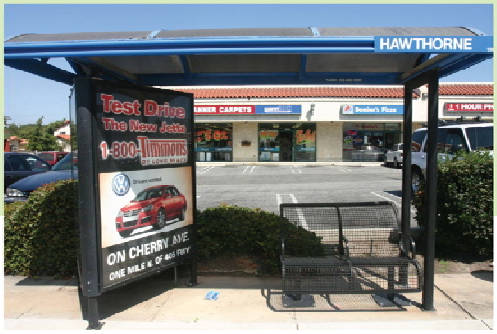

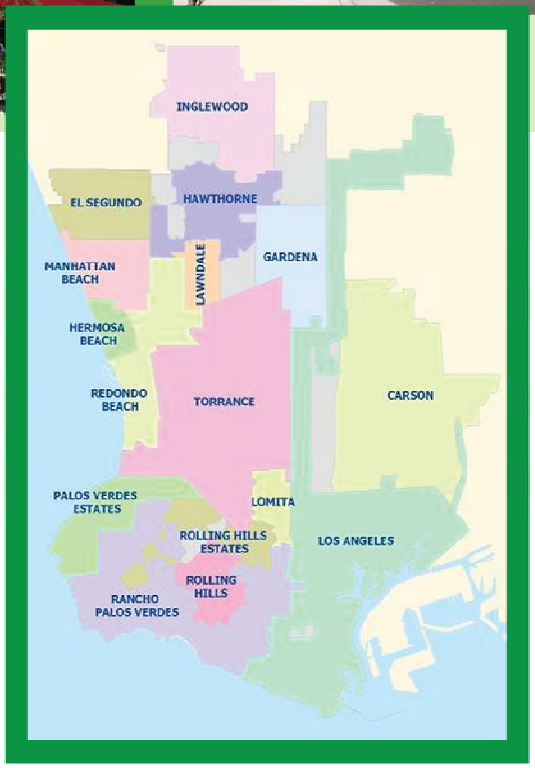

Sustainable South Bay

An Integrated Land Use and Transportation Strategy
July 2009

Prepared for:

SOUTH BAY CITIES COUNCIL OF GOVERNMENTS

and

Los Angeles County Metropolitan Transportation Authority

Prepared by:

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Introduction

What should be done to improve the transportation performance of South Bay neighborhoods? Specifically, is the popular smart growth model of walkable, dense, transit oriented neighborhoods a good model for the South Bay? Is there a strategy for built-out suburban sub-regions other than more urbanization?

The results and recommendations presented in this report answer those questions based on a four-year research study, known as the South Bay Transportation Performance Study (SBTPS) conducted by the South Bay Cities Council of Governments (SBCCOG – www.southbaycities.org).

The SBTPS was designed to examine the transportation performance of physically varied and geographically dispersed South Bay neighborhoods. The study targeted mixed-use neighborhoods with relatively high residential density because residential density, especially near transit corridors, is the leading characteristic of smart growth (or its form in the SCAG region, the "2% strategy").

The research anticipated the new political consensus that developed around the need to reduce green house gas (GHG) emissions that are linked to climate change. California's Global Warming Solutions Act of 2006 (AB 32) mandates reduction of GHG emissions generated by a wide range of sources including the transportation-land use interaction.

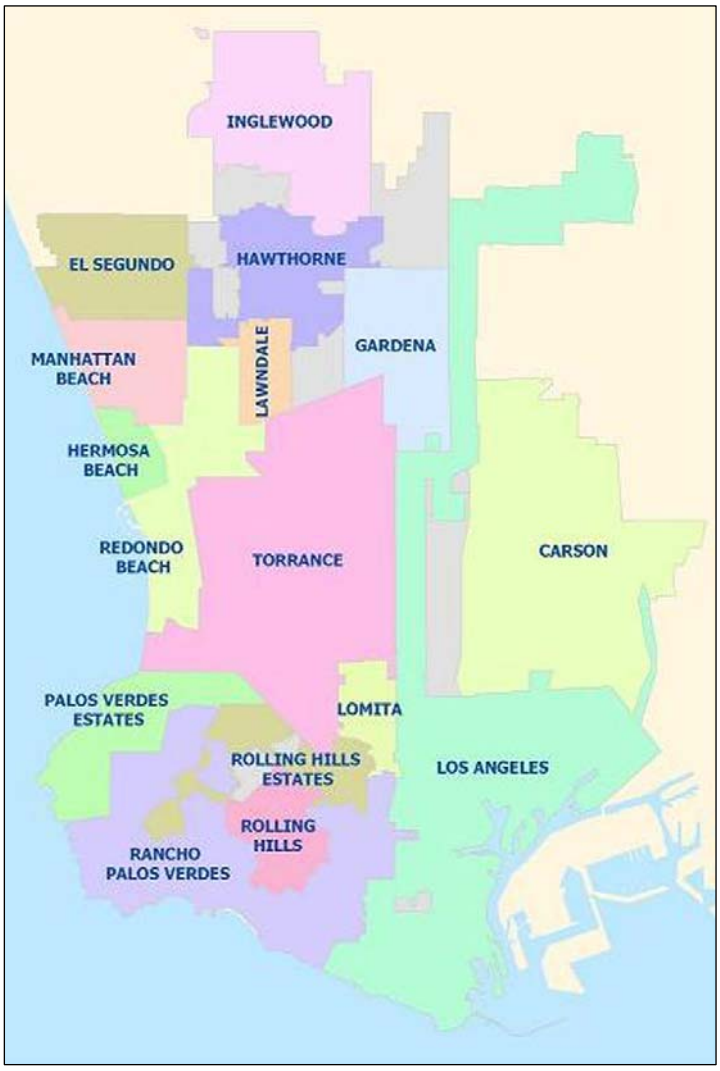
SB 375 mandates that land development in each region be planned according to smart growth principles with the goal of reducing GHG emissions. A new type of plan, the Sustainable Communities Strategy (SCS), will be a required component in each region's Regional Transportation Plan (RTP). Sub-regions in the SCAG region have the option of developing their own SCS.

The SBTPS found that smart growth as currently practiced – mixed-use centers with higher density residential adjacent to transit corridors, especially rapid transit -- is not a good fit with South Bay conditions. The findings and recommendations in this Sustainable South Bay Report, while needing verification in practice, provide a promising start toward a new strategy for integrating land use and transportation.

Characteristics of the South Bay

Seventeen jurisdictions make land use decisions in the South Bay -- 15 incorporated cities plus parts of the City of Los Angeles and sections of unincorporated Los Angeles County. Each has a unique history, size, geography and political orientation. The total size of the South Bay sub-region is 90,002 acres or 140.3 square miles. This is slightly larger than Portland, Oregon. Population in 2000 was just over 1 million (1,031,600), living in about 372,000 housing units, and driving about 550,000 cars. Almost half a million persons worked in the South Bay in 2000 (498,500). Gross residential density is approximately 4.1 DU/acre, about 1.5 times the density of Portland.

Figure 1
South Bay Map



Source: SBCCOG.

South Bay's Development History

Most cities in the South Bay were started about 100 years ago on agricultural greeenfields. By 1920 the Pacific Electric Railway had opened the South Bay to limited commercial and suburban residential development as street car networks spread in fingers throughout Los Angeles County while providing access to the dominant central business district in downtown Los Angeles. In fact, the early development of 3 of the 8 neighborhoods studied in this project was affected by the Pacific Electric network – Riviera Village, Old Torrance and downtown Inglewood.

The automobile age led to development of areas between the nodes served by the streetcars. Automobile use increased, encouraging more farm land development in a self-reinforcing cycle. Pacific Electric ridership declined with regional service ending in 1961 and even earlier in the South Bay. (see Sy Adler. "The Transformation of the Pacific Electric Railway: Bradford Snell, Roger Rabbit, and the Politics of Transportation," in Urban Affairs Quarterly, pp 51-86)

The post-war housing boom and accompanying commercial development absorbed virtually all of the remaining green fields and displaced the remaining farm land. Dairies were outlawed by municipal ordinances in the mid-sixties. Agriculture was essentially gone by 1984.

This familiar development process of agricultural greenfield to new suburb to mature suburb continues today with automobile oriented sprawl at the outer edges of the Los Angeles metropolitan region. Halting this process of spatial expansion is part of what SB 375 is trying to accomplish.

Development Pattern of Sprawling, Auto-Oriented Suburbs

The characteristics of the development pattern that makes suburbs auto-oriented are:

- Low density land use which creates distances of more than one half mile between origins and destinations.
- Housing stock which is dominated by single family tracts. Those tracts are the primary source of low suburban density.
- Single function centers which are virtual islands surrounded by parking in the form of large surface lots or structures. The retail shopping mall is a classic symbol of this form of suburban sprawl.
- Commercial strips which run along the edges of the major arterials. These commercial strips depend on a high volume of drivers passing by on their way elsewhere. They typically take some time to appear since commercial development lags behind residential.

South Bay's Development Pattern

The South Bay is auto dependent, but which of the four components of suburban sprawl creates the biggest problem? The answer varies since there are three distinct districts in the south Bay – beach cities, inland cities, and peninsula cities.

Density

With gross residential densities above 6 DU per acre, three quarters of the coastal and inland cities have average densities large enough to justify excellent public transit service. As previously mentioned, the South Bay overall has 1.5 times the density of the City of Portland, a leading national example of the smart growth strategy. However, the South Bay lacks the single dominant economic center and has none of the rail transit that characterizes the land use and transportation pattern of Portland.

Economic Research Associates (ERA – one of the consultants contributing to the SBTPS) concluded that the densest South Bay study areas (Riviera Village and Old Torrance both at around 20 DU per net acre) were comparable, although at a much smaller scale, to some of the most dense districts in Los Angeles County. Westwood is about 24 DU per acre and West Hollywood is about 25 DU per acre.

Table 1. Population and Employee Gross Density			
Jurisdiction	**People per Acre**	**Employees per Acre**	**Combined**
Lawndale	25.1	5.8*	30.9
Unincorporated County	23.3	4.7	28.0
Hawthorne	22.1	8.7	30.8
Hermosa Beach	20.3	9.5	29.8
Inglewood	19.3	8.5	27.8
Gardena	17.1	10.0	27.1
Lomita	16.5	6.5	23.0
Redondo Beach	15.4	5.9	21.3
Manhattan Beach	13.4*	5.4	18.9
Torrance	11.2	8.9	20.1
City of LA	10.9	3.6	14.5
Carson	7.3	4.7	12.0
Rancho Palos Verdes	4.7	0.5	5.2
El Segundo	4.5	16.2	20.7*
Palos Verdes Estates	4.3	0.4	4.7
Rolling Hills	3.8	0.1	3.9
Rolling Hills Estates	2.9	2.0	4.9

Sources: ICF Consulting and Siembab Planning Associates.
*Median

It is tempting to think that cities with low population density will have high employment density, and vice versa. But that relationship holds only in El Segundo and Torrance – both significant South Bay employment centers. Generally, cities that have relatively high population density also have relatively high employment density, and vice versa. Of course, most of the very low population densities are found among the cities on the Palos Verdes Peninsula. Those cities pride themselves on their semi-rural atmosphere and all cater in some degree to horse ownership.

This phenomenon can be seen in housing density rankings. El Segundo and Torrance have relatively low average housing densities because so much of their land is used for industrial and commercial activities. Of course, the Peninsula cities have very low housing densities.

Table 2. Gross Housing Density: DU/Acre	
Hermosa Beach	10.8
Lawndale	7.8
Hawthorne	7.8
Redondo Beach	7.2
Lomita	6.8
Inglewood	6.6
Unincorporated County	6.4**
Gardena	6.2
Manhattan Beach	6.0*
Torrance	4.5
City of LA	3.7
Carson	2.1
El Segundo	2.0
Rancho Palos Verdes	1.8
Palos Verdes Estates	1.7
Rolling Hills Estates	1.1
Rolling Hills	0.3

Sources: ICF Consulting and Siembab Planning Associates.
*Median
**Estimate

Single Family Housing

The South Bay it is a mature sub-region that has undergone substantial infill development over the years. Today, the percent of single family housing in the South Bay is approximately the same as the County as a whole, about 49% for the South Bay compared to 50% for the County. However, single family detached structures make up less than 40% of the housing stock in almost half the South Bay cities -- Gardena, Hawthorne, Inglewood, Lawndale, Lomita, Hermosa Beach, and Redondo Beach.

Large buildings, those with 20 or more units, make up over 10% of the housing stock in nine cities – El Segundo, Gardena, Hermosa Beach, Inglewood, Lomita, Redondo Beach and the San Pedro area of LA City. For Torrance that figure is 22.5 % and for Hawthorne almost 29%. The County average for buildings with more than 20 units is 17.2%. The South Bay is simply not dominated by sprawling low density housing tracts.

Closer to the regional periphery of the Los Angeles metropolitan area, the housing stock of cities such as Fontana, Rancho Cucamonga, and Corona typically consist of over 60% single family and less than 10%

buildings with 20 or more units. Over 80% of Fontana's 50,000 units are single family detached with only 6.2% in the large multi-family buildings (2000 Census).

It would appear that cities on the regional periphery are places where infill development over time will reduce the percent of single family dwelling units just as it has in the South Bay. The South Bay has been gradually densifying since its days as the agricultural greenfield on the urban periphery.

Single Function Centers

Single function centers are one of the most prominent characteristics of the spatial organization of the South Bay and of suburbs in general. They are significant from a transportation standpoint because there are seldom any houses within ½ mile walking distance of the facilities, they often are surrounded by surface parking lots and/or large parking structures, they have market areas up to 20 miles, and a very high percentage of both employees and visitors drive automobiles to get there. Single function centers arguably generate a great deal of vehicle miles traveled (VMT).

The single function centers include most notably the large, usually enclosed retail malls that were popular from the 1950s at least through the 1980s. According to ERA, the South Bay malls have the largest floor plates in Los Angeles County.

Other single function centers in the South Bay include secondary and post-secondary school campuses, office parks, municipal airports, civic centers, oil refineries and medical centers. And, of course, two single function centers of international significance provide bookends to the South Bay: Los Angeles International Airport (LAX) on the north and Port of Los Angeles (POLA) on the south. Table 3 below lists the single function centers in cities organized by their size in acres. Large cities, of course, tend to have more single function centers.

Table 3. Single Function Centers by City Size									
Jurisdiction	**Acres**	**Malls**	**Post Secondary Ed.**	**Stadia**	**Medical**	**Civic Center**	**Airport**	**Oil Refinery**	**Other Emp.**
City of LA	17,716		1						
Torrance	12,312	5	1		4	1	1	1	1
Carson	12,310	1	1	1		1			
Rancho Palos Verdes	8,745								
Inglewood	5,839			2	2	1			
Unincorporated County	4,675		1						
Redondo Beach	4,111	1							1
Hawthorne	3,801				1		1		1
El Segundo	3,550							1	1
Gardena	3,381				1				1
Palos Verdes Estates	3,075								
Rolling Hills Estates	2,624	1							
Manhattan Beach	2,518	1							
Rolling Hills	1,954		1						
Lawndale	1,264								
Lomita	1,212								
Hermosa Beach	915								

Source: Siembab Planning Associates.

