suburbanization to understand the nature of the jobs-workers relationship. Here we ask whether the suburbanization of

employment has been faster in those areas with more initial suburbanization of population. Has the suburbanization of employment been following the suburbanization of population? Our basic approach is to estimate the following regression:

$$(9) \frac{\text{Suburban Emp}_{97}}{\text{MSA Emp}_{97}} - \frac{\text{Suburban Emp}_{69}}{\text{MSA Emp}_{69}} = B \frac{\text{Suburban Pop}_{69}}{\text{MSA Pop}_{69}} + \varepsilon ,$$

where Emp represents employment in the suburbs and Pop represents residential population in the suburbs. We also include an intercept, region fixed effects, and unreported demographic controls. We are particularly interested in the coefficient on the initial suburban population share. Suburbs and central city are defined just at the county level. We define the central county as the county with the largest population in 1969, and the suburbs as the residual.

In the first regression, we find that as the initial suburban population share rises by 10 percent, the growth in suburban employment is .5 percent higher. Regressions (2)-(5) repeat this regression for different subsectors of the economy. It appears that manufacturing, and finance, insurance, and real estate are particularly likely to respond to the initial population share. Services are somewhat less mobile and more likely to stay in the city. While one might think that services are particularly likely to move close to people, services also have the highest transport costs and therefore might stick in the high density area where transport costs are minimized (Kolko, 1999).<sup>23</sup> Finally, the government sector is by far the least mobile. This final result is not surprising and suggests that government jobs have often made up for the exodus of private sector manufacturing jobs. This table provides more evidence suggesting that increasing mobile firms are moving to where people want to live.

## VII. Politics and Decentralization

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<sup>23</sup> Services include both business and consumer services.

Our last and most preliminary work examines political borders. One serious issue in the decentralization of jobs is whether this decentralization has occurred because of “natural” economic forces or whether or not it is the result of various forms of government interference. Certainly, as Gyourko and Voith (1998) and Voith (2000) have argued many national policies may have influenced the suburbanization of population, and through that the suburbanization of industry. We are not going to address this possibility. Instead, we will look at whether the decentralization of industry is influenced by local governments.

There are two clear hypotheses about local governments and the suburbanization of industry. One hypothesis is that industry has suburbanized because of local governments that are bent on redistributing income using the tax base of local industry. As governments raise taxes, firms flee and industry decentralizes. It is easy to believe that the policies of mayors like John Lindsay or James M. Curley encouraged firms to flee the borders of New York City and Boston respectively. On the other hand, many suburban communities specifically oppose negative externality-creating firms, and as a result, these firms may cluster in the more friendly central cities

To test between these hypotheses, we use the following regression:

$$(10) \text{Log} \left( \frac{\text{Employment}}{\text{Population}} \right) = f(\text{Distance}) + I_{\text{Central City}} + \varepsilon,$$

where  $f(\text{Distance})$  represents a fairly flexible polynomial (including logarithms, quadratic and third order terms) and  $I_{\text{Central City}}$  is a dummy variable that takes on a value of one if the zip code is within the central city’s political boundaries.<sup>24</sup> The interpretation of  $I_{\text{Central City}}$  is that this variable captures the extent to which employment lies disproportionately within the central city boundary, holding constant the distance from the city center. We are looking for boundary effects. In a sense, the point is to see

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<sup>24</sup> The MSA’s center city is defined to be the city within the MSA that has the largest population.

whether there are border effects holding distance constant. We are following the methodology of Holmes (1998) and others in this procedure. In our own previous work (Glaeser, Kahn and Rappaport, 2000), we have done this for poverty rates and central city boundaries and found quite significant border effects which we interpret as meaning that central cities disproportionately attract the poor.

However, in this case, there is no uniform central city effect. For some metropolitan areas, the central city is profoundly negatively associated with employment density. For others, employment shoots down when you cross the border into the suburbs. We interpret this heterogeneity as suggesting that some center cities are relatively business friendly (relative to the suburbs) and that in some metropolitan areas, the suburbs are quite friendly relative to business. Table 11 shows the list of the 10 largest and 10 smallest border effects by center city.

We looked for patterns in these border effects and found three basic facts. First, there are very clear regional effects. In the South and the Midwest, employment seems to be particularly high in the central cities. In the West, central city employment is particularly low. In the Northeast, border effects just appear to be small. Figure 16 shows these patterns.

In Figure 14, we document that in larger MSAs, border effects are more likely to be negative. It appears that in these bigger MSAs, the central cities are more likely to be anti-business than pro-business. It is in the smaller MSAs where center cities are really magnets for employment density. Perhaps this occurs because the central cities in the largest MSAs are bigger and try to exploit firms more fully because of their greater market power.

Third, in Figure 15, we show a strong connection between these center cities effects and the urbanization of poverty. The more that poverty was centralized in the main city, the more that these border effects occur. In principle, this might reflect reverse causality where poverty is higher in the centers in these cities because the firms have left (Kain

1968). Alternatively, this might reflect the possibility that the poorest cities engage in the most redistribution and this scares firms away.

## **V. Conclusion**

This paper has tried to establish a set of core facts about the decentralization of employment. First, while there is considerable heterogeneity across cities and industries, it is very clear that most of America is fairly decentralized. Across regions, the share of employment within 3 miles of the city center is never more than 19 percent. The typical American city looks much more like Los Angeles than like New York City.

Second, in these decentralized cities the basic Alonso-Muth-Mills framework no longer describes reality. In decentralized cities, commute times barely rise with distance. We believe that this occurs because increases in commuting distances are offset by increases in commuting speed. In decentralized cities, housing prices do not fall with distance from the city. Finally, as cities become more decentralized the central city-suburb poverty gap also falls. The basic theoretical framework of urban economics really doesn't operate well in America's sprawling metropolises.

Third, across metropolitan areas the best predictors of decentralization appear to be the industrial mix. Cities that specialize in services are relatively centralized. Cities that specialize in manufacturing tend to sprawl. This connection between manufacturing and decentralization is also seen in the cross-industry data. Manufacturing is more land intensive and cheaper to transport than services, which naturally gravitate to high density areas.

Fourth, across industries, high human capital measures and, to a lesser extent, the use of computers positively predict the degree of centralization. Industries which appear to be idea-intensive are more likely to locate in the central city. This may come about because dense urban areas facilitate the speedy flow of ideas and industries which are more idea-intensive want to locate in denser areas.

Fifth, the strongest determinant of whether an industry locates in the center city or the suburbs is its labor force. Using both cross industry and industry-MSA combined variation, we find that in cases where the workforce is predicted to live in suburban areas, the firms will also locate in suburban areas. This suggests to us that the primary determinant of the degree of suburbanization is the demand of workers for suburban lifestyles.

Finally, there is evidence that political borders matter. In many cities, there are significant effects of political boundaries on the employment to population ratio. However, these effects differ across metropolitan areas and it is not yet obvious if central cities are particularly friendly or hostile to firms. However, it does appear to be true that the central cities of the East and the West are least friendly to business and the central cities of the South and the Midwest are the most friendly to employment. These issues clearly need future research.

