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Publication Date
2010-07-01

University of California Transportation Center
UCTC-FR-2010-13

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University of California Transportation Center Working Paper

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1. Introduction

Employment decentralization has given rise to polycentric urban forms worldwide. Fueling the suburbanization of jobs has been a host of powerful forces, including the location-liberating effects of information technologies, central-city congestion, and a preference among many for low density living and working environments. Some U.S. suburban employment centers (SECs) have undergone a noticeable transformation in recent years, reflected by infill and densification, the addition of housing and retail uses, and the breaking up of superblocks through the construction of internal pathways and trail systems. More and more, once outlying employment centers are taking some of the features of traditional urban centers. Transformations have not occurred "overnight", however -- 37 years ago, Masotti and Haden (1973) wrote about the impending "citification of suburbs" in America.

Joel Garreau popularized the image of city-like clustering of development in America's suburbs in his celebrated book, *Edge Cities: Life on the New Frontier* (Doubleday Press, 1991). Robert Lang and others have challenged this notion of urbanizing sub-centers in recent times. Lang (2003) contends more and more peripheral development is becoming "edgeless", marked by a constellation of sprawling corporate enclaves, business parks, standalone office buildings, and power centers. By 2002, all U.S. metropolitan areas (with the exception of New York and Chicago) had the majority of office space outside of traditional downtowns. While 38 percent of all office space in U.S. metro areas was located in primary downtowns in 1999, nearly the same amount (37 percent) was found in highly dispersed clusters with less than 5 million square feet of space. From 1998 to 2006, 95 of 98 U.S. metropolitan areas witnessed a decrease in the share of jobs located within three miles of downtown (Kneebone, 2009). Today, more than 60 percent of U.S. metropolitan office space is outside of central cities (Dunham-Jones and Williamson, 2009A). In light of these trends, Giuliano et al. (2007) recent posed the question of: "whether the benefits of proximity have declined so much that employment clusters are becoming a less significant aspect of the urban landscape"?

A growing listing of U.S. suburban employments centers that first broke ground two to three decades ago – i.e., the first-generation of edge cities -- are today being redesigned, in response to market forces and a growing dissatisfaction with suburban work environments. A 2004 survey of nonresidential developers by the Urban Land Institute (ULI) and Price WaterhouseCoopers (2004) asked in which types of areas they expect to invest over the next several years. Four of the top five factors were: proximity to transit stations, in pedestrian-oriented suburban business districts, in inner ring suburbs, and in central business districts. At the bottom were such locations as suburban strip commercial centers, in suburban business parks, and exurbia. More recent editions of the ULI/Price WaterhouseCoopers report have confirmed these trends. The increased demand for homes in walkable communities close to good-paying jobs has been documented in a number of studies (Leinberger, 2007; Nelson, 2008; Thomas, 2009). Real-estate prices reveal these preferences: mixed-use office clusters enjoy a price premium relative to single-use, campus-style office development (Sohn and Moudon,

2008).

This working paper probes the phenomenon of employment center transformations. Because the process is still unfolding, very much still in a developmental stage, combined with data limitations, our original research focus had to be revised. Compared to the study of the effects of built environment on the travel of residents, there has been relatively little empirical research on how the design of employment centers impacts how workers travel. This is despite the fact that past research has suggested that design attributes of the destination-end of a trip has as much impact on travel choices as the residential-end of home-based trips (Cervero, 2002). Part of the reason for this slant is the fact that most regional travel surveys that inform these studies compile data on households and their members' travel patterns. Even the census journey-to-work data focus on residential travel and although it is possible to identify the non-home-end of work trips, the fairly small sample of travel choices limits the number of data observations assigned to any particular work destination. Accordingly, researchers interested in studying how design influences employee travel are dependent on the few specialized surveys focused on employment centers. Such surveys were more plentiful in the 1980s on the wake of trip-reduction ordinances that mandated employee surveys (Ferguson, 2001; Cervero and Geisenbeck, 1988) however in more recent times such specialized surveys have all but disappeared. The city of Pleasanton, California, for instance, required that employee surveys be conducted starting in the mid-1980s as part of its trip reduction ordinance but opted to eliminate this requirement by the late 1990s. Even regional ridesharing agencies have gotten out of the employee-survey business. RIDES for Bay Area Commuters, for instance, organized and conducted surveys of large employers from 1992 to 2002 (though admittedly samples were of insufficient size to draw inferences for any one center); after the organization was disbanded and these functions were taken over by 511.org in the mid-2000s, annual employee surveys were discontinued.

While the original aim of this research was to link changing employment center designs to changes in travel behavior, the absence of sufficient data to support such an investigation required a shift in focus. Accordingly, the work presented in this paper is more inductive in nature, relying on trend data (1990 to 2000) and several case studies to generate insights into the process and scope of employment center transformations. Like all qualitative, inductive research, our aim is not so much to test hypotheses as it is to probe and investigate changes in the make-up and design of suburban job centers with an eye toward building a stronger conceptual framework for studying this phenomenon – one that hopefully will aid in one-day formulating clear hypotheses and empirically testing the influences of shifting designs on workers' travel behaviors. In so doing, we hope to help lay a foundation that will hypo-deductive, empirical studies to be carried out in coming years.

This paper is organized as follows. The next section uses census data to investigate changes in Bay Area employment centers during the 1990 to 2000 period. Simple correlations are used to probe how transformations might have influenced various

metrics of journey-to-work available from the census. This is followed by two Bay Area case studies of SEC transformations in the eastern reaches of the San Francisco Bay Area: Bishop Ranch Business Park in San Ramon and Hacienda Business Park in Pleasanton. The paper ends with reflective discussions on opportunities for bringing about future SEC to mixed-use activity center conversions.

2. Employment Center Changes in the San Francisco Bay Area

The emergence of employment centers and the trend toward polycentric growth patterns more generally has been the subject of considerable research over the past several decades (Cervero 1989; Giuliano and Small, 1991; McMillen, 2001). Among other things, studies have examined the impacts of job decentralization on commuting patterns and travel choices (Giuliano and Small, 1993; Cervero and Wu, 1998; Prud'homme and Lee, 1999).

The challenge of examining impacts of changing employment center compositions on commuting is to obtain suitable data for place of work. The U.S. census is geared mainly toward studying behavioral characteristics of households, not workplaces. It is possible to link households to place-of-work through Parts II and III of the Census Transportation Planning Package (CTPP) however since these data are from a sample of the full census, it is often difficult to obtain sufficient numbers of records for any one census tract, much less employment centers, to draw statistical inferences on commuting.

Our focus, thus, was more on examining changes in the density and employment composition of employments centers over a one-decade period, using the Bay Area as a case context, than modeling impacts on commuting. This section presents empirical results on changes in employment center densities and occupational mixes over the 1990-2000 period and probes the relationship of transportation infrastructure to these changes. This analysis is a prelude to the case studies of two Bay Area employment centers which follow this section. While the 2010 census will be available in a year or two, allowing for a more up-to-date trend analysis (2000-2010), the fact that much of the suburban employment development occurred during the 1980s (Cervero, 1989) makes analyses of trends during the 1990-2000 period instructive nonetheless in light of our interest in tracking employment center transformations.

2.1 Identifying Employment Centers in the Bay Area

For defining employment centers, we built upon the work of Cervero and Wu (1997, p. 870) who adopted the following criteria: employment centers (ECs) comprise a contiguous set of census tracts with employment densities that exceed the regional average of 7 workers per gross acre and the combined tracts of a center must sum to at least 10,000 workers. In our updated analysis, a contiguous set of census tracts was not limited to tracts that border each other. If a tract was located in the same city as the core

district of the EC, even if the tract was not adjacent to the core district, it was considered part of an EC as long as its density exceeded 7 workers per acre.

Tract-level employment data for 1990 and 2000 were obtained from Part II of CTPP supplemented by relevant data from the Bay Area's Metropolitan Transportation Commission (MTC) and Bureau of Transportation Statistics (BTS). Applying the criteria, 28 ECs were defined, with steps were taken to reconcile changes in boundaries between the 1990 and 2000 censuses.

Table 1 shows the acreage, employment counts, and densities in 1990 and 2000 for the designated 28 EC areas, sorted by employment growth rate. Over half of all Bay Area jobs were located in the designated ECs in both 1990 and 2000. However, some ECs grew while the others declined. For example, employment in San Carlos almost doubled whereas in Vallejo it fell by nearly two-thirds during the 1990s. This contrasts with consistent growth in employment at all Bay Area ECs during the 1980s, as documented by Cervero and Wu (1998).

What might explain this polarizing trend in employment change during the 1990s? To probe this question, the 28 ECs listed in Table 1 were stratified into four categories based on their growth rates. San Francisco is the largest EC, accounting for about 15% of Bay Area jobs in 2000 and with a much higher density than other centers. Other ECs whose growth rates exceeded 10% were labeled "Growing Centers". This group was made up of 10 centers, ranging in growth rates from San Carlos (97.8%) to Emeryville (10.7%) and collectively comprising 17% of Bay Area jobs. ECs whose growth rates fell between -10% and 10% were considered "Stable Centers". This group consisted of 11 centers, with growth rates ranging from Oakland (6.8%) to Redwood City (-8.1%) and accounting for 16% of Bay Area jobs in 2000. Lastly, ECs whose job counts fell by 10% or more during the 1990s – 6 in all – ranged from South San Jose (Santa Teresa) (-13.9%) to Vallejo (-64.0%), making up just 4% of Bay Area jobs. Figure 1 shows that many of the *growing centers* were situated along the I-680 corridor in the East Bay and the US-101 corridor in the West and South Bay.

2.2 Occupational Composition of the Employment Centers

Was there a significant difference in the occupational compositions of Bay Area ECs during the 1990s, and if so, what kinds of occupations did growing centers attract? To probe this question, location quotients (LQ) were calculated as:

$$LQ_i = \frac{\text{EC's Employment in Occupation i} \,/\, \text{EC's Total Employment}}{\text{Bay Area's Employment in Occupation i} \,/\, \text{Bay Area's Total Employment}}$$

If a LQ in occupation i is greater than 1, the EC is said to be more specialized in that

Table 1. Acreage, Employment Counts, and Densities for 28 Bay Area Employment Centers: 1990 and 2000

Employment Center	Land Acre	1990		2000		Growth Rate
		Employment	Density	Employment	Density	
Group 1: San Francisco						
San Francisco	11,936.15	503,235	42.16	533,410	44.69	6.0%
Group 1 Total	11,936.15	503,235	42.16	533,410	44.69	6.0%
% of the Bay Area Total	0.3%	16.3%	-	15.6%	-	-
Group 2: Growing Centers (10 centers) Growth Rate >=10%						
San Carlos	1,658.21	15,748	9.50	31,155	18.79	97.8%
South San Jose (Tamien)	1,600.30	10,812	6.76	20,850	13.03	92.8%
Pleasanton	3,431.69	22,968	6.69	34,905	10.17	52.0%
San Ramon	1,780.51	15,590	8.76	20,955	11.77	34.4%
Sunnyvale	2,534.47	23,333	9.21	30,870	12.18	32.3%
Silicon Valley	18,848.87	239,422	12.70	300,455	15.94	25.5%
San Mateo	3,551.44	39,672	11.17	49,080	13.82	23.7%
Cupertino	2,992.81	26,783	8.95	32,625	10.90	21.8%
Concord	3,153.66	32,769	10.39	37,010	11.74	12.9%
Emeryville	2,266.27	32,994	14.56	36,525	16.12	10.7%
Group 2 Total	41,818.23	460,091	11.00	594,430	14.21	29.2%
% of the Bay Area Total	0.9%	14.9%	-	17.4%	-	-
Group 3: Stable Centers (11 centers) -10% < Growth Rate <10%						
Oakland	5,341.94	101,080	18.92	107,930	20.20	6.8%
Campbell	2,070.75	21,037	10.16	22,305	10.77	6.0%
San Francisco Airport	7,152.09	89,966	12.58	94,575	13.22	5.1%
Walnut Creek	1,751.08	35,752	20.42	36,425	20.80	1.9%
Downtown San Jose	8,739.13	103,894	11.89	103,115	11.80	-0.7%
Santa Rosa	1,767.44	24,469	13.84	24,145	13.66	-1.3%
Mountain View	3,122.97	31,919	10.22	31,180	9.98	-2.3%
San Rafael	2,389.30	20,658	8.65	19,995	8.37	-3.2%
San Leandro	2,711.36	22,720	8.38	21,710	8.01	-4.4%
Berkeley	1,779.14	48,067	27.02	44,295	24.90	-7.8%
Redwood City	1,593.03	26,361	16.55	24,220	15.20	-8.1%
Group 3 Total	38,418.23	525,923	13.69	529,895	13.79	0.8%
% of the Bay Area Total	0.9%	17.1%	-	15.5%	-	-
Group 4: Declining Centers (6 centers) Growth Rate =< -10%						
South San Jose (Santa Teresa)	1,716.80	18,804	10.95	16,190	9.43	-13.9%
Palo Alto	4,066.74	76,836	18.89	61,385	15.09	-20.1%
Fremont	821.84	10,849	13.20	7,895	9.61	-27.2%
Alameda	2,241.64	23,123	10.32	15,100	6.74	-34.7%
Hayward	2,024.83	27,060	13.36	16,665	8.23	-38.4%
Vallejo	1,123.38	14,221	12.66	5,115	4.55	-64.0%
Group 4 Total	11,995.23	170,893	14.25	122,350	10.20	-28.4%
% of the Bay Area Total	0.3%	5.5%	-	3.6%	-	-
Bay Area Total	4,430,446.20	3,082,906	0.70	3,416,065	0.77	10.8%
Employment Centers Total	104,167.84	1,660,142	15.94	1,780,085	17.09	7.2%
% of the Bay Area Total	2.4%	53.8%	-	52.1%	-	-1.7
Outside of Employment Centers	4,326,278.36	1,422,764	0.33	1,635,980	0.38	15.0%
% of the Bay Area Total	97.6%	46.2%	-	47.9%	-	1.7