Commercial Strips

Strip commercial development is auto-oriented in so far as it depends on drive-by traffic for customers. The South Bay has commercial strips in abundance.

The South Bay is approximately a rectangle with north-south as its longest dimension. Although hard distinctions are difficult to make, we estimate that there are ten major north-south arterials. The major north-south arterials run collectively for a total of 110 miles within the South Bay. Similarly, there are 15 major east-west arterials that run collectively for a total of 92 miles in the South Bay.

Those 202 linear miles of major arterials consist of mostly commercial edges (with sections in various mixes including residential). If these edges average 1/8 mile deep, there are approximately 25 square miles of major

corridor edges (16,000 acres). In other words, about 18% of the land in the South Bay runs along the edges of its major arterials.

There are, in addition, nine minor arterials that run north-south for a total of 67 miles within the South Bay and eight minor arterials run east-west for 37 miles. Commercial activity is also located on some unknown portion of those 104 miles.

If even half of the 306 linear miles of major and minor arterials is in commercial uses, then the commercial edges are by far the dominant location of retail, and surely contain a significant amount of office space (and therefore, office employment) as well.

On the upside, when there are residential tracts behind the arterials as there often are, the phenomenon of commercial running along arterial edges creates mixed-use neighborhoods. From a transportation perspective those mixed-use areas have a distinctly auto-oriented linear form, but they are none the less mixed-use and thereby shorten some shopping trips and even some trips to work.

The major and minor arterials also create a system of intersections at regular intervals. Auto-oriented businesses such as gas stations and drive-through fast food facilities typically locate at Intersections because of the high volumes of auto traffic. In such places, many more people typically drive-by than live nearby. The potential for intersections to be redeveloped into neighborhood centers is discussed later.

South Bay Transportation Characteristics

Transit is the most significant source of mechanized mobility in the smart growth strategy. This mutually reinforcing dynamic between density and transit was summarized by planner Julie Campoli in a recent Lincoln Land Institute newsletter, "Density makes transit possible, and transit makes density livable." But that dynamic is not present in the South Bay, despite relatively high average densities in the inland and coastal cities.

Transit service suffers from poor coverage, long headways, and not enough hours of service including no weekend service at all on some routes. The result is poor ridership which then fails to justify better service.

Based on the 2000 Census, we know that only 3.6% of the trips to work in the South Bay were on transit compared to the County total of 6.6%; and 76.4% trips to work were in single occupant vehicles in the South Bay compared to 70.4% in the County.

Unfortunately there is no handy transit service index (TSI) that would allow levels of transit service to be compared between sub-regions and used to establish service levels that satisfy density thresholds. However, even without a TSI, it is easy to observe that there are no rail or bus rapid transit services (BRT) into the heart of the South Bay.

As of today, the only rail infrastructure is that portion of the Metro Green Line than runs across the northern edge of the South Bay. Its utility to the South Bay is limited in that there are only a few stops in South Bay cities, all other stops are in the center of an 8 lane freeway and devoid of functionality, and its eastern terminus at the Blue Line in Norwalk is not a major activity center (connections to downtown LA require a transfer at the Blue Line). The Green Line does provide access to employment centers in El Segundo and Redondo Beach but only from the east whereas a significant percentage of employees in those districts live to the south and west.

Inland and coastal cities have relatively high average residential densities as well as pockets of relatively high density housing and other areas with high density employment. It is tempting to think that a rail system would be developed to connect these existing dense centers. But that's not the way it works. Most new surface rail systems follow existing right of way, usually developed for now-abandoned or minimally used freight lines. (Underground rail would be prohibitively expensive.)

The Harbor Subdivision line currently being studied for passenger use by Metro is on an existing freight route that has little relationship to where demand is now located, the South Bay Galleria being a significant exception. The Harbor Subdivision is not expected to receive funding until sometime in the 2030's and, in any case, would need to be enhanced by a different development pattern from what exists and from what is being proposed by the Sustainable South Bay Strategy. This adds to skepticism about how rail transit could contribute to the transportation performance of the South Bay at least within the next 25-30 years.

Summary

The South Bay has higher residential densities than typical suburban areas and is not dominated by single family residential tracts typical of sprawling suburbs It doesn't appear that low residential density is the problem.

The main sources of auto dependence from the perspective of the existing development pattern (additional issues suggested by the SBTPD are discussed below) appear to be 1) transit service that has not responded to existing densities, and 2) the approximately 45 single function centers, especially the employment districts, retail malls, and college and university campuses.

The prevalence of strip commercial along arterials, while accommodating automobile drivers through its linear pattern, also helps create horizontal mixed-use neighborhoods. The findings from the SBTPS shed light on how they should be handled.

Options for remediating single function centers are described in the Land Use Vision and also discussed in Technical Report 1.

The prospects for large investments to improve transit service, particularly for rail or BRT, are quite low for at least the next 20 to 30 years. Mature, built-out suburban areas need DOT (development oriented transit) more than new infrastructure that demands TOD to be effective.

An alternative mobility concept is needed.

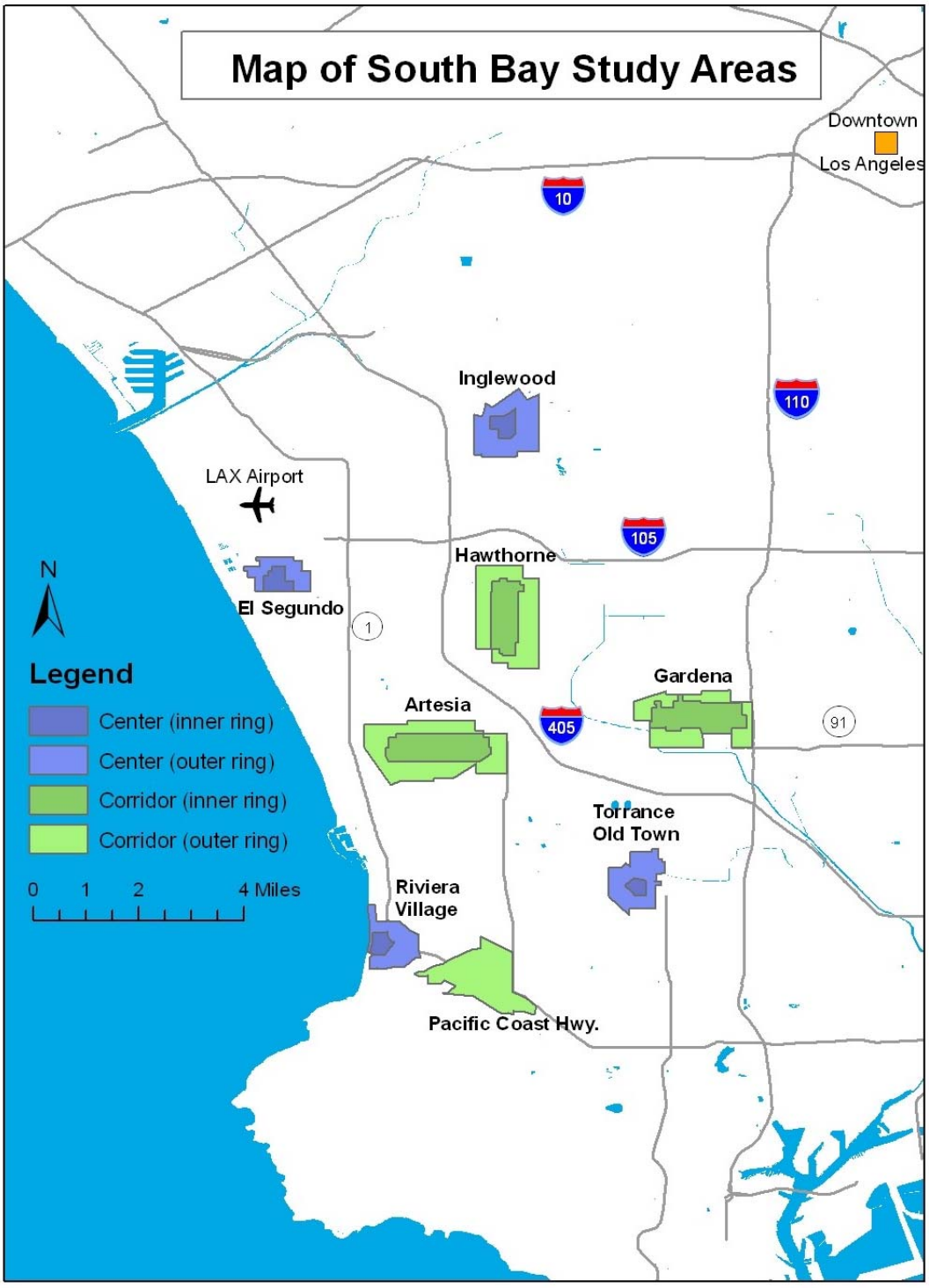
The South Bay Transportation Performance Study (SBTPS)

The South Bay Transportation Performance Study was conducted between 2004 and 2008. Because of the limited funds available per year from SCAG's Overall Work Program (OWP), four funding cycles were needed.

The study measured the transportation performance of 8 neighborhoods and tried to explain the causes of that performance in terms of each area's characteristics. The primary data source was a survey of the travel behavior of residents. Data organized to conform to the boundaries of each study area were drawn from the 2000 Census, InfoUSA, and the County Assessor. ERA drew on a number of specialized data sources to produce its analysis.

This research was completed in 2008 (except for a component of economic analysis on two of the centers and two of the arterials which remains unfunded due to the suspension of the OWP). Los Angeles County Metropolitan Transportation Authority (Metro) provided supplemental funds between 2007 and 2009 to deepen the analysis of existing data and to develop this summary report.

Figure 2
South Bay Overview Map with
All Study Areas



Source: Economics Research Associates.

Study Areas

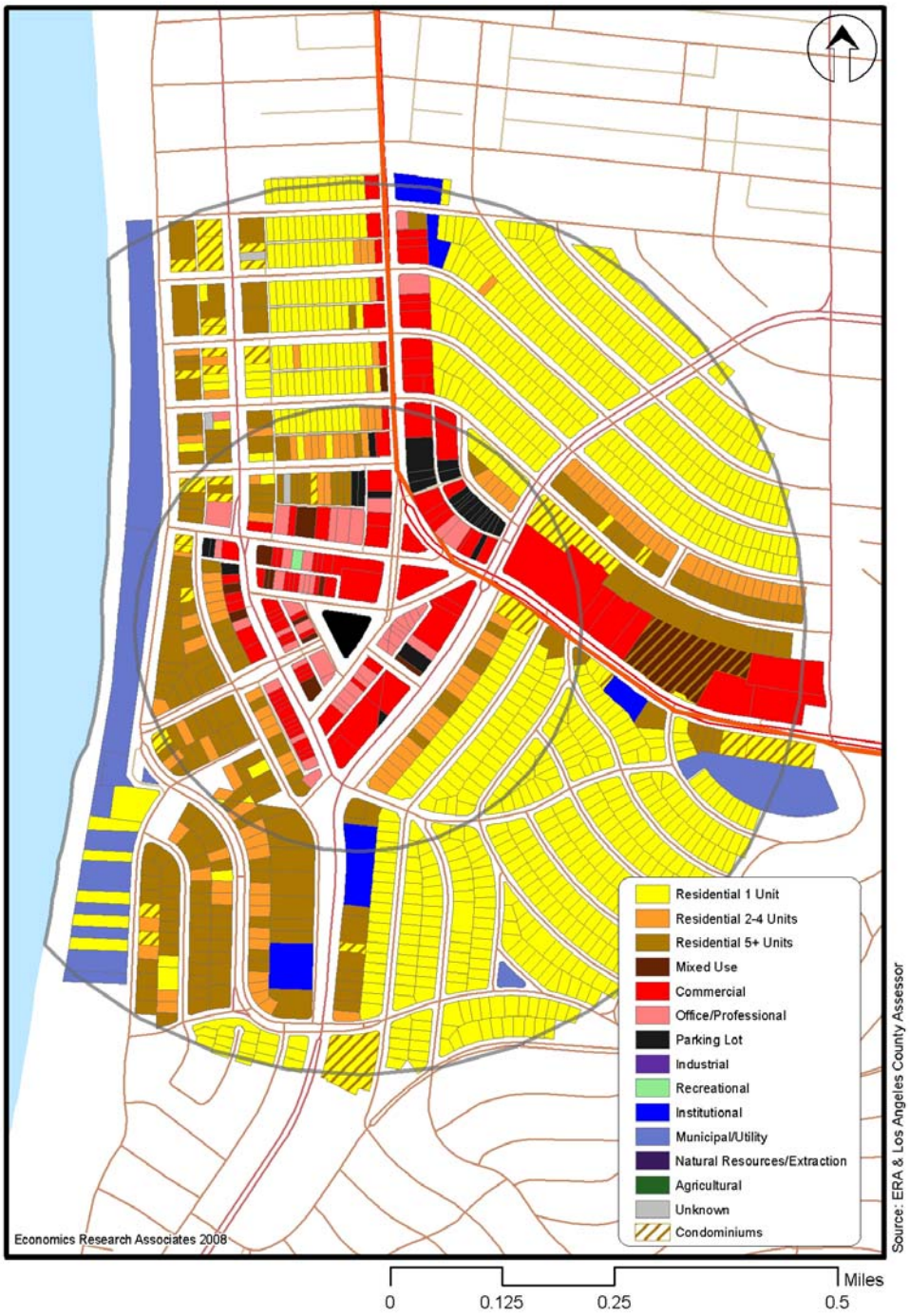
The eight South Bay study areas each had some mix of commercial and residential, mostly in a horizontal configuration (i.e., residential adjacent to commercial rather than over commercial in a single building).

Four study areas were neighborhoods with traditional commercial "centers" where the commercial districts had breadth and depth. Three study areas were adjacent to one-mile-long suburban arterials with commercial edges and were referred to as "corridors." The final study area was a neighborhood surrounding a single intersection similar to those found at the end points of the three arterials.

The centers were Riviera Village in Redondo Beach, Old Torrance, downtown Inglewood, and downtown El Segundo. The corridors were Hawthorne Blvd (between El Segundo Blvd. and Rosecrans), Artesia Blvd. (between Aviation and Inglewood) and Gardena Blvd. (between Western and Vermont). The intersection was at Pacific Coast Highway and Hawthorne Blvd in the City of Torrance.