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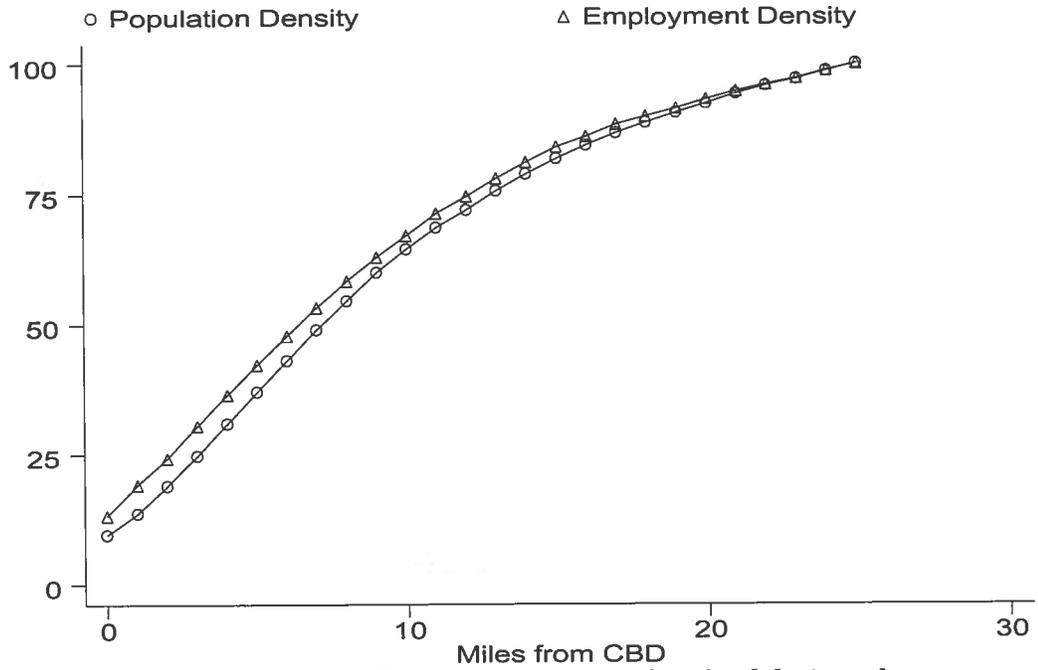
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Figure 1