Sources: Calculated from the 2000 CTTP (MTC) and the 1990 CTPP (BTS)

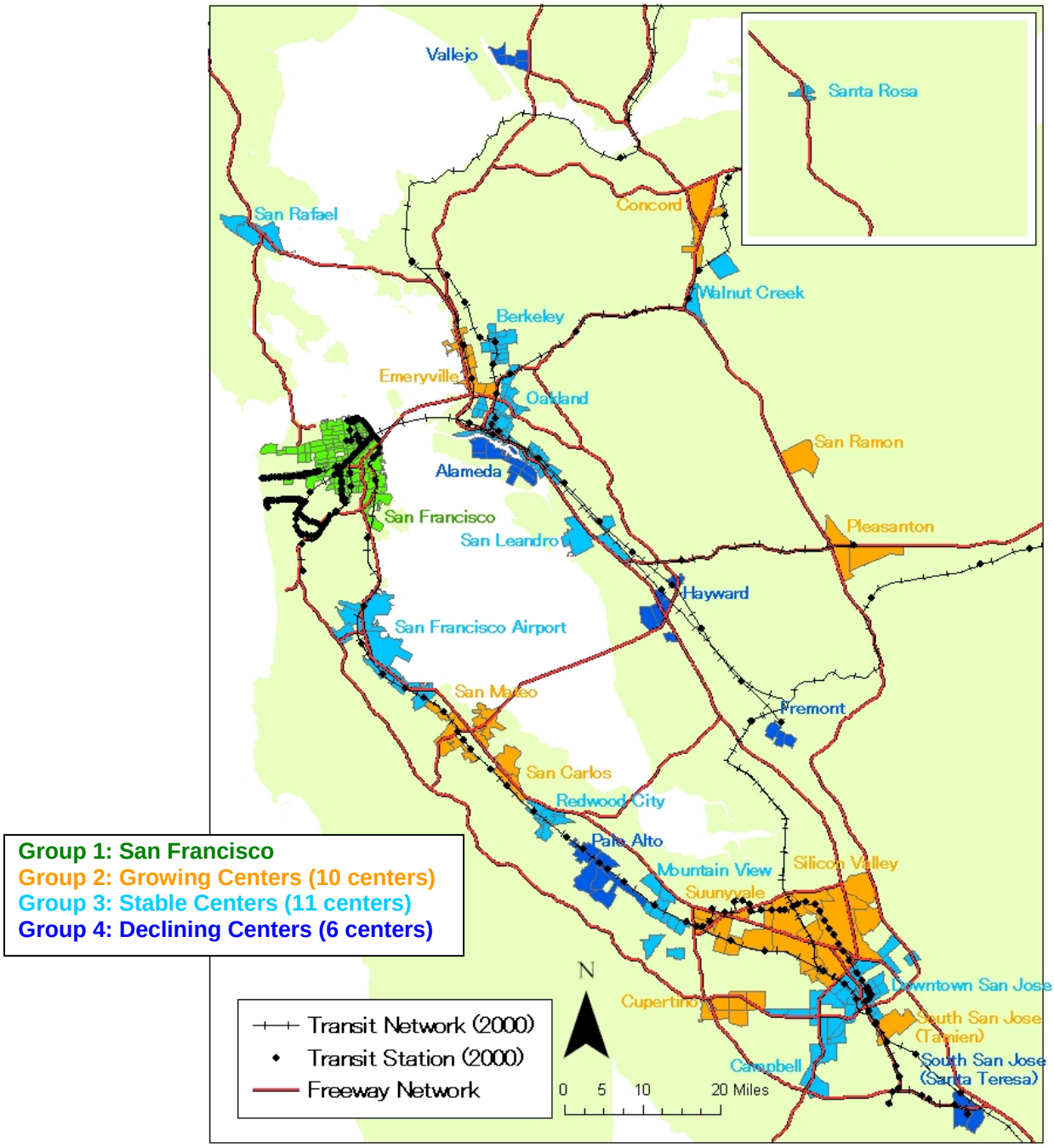

Figure 1. 28 Bay Area Employment Centers by Growth Type.

occupation compared to the Bay Area as a whole. Conversely, when a LQ is less than 1, the EC is comparatively less specialized in that occupation.

Changes in occupational compositions among ECs were further studied using shift-share techniques. Shift-share analysis attempts to determine how much of recorded regional job growth is attributable to national trends vis-à-vis unique regional factors (EMSI 2007). It apportions job change into three components: the national growth effect, the industrial mix effect (proportional shift), and the regional competitiveness effect (differential shift) (EMSI, 2008; McLean and Voytek, 1992). In our study, employment changes were apportioned as follows:

% change in the EC's employment in occupation i	
= % change in the Bay Area's total employment	
+ % change in the Bay Area's employment in occupation i	Proportion
- % change in the Bay Area's total employment	
+ % change in the EC's employment in occupation i	Differential
- % change in the Bay Area's employment in occupation i	

The differential shift is of particular interest since it reveals the competitiveness of an EC in attracting a particular occupation. A positive differential shift indicates an EC was attractive to a particular occupation and its related industry.

Table 2 shows the average LQs in 1990, weighted by 2000 employment size, arranged according to group of centers. The table shows that *growing centers* had a higher concentration of management and business and financial operations activities than in *stable* and *declining centers*. In particular, the San Ramon EC (the focus of the Bishop Ranch case study later in this paper) had the highest concentration of these jobs (1.70 for management and 1.66 for business and financial operations). On the other hand, *growing centers* were less inclined toward service-industry occupations, such as healthcare support, food preparation and serving related, and personal care service occupations. With the exception of the Palo Alto EC, *declining centers* tended to have relatively few jobs in management and business and financial activities.

Table 3 presents LQs for 2000, again weighted by 2000 employment size. Compared to the 1990 LQs, differences between *growing* and *stable/declining centers* diminished. In 2000, *growing centers* had higher concentrations of management, and computer and mathematical occupations. The San Carlos EC has the highest concentration (3.51) of computer occupations, followed by the Cupertino EC (3.24), and the Sunnyvale EC (3.04). San Francisco had a relatively high clustering of legal-related jobs and other high-skilled/knowledge-based occupations. Fewer ECs in *declining centers* has concentrations of computer-related jobs in 2000 than 1990. Instead, they tended to draw jobs in the areas of community and social service, healthcare, food preparation, and personal care. The pattern is clear: in 2000, the Bay Area's *growing*

Table 2. Weighted Average Location Quotients in 1990 among the Four Types of Centers

	Weighted Average by 2000 Employment Size				Weighted ANOVA (Group 2-4)		Unweighted ANOVA (Group 2-4)	
Occupations	Group 1 San Francisco	Group 2 Growing Centers	Group 3 Stable Centers	Group 4 Declining Centers	F-Statistic	Probability	F-Statistic	Probability
Management	1.22	1.21	1.01	0.98	7.923	0.002	10.579	0.001
Farmers and Farm Managers	0.29	0.57	0.77	0.73	1.760	0.194	1.489	0.246
Business and Financial Operations	1.22	1.20	1.01	0.98	7.502	0.003	10.450	0.001
Computer and Mathematical	0.94	1.12	0.97	1.47	2.881	0.076	0.296	0.746
Architecture and Engineering	0.94	1.11	0.97	1.48	2.803	0.081	0.282	0.756
Life, Physical and Social Science	0.95	1.10	0.97	1.46	2.672	0.090	0.244	0.785
Community and Social Service	1.01	0.95	0.95	1.28	1.269	0.300	0.019	0.981
Legal	0.97	1.05	0.97	1.38	2.052	0.151	0.119	0.889
Education, Training, and Library	1.02	0.96	0.96	1.27	1.256	0.304	0.018	0.982
Arts, Design, Entertainment, Sports, and Media	1.00	0.98	0.96	1.31	1.400	0.267	0.018	0.982
Healthcare Practitioners and Technicians	0.96	1.06	0.96	1.40	2.171	0.137	0.143	0.867
Healthcare Support	1.04	0.74	1.00	0.93	11.340	0.000	7.284	0.003
Protective Service	1.00	0.80	1.19	0.81	3.867	0.036	1.490	0.246
Food Preparation and Serving Related	1.08	0.67	1.00	0.82	11.937	0.000	5.403	0.012
Building and Grounds Cleaning and Maintenance	0.99	0.62	0.94	0.78	12.224	0.000	5.154	0.014
Personal Care and Service	1.06	0.66	0.97	0.83	13.676	0.000	6.048	0.007
Sales and Related	0.99	0.93	1.00	0.81	0.626	0.544	0.255	0.777
Office and Administrative Support	1.15	1.01	1.10	0.95	1.578	0.228	0.418	0.663
Farming, Fishing and Forestry	0.33	0.59	0.77	0.74	1.630	0.218	1.428	0.259
Construction and Excavation	0.72	1.07	1.02	0.82	0.713	0.501	0.027	0.974
Installation, Maintenance and Repair	0.72	1.12	1.01	0.84	1.028	0.374	0.057	0.945
Production	0.78	1.27	0.93	0.90	2.163	0.138	0.123	0.885
Transportation and Material Moving	0.82	0.91	1.08	0.74	1.212	0.316	0.243	0.786
Armed Forces	0.71	0.13	0.22	2.00	1.528	0.238	2.592	0.096

Note: A colored cell means a statistically significance at the 0.05 level.
Sources: Calculated from the 2000 CTPP (MTC) and the 1990 CTPP (BTS)

centers specialized in high-skilled/knowledge-based occupations, while *declining centers* were home to mostly service-industry occupations.

Table 4 summarizes findings on differential shifts. During the 1990s, the Bay Area's *growing centers* attracted workers in the areas of computers and mathematics, architecture and engineering, management, and business and financial operations, occupations that Florida (2002) has referred to as the "creative class". Jobs in computers and mathematics not only increased the fastest for the region as a whole but also tended to locate in *growing centers.* Conversely, *declining centers,* including Palo Alto, were less competitive in attracting such occupations.

In addition to attracting high-skilled/knowledge-based occupations, *growing centers* also drew in ancillary service workers, a necessary complement to white-collar businesses. *Growing centers* attracted more workers than *declining centers* in retail sales, office and administrative support, production, and transportation and material moving occupations. Similar to the LQ findings, *declining centers* are seen to have been most appealing to those working in life sciences, social sciences, and health care. In closing, the Bay Area's *growing centers* proved to be attractive to high-skilled/knowledge-based workers that benefit from agglomerations while *declining centers* drew in larger shares of

Table 3. Weighted Average Location Quotients in 2000 among the Four Types of Centers

	Weighted Average by 2000 Employment Size				Weighted ANOVA (Group 2-4)		Unweighted ANOVA (Group 2-4)	
Occupations	Group 1 San Francisco	Group 2 Growing Centers	Group 3 Stable Centers	Group 4 Declining Centers	F-Statistic	Probability	F-Statistic	Probability
Management	1.15	1.33	0.97	0.89	12.703	0.000	8.290	0.002
Farmers and Farm Managers	0.03	0.14	0.16	0.20	0.084	0.920	0.323	0.727
Business and Financial Operations	1.44	1.13	1.08	0.92	0.862	0.436	1.691	0.205
Computer and Mathematical	0.98	2.06	0.87	0.97	13.365	0.000	6.924	0.004
Architecture and Engineering	0.56	2.16	0.80	0.97	7.172	0.004	1.379	0.271
Life, Physical and Social Science	0.91	0.92	1.28	2.58	2.097	0.146	0.075	0.928
Community and Social Service	1.01	0.49	1.25	1.05	7.957	0.002	4.549	0.021
Legal	2.37	0.48	1.42	1.37	7.942	0.002	4.842	0.017
Education, Training, and Library	0.53	0.31	0.85	1.52	5.876	0.009	3.720	0.039
Arts, Design, Entertainment, Sports, and Media	1.79	0.89	0.84	0.97	0.209	0.813	0.792	0.464
Healthcare Practitioners and Technicians	1.03	0.40	1.19	2.09	17.187	0.000	8.960	0.001
Healthcare Support	0.81	0.37	1.05	1.71	16.639	0.000	9.778	0.001
Protective Service	1.11	0.61	1.38	1.06	4.754	0.019	2.909	0.074
Food Preparation and Serving Related	1.25	0.57	0.98	1.12	11.462	0.000	5.222	0.013
Building and Grounds Cleaning and Maintenance	0.91	0.69	0.94	0.84	2.573	0.098	0.634	0.539
Personal Care and Service	0.83	0.38	0.92	0.73	13.456	0.000	9.294	0.001
Sales and Related	0.99	0.86	0.97	0.89	0.450	0.643	0.280	0.758
Office and Administrative Support	1.08	0.95	1.12	1.03	2.365	0.116	0.837	0.445
Farming, Fishing and Forestry	0.25	0.28	0.44	0.19	1.478	0.249	0.809	0.457
Construction and Excavation	0.80	0.80	0.91	0.55	0.835	0.447	0.633	0.539
Installation, Maintenance and Repair	0.61	1.00	1.11	0.74	0.620	0.547	0.031	0.969
Production	0.61	1.45	0.76	0.68	4.832	0.018	0.730	0.492
Transportation and Material Moving	0.79	0.78	1.18	0.48	2.005	0.157	1.056	0.363
Armed Forces	0.11	0.16	1.09	3.26	1.702	0.205	2.318	0.120

Note: A colored cell means a statistical significance at the 0.05 level.
Sources: Calculated from the 2000 CTPP (MTC) and the 1990 CTPP (BTS)

low-to-medium skilled, lower-salaried jobs where there is less of a need for the face-to-face interactions and ease of external transactions allowed by spatial clustering.