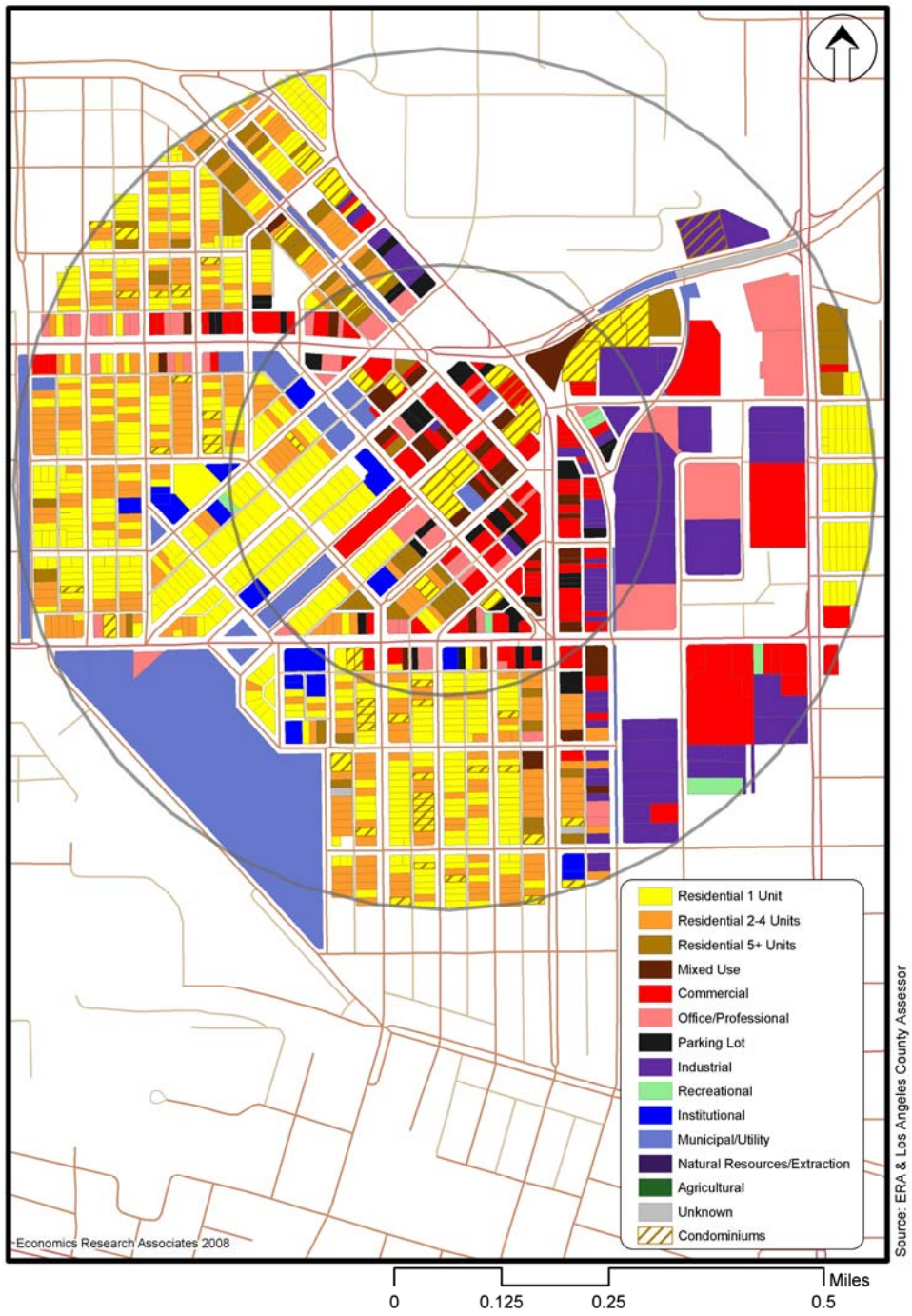
Each study area was analyzed in terms of two zones - the inner core consisted of a circle with a quarter mile radius around the geographical center point of each study area; and the outer ring ran from quarter mile perimeter to a circle with a one half mile radius width around the geographical center point. The inner core is an easy walking distance and the edge of the outer ring is considered to be the limit of walking distance. The analysis compared centers with corridors as well as inner cores with outer rings. Regression analysis of the data can be found in Technical Report 2, while Technical Report 3 contains the case study analysis.

Figure 3
Riviera Village Study Area
Land Use and Inner and Outer Study Areas



Sources: Economics Research Associates and Los Angeles County Assessor.

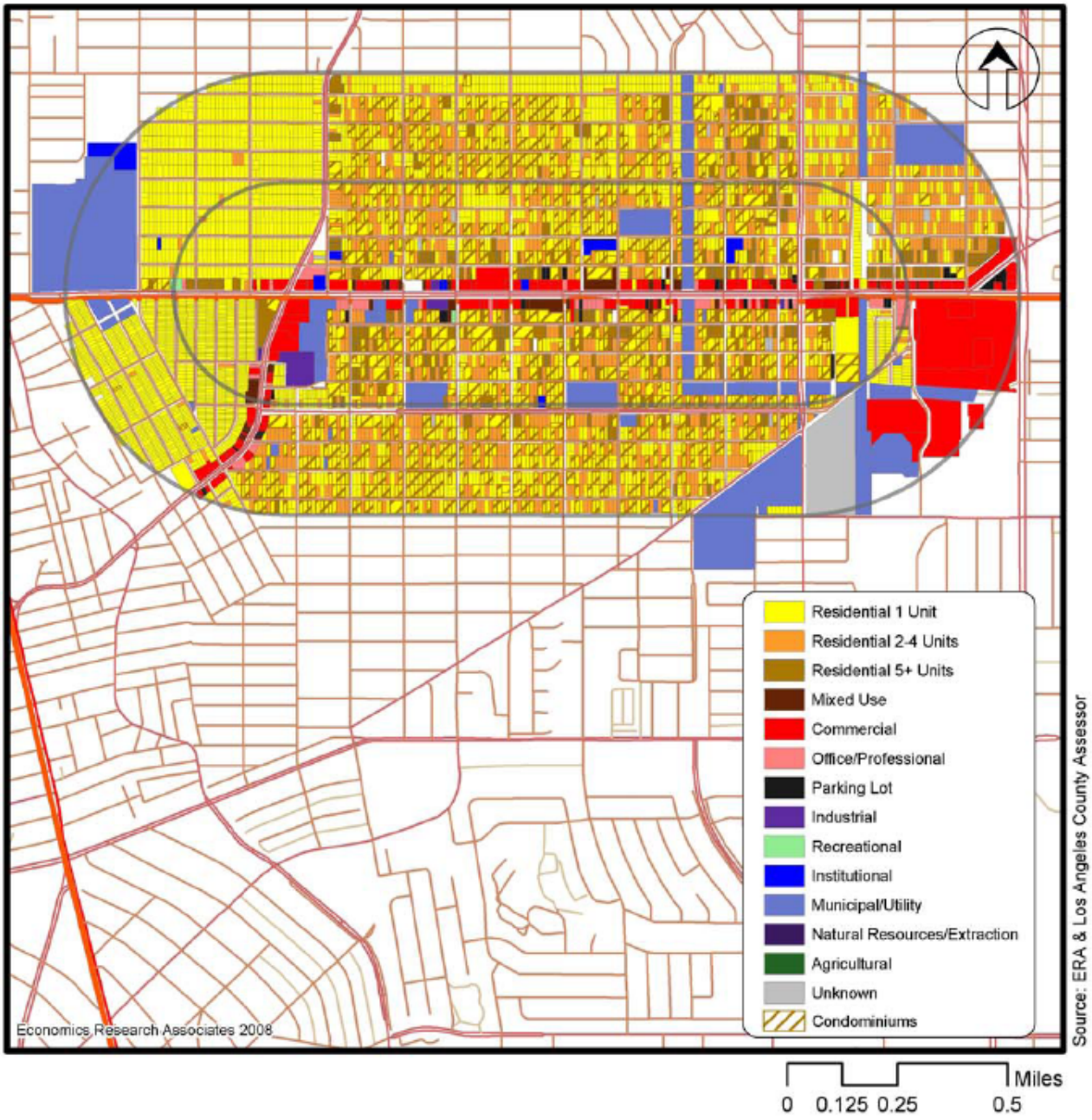
Figure 4
Downtown Torrance Study Area
Land Use and Inner and Outer Study Areas



Sources: Economics Research Associates and Los Angeles County Assessor.
Note: Honda property not included in Los Angeles County Assessor Database.

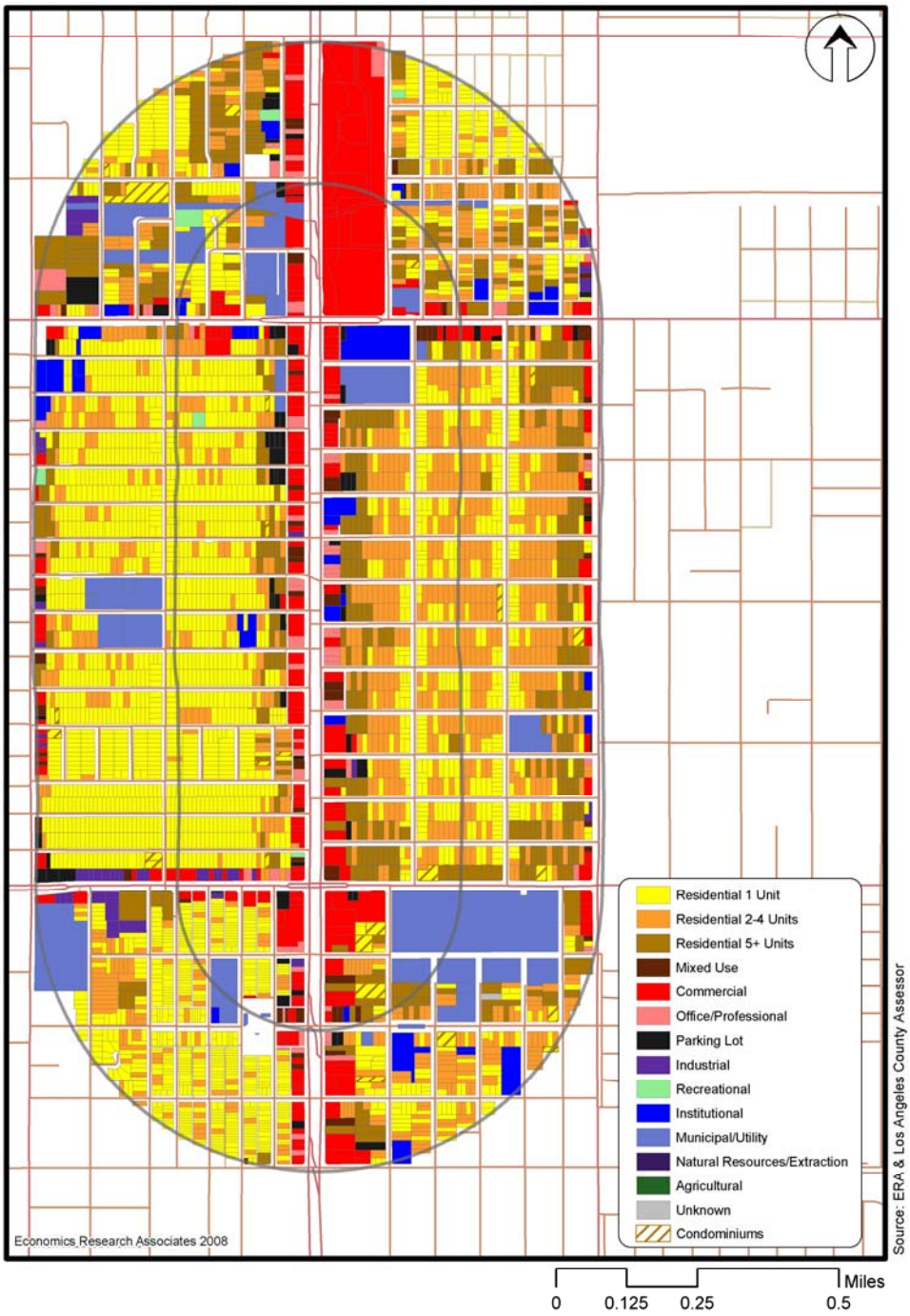
Figure 5
Artesia Boulevard Corridor Study Area

Land Use and Inner and Outer Study Areas



Sources: Economics Research Associates and Los Angeles County Assessor.

Figure 6
Hawthorne Boulevard Study Area
Land Use and Inner and Outer Study Areas



Sources: Economics Research Associates and Los Angeles County Assessor.

Transportation Performance of Land Use

Stakeholders evaluate development projects from their own perspective. For example, developers are of course concerned about the return on investment; local governments focus on the demand for services and the fiscal impact of the project; prospective tenants want high value low cost amenities; local and regional agencies worry about impacts on natural resources and habitat including traffic generation; neighbors want to avoid crowding and congestion; and everyone wants good design and a sense of place.

As if that calculus of development is not complicated enough, the changing conditions in the legislative and physical environments and energy and vehicle markets will soon require that city councils, planning commissions, developers, architects, neighborhood organizations and other stakeholders consider an additional priority -- transportation performance.

The land use pattern, by establishing the spatial distribution of origins and destinations, essentially determines transportation demand. Demand and supply were once well balanced at a small scale. The regional rail network of 1910 Los Angeles was very effective because it served distributed pockets of about 800,000 residents converging on a single dominant central city destination where many people worked and shopped. Today's widely dispersed pattern of 10 million residents traveling to widely dispersed destinations is a much more difficult challenge.

The idea of *good transportation performance* essentially means getting around without depending on automobiles powered by the fossil-fueled internal combustion engine.

The transportation performance of land use (i.e., the development pattern) is determined by the transportation behavior of residents. Some key attribute of a neighborhood such as residential density is thought to cause a particular type and volume of travel, such as fewer driving trips and more walking trips per person per day.

For example, a typical assertion about the transportation outcomes of smart growth is that close-in and walk-able compact development will reduce the need to drive by an average 30%, compared to 'sprawling' development. (Growing Cooler: The Evidence on Urban Development and Climate Change, Reid Ewing, et. al., Urban Land Institute, 2008)

A methodological flaw has plagued many of the studies that have related residential density to less driving. It has been difficult to account for "self-selection" – in other words, do people who like to walk choose to live in dense neighborhoods or do dense neighborhoods cause residents to walk who would otherwise drive? The SBTPS findings account for the self-selection issue (see Technical Report 2).

In the end, many factors influence the propensity to drive automobiles. The relationship between travel behavior and the built environment is complex.

Transportation Performance Metrics

How performance is conceived and measured determines the means by which it can be improved. The seemingly mundane process of defining and measuring performance is actually of fundamental importance to finding strategies for improving it.

Poor transportation performance for a proposed project has in the past meant that congestion would be generated. Remediation through reduction in scale, additional parking, intersection widening and other auto-friendly tactics would be recommended. In the world of tomorrow, development projects will be required to fit into a larger spatial framework such that aggregate automobile demand in the neighborhood declines or at least becomes no worse than what it was before the development.

Vehicle miles traveled (VMT) and its various derivatives such as VMT per person or per household per day is the key metric in current regional transportation planning practice and the output variable used in the transportation demand forecasting models. Vehicle trips (VT) and vehicles hours (VH) of travel, and number of walking trips per household can also be found in transportation research literature.

The Regional Targets Advisory Committee (RTAC) established by SB 375 will embrace VMT in some fashion. Reduction of GHG emissions is the goal but VMT reduction along with fleet composition and fuel improvements are the primary mechanisms for getting there.

Our problem with VMT is that it may be too imprecise for identifying detailed strategies for improving performance of the development pattern.

In order to effectively intervene in land development or transportation strategies, a planner needs to understand what part of the aggregate travel behavior that generates VMT is causing the problem. VMT is generated by distance traveled for each of a variety of trip purposes (D), frequency of trips taken for each purpose (F), and mode choice where the auto mode's fraction is (M): Summed over all trips D x F x M = VMT

Strategies for shifting the mode, shortening the distance or decreasing the frequency (through more effective trip chaining for example) are all options for reducing VMT. Increasing the share of modes that do not consume fossil fuels will reduce GHG emissions even if aggregate VMT fails to decline. Similarly, reducing the carbon content of fuels or increasing vehicle fuel efficiency will reduce GHG emissions for a fixed level of VMT.