The Distribution of People and Jobs in Metro Areas

Figure 2



The Concentration of Activity in Each CMSA's Major County

Figure 3

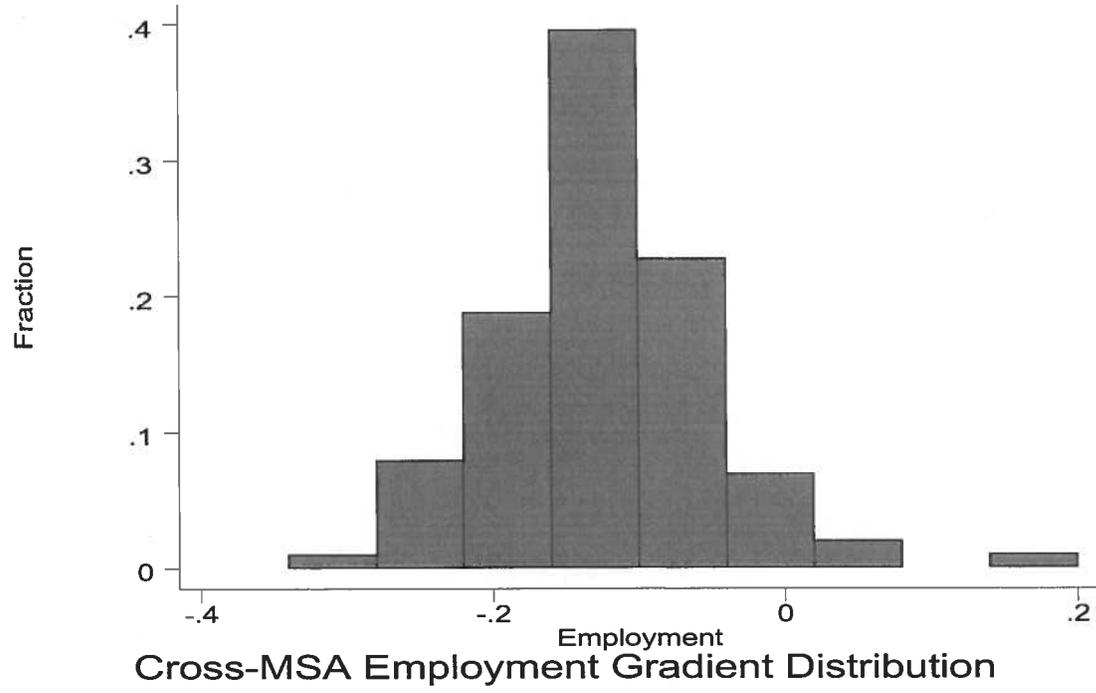


Figure 4

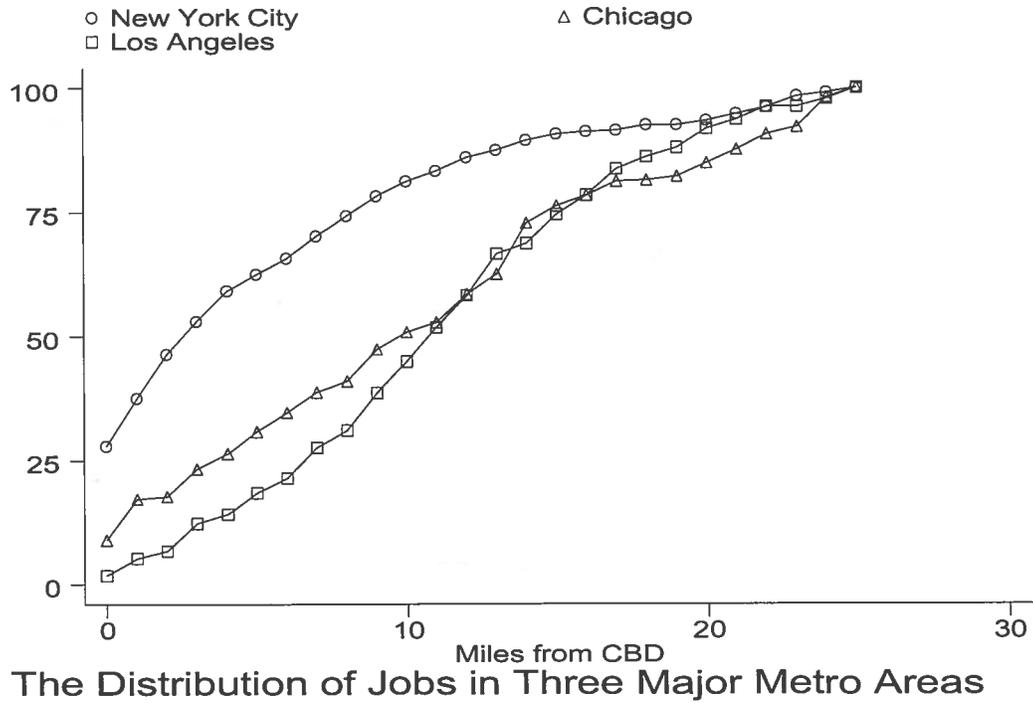


Figure 5

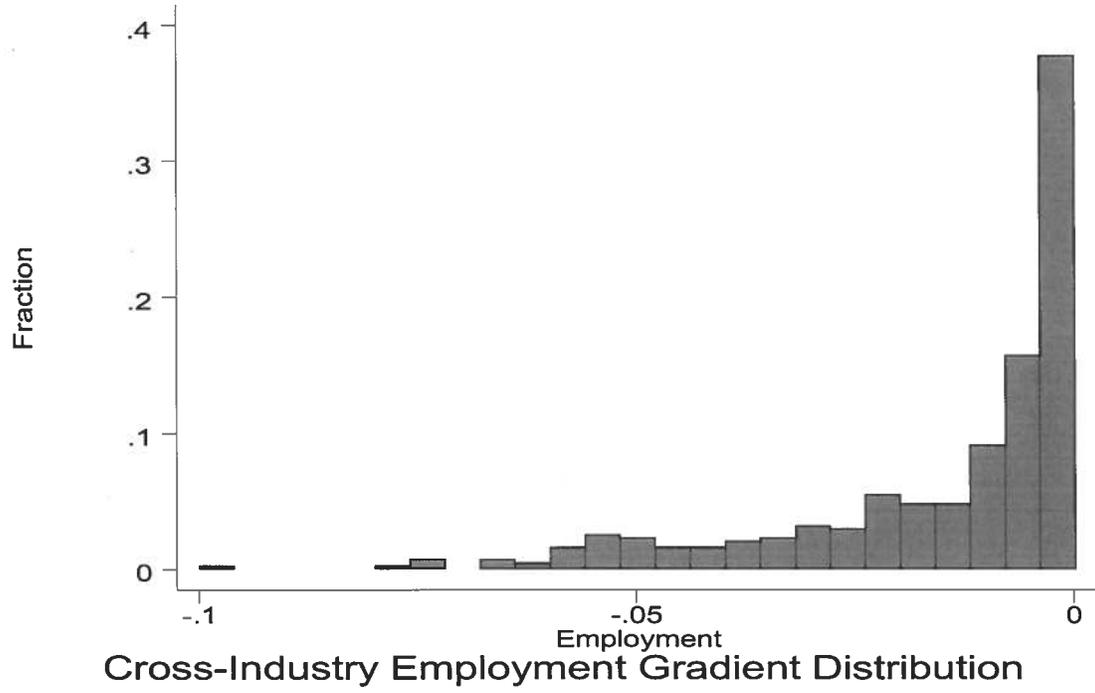


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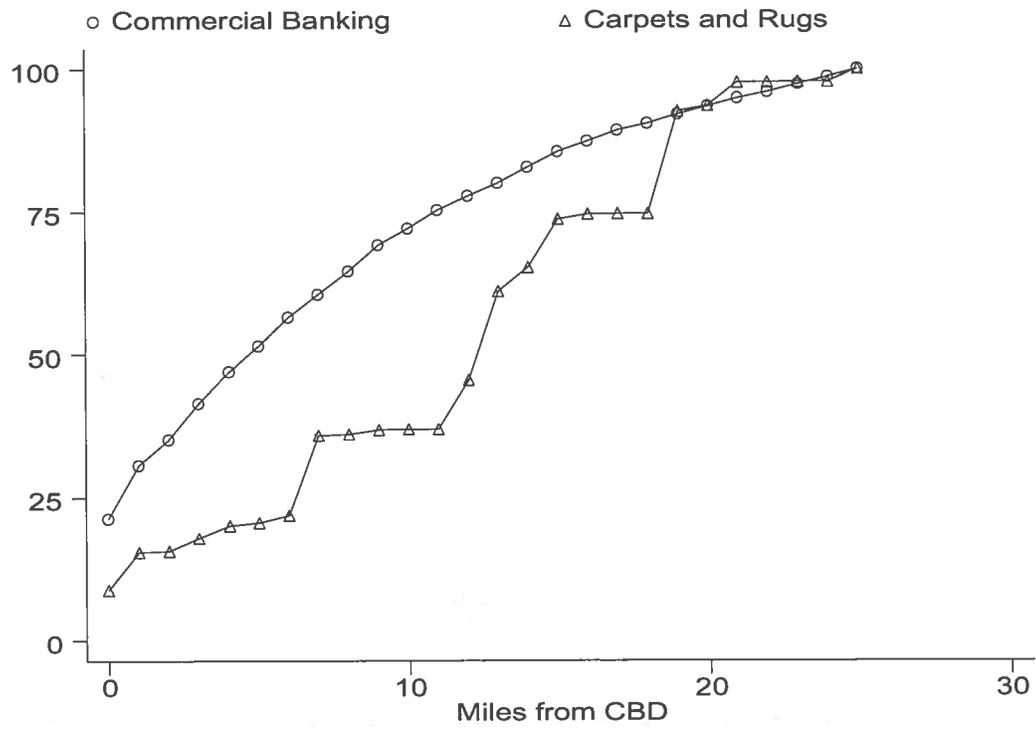