Table 4. A Comparison of the Weighted Average Differential Shifts from 1990 to 2000 among the Four Groups of Centers

Occupations	Proportional Shift	Weighted Average by 2000 Employment Size				Weighted ANOVA (Group 2-4)		Unweighted ANOVA (Group 2-4)	
		Group 1 San Francisco	Group 2 Growing Centers	Group 3 Stable Centers	Group 4 Declining Centers	F-Statistic	Probability	F-Statistic	Probability
Management	**27.8%**	**-14.2%**	**43.7%**	**-16.4%**	**-52.7%**	**11.292**	**0.000**	**11.440**	**0.000**
Farmers and Farm Managers	-81.8%	-26.4%	-21.5%	-23.0%	-22.4%	0.057	0.944	0.249	0.781
Business and Financial Operations	**20.4%**	**17.6%**	**14.5%**	**-3.9%**	**-47.6%**	**5.355**	**0.012**	**8.674**	**0.001**
Computer and Mathematical	**280.4%**	**-1.2%**	**500.4%**	**-70.6%**	**-210.2%**	**7.535**	**0.003**	**7.587**	**0.003**
Architecture and Engineering	**22.8%**	**-56.9%**	**156.3%**	**-29.0%**	**-74.1%**	**15.008**	**0.000**	**9.035**	**0.001**
Life, Physical and Social Science	**32.6%**	**-11.1%**	**2.5%**	**25.1%**	**11.7%**	**0.106**	**0.900**	**1.086**	**0.354**
Community and Social Service	-11.6%	-4.8%	-33.1%	15.1%	-41.3%	4.247	0.027	1.417	0.262
Legal	**43.2%**	**204.6%**	**-64.4%**	**58.4%**	**-45.9%**	**5.915**	**0.008**	**2.581**	**0.097**
Education, Training, and Library	-17.5%	-46.6%	-56.3%	-27.4%	-17.4%	4.755	0.019	1.291	0.294
Arts, Design, Entertainment, Sports, and Media	**29.4%**	**100.6%**	**18.6%**	**-22.2%**	**-70.9%**	**2.928**	**0.074**	**5.145**	**0.014**
Healthcare Practitioners and Technicians	-24.6%	1.7%	-45.0%	10.0%	3.5%	7.215	0.004	3.116	0.063
Healthcare Support	-13.7%	-24.7%	-43.4%	0.1%	22.1%	6.857	0.005	2.596	0.095
Protective Service	-4.3%	7.3%	-8.9%	0.7%	-26.7%	1.246	0.306	0.395	0.678
Food Preparation and Serving Related	-5.2%	11.4%	-4.1%	-10.2%	-11.8%	0.232	0.795	3.299	0.054
Building and Grounds Cleaning and Maintenance	**3.6%**	**-13.3%**	**47.1%**	**-11.1%**	**-30.5%**	**3.039**	**0.067**	**3.538**	**0.045**
Personal Care and Service	**40.0%**	**-38.0%**	**-52.8%**	**-22.0%**	**-62.8%**	**4.038**	**0.031**	**5.503**	**0.011**
Sales and Related	-13.9%	-4.4%	8.0%	-11.5%	-26.0%	10.737	0.001	20.998	0.000
Office and Administrative Support	-17.4%	-9.3%	11.5%	-6.9%	-27.4%	10.926	0.000	15.348	0.000
Farming, Fishing and Forestry	-19.2%	-26.6%	-36.3%	-43.2%	-77.9%	1.923	0.169	2.738	0.085
Construction and Excavation	-7.7%	6.3%	-11.4%	-18.9%	-55.4%	1.256	0.304	3.473	0.047
Installation, Maintenance and Repair	-4.3%	-19.7%	11.2%	-5.2%	-49.6%	2.438	0.110	7.934	0.002
Production	-19.1%	-23.2%	27.3%	-24.7%	-48.9%	19.652	0.000	12.545	0.000
Transportation and Material Moving	-8.1%	-7.1%	0.1%	-7.3%	-58.7%	3.430	0.050	6.007	0.008
Armed Forces	-103.4%	-6.3%	0.8%	26.2%	14.2%	7.473	0.003	2.413	0.111

Note 1: A colored cell means a statistically significance at the 0.05 level.
Note 2: An emboldened occupation is a positive one for proportional shift (industrial mix effect).
Sources: Calculated from the 2000 CTPP (MTC) and the 1990 CTPP (BTS)

Table 5. Net Growth of Employment from 1990 to 2000 for Inside and Outside of the Employment Centers

	1990		2000		Growth Rate	Net Growth	
	Employment	% of Total	Employment	% of Total		Employment	% of Total
Employment Centers	1,660,142	53.8%	1,780,085	52.1%	7.2%	119,943	36.0%
San Francisco	503,235	16.3%	533,410	15.6%	6.0%	30,175	9.1%
Growing Centers	460,091	14.9%	594,430	17.4%	29.2%	134,339	40.3%
Stable Centers	525,923	17.1%	529,895	15.5%	0.8%	3,972	1.2%
Declining Centers	170,893	5.5%	122,350	3.6%	-28.4%	-48,543	-14.6%
Outside of ECs	1,422,764	46.2%	1,635,980	47.9%	15.0%	213,216	64.0%
Within Transit Buffers	370,678	12.0%	363,305	10.6%	-2.0%	-7,373	-2.2%
Within Freeway Buffers	1,213,531	39.4%	1,385,620	40.6%	14.2%	172,089	51.7%
Outside of Transit and Freeway Buffers	189,184	6.1%	229,450	6.7%	21.3%	40,266	12.1%
Total	3,082,906	100.0%	3,416,065	100.0%	10.8%	333,159	100.0%

Sources: Calculated from the 2000 CTPP (MTC) and the 1990 CTPP (BTS)

2.3 Employment Growth Outside of the Employment Centers

Does Robert Lang's contention that more employment growth is becoming "edgeless", or less concentrated, hold for the San Francisco Bay Area, at least during the 1990s? As Table 1 showed, land outside of the 28 ECs made up 98% of the region's surface area and around half of all jobs. These non-EC areas accounted for a higher share of job growth during the 1990s (15.0%) than did the 28 ECs combined (7.8%).

Table 5 compares the net growth of employment among ECs and non-ECs from 1990 to 2000. Non-ECs captured 64.0% of job growth. The table shows that most of this growth outside of ECs was drawn to major transportation corridors: more than half of job growth took place within a 2-mile buffer of freeways serving these non-ECs.[1] In contrast, relatively little job growth occurred within a 1-mile buffer of transit lines of non-ECs.[2] While only 6.7% of Bay Area jobs were outside the defined transit and freeway buffers in 2000, these buffers captured 12.1% of job growth. In fact, more jobs grew were located during the 1990s away from freeway and transit corridors in non-ECs than in San Francisco. Overall, during the 1990s Bay Area jobs were drawn either to *growing centers* or non-ECs, especially along freeway corridors, though plenty of jobs opened up away from transportation corridors as well.

Table 6 shows the occupational compositions for three categories of the area outside ECs: the area within transit buffers, the area within freeway buffers, and the area outside of transit or freeway buffers. Based on the differential shift results, all three zones specialize in education, training, and library, personal care and service occupations. Transit buffers also attracted jobs in the areas of community and social service, healthcare support, and protective services. Areas outside of transit and freeway corridors drew primary activities like farming, fishing, and forestry – fields less tied to the availability of transportation infrastructures. Also, the Location Quotients from Table 6 show that non-ECs specialize in service oriented occupations than in high-skilled/ knowledge-based occupations.

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[1] The 2-mile freeway buffers consisted of census tracts that either had their centroids within a 2-mile buffer of a freeway corridor or which included a freeway ramp in the census tract.

[2] The 1-mile transit station buffers consisted of census tracts that either had centroids within a 1-mile buffer of transit stations (BART, Caltrain, MUNI, VTA, ACE, and Amtrak Capital Corridor) or which included a transit station in the census tract in 2000.

Table 6. Occupational Compositions according to the Three Categories of the Area Outside of the Employment Centers

Occupations	Within Transit Buffers			Within Freeway Buffers			Outside of Transit or Freeway Buffers		
	1990 LQ	2000 LQ	Differential Shift	1990 LQ	2000 LQ	Differential Shift	1990 LQ	2000 LQ	Differential Shift
Management	0.84	0.85	-14.8%	0.87	0.86	2.9%	0.75	0.78	19.1%
Farmers and Farm Managers	1.07	0.70	-12.3%	1.30	1.17	-2.1%	2.82	6.83	47.8%
Business and Financial Operations	0.85	0.74	-30.0%	0.88	0.80	-7.9%	0.75	0.74	9.1%
Computer and Mathematical	1.00	0.74	-136.7%	0.95	0.72	-85.1%	0.89	0.34	-226.7%
Architecture and Engineering	1.01	1.02	-13.7%	0.95	0.84	-11.4%	0.90	0.46	-59.0%
Life, Physical and Social Science	1.01	1.00	-18.5%	0.95	0.88	-7.0%	0.91	0.67	-28.0%
Community and Social Service Occupation	1.07	1.25	3.2%	0.99	1.09	12.4%	1.01	1.13	22.3%
Legal	1.03	0.55	-81.5%	0.96	0.59	-57.5%	0.94	0.54	-56.8%
Education, Training, and Library	1.07	1.44	18.2%	0.99	1.36	38.6%	1.00	1.71	82.3%
Arts, Design, Entertainment, Sports, and Media	1.06	0.86	-39.5%	0.99	0.81	-21.8%	0.99	0.96	8.4%
Healthcare Practitioners and Technicians	1.03	1.08	-6.7%	0.97	1.01	6.4%	0.94	1.32	46.2%
Healthcare Support	1.06	1.33	10.3%	1.05	1.16	13.3%	1.20	1.47	32.8%
Protective Service	1.21	1.28	-6.5%	1.03	0.99	-1.4%	0.82	0.81	8.6%
Food Preparation and Serving Related	1.07	1.07	-12.6%	1.07	1.02	-2.1%	1.25	1.43	26.1%
Building and Grounds Cleaning and Maintenance	1.09	1.12	-10.4%	1.12	1.10	1.6%	1.50	1.60	18.9%
Personal Care and Service	1.09	1.37	17.0%	1.09	1.29	34.0%	1.33	1.50	36.1%
Sales and Related	1.01	1.04	-8.7%	1.07	1.09	4.2%	0.86	0.98	24.4%
Office and Administrative Support	0.96	0.96	-10.6%	0.93	0.97	7.1%	0.81	0.83	11.7%
Farming, Fishing and Forestry	1.06	0.77	-32.8%	1.28	1.24	-0.3%	2.74	4.93	88.8%
Construction and Excavation	1.03	1.08	-8.2%	1.09	1.17	10.7%	1.13	1.42	39.5%
Installation, Maintenance and Repair	1.02	1.12	-3.2%	1.07	1.12	8.2%	1.13	1.08	5.3%
Production	0.99	0.94	-14.4%	1.04	1.11	8.5%	0.99	0.87	-3.2%
Transportation and Material Moving	1.02	1.08	-7.3%	1.12	1.17	7.9%	0.96	0.92	5.3%
Armed Forces	1.42	0.42	-5.5%	1.02	0.46	-4.0%	4.82	7.26	4.8%

Note 1: A colored cell in the 1990 and 2000 LQs show the high LQ that exceed 1.2.
Note 2: A Colored cell in the Differential Shift show the high differential shift that exceeds 10%.
Sources: Calculated from the 2000 CTPP (MTC) and the 1990 CTPP (BTS)

Given that the share of jobs in ECs did not change much during the 1990s, it would be hard to conclude that the Bay Area became more "edgeless". However, signs of edgeless growth were apparent. For example, more employment growth occurred outside of than within ECs. Freeway corridors outside of ECs were particularly attractive settings for new companies. Even areas far away from freeway corridors and rail stations or transit stations saw substantial job gains. Non-ECs appealed to service related industries. By one account, the Bay Area is still characterized by "job sprawl": 57 percent of jobs are more than 10 miles from the San Francisco's city center, making it the 9th most job-sprawled large metropolis in the U.S. (Kneebone, 2009).

2.4 ECs and Transportation Infrastructure

We investigated whether changes in journey-to-work statistics – such as mean commute times and percent of commutes by transit – were associated with changes in EC types and employment compositions. No patterns or statistically significant results emerged from the analysis. While cross-sectional comparisons show relationships – e.g., San Francisco has a much higher commute share by transit than other ECs in both 1990 and 2000 – changes in commuting behavior were not associated to changes in EC densities or employment compositions.