The SBTPS design was guided by the need to understand how VMT is generated in South Bay neighborhoods. We derived our metrics from the following model of neighborhood transportation performance:

In the ideal, the commercial "district" closest to each residential neighborhood will capture a high percentage of trips taken by the residents. The functionality and other features present in that district can make it not only the primary trip destination but also will support significant levels of trip chaining. The proximity

between commercial functionality and residence will lead to a low rate of auto mode use and high rate of walking, transit, cycling and other options. There will be fewer automobiles per household. Trips not captured by the local center will be captured by other nearby centers so that trip lengths are relatively short.

Mixed-use centers and mixed-use corridors were studied. Would mixed-use centers outperform mixed-use but auto-oriented corridors? Would more dense districts out perform those that are less dense? Where does walking compete with driving?

Findings

All eight study areas were generally horizontal mixed-use, with most of the housing located in multi-family or single-family tracts built adjacent to the commercial district.[i] There was also a smattering of buildings with residential or office over ground-floor retail.

The survey asked residents to assess what percentage of the total trips taken had the local commercial district as the destination. Respondents chose between categories in 10% increments. This meant that the regression analysis could use a variable such as "at least 40% of all trips" or the weighted average of the response for each study area. Those metrics are referred to as the "capture rate" of each study area.

Residents were also asked the mode they most often used to access the adjacent commercial district. The question was were "walk-able" (half-mile or less) distances walk-actual a high percentage of the time.

Good transportation performance means a high capture rate and a high rate of walking (only a miniscule number of respondents took transit or cycled to the adjacent commercial district).

Overview

The following general findings were drawn primarily from the regression analysis. These and other detailed findings can be found in Technical Reports 2 and 3.[ii]

- Higher residential densities, in isolation, were not the main drivers of our working concept of transportation performance. Well performing centers had relatively high residential densities, but those centers had other characteristics that appear to be more fundamentally important to transportation performance, and residential density alone can be counter-productive to the goal of improved transportation performance.

- The density of business establishments is the most effective predictor of walking trips per household per day and of trip capture rate by the commercial district in each study area.

- Centers performed better than corridors in that there were significantly more walking trips per household per day, but not fewer driving trips. That is, the residents of mixed-use centers tended to walk more than residents of mixed-use corridors, but both groups drove about the same amount.

- Centers place households in close proximity to shopping, service, and other business, eating, or entertainment destinations. As a result, average trip distances for a variety of trip purposes are shorter in centers than in corridors. That "trip shortening" characteristic of centers leads to more walking for almost all trip types studied. Shorter trip lengths tend to induce more total trips and more walking trips.

- Walking decreases with distance from the destination, as walking is more pronounced in inner cores (.25 miles from the center) than in outer rings (.25 - .5 miles from the center).

- Housing density, block size, and residential street pattern, while associated with transportation performance measures in some cases, were not associated as often as business density. Of the variables that measured study area characteristics, business density was the most consistent predictor of transportation performance.[iii]

- The implication is that transportation performance depends, in part, on concentrations of many business establishments. Taken literally, this implies that businesses on small parcels may contribute more to transportation performance than do larger establishments on larger parcels. Part of this may have to do with unmeasured design elements. Big boxes typically have large surface parking lots that break the pedestrian environment, leading to more auto-oriented urban form. Small parcels are more often consistent with narrow street setbacks and pedestrian orientation. Big boxes also tend to have large market areas while small businesses, with a few exceptions, do not.

Anatomy of VMT

The constituent parts of VMT, distance, frequency, and auto mode, can be further broken into specific performance categories. VMT is generated by the commercial district in a mixed-use neighborhood in 5 ways:

- Residents travel to the commercial district within the neighborhood – key variables are frequency and mode (walk, drive, transit), and distance if a driving trip.

- Residents travel outside of their own neighborhood –variables are frequency, mode (drive and transit) and distance for each trip purpose.

- Employees travel to work in the center – variables are mode and distance (assume a frequency is 5 roundtrips per week as an approximation, which would not account for telecommuting or non-standard or part-time work schedules).

- Non-local customers travel to the neighborhood commercial district -- these are customers from outside walking distance who visit the center – variables are mode, frequency, distance

- Employees who work in the center travel to deliver a product or service, e.g. pizza delivery, exterminators, plumbers, gardeners, etc. We collected no data regarding this phenomenon but it could be significant in some situations.

Residents Travel to Commercial District Within the Neighborhood

One of the first questions considered was whether neighborhoods around commercial centers, arguably similar to what might be developed with a smart growth infill strategy, would have a better capture rate than neighborhoods adjacent to typical suburban commercial strips.

Contrary to what we expected, overall, there is not a strong distinction between centers and corridors in trip capture rates (trips to the neighborhood commercial district as a percent of all trips taken by residents living within ½ mile walking distance of the district). While centers tend to have better trip capture than corridors, there are high capture corridors and low capture centers.

Trip capture rates are highest for two of the centers, Riviera Village (where residents stated that, on average, approximately 46% of their total trips were to the commercial center in the middle of the study areas), and Torrance Old Town (with trip capture rates of 45.5% in the outer ring and 47.2 percent in the inner ring.) The intersection, Pacific Coast Highway, also had a high trip capture rate – 44.2 percent.

Regression analysis found that there is not much variation in capture rates between inner cores and outer rings – trip capture does not decline much with distance, at least within the boundaries of these study areas.

Case studies revealed a more subtle finding. When the capture rate is relatively high, there is virtually no drop off between the rates at ¼ and ½ mile. When the neighborhood's capture rates are the lowest, moving from ¼ to ½ mile from the center results in a significant decline in capture rate.

In other words, when those qualities that attract visitors are present, they attract more or less uniformly throughout the neighborhood and do not decay with distance from the core to the half mile edge. When attraction is less to begin with, distance becomes a barrier to visitation.

Old Torrance

Table 4. Trip Capture Rates Selected Areas		
	Inner %	**Outer %**
Old Torrance	47	46
Riviera Village	46	46
Hawthorne	28	30
El Segundo	27	25
Artesia	26	19
Gardena	15	10

Sources: ERA and Siembab Planning Associates.

For residential density to lead to a high trip capture rate, the aggregate demand would need to support such a range of functionality that the local center would satisfy most travel needs. As we also learned, functionality that robust will also draw demand from a much larger market area than just within walking distance. This is discussed below under Employees and Visitors.

Choice of the walking mode is a different story. Whether judged by the average number of walking trips per person per day (a measure of walking trip frequency) or by the percent of survey respondents who said they usually walk to their neighborhood center (a measure of mode choice), centers have more walking than corridors. The "low walk" centers have more walking than the "high walk" corridors. Walking also displays a more pronounced inner core /outer ring split, with the inner cores having more walking.

Graphs of the percent walking and driving by the ¼ and ½ mile distances reinforced the fact that the propensity to walk varies greatly between and among centers and corridors. (See Technical Report 3) What was surprising was that the rate of drop-off between ¼ and ½ mile was very similar among the centers and among the corridors, but with a steeper rate of decline among centers.

It appears that the friction of distance affects everyone when it comes to whether to walk or drive. Put another way, it may be that center draw, landscaping or other amenities can attract more walkers, but no amount of it can overcome the unwillingness to walk longer distances.

El Segundo

Residents Travel Outside the Commercial District

Even successful commercial districts can satisfy the needs of only some of its residents some of the time. Travel outside of the neighborhood is a substantial component of VMT even in a place like Riviera Village with a high capture rate.

Journey to work tends to be the most frequent and longest trip taken. It generally terminates outside of the neighborhood and is usually driven. As shown in the following table, the geographically isolated cities on the Peninsula have the longest commutes.

Table 5. Journey to Work: Time and Estimated Distance

Cities	Time in Minutes	Distance in Miles
Coastal Cities		
Redondo Beach	28.0	12.6
El Segundo	21.9	9.9
Manhattan Beach	28.9	13.0
Hermosa Beach	32.8	14.8
Inland Cities		
Torrance	26.1	11.7
Carson	22.7	8.6
Inglewood	29.7	13.4
Los Angeles County	29.4	13.2
Los Angeles City	29.6	13.3
Hawthorne	26.9	12.1
Gardena	25.5	11.5
Lawndale	25.3	11.4
Lomita	25.6	11.5
Peninsula Cities		
Rancho Palos Verdes	33.1	14.9
Palos Verdes Estates	32.8	14.8
Rolling Hills Estates	31.9	14.4
Rolling Hills	32.0	14.4

Sources: ERA and Siembab Planning Associates.

The following table of Census data shows that despite having a high capture rate, the travel of residents to destination outside the neighborhood is significant, specifically, residents of Riviera Village tend to drive alone to work. Inglewood has the highest rate of transit usage.

Table 6. Mode Share

Drive Alone		Carpooled		Public Transit		Walked	
Los Angeles	70.0%	Los Angeles	15.1%	Los Angeles	6.6%	Los Angeles	2.9%
Torrance (Control)	82.5%	Torrance (Control)	7.8%	Torrance (Control)	0.7%	Torrance (Control)	1.2%
Riviera Village Total	85.6%	Hawthorne Total	16.4%	Inglewood Total	9.6%	Downtown Torrance Total	3.8%
Downtown El Segundo Total	84.3%	Gardena Total	14.4%	Hawthorne Total	6.3%	Downtown El Segundo Total	3.1%
Artesia Total	81.9%	Inglewood Total	13.4%	Gardena Total	3.5%	Gardena Total	2.7%
Downtown Torrance Total	76.0%	Downtown Torrance Total	11.4%	Artesia Total	2.5%	Downtown Inglewood Total	2.3%
Gardena Total	75.5%	Artesia Total	9.4%	Downtown Torrance Total	1.8%	Hawthorne Total	2.1%
Hawthorne Total	72.2%	Downtown El Segundo Total	7.1%	Downtown El Segundo Total	1.1%	Artesia Total	1.2%
Inglewood Total	71.3%	Riviera Village Total	7.0%	Riviera Village Total	0.6%	Riviera Village Total	0.9%

Sources: ERA and Siembab Planning Associates.

Correlation coefficients were calculated to assess the influence of household income on the propensity to drive alone, take transit and own vehicles. Household income was highly correlated with driving alone to work, with income explaining over 80% of the variation. Income explained 65% of the variation in transit use but had only a weak relationship with vehicles per household.

The residential survey asked for the frequency, mode and distance (in ranges) for different types of trips: eating a meal out, grocery shopping, personal shopping, and personal services are the most significant.

Although there are overlaps, the residents of centers stayed within their neighborhoods for the 4 trip purposes more of the time than did corridor residents. According to the regression analysis, this is because of the functional concentration of centers.

However, there were variations between trip purposes when leaving their neighborhood. Center residents stayed closer to home than did corridor residents when leaving their neighborhoods for personal services and to eat out. But when buying groceries and personal shopping both center and corridor residents traveled over two miles roughly the same percentage of time. Assuming personal shopping translates into visiting a mall, it would make sense that residential origin would not make a significant difference since malls are basically specialized, low density retail islands.

Even in the high capture neighborhoods of Riviera Village and Old Torrance, residents traveled over 2 miles most often for personal shopping (about 1/3 of the time) and eating out (25%-40% of the time).

The leakage of demand out does not appear as significant a VMT generator as the trips into the study areas by outsiders, but is still a factor and probably more of a factor in the neighborhoods with the lowest capture rates. Driving was the dominant mode when leaving the neighborhood in all study areas.

Employees and Visitors

One of the frequently mentioned virtues of mixed-use residential density is the ability of residents to walk to many destinations – to work, shop and play locally is often how it is expressed. This is however, an over simplification. The base analysis of four of the study areas produced by ERA highlighted the importance to the neighborhood economy of visitors who live outside of the neighborhood.

Those commercial districts with the highest capture rate also have the largest number of businesses and a broad mix of functions and/or variety within certain categories. The reason that the number, mix and variety of businesses responsible for the high local capture can stay in business is the demand that is imported into the neighborhood from beyond walking distance. In other words, the purely local market cannot by itself support the rich variety of retail, services, and restaurants found in the districts with the highest capture rates.

That external demand comes from two sources. Employees who work in the commercial district who become consumers before and after work and over the lunch break; and visitors that are attracted to the district by what is available to purchase – they visit to buy clothes, see a doctor, get a spa treatment, eat a meal, etc.

Some visitors and a very few employees live in the neighborhood. Their trips are counted as part of the capture rate of the commercial district.

Unfortunately, the research budget did not allow for a statistically valid, randomly sampled survey of employees and visitors. A few employers in each study area provided the home addresses of their employees. Visitors were people walking around during the hours of sampling. As a result the data collected are combined into anecdotes, far from the statistical significance of the residential survey. This suggests the need for more research attention to destination-origin relationships rather than the more traditional origin-destination studies.

Employees Travel to Work in Commercial District

The employee survey provided estimates of the distance to work. They are shown along with the total number of employees per study center.

Table 7. Employment Average Distance to Work

	Ave Miles	Employees
Centers		
Riviera Village	5.3	3,670
Inglewood	9.9	7,660
Old Torrance	11.3	7,410
El Segundo	16.5	3,420
Corridors		
Artesia	5.4	3,080
Gardena	10.6	8,550
Hawthorne	11.7	7,000

Sources: ERA and Siembab Planning Associates.

Gardena

If the distance figures are accurate to an order of magnitude, then each study center is likely generating about 20 million VMT per year in autos for the journey to work. Substantially less in Riviera Village and Artesia due to the relatively small work force and short distances; a little more in Gardena and Old Torrance.

Employees are, however, an important influence on center capture rate. They help support the range of functions that attract neighborhood residents. Fewer imported employees would likely mean fewer functions which would lead to a lower capture rate.

Non-Local Visitors Travel to District

Visitors to each study area are, like employees, vital contributors to the neighborhood economy. As with the employment, these data are not supported by statistically significant sampling methods. They reflect who was walking around each study center at the times of the survey.

As we expected, the average distances are much shorter than for employees. For all but PCH, the distances are 5 miles or less.

Table 8. Weighted Average Visitor Miles Traveled to District	
El Segundo	2.0
Artesia	2.2
Riviera Village	2.2
Inglewood	2.9
Gardena	3.2
Hawthorne	5.0
Torrance	5.0
PCH	5.7

Source: Siembab Planning Associates

Looking at those data more closely, 2/3 or more of the visitors surveyed in the commercial district of each study area lived within 5 miles of the district. Centers had no advantage over corridors.