Figure 7





Figure 9

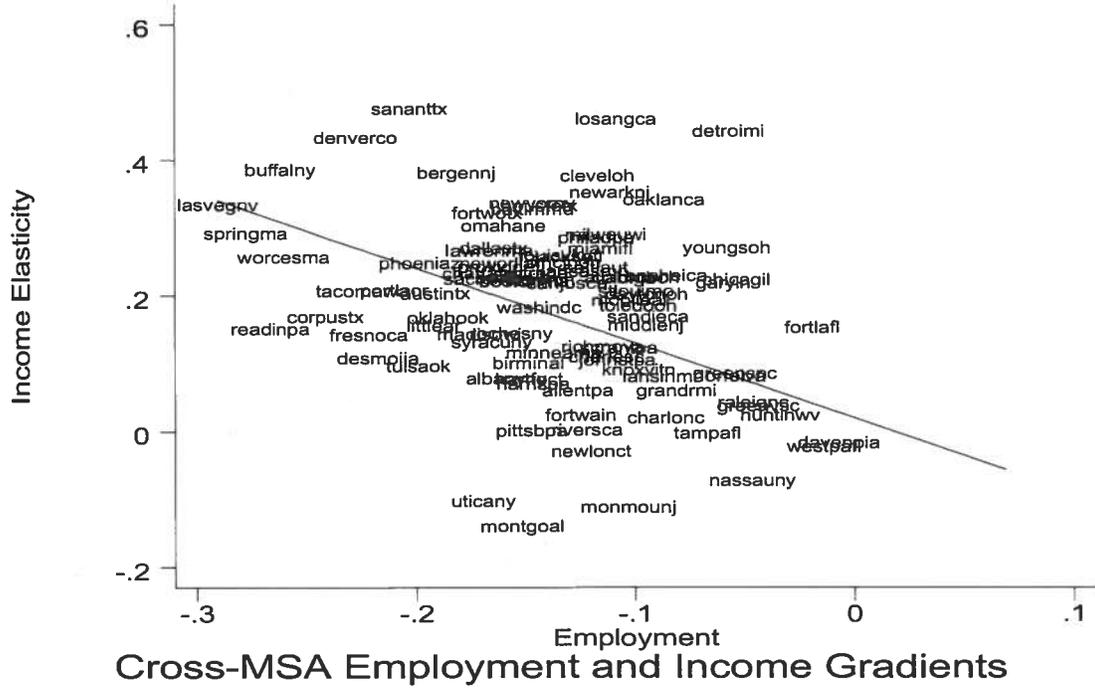


Figure 10

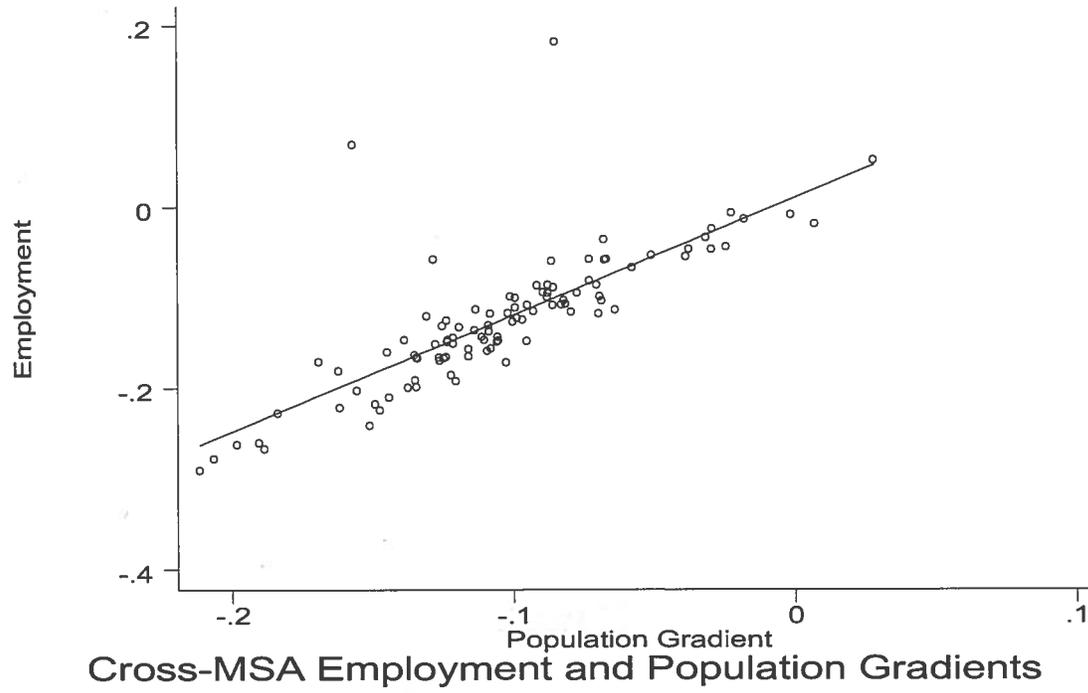


Figure 11

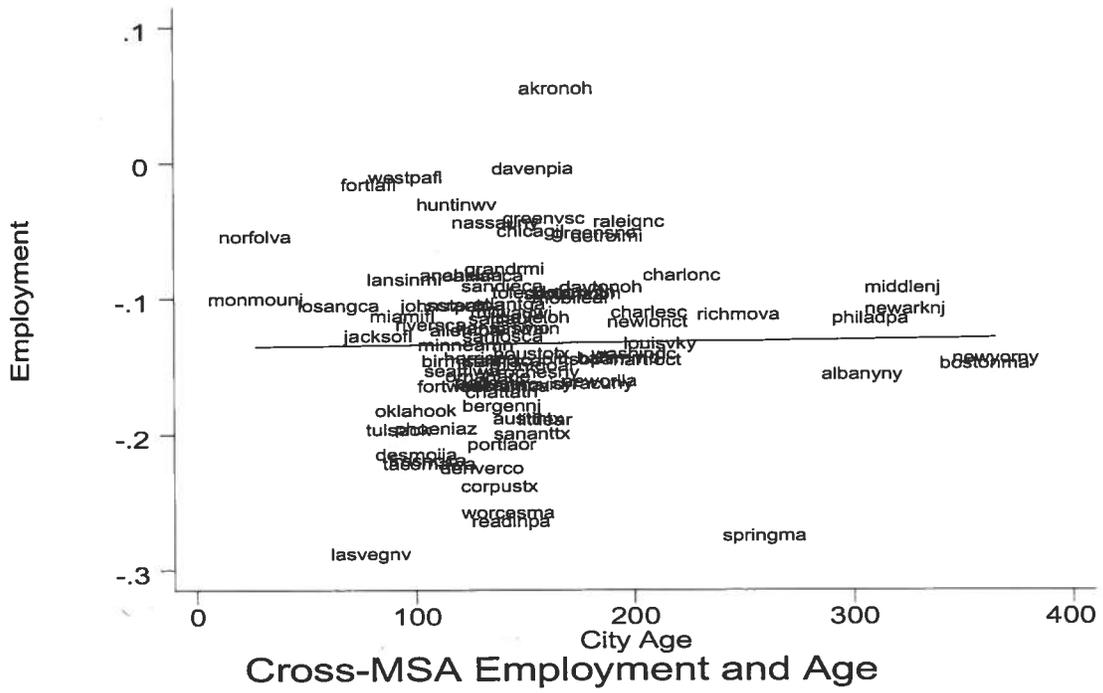


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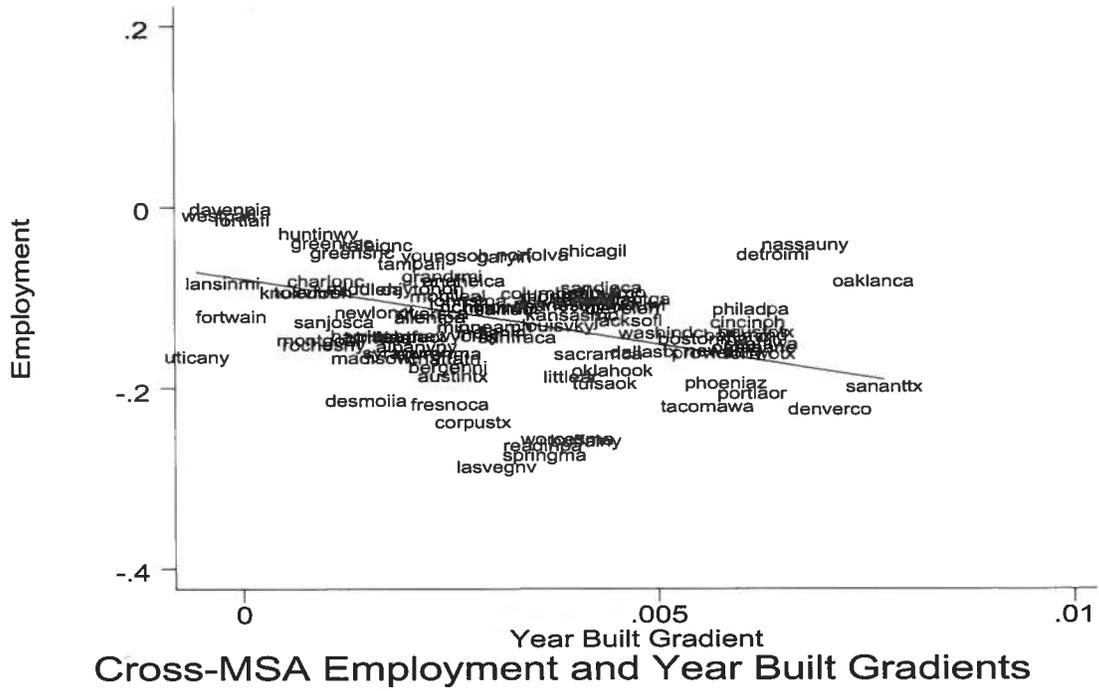