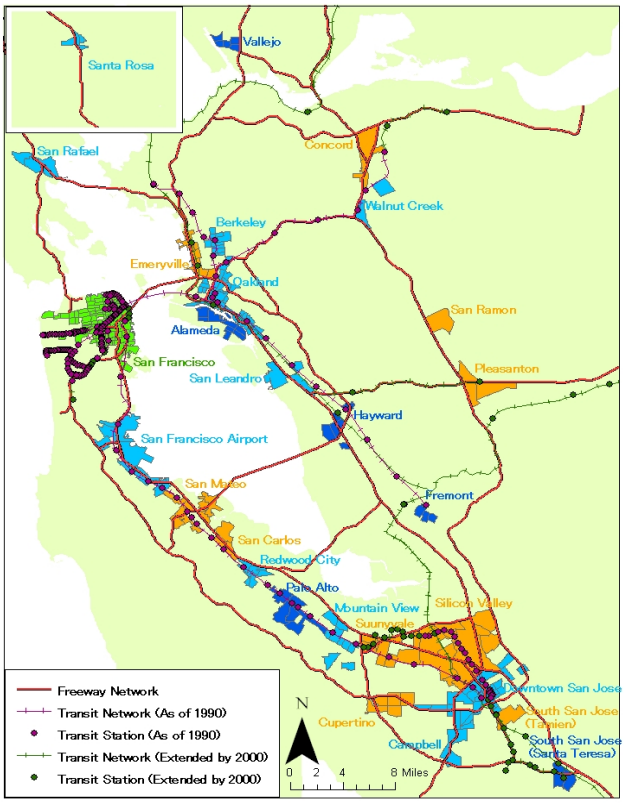
We then explored supply-side associations, such as the correlation between accessibility to transportation infrastructure and the growth/decline of ECs. Accessibility was defined as the number of freeway ramps and transit stations within an EC district. Table 7 shows the average numbers of freeway ramps and transit stations per center, per 1,000 acres, and per 100,000 workers, weighted by the year 2000 employment size and arranged according to type of EC. The number of transit stations was also weighted by the average daily ridership per station. The weight assigned to BART and the Caltrain stations was one, to MUNI and the VTA light-rail stations was 0.2, and to ACE and the Capital Corridor commuter-rail stations was 0.1. This weighting reflected the relatively intensity of rail services flowing into each station. Among *growing*, *stable* and *declining* centers, *growing centers* averaged more freeway ramps and fewer transit stations than *declining centers*. Overall, however, there were no statistically significant differences between accessibility to transportation infrastructures and the growth/decline of the ECs.

Table 7. A Comparison of the Weighted Average Numbers for Freeway Ramps and Transit Stations among the Four Groups of Centers as of the Year 2000

		Group 1 San Francisco	Group 2 Growing Centers	Group 3 Stable Centers	Group 4 Declining Centers	Weighted ANOVA (Group 2-4 Only)		Unweighted ANOVA (Group 2-4 Only)	
						F-Statistics	Probability	F-Statistics	Probability
Freeway	Number of ramps	22.00	14.17	13.14	1.25	1.4538	0.2544	0.9153	0.4139
	Per 1,000 acres	1.84	1.39	2.28	0.69	1.8940	0.1732	0.2079	0.8138
	Per 100,000 workers	4.12	9.93	15.47	9.77	0.8453	0.4423	0.6714	0.5204
Transit	Number of stations	91.00	10.12	5.03	2.17	2.4986	0.1042	0.5543	0.5816
Unweighted	Per 1,000 acres	7.62	0.89	0.87	0.74	0.0896	0.9146	0.4436	0.6469
	Per 100,000 workers	17.06	6.06	6.05	6.53	0.0126	0.9874	0.2232	0.8016
Transit	Number of stations	24.60	3.53	3.22	1.84	0.6055	0.5543	0.7758	0.4715
Weighted	Per 1,000 acres	2.06	0.39	0.64	0.55	1.7984	0.1881	0.3761	0.6905
by ridership	Per 100,000 workers	4.61	2.62	4.20	4.49	1.7457	0.1969	0.0751	0.9278

Sources: Calculated from data provided by the American Public Transportation Association (for MUNI and VTA data), Amtrak, BART, BTS, and Caltrain

Although there was no association between EC type and freeway or transit facilities, it should be noted that new ECs tended to take form where new rail lines were introduced during the 1990s. Figure 2 shows the location of the ECs arranged by type of EC and by Bay Area transit-network extensions between 1990 and 2000. In the 1990s, numerous new rail lines were opened. For example, BART extended its service to Pittsburg/Bay Point (1995-96), Dublin/Pleasanton (1997), and Colma (1996). The Valley Transit Authority (VTA) extended its light rail to Santa Teresa (1990-91) and Mountain View (1999), connecting with Caltrain at Tamien Station (1991). Altamont Commuter Express (ACE) and Amtrak Capital Corridor also began their services in the 1990s. Two centers that were not identified as ECs in 1990 -- Pleasanton and South San Jose (Tamien area) -- emerged as new ones following the opening of rail lines in the 1990s. Thus, although statistically speaking there are no significant differences among groups, it appears that the opening of rail lines likely had some bearing on the siting of new ECs during the 1990s.



Group 1: San Francisco

Group 2: Growing Centers (10 centers)

Group 3: Stable Centers (11 centers)

Group 4: Declining Centers (6 centers)

Figure 2. Location of the 28 Employment Centers by Type and with Reference to Bay Area Rail Transit Extensions during the 1990s
Source: Created by the authors from the 2000 CTPP (MTC) and the 1990 CTPP (BTS)

2.5 San Francisco Bay Area Employment Trends in Summary

This section of the report confirms the longstanding and continuing trend of employment decentralization in the San Francisco Bay Area. Even in 2000, however, employment centers were not irrelevant or at least not wholly edgeless as contended in the writings of Robert Lang and others. Indeed, the Bay Area's 28 ECs still comprised 52.1% of regional jobs in 2000. And downtown San Francisco still retained its primacy, accounting for 16% of Bay Area jobs. Suburban Employment Centers, popularly called "edge cities", remained a major employment force in their own right, making up 37% of regional jobs in 2000. While decentralization is alive and well, the amount of thinly spread and diffused patterns of employment growth – the so-called "edgeless-city" phenomenon – did not dominate in the 1990s. Whether the same can be said for the 2000s can be addressed once the 2010 census place-of-employment records are released, sometime in late 2011 or early 2012.

The analyses in this sections suggest employment growth trends do not lend themselves well to simple categorizations. Edge cities themselves have polarized into two groups: growing suburban ECs and declining suburban ECs. In fact, growing suburban ECs led Bay Area employment growth, accounting for 40% of net regional job gains in the 1990s. Indeed, *growing centers* experienced the fastest employment growth in the Bay Area during that decade. Thus, Lang's (2003, p. 38) statement that "edge cities … lost ground to both downtowns and edgeless cities" did not hold for the San Francisco Bay Area. However Lang's "edgeless" territories did exist. Areas outside of ECs along freeway corridors captured about half of new jobs in the Bay Area during the 1990s. Thus, job growth itself was most pronounced in two contrasting settings: "growing suburban ECs" and "the area outside of ECs with high freeway accessibility".

What might account for such patterns? Lang's analysis of why edge cities have lost ground to both downtowns and edgeless cities offers a possible explanation. Lang argues as follows:

> One reason that big downtowns remain relevant despite their costs and congestion is their agglomeration economies, which create efficiencies that lower the barriers of cost and inconvenience. Many edge cities lack an agglomeration economy… There is little evidence that office tenants are willing to pay much higher rents to be in an edge city than they would pay to be an edgeless city. …. If edge cities begin to grow denser, driving up costs, they may lose tenants to edgeless cities. Meanwhile, it is hard to justify the types of costs and congestions that are typical of large CBDs because many tenants not regard "a downtown suburban location … as a substitute for downtown." …. In sum, …it would not be surprising to see edge cities lose considerable ground relative to both edgeless cities and downtowns over the next decades. (Lang, 2003, pp. 97-98)

While this might explain why employment growth has occurred in areas "outside of ECs with high freeway accessibility," in that their land prices are much lower than those of ECs, this argument could also be used to explain differences between *growing* and *declining centers*. As noted earlier, *growing centers* have specialized in high-skilled/knowledge-based occupations, such as computer programming, management, architecture and business-financial operations. Such occupations rely on quick face-to-face access to specialized labor and ease of external transactions conferred by agglomeration economies. Therefore, even if real-estate prices and traffic congestion are higher in "edge" versus "edgeless" cities, such occupations may still be drawn to the higher agglomeration economies offered by edge cities. On the other hand, *declining centers* had smaller concentrations of knowledge-based occupations and tended to be comprised more of workers who placed less of a premium on spatial proximity to co-workers. Such jobs are more likely to gravitate to outlying areas with lower rents and less traffic congestion leaving the edge cities that traditionally catered to these markets less desirable. This suggests that edge city transformations consisting of infill and mixing of land uses could very well attract high-skilled, knowledge-based workers – i.e.,

work settings with agglomeration economies. The implication here, then, is that employment center transformations are not just a matter of physical alterations but rather are fueled by powerful market forces that favor settings that increase economic productivity.

The finding that new ECs gravitated toward newly opened rail lines during the 1990s bodes well for transit-oriented development (TOD) as a form of employment center transformation. High-quality transit can be an important factor influencing the citing of ECs that rely on agglomeration economies. Rail transit and knowledge-based ECs could very well exist in a symbiotic relationship – i.e., rail investments and extensions could attract employment centers and the emergence of dense job centers could over time spawn future investments in high-end transit.

3. Case Study: Transformation of Bishop Ranch Office Park

This and the case study that follows provide case contexts for the employment center changes highlighted in the previous section. The cases chronicle the evolution of development and land-use patterns of two massive employment centers, focusing on their densification and enrichment of land uses. The evolution of transportation programs in support of (and sometimes in response to) land-use transformations is also discussed.

This first case study, Bishop Ranch Office Park, reveals the maturation and transformation of a large-scale SEC aiming to take on the characteristics of a mixed-use activity center. Bishop Ranch, located off of Interstate 680 in the city of San Ramon in Contra Costa County of the San Francisco Bay Area (Figure 3), opened in 1978 at the leading edge of the San Francisco Bay Area's suburban office market boom (Cervero, 1986; 1989). At the time, the surrounding landscape was fairly virgin. The developers of Bishop Ranch, Sunset Development Company, were a family in the home building business who had primarily worked in the nearby city of Livermore. They had purchased the land that would eventually become Bishop Ranch to build homes on. However, after Proposition 13 passed, which posed limits on property tax income, that arrangement no longer looked nearly as enticing. At the time, suburban locales were in no mood to accept more housing development and the high service demands (notably schools) they imposed. The Sunset Development Corporation was able to sell two very large tracts to two large companies in the region that were seeking to relocate their headquarters from downtown San Francisco: Chevron and Pacific Bell. Those two sales alone helped finance nearly all of the infrastructure for the remaining parts of the park. As sole owners, Sunset Development Company was able to retain ownership of nearly all of its buildings and plan and lay out infrastructure as it saw fit instead of having to time markets as the Park was built out.

Figure 3. Location of Bishop Ranch in the San Francisco Bay Area

3.1 Bishop Ranch's Land-Use Transformation

The original Bishop Ranch project was unmistakenly a large-scale employment center, with nearly all of its building floorspace devoted to housing white-collar office workers. By the late 1980s, the 585-acre master-planned business park had a workforce of some 13,000 employees, with more than 90 percent of floorspace space devoted to offices, most of it built on a speculative basis. Over the past three decades, Bishop Ranch has slowly but steadily diversified its land uses and intensified activities through strategic infill. Figure 4 shows the current site plan and Figure 5 shows the site's transformation from its beginnings to today.

Guiding Bishop Ranch's transformation has been the city of San Ramon's *City Center Plan*, adopted in 2007. The Plan calls for Bishop Ranch to become a mixed-use activity center, featuring:

- 635,000 Retail/Commercial square feet
- 50,100 Professional Office square feet
- A 169-room hotel
- 488 Residential Units, amounting to 551,000 square feet
- City Hall
- A 682,000 square foot office complex

Bishop Ranch has never had housing on-site, and although the City Center Plan continues to emphasize office development, the plan demonstrates a paradigm shift in suburban employment center development. Indeed, the original vision to build Bishop Ranch as a