PCH-Hawthorne

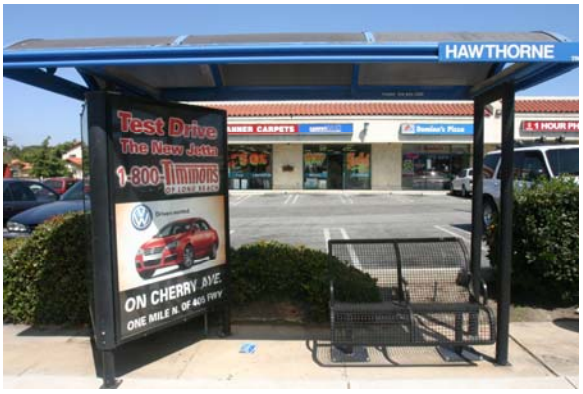


Table 9. Visitor Distances- Percent					
	Approximate Miles				
	0-.5	.5-2	2-5	<5	>5
Centers					
El Segundo	73.8	0	11.5	85.3	14.7
Old Torrance	38.9	5.2	19.6	66.3	33.7
Riviera Village	31.7	0	50	81.7	18.3
Ingelwood	35.2	13.4	22.5	71.8	28.2
Corridors					
Artesia	67.4	6.5	8.5	82.1	17.9
Gardena	74.4	7.1	9.4	92.1	7.9
Hawthorne	42.5	6.7	23.9	75.4	24.6
PCH	14.2	4.5	42.6	63.1	36.9

Source: Siembab Planning Associates.

Inglewood

Artesia

ERA estimated the percent of total sales that originated within the walking neighborhoods in 4 of the study areas.

Table 10. 2007 1/2 Mile Support	
Riviera Village	13.3%
Old Torrance	14.0%
Artesia Corridor	38.5%
Hawthorne Corridor	24.7%

Source: ERA.

Riviera Village

The centers are attracting a larger amount of market support from outside the walkable market shed. This reinforces the finding that study areas with the highest capture rates depend on a large volume of demand from outside the neighborhood that supports the wide range of functionality that neighborhood residents find so attractive.

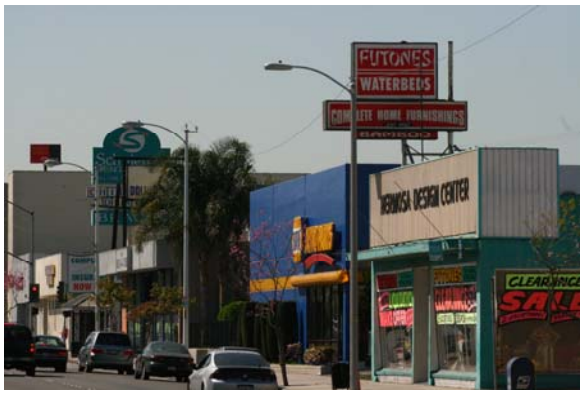
Primary plus secondary markets provide the population base that supports approximately 60-70% of the demand for retail goods. A great deal of total demand originates within 3 miles of the commercial district. Since these trips today are mostly driven, mode shift appears to be the best VMT reduction strategy.

Table 11. Retail Market Areas

	Primary	Secondary
Riviera Village	2.5 x 1	4.5 x 2.5
Old Torrance	1.5 radius	3 radius
Artesia	1 radius	3 radius
Hawthorne	1 radius	3 radius

Source: ERA.

Hawthorne



Sustainable South Bay: Transportation Vision

The transportation component of the Sustainable South Bay Strategy holds the promise of having an immediate impact on GHG emissions; criteria air pollutants, congestion, gasoline consumption, and safe, personal transportation for the growing population of seniors. And it can be implemented separate from and earlier than the land use component.

The current system of auto-mobility is in a highly volatile state since it is reaching the end of its life cycle. Pillars of the industry such as General Motors and Chrysler Corporation have filed for bankruptcy. Chrysler was purchased by Fiat and faces an uncertain future. Younger, smaller and more agile manufacturers of alternative fuel vehicles are emerging all over the globe.

Planners can strengthen the transportation-land use connection by recognizing the opportunities inherent in this sea change in mobility options.

Appropriate Vehicles

One of the changes useful to the attempt to marry land use and transportation strategies is the emerging alternative vehicle market which is segmented in terms of vehicle capability. Where 30 years ago the mode choices were limited to walking, cycling, public transit and fossil fueled, high performance automobiles (albeit available in various models), today there are a variety of choices, each with different performance characteristics.

One of the shortcomings of the current statement of the smart growth strategy is its mobility options which consistently identify only walking, cycling and transit. Options should actually include the proliferating range of non-polluting local use vehicles, such as the following (listed with their maximum speed and expected range).

- Electric cycles – 5-20 MPH up to 20 miles
- Personal transporters –skateboards to Segways, 10 MPH up to 2 miles
- Neighborhood Electric Vehicles (NEV) – 25 MPH with a practical range of 30 miles
- Medium Speed Electric Vehicles (MSEV) – 35 MPH (NEV technology with more lenient NHTSA regulations) with a practical range of 30 miles
- Commuter Electrics – freeway speeds up to 150 miles
- Touring (extended range) Vehicles – freeway speeds, unlimited range – electric or fuel cell versions are in development and will appear in the marketplace within 3 to 5 years; Chevrolet Volt expected in 2010.

Local Use Vehicles

Sources: Rick Sykes, zbike.com, and gamespot.com.

Those vehicles are available for creating a mobility strategy that matches the conditions in the South Bay and, possibly, other transit poor suburbs. It appears that many existing trips are currently well within the range of LUVs. ERA estimated the secondary market sheds for our study areas to average between 3 and 4 miles. The visitor survey, although not a statistically significant sample, found that 2/3 of the visitors traveled less than 5 miles. In order to significantly reduce the carbon footprint from the land use-transportation interaction, nothing need change beyond the vehicle of choice. The LUV alternatives are on the market, no technological development is needed.

The SBCCOG has already begun moving in the direction of NEVs and Segways, through its Local Use Vehicle (LUV) Demonstration Project funded by the AQMD between July 2009 and June, 2011. Part of the transition process will involve drivers coming to understand the speed and distance requirements of their trips and matching them to the appropriate technology.

The transition to appropriate vehicles will be aided by the transformation occurring in automobile culture. General Motors is credited with establishing the "ladder of success" where its brands corresponded to ascending social status – Chevrolet, Pontiac, Oldsmobile, Buick, and Cadillac. The collapse of that ladder eliminates an impediment to a culture that will support purchasing vehicles appropriate to trip characteristic rather than social status.

GM also pioneered the practice of "planned obsolescence" which made last year's product unacceptably unfashionable. NEVs are typically kept by their owners for around 10 years because few miles are driven and the technology is basic, limited and lacking the need for quantum leaps in capability or design every few years.

Mode choices appropriate to trip length will always minimize energy consumption, no matter the source – battery electric, hybrid, fuel cell, bio-diesel, ethanol, etc. For example, electric vehicles capable of faster speed and longer range require more batteries which must move more weight, consume more KW-hours and produce more waste. Driving one mile in a Tesla is more efficient than driving that mile in a Lincoln Navigator but not nearly as efficient as using an NEV.

Vehicle size also matters, not only to direct energy savings but also to the parameters that affect the built environment. Space for parking is expensive and does not directly produce revenue. Parking requirements drive up the cost of residential construction and affect the efficiency of commercial operations. Simply re-striping parking lots for NEVs could increase the lot capacity by 185%.

These issues signal a culture change and culture change requires extraordinary levels of support. To invest in alternatives vehicles, residents need confidence that local governments will do their part to foster the practicality of the full range of appropriate technologies.

Complete Streets

One of the features of good transportation performance will be mixed mode streets. Suburbs can turn a disadvantage into an advantage as wide suburban streets, considered an impediment to walking, provide opportunities to accommodate mixed mode traffic with lanes dedicated to alternative vehicles.

It appears likely that large scale deployment of local use vehicles for short trips depends on municipalities preparing to accommodate these vehicles on mixed-mode streets. Interconnected low speed routes are generally lacking in every city. Local and sub-regional NEV plans are needed to overcome connection issues so that drivers have a clear understanding of what routes are available to NEVs.

Currently, arterials are managed so that they will move large volumes of automobiles at speed limits of 35, 40, 45 and in some cases 55 MPH. While actual traffic flow often exceeds the speed limits, congestion makes it all grind to a halt.

NEVs are currently limited by federal regulations to a maximum speed of 25 MPH although they are authorized to travel on streets posted at 35 MPH. This means that NEVs can share a 35 MPH street as is, but that they will need special striped lanes like bicycle lanes on the streets with higher speed limits (referred to as Class 2 routes, Class 1 being a dedicated roadway, and Class 3 being a designated mixed mode street of 35 MPH or less). Safety and the perception of safety is the primary challenge in either of those mixed-mode scenarios.

Neighborhood streets accommodate NEVs with no particular problems since they are posted for 25 MPH maximum. In fact, LUV/NEVs will make costly speed bumps unnecessary in most neighborhoods.

Travel outside of the walking neighborhood can be routed on a network combining residential streets with 35 MPH-and-slower arterials. In some cases, the volume of the mixed-mode traffic or the higher speed limit will require Class 2 routes. Anecdotal information out of Lincoln, California suggests that the wide combination-lanes that accommodate both bicycles and NEVs have fostered more bicycling.

A bold vision for streets such as PCH and Hawthorne Blvd would be a repartitioning with Class 2 combination NEV/cycling lanes and exclusive bus lanes that could accommodate bus rapid transit in both directions. This would mean eliminating left turn pockets but offering two through lanes for full speed automobiles at 45 MPH.

As of 2003, 9 jurisdictions in the South Bay had Class 2 bicycle lanes for a total of 52.7 miles, while 7 have no such lanes. Torrance has the most miles (13.5) followed by the City of Los Angeles (8.9 miles), Rancho Palos Verdes (8.4) and Carson (7.0 miles). Those might be places to begin by widening the lanes to also accommodate NEVs.

Adopting "complete streets policies" is part of what's needed but full scale LUV implementation goes beyond street management into areas such as consumer education, driver etiquette, and parking policies.

Fleet Composition

South Bay residents owned about 550,000 automobiles in 2000, approximately 175,000 of which are second or third vehicles. The development of the market segments previously described means that the transition away from the gasoline-fueled vehicle fleet can proceed at a more rapid rate than if the only option was replacement in just the high-performance segment.

Some portion of the high performance fleet will migrate to extended range, reduced or carbon free fuel vehicles over the next 5 years, perhaps to plug-in hybrids, hydrogen fuel cells, or innovations like the Chevrolet Volt. Some will be replaced by the full speed, limited range commuter cars now beginning to appear in the market, the Miles Coda or BMW's Mini-Cooper Mini-E for example.

Many of the second and third vehicles in a household are candidates for replacement at the bottom end – by local use vehicles including the Segway, electric bike, NEV and MSEV. As mentioned, complete streets policies and educational programs that support consumers' willingness to use vehicles appropriate to trip type are keys to this transition.

Car Sharing Service

Car sharing is the practice of offering affordable hourly rentals of extended range vehicles from inside a neighborhood -- gasoline fueled today and in the foreseeable future, although some mix of alternate fuel vehicles with various ranges is likely. The point is that if a resident needs to drive out of the neighborhood only occasionally, then s/he need not own an extended range vehicle if one can be affordably rented locally on demand.

The idea of flexible terms for car rentals known as "car sharing" has grown in various places around the nation. The target has so far been dense urban neighborhoods such as found in Chicago and also college campuses with a large resident population of students who do not regularly require a motor vehicle.

In Metropolitan Los Angeles, Zip Car provides service to both USC and UCLA but not yet elsewhere in the County. The SBCCOG made a preliminary inquiry to Zip Car in 2007. Zip Car expressed initial interest in the second car replacement strategy but the recession made innovation and market expansion much more difficult.

Competitive Local Taxi Market

The goal is for people to get where they need to go without burning gasoline. Walking; personally owned NEVs; commuter cars; car sharing services; and public transit all can play a role. So can a much wider deployment of common carriers – car and drivers available per trip. Taxis, in other words, however, an expanded concept of taxis.

Travelers to third world nations usually encounter a novel form of private common carrier. They might be pedicabs or motorized rickshaws referred to in Southeast Asia as tuk-tuks. Pedicabs may be on their way back in Los Angeles as the City's Transportation Committee is in the process of evaluating a proposal to allow commercial pedicabs in certain districts (see http://la.streetsblog.org). Many of the local use vehicles with an entrepreneur driver can also be deployed as commercial common carriers or in non-profit situations like dial-a-ride for seniors.

A competitive local common carrier market could, if affordable, provide on demand, door-to-door service within the limited service areas contemplated in the land use component of the Sustainable South Bay Strategy.

Public Transit

Transit planning is a science in itself. This vision of the mobility component of a Sustainable South Bay cannot provide much more than some general ideas about the role of transit.

The South Bay has pockets of very low density housing but for the most part it is a relatively dense sub-region. Certainly dense enough to justify better transit service than exists. The wild card in transit planning can be expected to be the inconsistency in transit funding, especially that dedicated to the South Bay. Competition for funding within Los Angeles County is fierce.

One need is truly rapid transit connections to the other sub-regions in LA County and to the inter-city rail network that serves all of Southern California. The Harbor Subdivision rail line is in the early planning stage but even if it advances in the funding queue and gets built, it would not begin operation before 2025-2030.

The most recent sales tax measure included an expenditure plan for the next 20 to 30 years and projects for the South Bay are in the second and third decades. Therefore, the long term use of transit resources in the county has been established and the South Bay cannot expect any significant gains in rapid transit service for the next 20 years at least.

A second transit service need is rapid circulation within the South Bay itself, particularly to the various employment centers and to other single function centers like the colleges and universities.

Finally there will be a need for circulation between the various neighborhood commercial concentrations proposed in the land use component of the Sustainable South Bay Strategy. Those services might need to be demand-responsive, or a rapid fixed route DASH system.

One of the challenges in creating the transit element of the Vision is the lack of a "transit service index" or TSI (comparable to the level of service index for intersection performance) that would allow each sub-region to characterize its level of service for comparison to other sub-regions, to set long term goals toward which progress could be measured, and to evaluate the residential density-transit service balance.

Sustainable South Bay: Land Use Vision

The land use component of the Sustainable South Bay Strategy will take decades to implement and reach a threshold of impact. Land use is also the most politically difficult to change in part because of the extended public dialogue that will be necessary.

When change involves adding housing, even at the low densities suggested by the Sustainable South Bay Strategy, cities will have legitimate concerns for fiscal impacts. Housing tends to add cost burdens while retail generates revenue.

Of the 9 development scenarios developed by ERA in the economic component of the SBTPS, the big box retail development produced the largest fiscal benefit to cities. That this would also worsen transportation performance in the neighborhood reminds us that the fiscalization of land use has been an issue for years and needs to be addressed head-on by policy makers in Sacramento – this time in order to improve transportation performance. SB 375 adds urgency to the situation since it is incompatible with current financing for local government that makes big box retail a municipal lifeline.

The dictum that "its time to build up, not out" is easy to say but much harder to do at least from the municipal perspective. In mature suburbs, there are capacity issues when adding anything, but especially housing. Parks and open space are notoriously difficult to add in proportion to new development. Two of the three cities studied by ERA were found to have serious solid waste diversion deficiencies. The land fills serving the South Bay are expected to be exhausted in 2009-10. Sewer condition and capacity could be an issue in many cities but relatively expensive assessments are needed in order to know how serious those problems are. Key intersections operate at level of service E or F throughout the South Bay. In Hawthorne, location of the densest corridor studied, 7 out of 7 measured intersections were rated at LOS E or F.