Figure 13

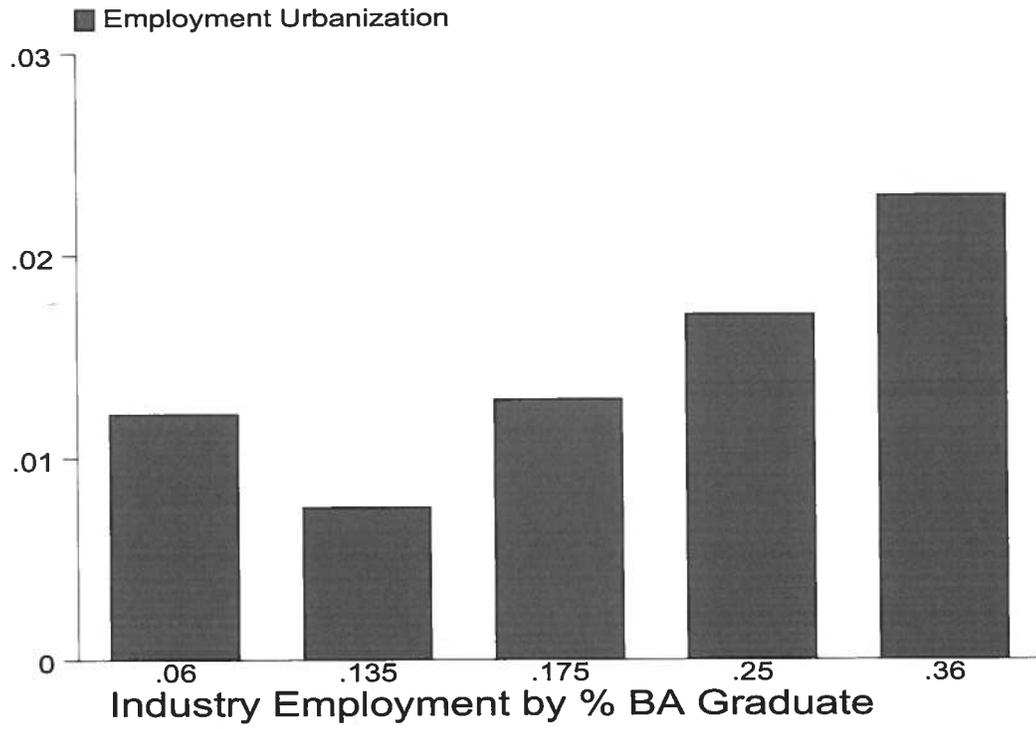


Figure 14

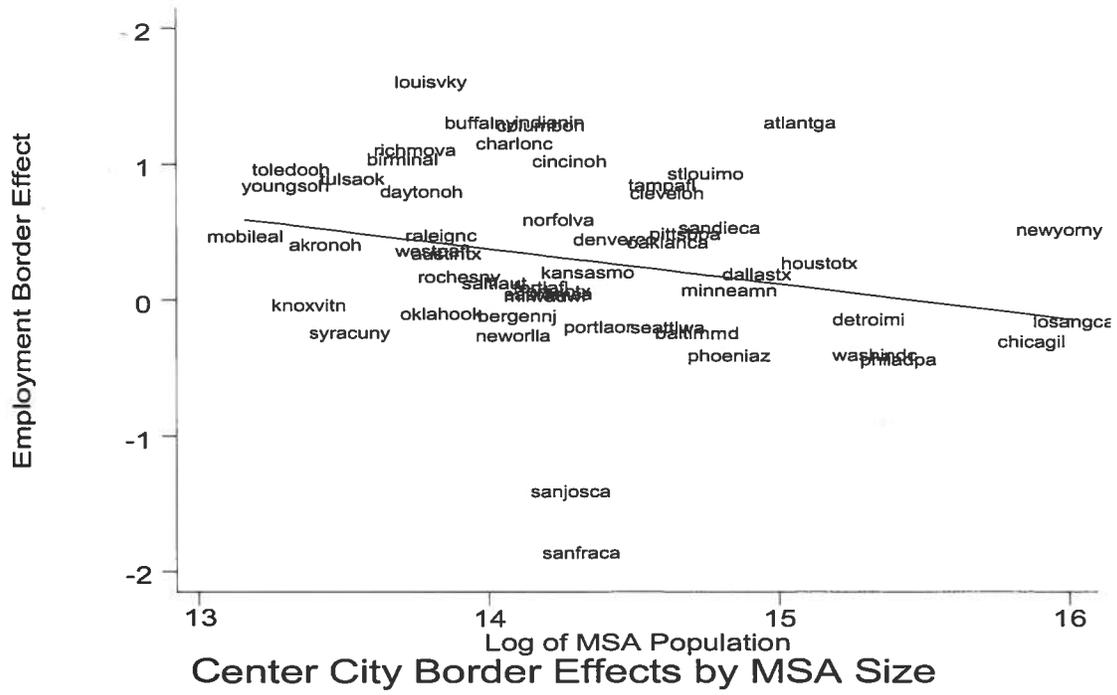


Figure 15

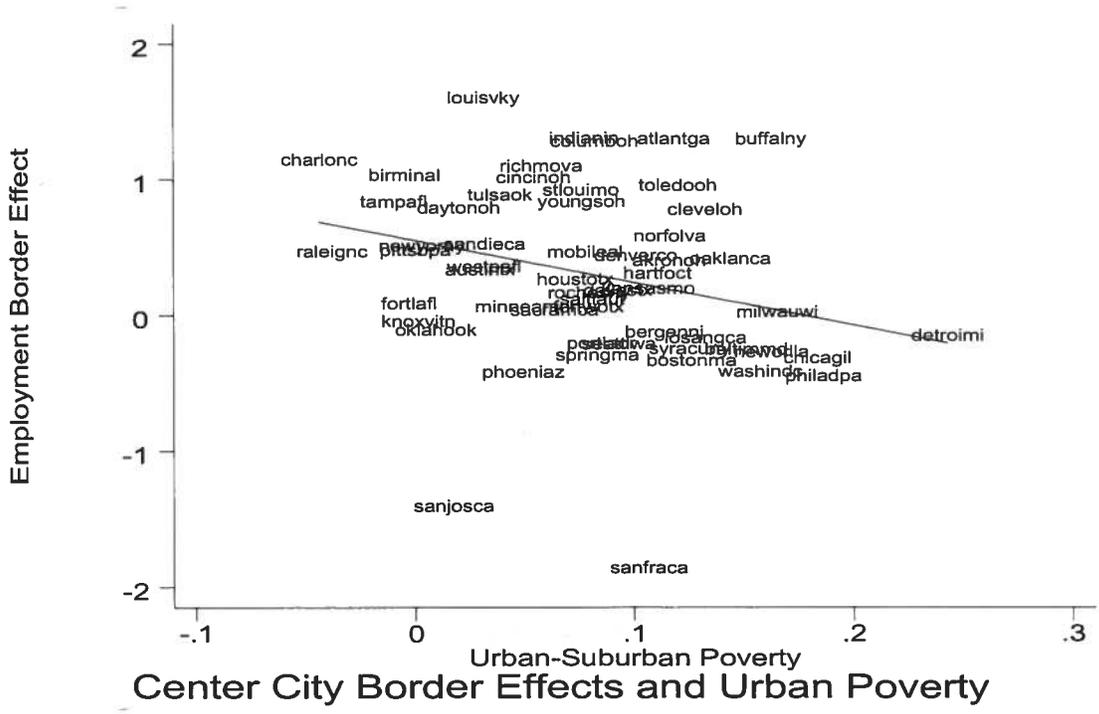
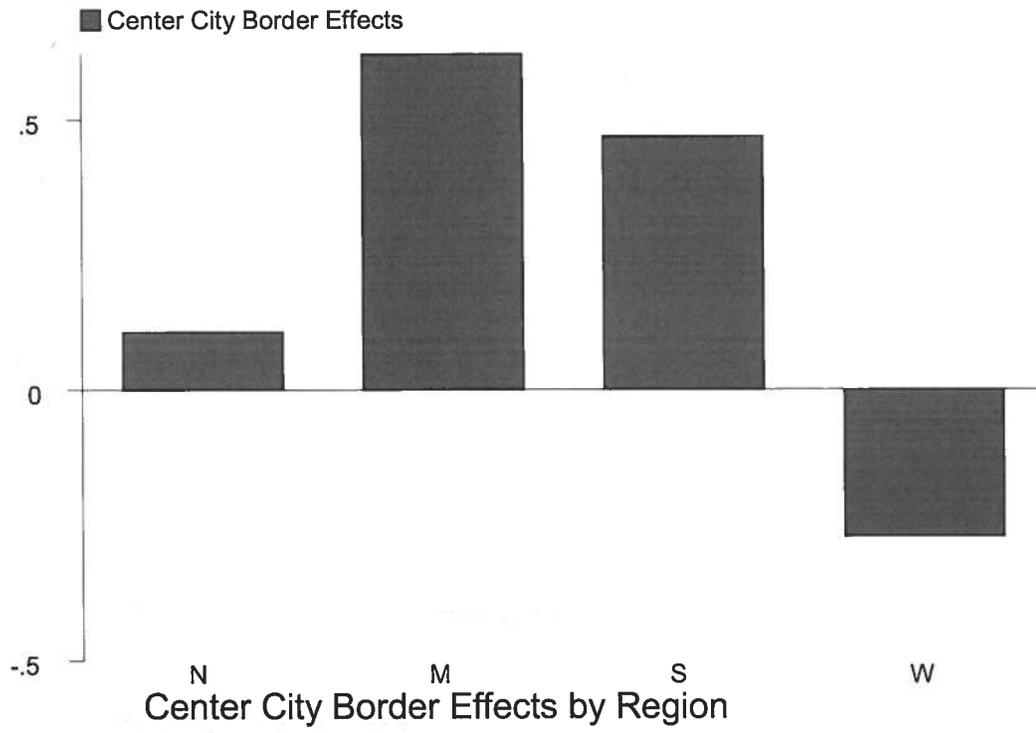