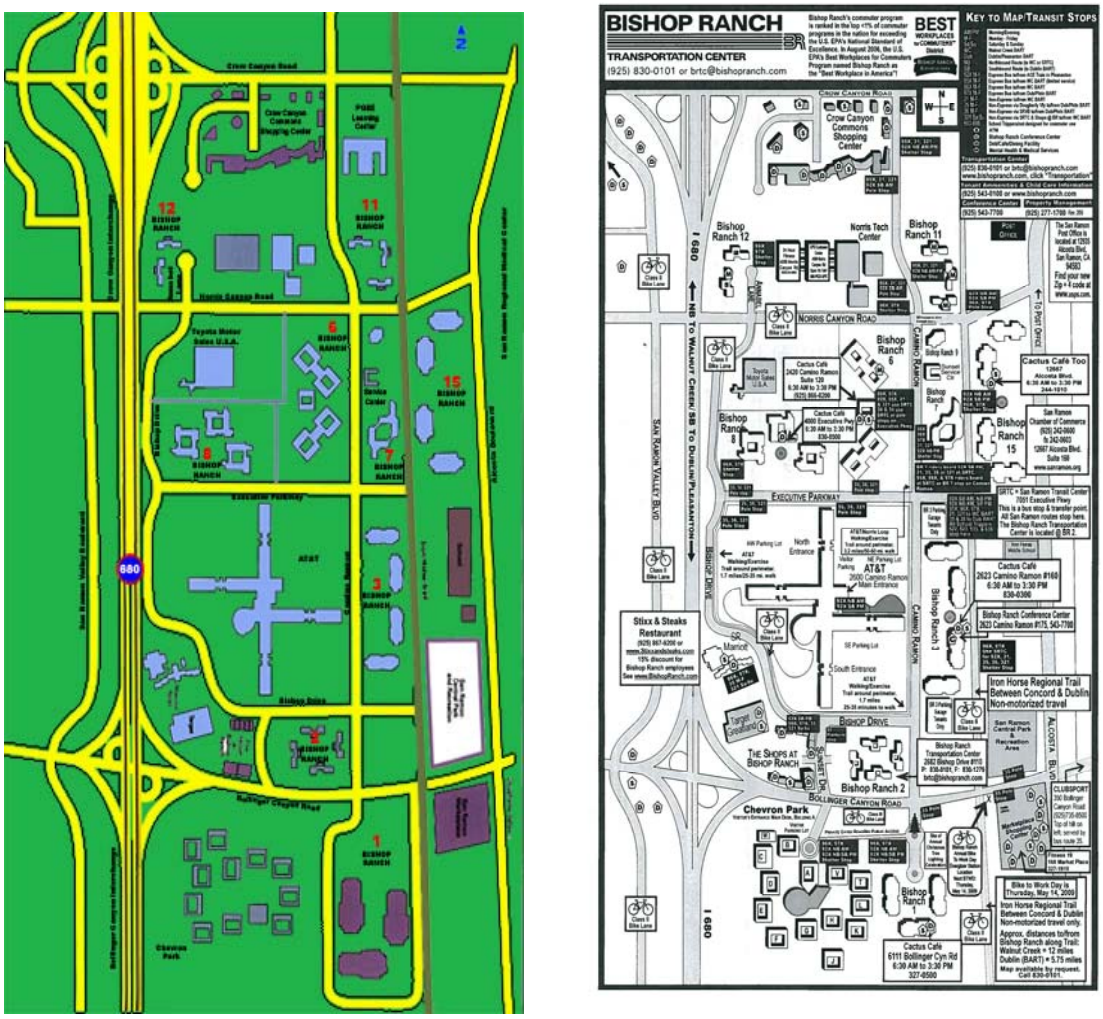


Figure 4. Current Site Play and Land-Use Composition of Bishop Ranch

Figure 5. Bishop Ranch Site: 1978 (left panel) and 2006 (right panel)

planned unit development (PUD) with subdivisions of ranch-style housing prompted a citizens revolt which led to the creation of San Ramon as municipality to control such development. Thus adding nearly 500 housing units to the project is a monumental breakthrough. The Final Environmental Impact Report (EIR) was circulated in October, 2007, and the plan and all development entitlements had been approved by May, 2009, but a set of lawsuits associated with the EIR has held up progress. By the time the lawsuits were dismissed, declining economic conditions and tightening credit markets forced the project to a standstill, with infrastructure investment delayed to late-2009 and the construction of the first new office building not having taken place until mid-2010.

3.2 Transportation Programs and Trends

Balanced, multi-modal, and sustainable mobility was envisaged for Bishop Ranch at the outset. The site's original design included a multimodal transit hub in the center of the business park as well as plexi-glass bus shelters on each campus. Shower rooms with lockers and bike racks were designed into major buildings. Biking, walking, and exercise trails were included throughout the site and on-site cafes were included to eliminate midday car trips. Those designs were never implemented, however. Over the years Bishop Ranch has sought to reactivate the previous plans. A major impediment has been demands for plentiful parking from tenants. Through Bishop Ranch's Transportation Demand Management (TDM) measures, parking has been reduced from 5.0 to 2.2 spaces per 1,000 square feet. Nevertheless, no infill development has been built on the sea of asphalt that envelops Bishop Ranch. Tenants, the city of San Ramon, and companies want *more* than enough parking for any "rainy day" situations (i.e., safety in excess).

To promote alternative means of commuting, Bishop Ranch formed a Transportation Management System (TMS) in 1983. In 1990, a Transit Center opened on the Bishop Ranch campus. And in 1994, a free privately contracted shuttle bus was launched that ran to and from the Walnut Creek BART. An employee I.D. guaranteed a free ride. This service was expanded to the Dublin BART station, to the south, in 1997 once BART had arrived. Free shuttle services have ended up saving employees who take advantage of the program about $1,000 per year. There is currently service to and from the Pleasanton Altamont Commuter Express (ACE) train station as well.

The contracting out of bus services to the County Connection agency is Bishop Ranch's most expensive transportation-related expenditure, costing around $500,000 a year. Costs associated with the operation of the transportation center are around $250,000 annually. Procuring funding takes up a large amount of the transportation center's two full-time staff positions which leaves little time or resources for actual implementation or outreach of the center's mission objectives. Prior to 2000, there were no full-time staff positions for transportation management at Bishop Ranch. That year, two full-time staff positions were added to contribute to awareness and strengthen employee/employer relationships surrounding transportation alternatives. As seen in Figure 6, Bishop Ranch's ridership on County Connection buses has seen a continual rise even as County Connection's overall ridership has declined.

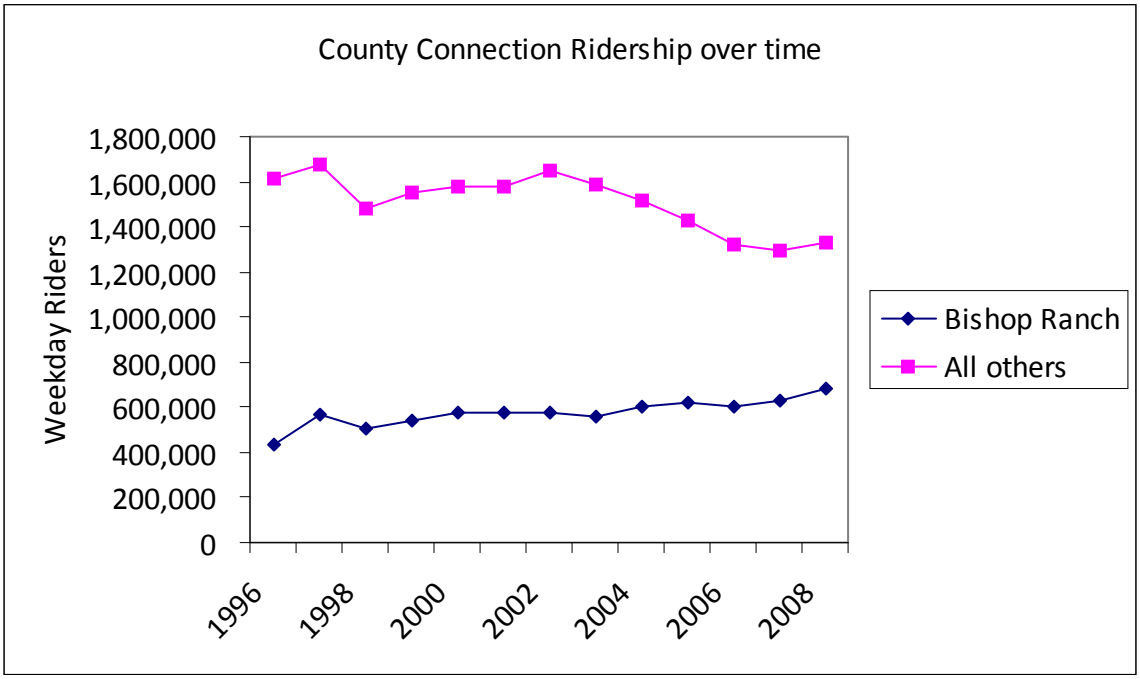


Figure 6. Trends in Transit Ridership: Bishop Ranch Bus Services and Contra Costa County Connection as a Whole. Source: County Connection

Bishop Ranch's shuttle bus system depends heavily on reliable and seamless intermodal connections. Experiences show that tardy buses and mis-connections will chase away riders in droves. This is particularly the case given that the vast majority of Bis Ranch's workers can park for free. One of the Transit Center's major headaches is making sure that Bishop Ranch's shuttles maintain routes and schedules are in synch with those of general-purpose transit routes operated by County Connection. Route and schedule changes occur all the time, and Bishop Ranch's shuttle planners are not always informed of changes that have been introduced. Routine travel surveys are one way to stay on top of customer concerns. Bishop Ranch is currently attempting to issue travel surveys when employees renew their bus passes every six months. Completing surveys is completely voluntarily, however, and many employers do not even distribute them to their workers when passes are renewed.

Besides its transit initiatives, Bishop Ranch planners has long been a leader in incentivizing its workforce to take alternative modes of transportation, including carpools and vanpools. This is particularly necessary given that most employees reside in outlying settings with historically limited and sometimes poor transit services, conditions that encourage solo-commuting. An early study of workers whose jobs were relocated from

downtown San Francisco to Bishop Ranch underscored the transit-unfriendly nature of the office park: shares of commutes by mass transit fell from 58.1 percent when working in downtown San Francisco to just 2.8 percent when at Bishop Ranch (Cervero and Landis, 1992).

Commuteshed analyses can throw light on the spatial extent and market attributes of Bishop Ranch's workforce. Figure 7 maps the 2000 commuteshed of employees for census tract 3451.08, that is comprised predominantly of Bishop Ranch (Figure 8). Most workers reside in census tracts within 10 miles of Bishop Ranch, however a substantial number of employees live beyond what is a "bus-able" or easily transit-rideable distance. These outlying workers comprise the most likely market for ridesharing. A 2003 survey of the Bishop Ranch's workers updated the 2000 census data. Figure 9, from the survey, further underscores the dispersed pattern of worker residences. The demographic attributes of these workers – characterized by CBRE Consulting (2009, p. 1) as "high-income households with a propensity toward home ownership, and a highly skilled labor force with a high percentage engaged in management, business, and financial operations" – make the promotion of alternative community modes all the more challenging.

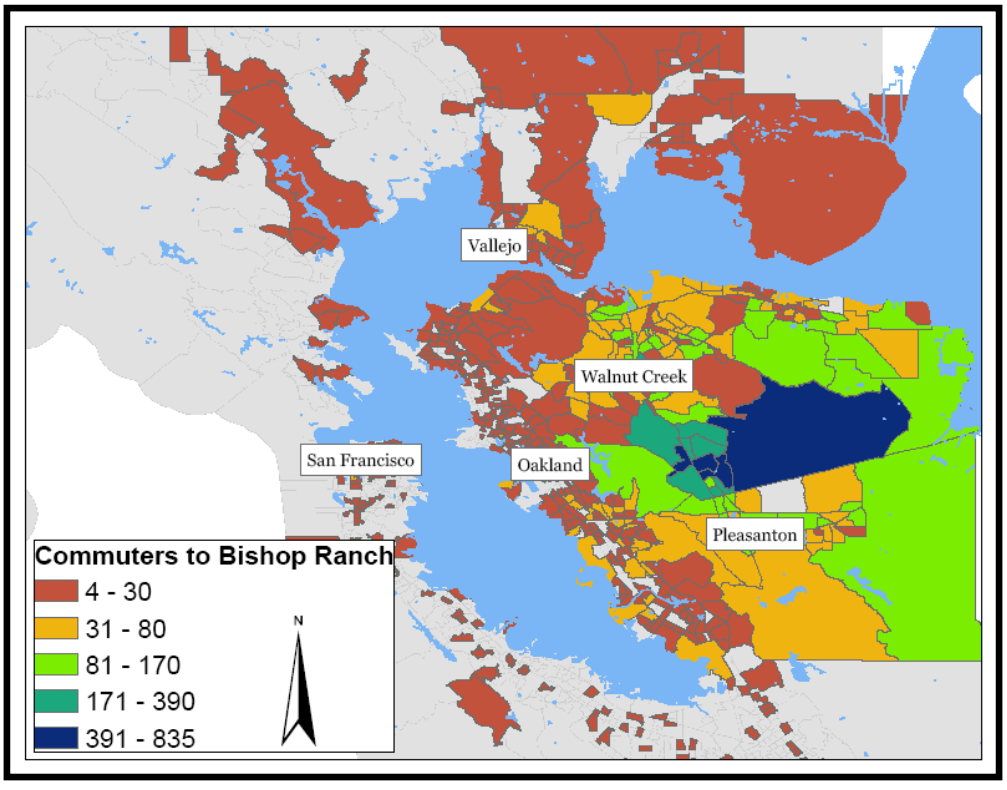


Figure 7. Bishop Ranch Commuteshed, 2000. Distribution of place-of-residence for Bishop Ranch workers. Source: 2000 Census Transportation Planning Package.

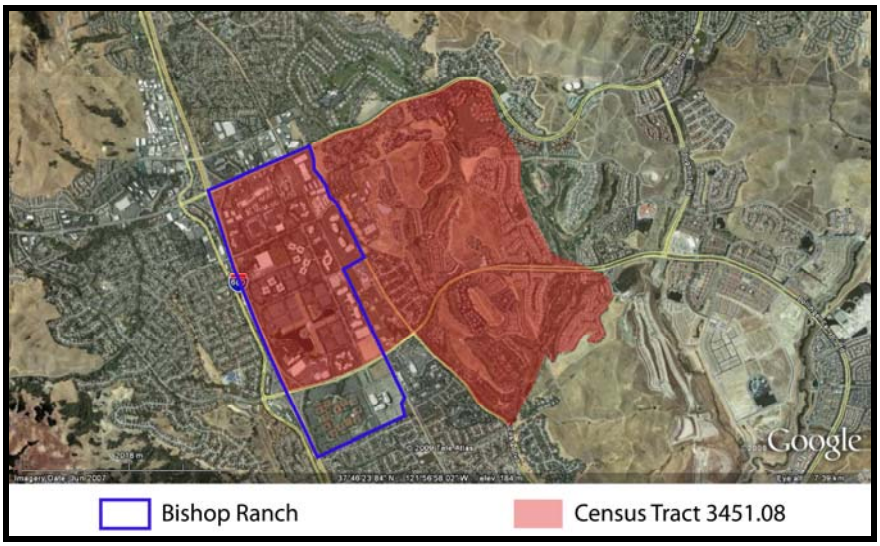


Figure 8. Bishop Ranch as part of Census Tract 3451.08.