ERA also examined the general fund revenues and expenditures for the 3 cities studied in order to determine the fiscal impact of new development (ERA analyzed 4 of the 8 study areas and they were in 3 cities – two were in Redondo Beach). Costs and revenues are expressed in terms of equivalent dwelling units (EDUs). The analysis determined that in one of the cities the cost per EDU exceeded the revenue (meaning that development of any kind would create a drain on the general fund). A second city was exactly balanced and a third was slightly positive. But this analysis was conducted before the recession with its precipitous declines in municipal revenue. At this point, probably none of the cities studied could afford to absorb any development project.

We said earlier that the pattern of buildings need not change at all for gasoline consumption and GHG emissions to decrease. However, the South Bay has been built in an auto-oriented pattern. So it makes sense to use whatever new construction and replacement that will actually get built to contribute to shaping environments that foster walking, alternative modes, and alternative vehicles.

Energy, no matter its source, will have costs to generate and distribute, and will produce waste. Conserving energy will always be a good practice and the development pattern is one of the factors that can help conserve energy.

The problem is that the built environment will take decades to significantly change, even if there was a blueprint for how to change it in the many different contexts in which change must occur. Infrastructure, buildings, and their juxtaposition are long term propositions and have the flexibility of other things that are literally cast in stone (or concrete, asphalt, or steel) – very limited.

But, it is possible that the reforms on the mobility side will not proceed as quickly as expected, or not be as effective as predicted. It is also possible that the climate problem is worse than anticipated or that a genuine gasoline crisis will appear in the short run. It is against those prospects that changes in the development pattern should proceed. In other words, it would be a big gamble not to proceed with at least some test in the near future of the land use component of the Sustainable South Bay Strategy.

Leave No Neighborhood Behind

A transportation strategy that depends on automobiles requires things spread out with significant destinations well supplied with parking. The typical auto suburb has retail developed in low density malls surrounded by a sea of parking and along arterials that are the routes between residences and work places. Distances are not much of an issue since autos can cover a lot of ground in a short period – unless congestion has developed because the spread-out framework has become too densely filled-in over time. Being enfranchised requires owning a motor vehicle.

A transportation strategy that depends on public transit requires high density housing and some level of commercial activity at the access nodes, especially in the case of rail. An ideal transit system carries large volumes of people from dispersed locations into a central marketplace like a central business district.

The transit-based strategy requires high levels of public capital investment in infrastructure and equipment. In addition, large amounts of public and private investment are usually required for building the dense nodes that the economics of transit require. However, this investment pattern fails to spread the benefits to every neighborhood in need of improved transportation performance.

Distance from residence to transit and from transit to commercial destinations are important. Walking distance of a half mile provides the outer limit. Beyond that distance transit itself becomes auto dependent as riders drive to the access nodes.

The transportation strategy envisioned for the South Bay depends on walking as the primary mode and local use vehicles as a close secondary, or the reverse in some neighborhoods. It requires many compact commercial nodes each with robust functionality that serve as decentralized destination nodes which produce

short-distance access to commerce for virtually everyone (the Strategy of Distributed Commercial Concentrations).

This land use component of the Sustainable South Bay Strategy has an inherent spatial equity since it seeks to distribute concentrations of commerce relatively evenly so that every resident has nearby access to what they need. It avoids channeling investment which yields benefits disproportionately to the residents and businesses inside that channel, a critical shortcoming in case of a sustained fuel crisis that would dramatically increase the costs of auto-mobility.

Jobs-Housing-Services Match at a Target Distance

Conceptually, the primary land use objective should be to provide something like 80% of the destinations needed by residents of each neighborhood at a distance no further than a reasonable ride in a local use vehicle. Subject to further study and discussion, we assume that distance to be about 3 miles.

In other words, the goal of the land use component is to create a match in each neighborhood between jobs, housing and services within 3 miles 80% of the time. Returning to the VMT formula, this means that the .8 times the sum of the Average Frequency per trip type times Average Distance per trip type all divided by the number of trip types should be less than or equal to 3 miles.

The standards of three miles and 80% of the time may take many years to accomplish. It may be that today the jobs-housing-service match is at 5 miles for 60% of the trips. The average distance at which a jobs-housing-service match is achieved 80% of the time could become a useful metric for evaluating progress from the land use side. Making the most frequent non-work trips as short as possible can also help compensate for the inevitably longer work trips.

Three Mile Square LUV Communities

We refer to these 3 square mile areas as LUV Communities. This means that the South Bay sub-region can more or less be organized into about 5 of them. A LUV Community is really nothing more than a market area overlay shaped around LUV capabilities. LUV communities will have no formal existence.

LUV Communities will provide a spatial framework for monitoring and guiding the spatial distribution of functionality so that it can, over time, be massaged so as to form the match with the trip destinations of the residents. How this can be accomplished in practice is discussed in the Implementation section of this report.

Concentrated Commercial with Offset Street Patterns

The SBTPS found that concentrated commercial nodes located as close to as many residential neighborhoods as is economically possible, are consistent with mobility based on walking and local use vehicles.

In other words, in order to foster the development of neighborhoods with a high rate of walking, compact commercial concentrations with both retail and office components need to be developed around intersections of major arterials. These centers should incorporate an office-based work force and include the so-called neighborhood functions plus other functions that give each center some form of specialization (the export base of the neighborhood economy).

There are 16 intersections of major arterials in three square miles of the typical grid pattern found throughout the coastal and inland cities. Ideally those 16 intersections with concentrated commercial functionality in the center of each will satisfy 80% of the trip destinations of the residents If that is the case, local use vehicles supplemented by some form of transit and vigorous competition among short haul alternate taxis should be the ideal modes for circulating among the centers.

One of the economic realities determined by the SBTPS was that walking neighborhoods cannot, even with extreme levels of residential density, support the commercial activities in the neighborhood core. Visitors from other neighborhoods provide the demand necessary to support the commerce. This is why some vehicular means of circulation between the centers is an economic necessity.

ERA developed a scenario to illustrate this point. "If one were to convert a mile long stretch of a corridor into three story mixed-use use residential above retail (570,000 square feet), the residential component (916 units) will account for approximately 3% of the total demand required to support the new retail. The retailers in other corridor will have to rely on other sources of demand to support 97% of the sales." (Page 5, The Compass Blueprint Market Feasibility Analysis, Economic Research Associates, July 2008)

Based on examining demand alone, the corridor intersections clearly have the potential to support a significant level of retail, but are not currently oriented to that market. (See page 80 of the ERA Report)

One additional finding was that a physical feature that enhances the capture rate of a commercial district is an offset street pattern that creates a sense of place in the form of an enclave. This suggests that in cases where a parcel is particularly large – for example it currently contains an aging 1 story mall with surface parking on a 5 acre parcel – it should be redeveloped around a street pattern that makes acute angles with the rectangular grid.

The mix of functions should include retail and office and even perhaps some light industrial for such activities as bicycle assembly. Adding housing would mean less space available for the commercial concentration which acts as the demand magnet that draws trips from the adjacent neighborhood. There will be enough housing within the half mile walking radius and the 3 mile area within which LUVs will be effective.

Intersections Define a Natural Hierarchy of Centers and Proto-Centers

There are 3 types of intersections:

- Major-Major – where two major arterials cross
- Major-Minor – where a major arterial crosses a minor
- Minor-Minor – where two minor arterials cross

Within each 3 mile square planning area, there are 16 intersections of two major arterials, 24 intersections of a major and a minor arterial, and 8 minor-minor intersections. This forms a natural three level hierarchy of centers.

We do not know enough yet to postulate hypotheses about what kind of functionality should be assigned to each level of the hierarchy. Research should be conducted on existing intersections within this hierarchy, particularly those that feature some form of concentrated commercial activity.

Hypothetically, the major-major arterials could be the preferred location for the densest buildings with the most commercial activity. The major-minors could be similarly commercial but at lower densities. The minor-minors could provide locations for the most dense residential buildings in the 3 square miles, or possibly mixed-use residential over retail.

One reason for adding commercial density to the major intersections is that many today are oriented to some form of auto-mobility, especially gas stations but also drive-through fast food, muffler shops and the like. As auto-mobility declines, so will the need for at least the gas stations, muffler shops, and mechanics.

Planners will need to monitor the evolving fuel markets for ground transportation. If hydrogen becomes the fuel of choice for the next generation of extended range vehicles, then it may be that those corner locations will still be needed as re-fueling stations. If the energy source becomes battery electric, then fueling stations will not be needed or at least not needed in the same quantities as gas stations are today.

Treating arterials as a sequence of neighborhood centers or proto-centers may well prove to be part of a successful transition away from auto-dominance.

Designate South Bay Center for Intra-Regional Transit Access

With a semi-regular pattern of commercial centers within walking distance of most neighborhoods, the largest or most significant of them should be designated as South Bay Mobility Centers -- the access points to the intra-regional rapid transit backbone network. Those few centers are where BRT in the future would stop to collect passengers leaving or entering the South Bay from other sub-regions. This is reminiscent of the Centers Plan developed in the 1960s (Concept LA, Los Angeles Department of City Planning January, 1970).

South Bay Mobility Centers would have slightly higher commercial densities with functionality appropriate to visitors, employees and residents coming and going from the South Bay. These places might also provide access to LUVs available for day use as station cars. The car sharing service could be located on one or more of those designated centers. Private taxis and public DASH would also cluster around South Bay Mobility Centers.

Parking for Local Use Vehicles

When converting local trips from high performance autos to LUVs, parking can be an effective complement to mixed-mode streets. Any of the following policies will encourage LUV usage:

- Free parking in municipal spaces (police wouldn't ticket LUVs parked at meters).
- Preferential parking locations in malls, other private centers, and municipal parking lots.
- Dedicated parking spots, for example, by replacing parallel spots for autos with head-in LUV parking.

If the replacement of second and third vehicles in a household by LUVs reaches some critical mass, cities will be able to reduce parking requirements per dwelling unit and per square foot of commercial space in new construction. This would reduce the cost of new housing and commercial development which would contribute to the transition to a LUV oriented pattern. A fast pace of transition to LUVs can have a significant impact on the pace of both residential and commercial development.

Guide for New Development

One question is how this spatial framework would be used as a guide to new development projects. From the ground level, cities interested in trying a new development pattern will need to look at each development proposal received in terms of how it contributes to the migration of retail from arterial strips into compact concentrations.

Because of concern for fiscal impacts, this migration process might work best by giving priority to the new commercial development projects and then replacing the existing commercial with housing. This would mean guiding developers away from the residential over retail model that is popular today.

From the sub-regional level, the SBCCOG should begin work on a sub-regional land use and transportation plan that would provide a framework for guiding action in those cities interested in using it. The plan itself would be developed in cooperation with member cities and would identify South Bay Mobility Centers and locations of proto-centers designated for commercial densification. These should be adjacent to arterials on which the commercial is relatively old with low improvement-to-land value ratios.

This plan would also track the spatial distribution of functionality and the location of neighborhood functions in particular. The online data base, LA Lots, has made the functional information provided by the InfoUSA data base used in the SBTPS available to everyone for no cost. It also provides information at the parcel level on the value ratio previously suggested.

This sub-regional plan would also develop approaches to transforming the single function districts which form the remaining significant challenges to improving transportation performance in the South Bay.

The sub-regional land use – transportation plan is explored further under Implementation.

Single Function Centers: The Remaining Challenge

Single function centers typically are islands surrounded by parking lots with large market areas and no adjacent residential neighborhoods. Many attract large numbers of employees and customers.

Not much can be done with the large stadiums or performing arts centers since hosting live performances or games is why they exist. Public transit and Class 2 combination bike-NEV lanes are the only likely remedies.

This is equally true of industrial employment centers like the oil refineries. Telecommuting is not a significant option since most employees work with their hands on machinery. Good transit service, perhaps company vans, and Class 2 combination lanes for those who live within a few miles seem to offer the best options.

Retail malls provide additional opportunities. The leading characteristic of retail malls is their relative low density, as low as two businesses per acre VS 10 – 20 per acre in our study centers.

The first option for improving the transportation performance of a suburban mall would be, without building more square footage, to add many more businesses, each with much smaller formats than what exists. Del Amo Mall, the largest mall in the South Bay, hosts only 191 businesses while study center Riviera Village has 644. Using Del Amo as an example, doubling the number of businesses to around 400 in the same or modestly expanded space should improve its transportation performance (by allowing more trip chaining and by capturing more trips by residents of the adjacent neighborhoods).

The functional analysis in Technical Report 3 suggests that in addition to adding businesses without necessarily increasing the building space, malls should dramatically broaden the business mix to include services normally found in our study centers (which tend to be personal services) and several employment categories. The

Peninsula Center on the Palos Verdes Peninsula has comparatively broad functionality due to its relative physical isolation, and could conceivably be a model for the flat land malls to emulate.

If new construction is an option, the logical choice would be to convert some of the surface parking capacity to a residential neighborhood built at modest density. The main purpose of adding housing would be to help reduce the island quality of malls, more than adding demand for the retail in the mall. Some kind of "bridge" to encourage pedestrian access from existing neighborhoods would also help.

Another building option, particularly on the surface parking lots, would be adding more commercial space. As mentioned above, streets at acute angles tend to attract visitors more than a continuation of the normal grid. This would mean that the island of commerce would be surrounded by a commercial village environment where parking is tucked in between the new buildings, possibly in structures, rather than monopolizing the surrounding surface.

The good news is that mode options can improve transportation performance without any changes to the mall itself. All of our 8 study centers were no further than 3.5 miles away from the nearest suburban mall. This suggests that careful routing could help improve access for LUVs and a Class 2 combination lane would certainly improve non-automotive vehicular access. Improved access arguably would increase the capture rate within 2 to 3 miles which ERA identified as the hedge against long run decline in mobility. Of course, improved transit service could also improve mall performance.

Post secondary education institutions could consider options in two directions. Add functionality to the campus, perhaps more student resources or even dense retail on surface parking lots that would appeal to the adjacent residential neighborhoods. Deliver some of its educational products off campus at satellite centers or over a network as distance education.

Medical campuses are more limited and can realistically only offer the tele-medicine option, most likely to satellite centers.

Employment centers, whether dominated by a single employer such as Northrop Grumman in Redondo Beach, or containing many employers such as in El Segundo, could improve transportation performance of their centers primarily by distributing their work force – moving the work to the workers was the catch phrase in the 1990s. This could be done through strategically located single employer dedicated work centers, shared work centers, or work at home options.

Network applications could play a role in several of these situations[iv] – distance education, telemedicine, and telecommuting have been well documented. One way to imagine shrinking the physical format of retail is through some combination of bricks and mortar with electronic presence. A new model for this small hybrid retail format was named the Epicenter and was proposed in Columbus, Ohio, 5 or 6 years ago. The Epicenter was an effort to give online and catalog retailers their own space in brick-and-mortar shopping malls,

Implementation: Who Does What?

Visions are notoriously difficult to implement. We are not naïve about the prospects for our vision of a Sustainable South Bay. South Bay cities will relate to the Vision in as many different ways as there are cities.

The transportation component has the best chance of gaining traction. It can be implemented independent of the land use component and does not depend on large scale public or private investments. It can reduce per capita gasoline consumption as well as reduce GHG emissions in a relatively short time frame. The potential to reduce transportation costs for individuals and business will make it a popular option, especially once gasoline prices increase again.