Figure 16



N = North  
M = Mid-West  
S = South  
W = West

Table 1a Simple Correlations

MSA Correlations

n=85

	log level slope	three mile share	ten mile share	median distance
log-level slope	1			
three mile share	-0.447	1		
ten mile share	-0.7	0.559	1	
median distance	0.64	-0.638	-0.906	1

Table 1b

SIC Correlations

n=439

	log level slope	three mile share	ten mile share	median distance
log-level slope	1			
three mile share	-0.022	1		
ten mile share	-0.168	0.71	1	
median distance	0.176	-0.702	-0.885	1

In both panels, the log-level slope is the OLS regression coefficient of the log of zip code job density regressed on the zip code's distance from the CBD. The three mile and ten mile share represent the share of MSA jobs located in these respective rings. Median distance is the distance from the CBD for the median employee.

Table 2 Regional Trends in Employment Centralization

	East MSA/PMSA	Beta	South MSA/PMSA	Beta
average log-level slope		-0.151		-0.126
three mile share		0.189		0.145
ten mile share		0.616		0.561
median distance		8.029		9.383
Five most centralized	Reading, PA	-0.267	Corpus, TX	-0.241
	Buffalo, NY	-0.262	San Antonio, TX	-0.202
	Bergen, NJ	-0.181	Tulsa, OK	-0.199
	Utica, NY	-0.169	Little Rock, AR	-0.192
	Syracuse, NY	-0.165	Austin, TX	-0.191
Five least centralized	Johnston, PA	-0.108	Greensville, NC	-0.054
	Scranton, PA	-0.107	Raleigh, NC	-0.046
	Monmouth, NJ	-0.103	Greenville, SC	-0.044
	Middlesex, NJ	-0.095	Fort Lauderdale, FL	-0.019
	Nassau, NY	-0.047	West Palm Beach, FL	-0.014

	Midwest MSA/PMSA	Beta	West MSA/PMSA	Beta
average log-level slope		-0.105		-0.167
three mile share		0.150		0.174
ten mile share		0.580		0.608
median distance		8.819		8.304
Five most centralized	Des Moines, IA	-0.217	Las Vegas, NV	-0.291
	Madison, WI	-0.171	Denver, CO	-0.227
	Omaha, NE	-0.160	Tacoma, WA	-0.224
	Indiana, IN	-0.143	Fresno, CA	-0.221
	Minneapolis, MN	-0.137	Portland, OR	-0.210
Five least centralized	Detroit, MI	-0.057	Riverside, CA	-0.122
	Chicago, IL	-0.053	Salt Lake City, UT	-0.118
	Huntington, WV	-0.034	Los Angeles, CA	-0.108
	Davenport, IA	-0.007	San Diego, CA	-0.094
	Akron, OH	0.052	Oakland, CA	-0.086

For each MSA with over 25 zip codes, an OLS regression is estimated where the dependent variable is a zip code's log(job density) and the independent variable is zip code distance from the CBD. The OLS slopes are sorted by most and least centralized.

Table 3 Centralization by Industry

SIC Code	Industry Name	Beta
<b>Ten most centralized</b>		
581	Eating and drinking places *	-0.099
541	Grocery stores	-0.077
801	Offices and clinics of medical doctors	-0.075
738	Miscellaneous business services *	-0.075
866	Religious organizations	-0.074
832	Individual and family services	-0.067
736	Personnel supply services *	-0.065
602	Commercial banks	-0.065
651	Real estate operators and lessors	-0.063
653	Real estate agents and managers	-0.060
<b>Ten least centralized</b>		
124	Coal mining services	0.000
140	Nonmetallic minerals, except fuels *	0.000
214	Tobacco stemming and redrying	0.000
460	Pipelines, except natural gas *	0.000
101	Iron ores	0.000
840	Museums, botanical, zoological gardens *	0.000
376	Guided missiles, space vehicles, parts *	0.000
213	Chewing and smoking tobacco	0.000
147	Chemical and fertilizer minerals *	0.000
142	Crushed and broken stone *	0.000

For each three digit SIC industry, a OLS regression is estimated. The unit of analysis is the zip code. The dependent variable is  $\log(1+\text{job density})$  and the independent variables are MSA fixed effects and the zip code's distance from the CBD. This table reports the coefficient on zip code distance.

Table 4 Travel Time, Speed and Distance

Dependent variable	Log(travel speed)	Log(travel time)	Log(travel distance)
Log(density)	-0.1100 (0.0031)	-0.0457 (0.0038)	-0.1557 (0.0055)
R2	0.0948	0.0441	0.0566
N	22162	22162	22162

The data source is the 1995 National Personal Transportation Survey. For households who live in a metropolitan area, this table reports how the population density at place of residence (based on the census block) affects travel time to work and travel speed. Metropolitan area fixed effects are included in each OLS regression. Standard errors reported in parentheses. Intercepts calculated but not shown.

Table 5 Distribution of Population and Jobs

MSA	Inner Ring		Outer Ring	
	Employment	Population	Employment	Population
Albany, NY	0.5048	0.2935	0.1211	0.1037
Atlanta, GA	0.4278	0.2181	0.2116	0.1330
Baltimore, MD	0.3816	0.3063	0.1155	0.0875
Bergen, NJ	0.1654	0.1189	0.1396	0.0752
Birmingham, AL	0.6716	0.4050	0.0954	0.1043
Boston, MA	0.4331	0.2979	0.0976	0.0575
Chicago, IL	0.2969	0.1762	0.1285	0.0622
Cincinnati, OH	0.4147	0.2925	0.2427	0.1157
Cleveland, OH	0.3223	0.2062	0.1237	0.0880
Dallas, TX	0.5496	0.2716	0.1736	0.1549
Denver, CO	0.4857	0.2965	0.2133	0.1470
Detroit, MI	0.3392	0.2099	0.2452	0.1193
Houston, TX	0.4722	0.2328	0.1550	0.1019
Kansas, MO	0.5052	0.3250	0.2248	0.2098
Los Angeles, CA	0.3236	0.1579	0.1994	0.1136
Minneapolis, MN	0.5612	0.3375	0.1499	0.1635
Nassau NY	0.1299	0.0571	0.1048	0.0425
New York, NY	0.5986	0.2702	0.0632	0.0882
Newark, NJ	0.2423	0.1940	0.1403	0.0364
Oakland, CA	0.2562	0.1999	0.1964	0.0539
Philadelphia, PA	0.3190	0.3029	0.1822	0.0930
Phoenix, AZ	0.3952	0.1864	0.1610	0.1598
Pittsburgh, PA	0.4552	0.2636	0.0431	0.0373
Riverside, CA	0.3501	0.1904	0.1600	0.1311
Sacramento, CA	0.5249	0.3517	0.1044	0.1467
St. Louis, MO	0.4714	0.3339	0.2182	0.1552
San Diego, CA	0.3997	0.2167	0.2296	0.1075
San Francisco, CA	0.5552	0.3872	0.1596	0.1319
Seattle, WA	0.5463	0.2558	0.1715	0.1365
Tampa, FL	0.3614	0.1999	0.2609	0.1458
Washington, DC	0.4578	0.2495	0.2047	0.1004

The Inner Ring is defined as those zip codes whose distance from the CBD is less than the MSA median. The Outer Ring is defined as those zip codes whose distance from the CBD is greater than the MSA median. In each ring, zip codes are sorted by job density from highest density to lowest. Zip codes are added until the total land area of the set equals 5% of the MSA's total area. The table reports the share of all MSA jobs and population in each of these cells.