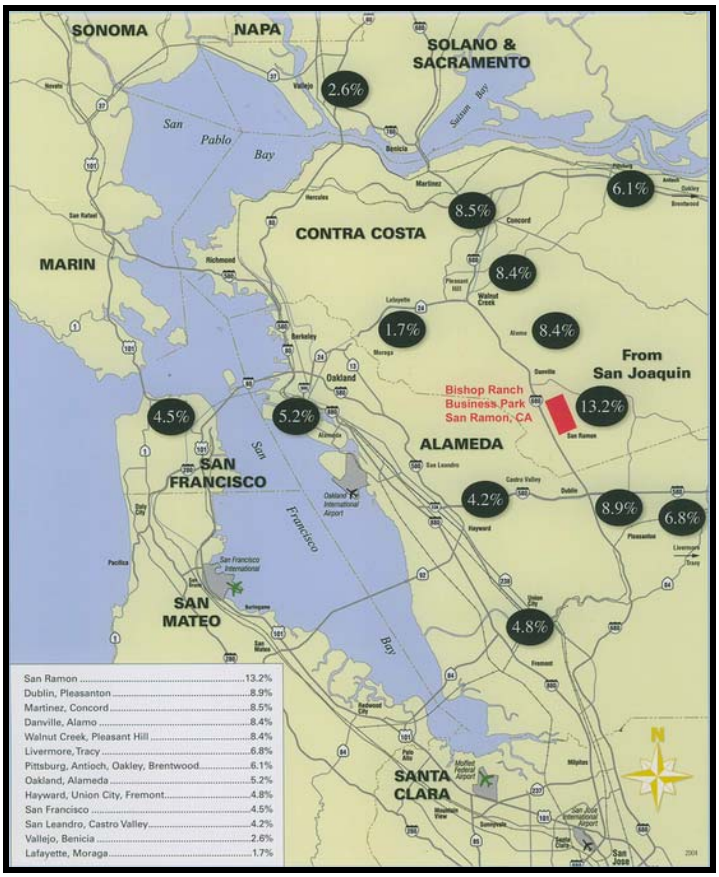


Figure 9. Bishop Ranch Employee Residential Locations, 2003.
Source: Bishop Ranch Transportation Center

With such an expansive commuteshed, it is not surprising that the vast majority of Bishop Ranch's employees reached their jobs by private car in 2000. Commute modal splits by place-of-work for Bishop Ranch's census tract in 2000 were: drive-alone (81.6%), rideshare (12.1%), bus transit (1.1%), rail transit (0.26%), and walk-bike (1.2%). Long-distance commutes, combined with free on-site parking and the project's single-use nature (which strands those without a car in the midday), have generally conspired against alternative modes. Despite all the money and time poured into it, transit's mode share for Bishop Ranch's census tract rose just one percentage point from 1990 to 2000 (0.4% to 1.4%). Nonetheless, Bishop Ranch remains committed to promoting alternatives to the private car through various incentive-based programs, including:

- **FREE Bishop Ranch BART Express Passes** are provided to employees in Bishop Ranch on an on-going basis to ride between the Dublin or Walnut Creek BART Stations and Bishop Ranch. Value: $1,000 per employee per year.

- **Guaranteed Ride Home Incentive** via taxi or rental car is provided for free, up to six times each year, for employees who carpool, vanpool, bike, walk or ride transit to work. Such a guarantee is valuable safety net to those who might have to work late or make an emergency trip home to tend a sick child. This program is destination-based, so a worker can live anywhere in the Bay Area or Central Valley (a several hundred dollar taxi ride away) and use this program as long as he or she works at Bishop Ranch and has registered in advance.

- **ACE Train Incentives**: A free month of travel to qualified new riders who work in San Ramon, plus 50% pass discount for the second month.

- **ACE Loyalty Rewards Program**: Save monthly passes entitles workers to a free month of travel on ACE commute trains each year. Additional discount incentives are available for regular riders who recruit new passengers.

- **Carpool Incentive**: A $60 gift card for each new carpooler who shares a ride at least 2 days per week.

- **Transit Incentive Program**: One free week of travel on regional transit systems including, BART, County Connection, Wheels, and AC Transit to solo drivers who try transit.

- **Vanpool Incentive**: 50% of the first 3 months of expenses to new passengers via a reimbursement check in the fourth month of participation.

- **Vanpool Driver/Coordinator Incentive**: Drivers or coordinators who form a new vanpool receive a $1,000 check on their first anniversary of operation.

- **Buy One Month, Get the Second One Free on the TriDelta Express Bus** serving Antioch, Oakley, Brentwood, Discovery Bay, Bryon and Bishop Ranch.

Many of the incentive programs cited above have been funded in partnership with public agencies, including: 511 Contra Costa, the Bay Area Air Quality Management District's Transportation Fund for Clean Air, and the Contra Costa Transportation Authority. Just as Bishop Ranch itself has matured and enriched its activities, so has its transportation programs and the stakeholders who support them.

Despite aggressive TDM efforts, one notable trend has been the dramatic decline in vanpooling at Bishop Ranch in recent years.[3] Anecdotally, this may be due a change in the times (e.g., people are busier, schedules are tighter), making it difficult for employees to organize vanpooling themselves. Declines in ridesharing among non-family members indeed has been a nationwide trend. Other modes, however, have witnessed increased travel. In 1998, fewer than 100 employees were biking to work via the Iron Horse trail (a portion which runs through the park and was funded by Bishop Ranch); by 2009, 700 Bishop Ranch employees rode a bike on "Bike to Work Day" and by local estimates the number remains high other workdays of the year. Such events have not gone unnoticed. Bishop Ranch's Transportation Center has won awards for introducing proactive TDM measures such as these.

4. Case Study: Transformation of Hacienda Business Park

Like Bishop Ranch, most of Hacienda Business Park's layout and design can be attributed to the 1980's office boom in San Francisco Bay Area. San Francisco's office rents had become prohibitively high at this point in time, yet the market was still clamoring for office space. This was mixed with the fiscal climate of cities adapting to Proposition 13's impact. The coalescence of high rents in San Francisco, high demand for office space within the Bay Area, and cities scrambling to find revenues unconnected to residential development helped to shape the majority of the Hacienda Business Park's identity and land uses. In a wider scope, changes to federal tax codes and relatively free lending practices for commercial development also contributed to Hacienda's campus style and concentrated commercial/industrial office space.

4.1 Hacienda's Design and Land Uses

The desire to "blend in" figured prominently in decisions governing Hacienda's building designs and placements, landscaping, and site organization. The delicate relationship between the built and natural environment was particularly evident in Hacienda Business Park's design guidelines which specify that interior zones of the

[3] This decline has been a post-2000 phenomenon. The share of workers who carpooled or vanpooled to work rose for Bishop Ranch's census tract from 9.6% in 1990 to 12.1% in 2000.

complex should recall the "orchard or grove-like character typical of California farm communities" (Fee and Munson, Inc. 1983). The guidelines allowed six-story mid-ride structures, but only on two parcels at the center of the park. Hacienda's master plan sought to control scale changes at the park's edges by zoning for lower densities and shorter building profiles around the periphery of the site.

The choice of Hacienda's 860-acre site was considered ideal because of its proximity to the interchanges of I-580 and I-680 and the plan to open a nearby BART station (Figure 10). This made the suburban location seem less distant and allowed Hacienda to pull from a much larger labor pool. Because the park sought to draw from a large regional labor-shed, the internal design and infrastructure was expansive and generous in capacity. The wide, open expanse of buildings, coupled with wide roads with long site-lines and plentiful parking, were consequences not only of the campus style of the day, but a practical effort to serve the park's employee base. By the late 1980s, Hacienda Business Park had over 5,000 workers, spread among inward-focused buildings separated by vast lawns of green, parking lots, and generously designed roadways (Cervero, 1986; 1989). The current site layout and land-use program of Hacienda is shown in Figure 11.

Figure 10. Hacienda location within the San Francisco Bay Area and with Reference to two Major Freeways: Interstate 680 and 580

The first major land-use shift for Hacienda came as the office boom waned in the late 1980's. The market fell and Hacienda's owners had to attract other tenants to remain solvent. They filed a petition to revise Pleasanton's General Plan to allow the construction of on-site housing. The request was denied, in large part because of a 2 percent annual growth limit placed on residential construction by the city of Pleasanton. Pressure from regional planning interests and employers to balance growth and offer workers nearby housing eventually prompted the city to relax its restrictions. Today, 1,550 residential units are in the park, situated on the eastern and southern portion of the project (Figure 12).

Figure 11. Current Site Layout, Land Uses, and Building Coverage of Hacienda Business Park

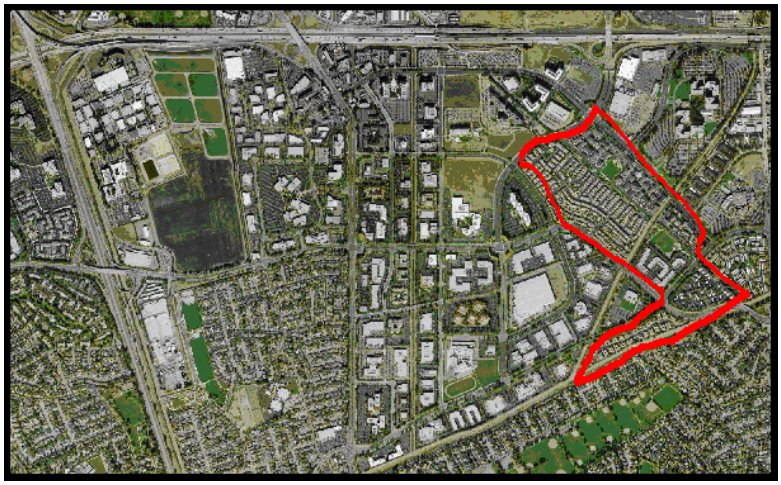


Figure 12. Housing Zone of Hacienda Business Park, 2006

In 1991, Hacienda's first residential housing projects -- "Verona" and "Springdale," both located in the southeastern part of the park – were approved. Their existence owed to rising market demand, proximity to other housing, and the presence of some odd-shaped parcels which were ill-suited to other uses. More townhouses and apartments were added in the mid-1990s in the park's center. Converting from an employment center to a more mixed-use environment has not been a smooth or easy

process. A constraint to adding more housing was a cap on Pleasanton's housing supply approved by voters in 1996. Under the cap, no more than 29,000 units of housing can be built in the city. The city is currently being sued by both the state's Attorney General and Urban Habitat to lift this cap.

Hacienda has also struggled with the city in regards to updating the project's Planned Urban Development (PUD) permit to allow more mixed-use and transit-friendly development. Pleasanton's General Plan update and the draft-EIR goals encourage more housing in areas with high employment that are close to transit. In practice, however, Hacienda's owners have struggled with the city to update the PUD or create a Specific Plan. Several concept studies were prepared by local consultants that advanced smart-growth principles for a newly created Specific Plan. The city of Pleasanton opted not to support the proposal, prompting Hacienda's developers to try to update the project's PUD. Most of Hacienda's future land-use development remains in limbo until lawsuits over Pleasanton's housing cap in the General Plan are settled. Foot-dragging has not only come from the city. For the most part, individual land owners at Hacienda have also resisted densifying and adding a panoply of new land uses to the project, preferring a free reign over what and how to build on their sites. This highlights a major difference in ownership structure between Hacienda Business Park and Bishop Ranch.

Images portray the gradual but steady physical transformation that Hacienda Business Park has experienced since its 1983 inception (Figure 13). The addition of housing, corporate offices, lodging, and retail services has not only enriched land-use offerings but has also served to bring buildings – and thus potential trip origins and destinations – closer together, which in turn should bring about more internal capture (in the form of pedestrian and shorter trips that replace automobile, off-site travel). This is supported by recent research that shows mixed-use activity centers across 6 U.S. metropolitan areas averaged internal captures (trips made within the mixed-use site) of 18 percent (Ewing et al., 2010).

Hacienda's metamorphosis and maturation is also revealed by its denser road network, offering higher connectivity. Most notable has been the addition of a finer grained road pattern serving new residential enclaves on the eastern side of the project. This has helped break up the superblock design and along with a few additional links has provided a slightly more modified-grid road layout. The higher connectivity is revealed by the increase in Hacienda's connectivity index (links/nodes) from a value of 1.96 in 1990 to 2.10 in 2007. The project's road density (lineal distance of roads divided by land area) has similarly increased in magnitude.