However, it is far from problem-free. Mixed-use streets introduce what could become a difficult political conflict over the allocation of street capacity. Working on a transition in fleet composition at both the low end of local use vehicles as well as the high end of extended range and commuter vehicles will require that some of the major arterials will be re-partitioned by allocating space to the smaller, slower vehicles. Transit will also be a stakeholder since truly rapid transit requires dedicated infrastructure (like the Orange Line in the San Fernando Valley) or dedicated lanes on mixed flow streets.

The land use component will lag and probably will be tried in only a few places, if at all, over the next 10 years. Part of the reality is that there will not be that many opportunities to realize the land use vision in the next few years. New building in the South Bay occurs slowly under the best of circumstances and recovery from the current recession is apparently several years off.

Testimony presented to the Regional Target Advisory Committee (RTAC) estimated that housing stock normally changes at about 6% per year. About 45% of the change is due to replacement and 55% to growth. Given that the South Bay has few places in which development can occur and that there is a widespread concern about the consequences of additional density, those figures are probably high for the South Bay

Yet, the status quo will almost always give-way in a crisis. Realistically it may take one or both of the environmental and gasoline crises before the land use component finds its way into demonstration or practice.

Whatever element of the Vision is ultimately implemented, funding should be found to monitor and evaluate the outcomes. There is little margin to absorb consistently poor transportation outcomes since the viability of the regional metropolis depends on our ability to move around relatively inexpensively. No concept or plan can fit everywhere or deliver on all of its promises. Practice should involve a core process of testing and verifying.

It is hard to imagine any significant strategy for changing the status quo that is not complex and does not require coordinated changes among many elements and different institutional actors. Attempting to employ land use as a TDM strategy as part of a national transition from fossil fuels to renewable energy is surely a lot more complicated than building pockets of mixed use density at transit stops.

So it is with our *Vision*. It will take much more than low carbon vehicles and zoning changes to actually achieve the results that have been envisioned

With the idea of complexity in mind, we have attempted to sketch some of the actions that appear to be required by a range of institutional actors to make a new transportation-land use strategy work so that the South Bay can actually become more walk-actual and dramatically reduce its carbon footprint. Implementation of the SSBS will require additional actors and many more policies. But this is a start.

We offer the following implementation steps contingent on the SBCCOG Board endorsing the Sustainable South Bay Strategy.

South Bay Cities Council of Government

The implementation discussion begins with the SBCCOG for several reasons:

Because of the size of the SCAG region, SB 375 created the opportunity for SCAG sub-regions to assume responsibility for producing their own Sustainable Communities Strategy (SCS). Whether or not the SBCCOG accepts delegation of responsibility for producing its SCS, the planning process will require evaluating the existing development pattern.

Second, the SBCCOG is a joint-powers authority charged with the responsibility of furthering the interests of its members. It is the only such organization representing South Bay cities. In this case, the SBCCOG has already established its Environmental Services Center which has introduced a number of innovative energy saving and consumer education programs in the greater South Bay. The Sustainable South Bay Strategy would be an extension of that existing initiative.

Finally, the SBCCOG is authorized to seek grants to implement programs on behalf of its members. We recognize that in order to take on most of the responsibilities identified, the SBCCOG will need additional funding. The new work scope cannot be afforded by its city-members. This is of course one of the problems associated with accepting delegation for producing the South Bay Cities' SCS. The State has not yet provided the funding to support the work.

Supporting implementation of the Sustainable South Bay Strategy (SSBS) may be similar to the situation a few years ago when energy audits and energy savings programs were developed and ultimately assigned to what became the South Bay Environmental Services Center. External funds from Southern California Edison (SCE) and others were found to support the ESC. Possibly the SSBS can be similarly endowed.

We recommend the SBCCOG Board consider a broad, five step process for implementing the Vision for a Sustainable South Bay Strategy:

1. **Educate:** Present the Sustainable South Bay Strategy to public officials, professional staff, neighborhood organizations and developers for their consideration and discussion. SCAG recently approved the SBCCOG's proposal to the Compass Blueprint Call for Projects to pursue this activity.

2. **Incorporate:** The South Bay SCS required by SB 375 will provide the opportunity for the SBCCOG to incorporate the Sustainable South Bay Strategy into that plan, or at least help broaden the discussion about policy choices.

3. **Facilitate:** The SBCCOG Board should adopt supporting policies as they are proposed (similar to NEV Friendly Initiative adopted in March, 2008).

4. **Coordinate:** The SBCCOG should coordinate certain actions by the cities participating in the LUV Initiative. Fleet composition, inter-city LUV routing, complete streets planning, and connected Class 2 lanes where needed are examples. Coordinating land use with the evolving mobility vision will become an issue down the road.

5. **Evaluate:** Monitor and evaluate the outcomes of the transportation and land use components of the vision as various jurisdictions implement them.

Within that general framework of action, the SBCCOG should focus on the following three areas:

- Apply the Sustainable South Bay Strategy Vision to the South Bay's Sustainable Communities Strategy.

Whether or not it accepts delegation for its SCS, the SBCCOG will be required to work with SCAG evaluating the growth projection for the sub-region and its allocation of GHG emissions reduction. There are three land use patterns to be considered – the existing auto oriented pattern, SCAG's 2% transit oriented, and the LUV oriented pattern of the Sustainable South Bay Strategy. As mentioned, the SBCCOG recently received a Compass grant to facilitate the educated dialogue over these issues among its cities.

- Focus on the mobility component.

There are at least two reasons for making the mobility component a priority:

- LUVs hold the promise of reducing GHG emissions (and help meet the sub-regional target) faster than any other initiative, and can be implemented without significant government investment.
- A surge in LUV deployment will provide an early test of the prospects for replacing the second and third vehicles per household and of evaluating the benefits of their use. Rapid, wide scale adoption would have implications for reducing parking requirements for both residential and commercial development. There may be no more significant linkage between transportation and land use than in the area of parking standards.

The steps of course begin with the LUV Demonstration Project between July, 2009 and June, 2011, funded by AQMD. This project will involve a fleet of six vehicles being rotated between drivers in different applications (pizza delivery, journey to work, errands by senior citizens, etc.). The costs and benefits in each application will be monitored and evaluated in order to better understand the potential for LUVs in suburban applications.

Expand the LUV demonstration into an initiative with many more vehicles. The working title for this has been the "1,000 vehicle project." Funds for purchase vouchers and evaluation research were initially sought from the California Energy Commission's grant program pursuant to AB 118; and from the U.S. Department of Energy's Clean Cities Program. The guidelines adopted in both programs have failed to match the SBCCOG's needs. The search for funds should continue.

The next highest priority should be implementing complete streets policies in one or two cities willing to take the lead. AB 1356, the California Complete Streets Act of 2008 requires that cities and counties adopt complete streets policies as part of changes to the circulation elements of their General Plans after 2011 so that roadways are planned, designed, operated and maintained to provide safe mobility for <u>all</u> users. Early adoption in a couple of test cities will help all other South Bay cities once the deadline arrives.

As Class 2 lanes are developed in various places over time, the SBCCOG should ensure that they connect in order to provide a continuous network for LUVs to travel throughout the South Bay.

The SBCCOG should sustain its efforts to attract a car sharing operation to the sub-region. This may require some level of economic recovery before a discussion can begin.

- Develop and maintain a long range sub-regional land use and transportation plan.

This task is important, complicated, and probably expensive. The challenge of coordinating land use planning with transportation planning will be more complex in the future than it has been in the past. Continuing to implement the auto friendly patterns embedded in General Plans and zoning ordinances essentially maintains the status quo. Change, whether to transit oriented or LUV oriented development, will require more effort.

Furthermore, if the State of California is going to designate sub-regions in Southern California as significant planning units, then the SBCCOG should develop into one. It looks like the Regional Housing Needs Allocation (RHNA), the Regional Transportation Plan (RTP), and the SCSs are going to be around for a while.

The spatial distribution of functionality is one of the key factors to producing good transportation performance in the South Bay. Yet no city currently monitors that layer of the built environment, and even if any did, the pattern is not as significant at city-scale as it is at the scale of the sub-region. Municipal boundaries mean little to travelers.

To do any of this, the SBCCOG will need to develop additional capabilities. Top priority should be acquiring sub-regional GIS capabilities. GIS is a powerful tool for day to day analysis of spatial phenomenon – and was deployed extensively by the consultants in the SBTPS. Grant proposals are always strengthened by GIS analyses.

Part of the long range planning work of the SBCCOG should be to define exactly what should be in this plan. As an aid to that process, here are a few suggestions.

- Work with member cities to identify candidates for demonstrating commercial migration – for example, mile long arterials with old and/or low-valued commercial structures and with major intersections in some auto oriented use such as gas station, muffler shop, drive-through fast food, parking lot, etc.

- Monitor and evaluate the transportation performance of significant changes to the built environment. Before development of significant scale actually occurs – regardless of whether it is auto, transit or LUV oriented -- apply the SBTPS to the neighborhoods. Re-apply the SBTPS again one to three years following initial occupancy so that the impact of development projects on neighborhood transportation performance can be identified.

- Work with Metro and member cities to designate South Bay Mobility Centers from among the existing candidates. Identify the intersections with the potential to become proto-centers with the right commercial development.

- Work with the various single function centers to develop a plan for improving their transportation performance.

- Work with cities to establish the "LUV oriented communities overlay." Track the functional distribution for each village and provide cities with information about the jobs-housing-service match. Advise cities as to the functional gaps in the suburban villages in which they are found.

Municipal Governments

Member cities of the SBCCOG are of course independent corporations with a varied set of land use and transportation policies. The recommendations are offered for consideration by the disparate city councils and management teams. If the Vision is compelling, here's what individual cities might do:

Transportation

Examine the current use of major and minor arterials: How is the roadway divided among users (vehicle lanes, left turn pockets, bicycle lanes, street parking spaces)? Where is there unused right of way? How many transit stops are there, what is the frequency of the buses, and what is the level of utilization of each stop?

Assess current conditions on the arterials in terms of the demands raised by complete streets policies. While this will not be required until 2011, early adoption will facilitate LUV deployment.

Work with the SBCCOG to identify arterials where Class II combination lanes will be necessary. Develop a plan for creating those lanes, including preparing to apply for implementation funds from Metro's Call for Projects.

Examine the ordinances and franchise agreements that govern taxis and other common carriers. Identify changes that would open up the local market to more competition from more varied types of carriers and vehicles.

Land Use

Examine the zoning and current land uses along the major and minor arterials, giving special attention to the major-major intersections. Look at the age of structures and the ratio between improvement and land in order to identify candidates for replacement that could play a role in the transition to a LUV-oriented development pattern.

Corridors with aging strip commercial anchored by auto oriented land uses at the major-major intersections should be identified as possible candidates for redevelopment as part of the Sustainable South Bay Strategy. The intersections with large lots are also candidates for creating an internal street pattern that is angled to the arterial.

Economic Development

Municipal economic development professionals are generally concerned with recruiting businesses to fill vacant commercial or industrial spaces; helping businesses navigate the government permit process when facility expansion, renovation or constructions are necessary, and recruiting employers.

Armed with information on the existing spatial distribution of functionality and the importance of commercial clusters, local development professionals should start filling vacancies so that they will complete the cluster and help encourage more walking. Ideal businesses would be able to capture a high percentage of total sales from a 3 mile market area or be able to find employees within a 3 mile range

This could involve tracking the business composition of each significant commercial cluster at the 2, 3 or 4 digit NAIC code level. One of the transportation issues entails creating a strong enough core that will attract local visitors at a high rate to the outer limit of walking.

As LUV penetration increases, a sub-regional effort should be mounted to attract businesses in the various developing market niches -- manufacturers, assemblers, distributors, suppliers, and retailers. In other words, as the internal market for LUV technology grows, the businesses developing in the value chain may well want to locate near a prime market, which is also adjacent to LAX and POLA. For example, e-ride, a retailer of neighborhood electric vehicles is currently located in Gardena. South Bay cities should be alert to the opportunities.

A special effort may be required by cities testing or adopting the Sustainable South Bay Strategy to work with land developers so that they understand the objectives of commercial migration off the arterial edges into compact commercial centers in the context of specific examples, such as those corridors identified by cities as potential targets for conversion. Developers may need to be recruited since the product desired is not now on many developers' radar.

Developers

Developers need to be asked to design and build the next generation of "mini-malls" – 3 or more stories of very small but combinable spaces around a central courtyard of parking for the relatively small LUVs.

Hypothetical development scenarios were proposed and analyzed by ERA as of the market conditions of mid-2008. The internal rate of returns (IRRs) ranged from 9.9% for a two-story retail project above podium parking to 18.8% for a condominium development on a corridor at a density of 40 DUs per acre. ERA concluded that the shortage of housing supply in the Los Angeles basin has led to residential being the highest valued land in almost any circumstance. One result was that asking prices for land were higher than their allowable uses would support due to the expectation of converting the use to residential.

As mentioned above, developers' interest in residential over commercial projects conflicts with transportation goals and the fiscal impact that cities seek. While all of this analysis will need to be re-evaluated as the recession ends, developers may want to look over ERA's hypothetical scenarios.

Retailers

Retailers need to develop small format capabilities. Big box brands, from Best Buy to Target need to fit some minimal scale of operations into small box stores. Picture a Macy's as the sole occupant in a corner mini-mall. It will be difficult to implement functionally compact centers without compact retailers.

This idea has something of an historical precedent. The Janss Investment Company when developing Westwood Village in the early 1920s, attracted some of the significant downtown businesses which were beginning to open branch stores. The Westwood stores were required to be smaller than other branches so that no one store would dominate and there would be a greater variety in the Village. As a result, both Westwood Bullock's and Desmond's were much smaller than their counterparts in the Miracle Mile. (See City Center to Regional Mall: Architecture, the Automobile, and Retailing in Los Angeles, 1920-1950, Richard Longstreth, MIT Press, 1997)

Metro

Metro is a key player in these discussions about future development patterns and recently reached out to the SBCCOG and other sub-regional COGs to forge effective working relationships. The SCS planning process provides a good opportunity for Metro to work with and jointly plan the transit services envisioned for the future.

For example, the Sustainable South Bay Strategy may require the following services:

- Rapid, long haul market that provides circulation between sub-regions
- Intra South Bay circulation
- DASH for LUV Communities, possibly on-demand, and possibly provided by municipal bus operators or other contractors.

Metro and the SBCCOG could work together to identity the most productive investments to address the various types of service needs within the long range budget. What if the development pattern began to change toward neighborhood commercial concentrations within three square mile market areas? How would Metro address that pattern, what level of funding would be required, and what mode share could reasonably be achieved given the plan for developing other personal modes?

SB 375 has raised the need for some way to measure and compare transit service between sub-regions. Terms like "transit rich" and "transit poor" are purely subjective without metrics.

We suggest that Metro develop a *transit service index* (TSI) that would probably include a number of metrics such as route miles per capita, average headways, average time to cover a standard distance, and so forth.