Table 6 Centralization of Employment not Explained by Centralization of Population

	MSA/PMSA	MSA	"Unexplained" Employment Centralization	Employment Centralization log-level slope	Population Centralization log-level slope
Top five	Chattanooga, TN	1560	-0.0475	-0.1722	-0.1025
	Charleston, NC	1440	-0.0472	-0.1258	-0.0636
	Des Moines, IA	2120	-0.0344	-0.2143	-0.1490
	Salt Lake City, UT	7160	-0.0331	-0.1185	-0.0694
	Little Rock, AR	4400	-0.0324	-0.1783	-0.1204
Bottom five	Fort Wayne, IN	2760	0.0241	-0.1258	-0.1237
	Oakland, CA	5775	0.0262	-0.0855	-0.0915
	Gary, IN	2960	0.0346	-0.0706	-0.0861
	New London, CT	5520	0.0385	-0.1194	-0.1306
	Las Vegas, NV	4120	0.0394	-0.2143	-0.2114

For each MSA, two regressions are estimated. The first regression fits log(job density) as a function of zip code distance from the CBD. The second regression fits log(population density) as a function of zip code distance from the CBD. In the second stage regression, the OLS slope from the employment regression is regressed on the OLS slope from the population regression. This table reports the residual from this regression.

Table 7 Explaining MSA Employment Concentration

	Dependent Variable					
	Log-level employment slope			Share of MSA jobs outside of the inner three mile ring		
	(1)	(2)	(3)	(4)	(5)	(6)
Midwest	0.0426 (0.0165)	0.0647 (0.0213)	0.0539 (0.0207)	0.0352 (0.0344)	0.0501 (0.0379)	0.0058 (0.0343)
South	0.0211 (0.0170)	0.0289 (0.0197)	0.0235 (0.0189)	0.0329 (0.0310)	0.0688 (0.0432)	0.0465 (0.0364)
West	-0.0261 (0.0177)	0.0218 (0.0200)	0.0169 (0.0193)	-0.0125 (0.0384)	0.0148 (0.0418)	-0.0053 (0.0366)
log(MSA area)	-0.0121 (0.0065)	-0.0046 (0.0056)	-0.0030 (0.0049)	0.0115 (0.0185)	0.0087 (0.0143)	0.0154 (0.0120)
log(major city's age)	-0.0051 (0.0129)	-0.0121 (0.0128)	-0.0109 (0.0125)	-0.0377 (0.0257)	-0.0258 (0.0290)	-0.0211 (0.0243)
log(MSA Population)	0.0182 (0.0085)	0.0152 (0.0097)	-0.0013 (0.0134)	0.0248 (0.0190)	0.0531 (0.0212)	-0.0150 (0.0292)
Percent Hispanic		-0.0004 (0.0005)	-0.0003 (0.0005)		-0.0010 (0.0008)	-0.0007 (0.0007)
Percent with college or higher degree		0.0040 (0.0013)	0.0036 (0.0013)		-0.0008 (0.0034)	-0.0023 (0.0031)
Percent over 65 years old		0.0096 (0.0020)	0.0087 (0.0021)		0.0014 (0.0035)	-0.0022 (0.0037)
Percent Black		0.0019 (0.0009)	0.0021 (0.0009)		0.0018 (0.0016)	-0.0011 (0.0016)
Share of employment in manufacturing		0.3269 (0.2222)	0.3284 (0.2093)		0.1387 (0.3929)	0.1449 (0.3642)
Share of employment in service		-0.5751 (0.1742)	-0.5785 (0.1495)		0.7759 (0.3495)	0.7897 (0.3098)
log(number of political jurisdictions)			0.0154 (0.0103)			0.0633 (0.0193)
R2	0.2077	0.4753	0.4948	0.1150	0.2405	0.3603
N	77	77	77	77	77	77

The unit of analysis is the metropolitan area. The dependent variables in Columns (1)-(3) is the MSA's OLS slope from a log-level job density on zip code distance from the CBD. The dependent variable in Columns (4)-(6) is the MSA's share of jobs outside of the inner three mile ring. Intercepts calculated but not shown.

Table 8a Explaining Industry Employment Concentration

Dependent variable: Three Digit SIC industry log-level Urbanization Coefficient

Sample	Whole Sample			Manufacturing only			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Worker suburbanization index	0.0955 (0.0601)	0.1231 (0.0646)	0.0973 (0.0651)	-0.0034 (0.0197)	-0.0073 (0.0179)	0.0035 (0.0183)	-0.0134 (0.0181)
Input Supplier Suburbanization Index	0.0986 (0.0321)	0.0778 (0.0324)	0.1035 (0.0341)	-0.0381 (0.0317)	-0.0437 (0.0357)	-0.0360 (0.0289)	-0.0454 (0.0353)
Manufacturing	0.0130 (0.0029)	0.0114 (0.0030)	0.0126 (0.0029)				
Log of average firm size (workers/plants)	-0.0019 (0.0010)	-0.0016 (0.0009)	-0.0019 (0.0010)	0.0021 (0.0008)	0.0023 (0.0009)	0.0023 (0.0009)	0.0019 (0.0007)
Percent with high school degree		-0.0126 (0.0176)					
Percent with college or higher degree		-0.0230 (0.0128)					
Percent of industry workers using computers at their job			-0.000000107 (0.000000673)				
Dollar value added per pound of output				0.0000527 (0.0000335)			0.0000252 (0.0000263)
Share of domestic production that is exported					0.0033 (0.0011)		0.0032 (0.0011)
Energy expenditure per dollar of output						0.0007 (0.0005)	-0.0002 (0.0008)
R2	0.2352	0.2487	0.2367	0.1080	0.2150	0.1603	0.1828
Number of clusters	69	69	65	20	20	20	20
Number of observations	434	434	416	123	137	137	120

Standard errors reported in parentheses. Intercepts calculated but not shown. Results reported are for regression with correction for correlation in error structure within two-digit SIC codes.

Table 8b Explaining Industry Employment Concentration

Dependent variable: Share of Three Digit SIC Industries Located Outside the Inner Three Mile Ring

Sample	Whole sample		Manufacturing only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Worker suburbanization index	0.9204 (0.4392)	0.9704 (0.4228)	1.0119 (0.4845)	1.8130 (0.5373)	1.9733 (0.6399)	1.8591 (0.6276)	1.8851 (0.5472)
Input Supplier Suburbanization Index	-0.0510 (0.2366)	-0.2282 (0.2089)	-0.1521 (0.2159)	-0.4796 (0.4512)	-0.3500 (0.4898)	-0.4324 (0.5192)	-0.3462 (0.4555)
Manufacturing	0.0477 (0.0240)	0.0398 (0.0247)	0.0478 (0.0235)				
Log of average firm size (workers/plants)	-0.0143 (0.0115)	-0.0106 (0.0117)	-0.0133 (0.0113)	0.0306 (0.0130)	0.0409 (0.0144)	0.0415 (0.0157)	0.0325 (0.0118)
Percent with high school degree		0.1026 (0.1550)					
Percent with college or higher degree		-0.1771 (0.0983)					
Percent of industry workers using computers at their job			-0.000011 (0.00000499)				
Dollar value per pound of output				-0.0019 (0.0009)			-0.0016 (0.0009)
Share of domestic production that is exported					-0.0356 (0.0193)		-0.0279 (0.0200)
Energy expenditure per dollar of output						-0.0075 (0.0075)	0.0072 (0.0180)
R2	0.0625	0.1149	0.0938	0.3884	0.3580	0.3294	0.4003
Number of clusters	69	69	65	20	20	20	20
Number of observations	434	434	416	123	137	137	120

Standard errors reported in parentheses. Intercepts calculated but not shown. Results reported are for regression with correction for correlation in error structure within two-digit SIC codes.