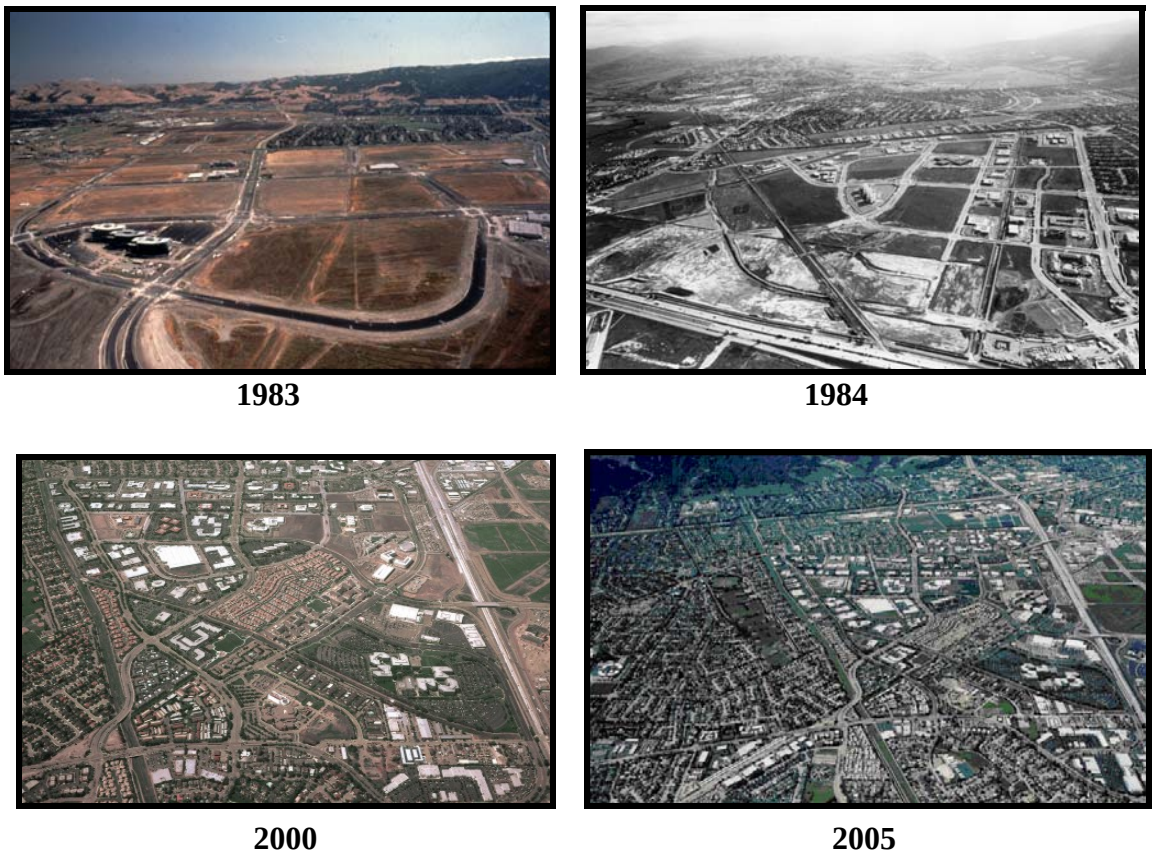


Figure 13. Hacienda Business Park Site Development Over Time

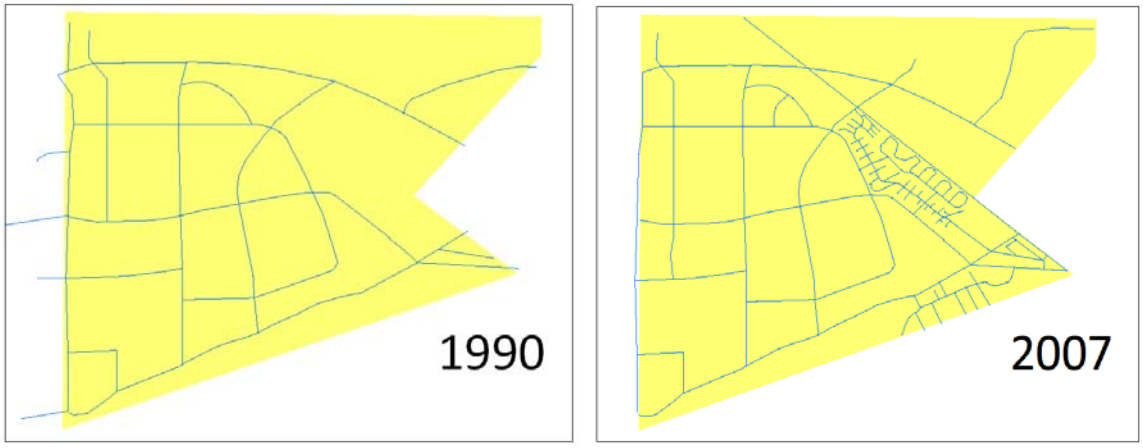


Figure 14. Hacienda Business Park's Road Networks: 1990 and 2007.
Source: US Census Bureau TIGER line files

4.2 Hacienda's Transportation Program

Hacienda Business Park was one of America's first large-scale employment centers to aggressively pursue TDM as a means to encourage workers to commute via alternative modes (Cervero, 1986, 1989; Cervero and Griesenbeck, 1988). Hacienda initiated a "Transportation Services" program in 1983 in concert with the city of Pleasanton. The Business Park's development agreement included a TDM program as a precondition to project approval. Money to support TDM came mainly from land owners (and thus tenants) who were charged on a per land acre basis. This meant, of course, that denser projects contributed less to TDM programs on a per square foot or per employee basis.

The city of Pleasanton was one of the first municipalities in the country to mandate traffic congestion mitigation. The main mitigation measure required companies to roll back peak-hour traffic 45% if the company employed over 75 people. Prior to 1993, when the courts held that municipalities could no longer mandate employer-financed TDM programs, transportation services at Hacienda employed a small full-time staff which worked on TDM measures (in partnership with a human resources representative from each company). These efforts paid off, reflected by programs like flexible work schedules that significantly increased the share of employees who carpooled or vanpooled to work (Cervero and Griesenbeck, 1988). After 1993, Hacienda shifted to a packaged "shared responsibility of TDM" format. Instead of having a full-time staff coordinate TDM measures with all the companies, TDM was marketed to individual companies by the general managing leadership of the Hacienda Owner's Association. TDM was combined with child-care and security as a bundle of services offered by Hacienda.

Currently, Hacidena's TDM programs consist of:

- Wheels Pass for employees and residents: local bus service free of charge.
- Commuter Choice tax benefit: reimbursement for taking transit to work.
- Guaranteed ride home: Alameda County Guaranteed Ride Home program, which provides emergency rides home to workers who must leave during the day or stay late in the evening.
- Carpools and Vanpools: reserved preferential parking and ride-matching: On-line matching program that offers convenient and reserved parking spaces to successfully organized carpools and vanpools.

While there has been a diminution of services, compared to the 1980s and early 1990s, Hacienda today offers TDM to workers and residents at a fraction of the early-year costs

of implementation.

In 1985, shortly after the transportation services were founded, Hacienda hired a private contractor to run shuttles for connections from Bayfair and Walnut Creek BARTs to Hacienda. Because of high operating costs, Hacienda's Owners Association opted to partner with the Livermore-Armador Valley Transit Authority (LAVTA) to run the Wheels shuttle-bus services to and from BART stations under a shared-cost agreement. This arrangement has provided Hacienda's workers with more affordable housing options in nearby Livermore, along with the ability to economize on commuting costs. With just 12% of Pleasanton's employed-residents living within a half mile of a BART corridor, only 2.8% got to work by BART in 2000. The Wheels service averages a mode split of 1.7% by comparison. Most of Hacienda's workers (94.8%) continue to reach their job sites by private car, largely because many continue to work in low-density suburbs with limited transit service connections (Figure 15). The commute-shed map in Figure 15 is based on 2000 journey-to-work statistics for workers in census tract 4507.22, which contains Hacienda (Figure 16). Journeys-to-work among those working in tract 4507.22 were as follows in 2000: drive-alone (83.7%); rideshare (11.1%); transit (1.8%); and bike/walk (1.6%). A significant share of Hacienda's workforce resides in the city of Pleasanton and quite a few live in nearby communities, thus there remains reasonable opportunities for commuting via alternative modes, including transit and bicycle.

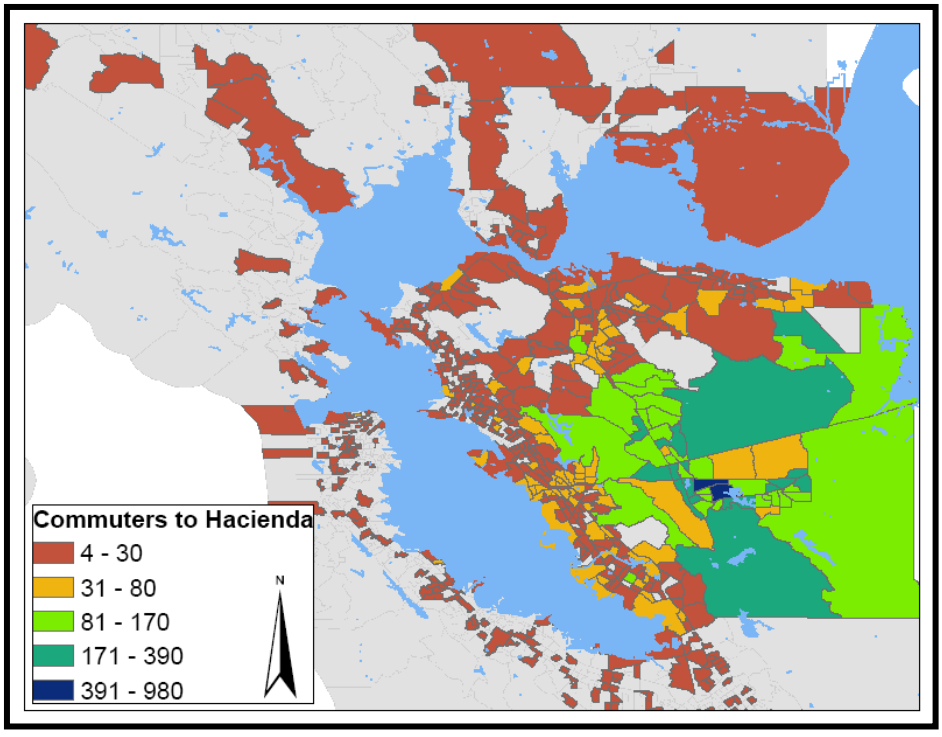


Figure 15. Hacienda Commuteshed, 2000. Distribution of place-of-residence for Hacienda workers. Source: 2000 Census Transportation Planning Package.

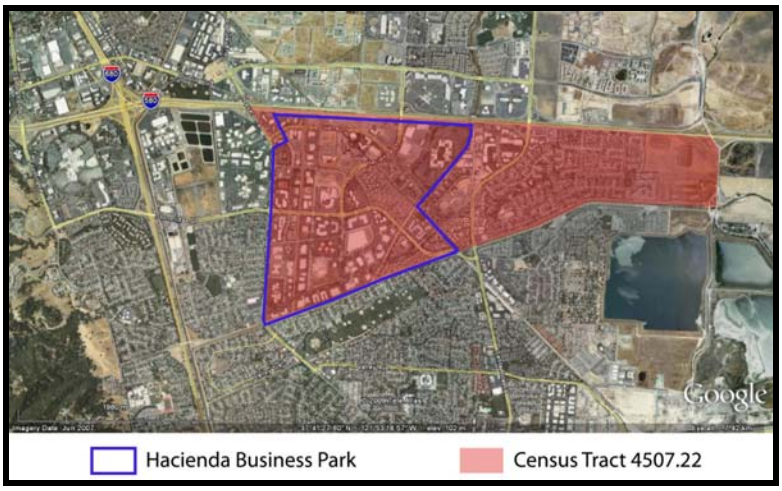


Figure 16. Hacienda Business Park as part of Pleasanton's Census Tract 4507.22

5. Reflections and Conclusion

The maturation of suburban employment centers, nationwide, presents unprecedented opportunities to create more transit- and pedestrian-friendly work environments through densification and the addition of mixed land uses. The suburbs have never been public transit's natural habitat. The conversion of more and more SECs into mixed-use activity centers could change that.

Decentralization of employment, absent efforts to channel jobs into balanced, mixed-use activity centers, could have serious economic repercussions. In a recent Brookings report, Kneebone (2009) notes unplanned and unmanaged job decentralization stands to: increase energy consumption, add to the costs of building infrastructure, increase community times, reduce innovation by lessening opportunities for firms to interact and exchange ideas, and worsen structural unemployment by isolating low-income and minority workers in the urban core from job opportunities on the fringes.

The transformation of suburban workplaces has captured the attention of several notable architects and designers in recent years. DPZ Inc. (Duany-Plater-Zyberk) have applied the New Urbanist Transect principle in demonstrating how a campus-style office park (S7 on their transect) can be converted to an urban core zone (T5 in the transect zone). A visual caricature of DPZ's retrofitting and infilling the "random, train wreck pattern" of building placement to buildings oriented to the street is shown in Figure 17. [4]

[4] In their unpublished piece on "Retrofit-Infill", DPZ define the S7 "Business Park" as: homogenous, auto-dependent, limited connectivity, lack of relationship between buildings and street; a random, train-wreck pattern of building placement; front lawns; one-to-multistory buildings; and a civic space comprised largely of indoor lunch cafeteria. The Urban Center (T5), on the other hand, has a mix of houses, commercial activity, offices, workplaces, and civic buildings; predominantly attached buildings; buildings oriented to

Paul Lukez (2007) has proposed an "adaptive design process" that phases in and in-fills spaces with buildings, trees, permeable paving, gateways, and other design elements. Receiving more attention is the book *Suburban Retrofits* (2009B), by Ellen Dunham-Jones and June Williamson, which documents the transformation of not only office parks but also dying shopping malls, residential subdivisions, retail strips, and similar banalities of late-20th century suburban development. The authors chronicle not only the physical elements of this metamorphosis but also the sociological, cultural, and financial-economic dimensions behind successful changes as well. The ability to form business improvement districts, use tax increment financing (TID), seek out "patient capital" for land-banking, create zoning overlay districts, and implement high-quality transit improvements has been pivotal in allowing most suburban transformations take form.