One application of a Transit Service Index (TSI) would be to help the SBCCOG assess the impact of a change in service – a line is added or cancelled, weekend service is added or eliminated, BRT is being added or removed, etc. Another would be to compare levels of service between sub-regions so that transit equity and transit needs can be rationally debated. Finally, a TSI could be used to define the threshold that service must reach before additional residential density should be built.

In the interests of equity, the South Bay and other sub-regions that have not received large scale transit investments in the recent past and have none planned in the near future, should be considered for priority in future Calls for Projects. In this way, South Bay cities can obtain funding for the street improvements and other initiatives consistent with the Sustainable South Bay Strategy.

Regional MPO–SCAG

SCAG is a partner with the sub-regions in developing the SCS. As the deadline approaches for declaring whether or not to accept delegation for the sub-regional SCS, the definition of this partnership will be further clarified. It may be that SCAG and the sub-regional COGs will simply work together collaboratively.

Terminology may be an issue as the process unfolds. The Vision of a Sustainable South Bay has much in common with SCAG's 2% Strategy and with the Smart Growth Strategy. For example, preserving stable neighborhoods, creating walk-able neighborhoods, providing mobility alternatives to the automobile, forging mutually supportive transportation investments and land use decisions, and many more examples are shared by the Sustainable South Bay Strategy and the 2% Strategy.

One point of departure is the reliance on public transit as the significant alternative to the automobile and the constrained set of transportation options expected to provide complementary alternatives. Transit and residential density depend on each other. Expressed by planner Julie Campoli in a recent Lincoln Land Institute newsletter, "Density makes transit possible, and transit makes density livable."

The problem is that despite relatively high existing levels of density for a suburban area, the South Bay is relatively transit poor, and has no major infrastructure investments on the horizon. It would not be prudent to continue adding density without the transit service that will make it "livable."

The transportation alternatives to the automobile beyond transit typically do not go beyond biking and walking. As the SCAG Website says, "The key [to transportation] is to ….provide choices, such as walking, riding a bike or using transit. ….The Compass Blueprint vision calls for designing streets that can accommodate pedestrians, bicycles and vehicles and that can include amenities such as medians and street trees. "(See http://www.compassblueprint.org/about/principles#mobility)

While local use vehicles would surely be considered part of those transportation options, basing the Transportation Vision on them seems quite a departure from the 2% Strategy. A second significant departure is that more than 2% of current land use will need to be changed in order to improve transportation performance in the long run. A third is the key role of commercial density rather than residential density.

So while there are similarities and compatibilities, there are also significant differences. Whether the Sustainable South Bay Strategy is a variation of the 2% Strategy or something different will probably be decided by SCAG. For now, we are describing it as a distinct strategy. We hope that will be compatible with the direction of SCAG and smart growth advocates.

While the SCS planning process is new, the specifics are not since it is part the Regional Transportation Plan and must be consistent with the RHNA. What is new is that the SBCCOG has conducted the research which has been synthesized in this Sustainable South Bay Strategy. The Sustainable South Bay Strategy is a land use – transportation strategy that is quite different from smart growth.

From this perspective, the SBCCOG needs at least two types of support from SCAG:

- Resources that will help the SBCCOG present the Sustainable South Bay Strategy to the sub-regional stakeholders and to apply it to the SCS planning process. SCAG provided the funds for the SBTPS through its OWP and recently awarded a Compass grant to the SBCCOG to help stage workshops that would start the municipal education process. . SCAG has also been responsive to requests for data and expertise.

- Adjustment to the transportation models deployed to calculate VMT reductions from various changes to the auto oriented development pattern. It appears that these models have been designed to reward changes consistent with the 2% Strategy and fail to recognize other changes.

Public sector budgets have been reduced at every level throughout California. SCAG is no exception as it recently reduced its annual fees by 10% in recognition of the impact of the recession on county and municipal budgets. This is not a time when program expansion can be considered.

Nevertheless, some level of prosperity will hopefully return within a couple of years. The following are suggestions for the kind of projects SCAG could pursue should funding become available.

The South Bay Transportation Performance Study developed an online survey instrument and a method of analysis which were used to produce a data base. It would be productive to build on what is essentially knowledge infrastructure that can benefit the sub-regions elsewhere in the region as well as continue to serve South Bay Cities.

An initial investment should be developing the existing Web-based travel survey into a turn-key research package that could replicated at very low cost and made available through the SBCCOG to all South Bay Cities.

One application would be to support the discussion of development proposals among city planners, developers and neighborhood organizations. The research package could be requested by the neighborhood organization in order to assess its current transportation performance; Comparing that neighborhood's performance profile to the existing data base would help the stakeholders make informed decisions about the scale, design, and functionality of the project.

A second priority is to grow the South Bay data base by studying at least two more neighborhoods per year. More variety in the data base allows stronger conclusions. Ideally the 4 areas surveyed in 2005 could be revisited in 2010, to identify the changes in characteristics and performance over the five year period. It would be particularly useful if some of the neighborhood re-surveyed had participated in the Local use Vehicle (LUV) Initiative, funded by the AQMD, and starting as of July 1, 2009.

If the turnkey package is developed, then it would also be available to neighborhoods throughout the region. Over a few years, the data on transportation performance would be substantial.

Other Government Agencies

Successful implementation of the Vision of a Sustainable South Bay will depend on the policies and programs of a number of state and federal agencies. At this point we cannot do more than identify some of the barriers encountered in the initial attempts at implementation. They stand as testimony in support of the proposition that implementing innovation is challenging.

Federal

National Highway Transportation Safety Administration (NHTSA), Department of Transportation restricts the speed of neighborhood electric vehicles (NEV) to 25 MPH even though they are capable of 35 MPH. Many professionals familiar with the technology believe that they are safe at 35 MPH and will not find consumer acceptance at the slower speed outside of closed campus situations. Given the global concerns for GHG emissions and climate change, NHTSA could authorize a pilot test of the faster speed in participating South Bay cities. Ironically, three-wheeled versions of NEVs such as the ZAP can be legally driven at 35 MPH because they are technically a motorcycle. Use four-wheels and the maximum speed drops to 25 MPH.

The SBCCOG wants to expand the existing 6-vehicle LUV Demonstration (funded by AQMD primarily as a research project) to vehicle deployment that will gain greater visibility and have more significant impact. 1,000 vehicles is the working target. The American Recovery and Reinvestment Act (ARRA) contains many funding programs, The Clean Cities Program offered by Department of Energy included vouchers to buy down the cost of an NEV by $1,500. Unfortunately, to qualify a consumer needed to scrap an automobile. This means that the program was aimed at converting fleets from gas to electric – a worthy goal but not geared to wide spread suburban deployment. This is not to say that the federal government is not offering other incentives to NEV purchase, only that the Clean Cities program was too narrow to help.

State

Caltrans owns the State highways throughout California including In the South Bay, PCH (Route 1) and Hawthorne Blvd. (Route 134). Caltrans' willingness to work with the SBCCOG to implement complete streets policies on PCH and Hawthorne Blvd. will be essential.

The California Energy Commission (CEC) looked for a while like it would provide an NEV voucher program using funds allocated by AB 118. The plan was to obtain $4,000 per vehicle vouchers for residents of the South Bay plus additional funds to pay for complete streets planning and implementation in participating cities. This would have provided both a market stimulus and infrastructure improvements thereby establishing the conditions for a true test of the feasibility of local use vehicles. The CEC's AB 118 Investment Plan deferred funding of NEVs to the California Air Resources Board which is expected to offer a statewide voucher program, of $1,500 per vehicle and nothing for complete streets.

The following has been extracted from the SBCCOG's comments to the CARB regarding the AB 32 Scoping Plan:

"Transportation planning has long followed a "forecast and allocate" paradigm. The classic tools of the profession, including the four-step model, forecast travel patterns and then allocate projected future travel to network paths. California shows signs of adopting a similar "forecast and allocate" paradigm to control greenhouse gas emissions (California Air Resources Board, 2008; Stivers, 2008). This approach is inherently top-down, model-based, and better illuminates relationships that are general rather than context specific. Providing alternative modes of mobility in auto-oriented suburbs will require context sensitive solutions and some experimentation. In short, a shift from a top-down (forecast and allocate) to a bottom-up (test and verify) approach will be necessary."

It is also important to take on the fiscalization of land use. Big box retail and island-like low density malls, favored by many municipalities as a revenue sources, are antithetical to good transportation performance. It is ironic that the same state government that wants to discourage GHG emissions through land use policy encourages them through its fiscal policies. Or that it is cutting funding for public transit at the same time it is encouraging public transit as a transportation strategy to match the land use density it is encouraging.

Employers

The journey to work is typically the longest household trip. Because work trips are frequent and usually driven, the journey to work is certainly the most significant generator of VMT in the South Bay. Employers can contribute to the SSBS by adopting parking policies that favor LUVs. They can also seek job candidates who live within a few miles – i.e., a local preference for workers policy. (Cities could also adopt a "local preference housing" policy in housing developments in which the municipality has some partnership role.)

At the same time, employers need to move the work to the worker to the maximum extent possible. This would mean deploying either satellite work centers, participating in shared work centers, or authorizing work at home practices.

Car-Sharing Operators

A car sharing operation in the South Bay, if one can be recruited, should significantly increase the pace of replacement of 2nd and 3rd cars with NEVs. Traditional car rental companies as well as the new car sharing services should look into expanding operations into the South Bay.

Citizens/Consumers

In the end, people must be willing to embrace significant change in their travel patterns, mode choices, and perhaps even the fundamental concepts of mobility. Inexpensive fuel and the sense of freedom delivered by relatively affordable mobility are embedded in the culture. Personal vehicles have been sold for generations to convey a sense of status and to reflect the personality of the driver.

As suggested earlier, the personal vehicle industry is undergoing massive change. The key question is how rapidly consumers will purchase unconventional vehicles with capabilities limited in terms of range and speed, at premium prices (at least until economies of scale can be captured through growing markets)? How long will it take for travelers to select the mode of travel based on the characteristics of the trip?

Although purely speculative, it seems likely that citizens/consumers will have an easier time embracing the land use vision of commercial density, so long as it is at a manageable scale and one need not live directly inside it.

Ironically, the transportation vision, so immediately available and with short term promise, may lag behind the land use vision which requires more fundamental institutional changes and in any case takes decades to have an effect. Even though the mode choices are proliferating each month – and their practicality can be hastened through some key institutional changes – consumer acceptance is the key variable.

Coda

When this research plan was originally designed in 2005, the goal was to illuminate the extent to which yesterday's smart growth had succeeded in the South Bay. The idea was to anticipate and, if possible, inform any smart growth initiatives that would be proposed in South Bay cities.

By 2008, other imperatives for conducting the research had emerged. The most significant of which today is the political consensus that developed around the need to reduce green house gas (GHG) emissions that are linked to climate change.

The result of that political consensus in California was first AB 32 that mandated reduction of GHG emissions being generated by a wide range of sources. Second, SB 375 that mandated that land development in each region be planned so as to reduce GHG emissions.

A second major event occurred in 2008 that added relevance to the South Bay research – gasoline prices exploded to above $4.50 per gallon. The immediate impact included a dramatic reduction in gasoline consumption as people drove less, purchased fuel efficient vehicles (including electric hybrids), and shifted some trips to public transit. All are examples of previously unimaginable behavioral change.

The price spike, even though short lived, sent a troubling message to every region, sub-region and city across the nation. The era of cheap gasoline and stable prices is nearing its end. The implication is that the cost of mobility will increase in the future, likely in association with recovery from the current recession.

It's not known when gasoline prices will rise again, how fast the increase will occur or how high the market will go. However, as this is being written, the Los Angeles Times reported that the rate of increase in gasoline prices over the first 6 months of 2009 has been the most rapid in history, although the current pump price remains well below its 2008 peak. (Gas Prices May Imperil a Recovery, Ronald D. White, Business Section, Los Angeles Times, June 15, 2009).

As South Bay cities re-evaluate their existing development pattern in relation to the environmental goals mandated by AB 32 and SB 375, they should also consider that the era of more expensive fuel and more turbulent oil markets has arrived. An unstable travel environment, increased friction of distance and a decline in mobility are among the possible consequences.

This will be particularly significant here because within Los Angeles County the South Bay has the largest share of shopping centers in configurations over 100,000 square feet with market sheds that extend to as much as 25 minutes driving time. This means that retail spending and therefore municipal tax revenues are currently supported by auto travel instead of walking or an alternative mode of transportation.

According to Economic Research Associates (ERA -- one of the consultants contributing to the SBTPS) if mobility declines, adaptive changes in retail format will be required. Big box stores and other large format retail centers will need to adapt by capturing a higher share of consumers in their primary market areas. Ultimately, new retail formats that are smaller in size but with a wider offering of merchandise will need to evolve. But retail is the tip of the iceberg. Similar changes may be required in the spatial markets for labor, education, health care, and so forth.

Within an unusually short time frame, South Bay cities may need to consider changing their auto oriented development pattern and level of auto dependence as much for economic necessity as environmental imperative.

Although significant change in policy and practice is often difficult, sticking with the status quo will likely become a competitive disadvantage for cities.

Endnotes

[i] The Appendices describe the research and provide a robust set of detailed, nuanced findings. This section is highly condensed.

[ii] Regression analysis has the power to sort through many variables in order to determine which has a statistically significant relationship to an outcome, as well as the magnitude of that relationship. The results are accepted as scientifically valid within reasonable margins of error. In general, statistical validity increases with the number of observations. The SBTPS included 2,399 surveys from the 8 study areas. This is considered to be a reasonable number and is a large sample size in the context of similar neighborhood-focused travel studies.

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Table 12: Mean Value for Land Use Characteristics in Study Areas

Study Area	Housing units per acre	Total businesses per acre	Neigh. Businesses per acre	Average block size (in acres)	% of 4-way inter-sections
Centers					
Riviera Village, inner ring	12.25	6.44	3.50	5.10	33.30%
Riviera Village, outer ring	8.81	0.39	0.20	8.00	37.10%
Torrance Old Town, inner ring	13.16	6.26	2.50	5.40	56.00%
Torrance Old Town, outer ring	4.25	0.96	0.34	4.60	52.20%
El Segundo, inner ring	7.51	2.62	1.05	4.50	66.70%
El Segundo, outer ring	6.81	1.98	0.42	4.50	57.10%
Inglewood, inner ring	4.95	5.68	3.15	4.60	61.50%
Inglewood, outer ring	5.56	0.53	0.22	6.80	46.80%
Corridors					
Pacific Coast Highway	5.32	0.62	0.31	7.00	26.70%
Artesia Blvd., inner ring	10.27	1.05	0.38	5.00	84.90%
Artesia Blvd., outer ring	7.49	0.21	0.07	5.00	55.60%
Gardena Blvd., inner ring	6.36	1.03	0.47	5.50	37.80%
Gardena Blvd., outer ring	9.60	0.66	0.21	5.90	29.10%
Hawthorne Blvd., inner ring	8.94	1.39	0.66	9.70	53.80%
Hawthorne Blvd., outer ring	10.05	0.87	0.27	8.90	53.10%

[iv] The point is that broadband network applications can play a significant role in improving transportation performance. Those strategies were not included in the SBTPS and so are outside of the scope of this report. Senior author Walter Siembab will distribute a subsequent report covering those network strategies later in 2009 under the title “Making Suburbs Smart.”