Table 9 Firm Location and Desire for Suburbanization

	Dependent variable:			
	MSA/SIC log-level slope	Share of MSA/SIC Employment Outside the Inner Three Mile Ring		
	specification (1)	(2)	(3)	(4)
Worker Suburbanization Index	0.0370 (0.001)	0.0350 (0.001)	0.2440 (0.008)	0.2270 (0.007)
Input Supplier Suburbanization Index	0.0750 (0.002)	0.0750 (0.001)	0.2960 (0.011)	0.2990 (0.010)
MSA fixed-effects	Yes	Yes	Yes	Yes
SIC fixed-effects	Two-digit	Three-digit	Two-digit	Three-digit
R2	14230	14230	14230	14230
N	0.492	0.629	0.364	0.455

The unit of analysis is the MSA/SIC pair. In specification (1) and (2) the dependent variable is the slope of a MSA/SIC specific regression of log(employment density) on distance. The mean of this variable is -.033 and its standard deviation is 0.033. In specification (3) and (4) the dependent variable is the share of employment in a given MSA/SIC outside of the inner three mile ring. The mean of this variable is 0.690 and its standard deviation is 0.291. The explanatory variables include MSA and SIC fixed effects and the Worker Suburbanization Index and the Input Supplier Suburbanization Index. Both of these variables are defined in the text. Standard errors are presented in parentheses. The variable "Worker Suburbanization Index" has a mean of 0.57 and a standard deviation of 0.154. The variable "Input Supplier Suburbanization Index" has a mean of 0.29 and a standard deviation of 0.21.

Table 10 Suburban Growth

Dependent variable: Suburban employment growth in sector (see Note for definition)

	All	Service	Manufacturing	FIRE (finance)	Government
1969 population share	0.0542 (0.0200)	0.0599 (0.0204)	0.0881 (0.0260)	0.0818 (0.0254)	0.0266 (0.0142)
R2	0.0772	0.0839	0.1073	0.1393	0.0246
N	322	318	322	320	322

Using 1969 and 1997 data from the US Bureau of Census REIS CD-ROM, we construct the share of MSA jobs in the suburban counties. Suburban counties are defined to be those counties that are in the MSA but do not have the largest county population in the MSA in 1969. The dependent variable in each of these regressions is the first difference of the suburban employment share between 1969 and 1997. The explanatory variable is constructed by calculating the share of the MSA's population who lived in the suburban counties in 1969. Each column reports the regression for a different employment sector. All regressions include region fixed effects and demographic controls as described in Table Eight. Robust standard errors are reported in parentheses. Intercepts calculated but not show.

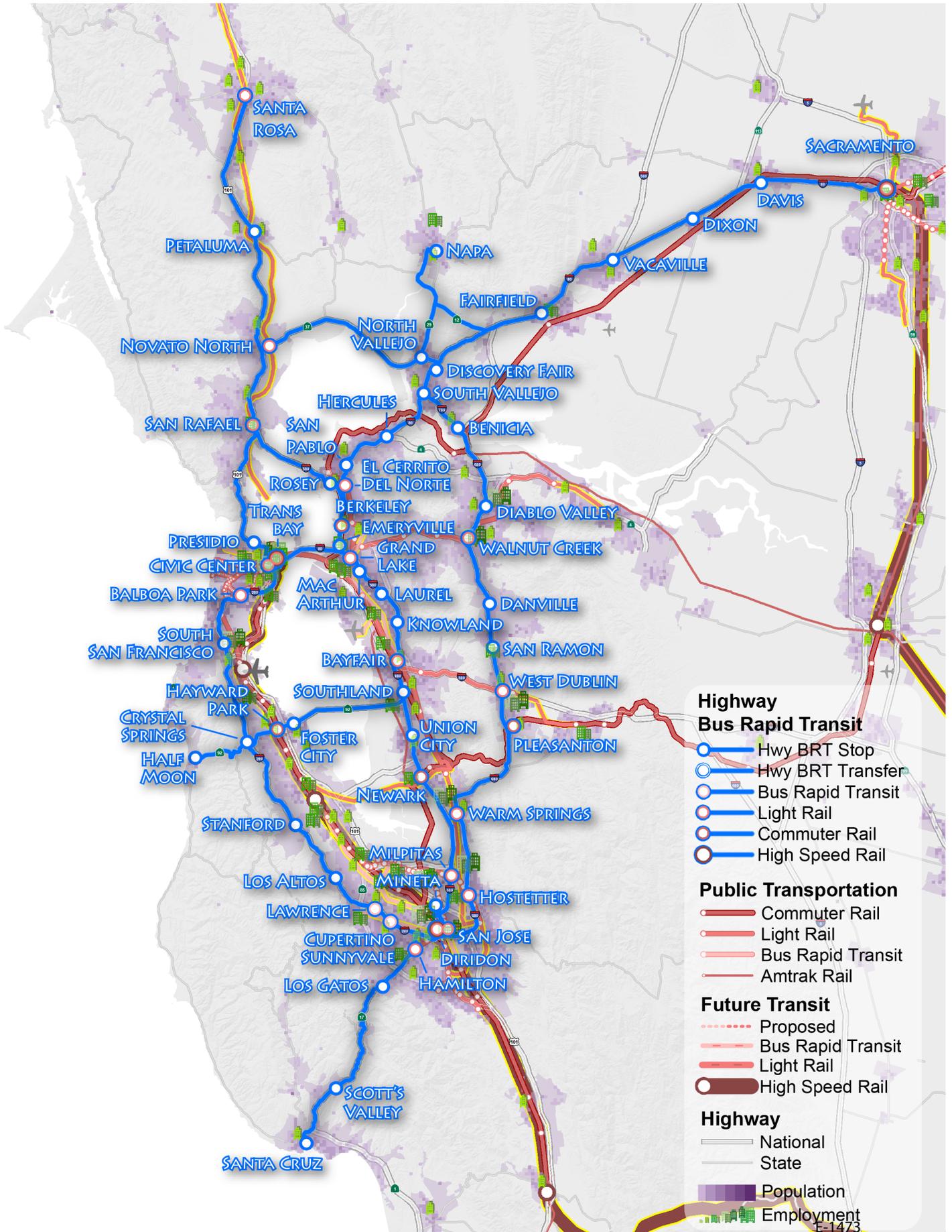
Table 11 Political Boundary Effects

The Ten MSA Featuring the Greatest Negative Employment Effects		The Ten MSA Featuring the Greatest Positive Employment Effects	
MSA	center city border effect	MSA	center city border effect
San Francisco	-1.8847	Toledo	0.9279
San Jose	-1.4371	Cincinnati	0.9866
Philadelphia	-0.4675	Birmingham	1.0058
Phoenix	-0.4410	Richmond	1.0712
Washington	-0.4339	Charlotte	1.1171
Boston	-0.3567	Columbia	1.2529
Chicago	-0.3354	Buffalo	1.2694
Springfield	-0.3161	Atlanta	1.2702
New Orleans	-0.2896	Indianapolis	1.2771
Baltimore	-0.2728	Louisville	1.5750

This table reports the estimate of the center city dummy based on equation (6) in the text  
 The dependent variable is a zip code's log(job density/population density)  
 Center city is a dummy variable that equals one if the zip code is located in the center city

Appendix

Regional Highway Bus Rapid Transit Network



## Regional Highway Bus Rapid Transit Routes

### HIGHWAY BRT

**Connections**

- High Speed Rail
- Commuter-Light Rail | BRT
- Hwy BRT
- Transfer

**Routes**

- Eighty
- Redwood
- Santa Cruz
- Vino Diablo
- Southern Serra
- Eastshore
- Moon Fair
- Sac Valley
- Mineta

**Public Transit**

Today | Planning

- Bus Rapid Transit
- Amtrak
- Light Rail
- Commuter Rail
- High Speed Rail