Figure 17. Transect Transformation from a Business Campus to an Urban Center.
Source: DPZ Inc., "Retrofit – Infill", 2008.

A sign that employment-to-mixed use centers is alive and well is the recent attention given to the subject by the Urban Land Institute (ULI). For purposes of encouraging green workplaces and reducing the car's environmental footprint, ULI's *Urban Land* ran a piece that chronicled successful office-park transformations in Hyattsville, Maryland and Westwood, Massachusetts (Dunham-Jones and Williamson, 2009A). Market forces and demographic shifts are largely driving these transformations. In *Transforming Suburban Business Districts* (ULI), Geoffrey Booth contends: "It's all about quality of life". People and employers are looking for more vibrant, pedestrian-friendly, live-work-shop places" – what is called the "place-making dividend". According to ULI's President, Richard Rosan, more than 200 suburban business districts in the U.S. can today be developed into "safe, secure and attractive gathering places" (Heavens, 2008, p. 1).

Favorable conditions could work in favor of office-park to mixed-use center transformations. One estimate holds that 2.8 million acres of greyfields will become

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streets forming a street wall; 3-to-5 story buildings; and civic spaces made up of parks, plazas, and median landscaping.

available throughout the U.S. by 2025 (Dunham-Jones and Williamson, 2009A). If only one-quarter is changed to mixed-use centers, half the housing needed by that year can be built on these sites. At a larger scale, such transformations could give rise to polycentric regions, the building blocks of designing successful public transit networks at a regional scale (Cervero, 1998). Transformed rail stops at Twinbrook (in Rockville, Maryland) and White Flint (outside the District of Columbia) could be harbingers of things to come (Goldberg, 2010) .

Perhaps America's greatest suburban transformation is slated for Tysons Corner, what might be considered the "mother of all edge cities" (Cervero, 1986, 1989; Garreau, 1991). Tysons Corner epitomizes all that can go wrong when a car-oriented employment center is built on the urban edge – nightmarish traffic conditions, a deplorable walking environment, and except for its shopping malls, a place that is largely abandoned on weekends. What was a quaint intersection of two county roads 50 years ago is now a two-tiered interchange with 10 lanes of jam-packed traffic heading to what is the 12th biggest employment center in the U.S. The planned opening of four new Washington Metrorail stations has created an unparalleled opportunity to transform Tysons from a predominantly employment and commercial center to a more balanced, mixed-use community. The plan, shown in Figure 18, calls for targeting compact, mixed-use, and easily walkable development near the Metrorail stops. Six times as much housing as currently exists will be built on the 1700 acre Tysons site, most of it within walking distance of a rail stop, bringing the total housing count to some 50,000. Densities will drop off precipitously, wedding-cake style, beyond one-quarter mile of stations. A major component of the plan involves breaking up the current superblock structure with local streets, bikeways, and internal trails, creating a more fine-grained, modified grid-like street pattern (Figure 19). Planners hope this more permeable road pattern will encourage non-motorized access (i.e., walking and cycling) to stations. That is, the traditional suburban practice of park-and-ride access will be replaced by walk-and-ride, bike-and-ride, and bus-and-ride. In many ways, the plan aims to mimic the highly successful transit-oriented development found some 10 miles inward from Tysons along the Rosslyn-Ballston corridor of Arlington County (Cervero et al., 2004).

The consensus view is it will take some time for the Tysons transformation to take shape. Notes one developer: "It took 40 years to get to this point, and significant changes are going to take another couple of decades". [5] The challenges of inserting stations and TOD into an edge city not planned for them will no doubt delay Tysons's transformation.

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[5] L. Rein and K. Hosh, "Transformed Tysons Corner still years away in Fairfax", *Washington Post*, June 23, 2010.

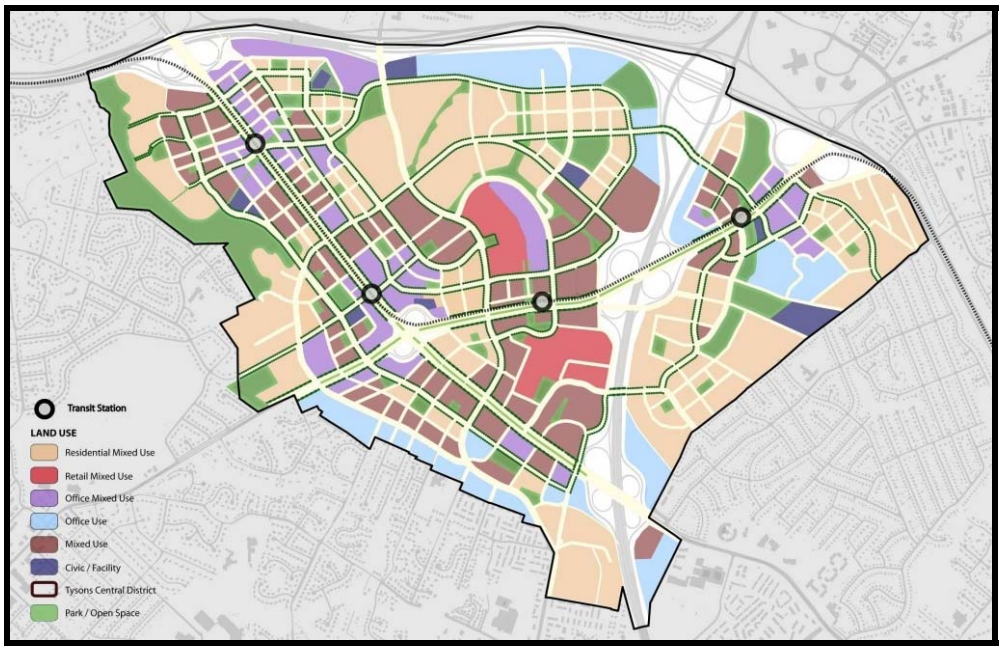

Figure 18. Land Use and Project Layout Plan for the "Transformed" Tysons Corner. Source: PB Placemaking (2008)

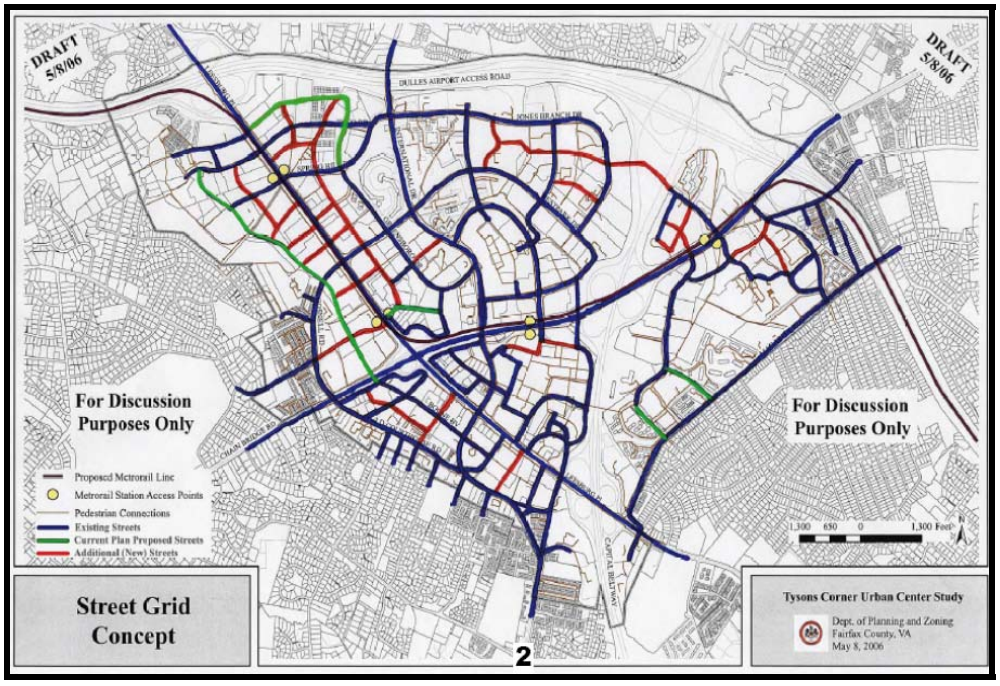

Figure 19. Modifed Grid Street Concept Plan for the "Transformed" Tysons Corner. Source: PB Placemaking (2008)

Tysons Corner, of course, is an extreme case of employment-center transformation. Most office parks, however, are not served by rail. Extensions of existing rail lines are one way to help jumpstart conversions. However more likely to resonate and find political acceptance are road-based solutions. This could include inserting dedicated-lane bus rapid transit (BRT) services along major arteries feeding transformed centers. After all, higher densities and mixed-use activities are the very land-use patterns needed to sustain successful BRT services. Also possible is the creation of multi-way boulevards that separate high-speed traffic from slower local traffic, offering ease of site access and a better quality pedestrian environment. The co-development of land-use changes with high-quality multimodal transportation options offers the best hope of placing mixed-use activity centers of the future on sustainable pathways.

Acknowledgements

We thank the following individuals for their help with this work: Lucas Woodward, James Paxson of the Hacienda Business Park Owners Association, and Marci McGuire and Peter Oswald of the Bishop Ranch Transportation Center.

References and Data Sources

American Public Transportation Association. 2007. "Light Rail Public Transportation Ridership Report: Fourth Quarter 2007"
http://www.apta.com/research/stats/ridership/riderep/documents/07q4lr.pdf

Amtrak. 2004. "Amtrak Fact Sheet, Fiscal Year 2004 State of California"
http://www.amtrak.com/pdf/factsheets/CALIFORNIA04.pdf

Bendavid-Val, A. 1991. *Regional and Local Economic Analysis for Practitioners*. Westport, CT: Praeger Publishers.

Bay Area Rapid Transit. "BART Fiscal Year Weekday Average Exits"
http://www.bart.gov/docs/station_exits_FY.pdf

Booth, G. 2001. *Transforming Suburban Business Districts*. Washington, D.C.: Urban Land Institute.

Bureau of Transportation Statistics. "Bureau of Transportation Statistics."
http://www.transtats.bts.gov/

Caltrain. 2009. "Caltrain Weekday Passenger Boarding"
http://caltrain.com/pdf/annual_ridership_counts/CT_Weekday_Passenger_Count_SUMM

ARY.pdf

CBRE Consulting, Inc. 2009. *Bishop Ranche Employee Demographic Survey*. San Francisco: CBRE Consulting, Inc.

Cervero, R. 1986. *Suburban Gridlock*. New Brunswick: Center for Urban Policy Research.

Cervero, R. 1989. *America's Suburban Centers: The Land Use-Transportation Link*. Boston: Unwin-Hyman.

Cervero, R. 1998. *The Transit Metropolis: A Global Inquiry*. Washington: Island Press.

Cervero, R. 2002. Built Environments and Mode Choice: Toward a Normative Framework, *Transportation Research* D, Vol. 7, pp. 265-284.

Cervero, R, 2006. Economic Growth in Urban Regions: Implications for Future Transportation. Washington, D.C., Eno Transportation Foundation.

Cervero, R. and Griesenbeck, B. 1988. Factors Influencing Commuting Choices in Suburban Labor Markets: A Case Analysis of Pleasanton, California. *Transportation Research* A, Vol. 22, No. 3, pp. 151-161.

Cervero, R. and Landis, J. 1992. Suburbanization of Jobs and the Journey to Work: A Submarket Analysis of Commuting in the San Francisco Bay Area. *Journal of Advanced Transportation*, Vol. 26, No. 3, pp. 275-297.

Cervero, R. and Wu, K. 1997. Polycentrism, Commuting, and Residential Location in the San Francisco Bay Area. *Environment and Planning A*, Vol. 29, pp. 865-886.

Cervero, R. and Wu, K.L. 1998. Subcentering and Commuting: Evidence from the San Francisco Bay Area, 1980-1990, *Urban Studies*, 35, 7: 1059-1076.

Cervero, R. and Wu, K. 1998. Sub-Centering and Commuting: Evidence from the San Francisco Bay Area, 1980-90. *Urban Studies*, Vol. 35, No. 7, pp. 1059-1076.

Cervero, R., Arrington, G., Smith-Heimer, Dunphy, R. and others. 2004. *Transit Oriented Development in America: Experiences, Challenges, and Prospects*. Washington, D.C.: Transit Cooperative Research Program, Report, 102.

DPZ, Inc. 2008. Retrofit-Infill: Suburban Retrofit and Infill – A Lexicon of Advanced Techniques. Miami: DPZ, Inc.

Dunham-Jones, E. and Williamson, J. 2009A. Retrofitting Suburbia. *Urban Land*, Vol. 69, No. 6, pp. 38-47.

Dunham-Jones, E. and Williamson, J. 2009B. *Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs*. New York: John Wiley & Sons.

Ewing, R., Greenwald, M, Zhang, M., Walterns, J., Feldman, M., Cervero, R., Frank, L., and Thomas, J. 2010. Traffic Generated by Mixed-Use Developments: A Six-Region Study Using Consistent Built Environmental Measures. *Journal of Urban Planning and Development* (forthcoming).

Fee and Munson, Inc. 1983. Hacienda Business Park: Design Guidelines. San Francisco: consulting report.

Ferguson, E. 2001. *TDM and Public Policy*. Ashgate Publishing, Ltd.

Florida, R. 2002. *The Rise of the Creative Class*. Cambridge, MA: Basic Books.

Garreau, J. 1991. *Edge City : Life on the New Frontier*. New York: Doubleday.

Giuliano, G. and Small, K. 1991. Subcenters in the Los Angeles Region. *Regional Science and Urban Economics*, Vol. 21, pp. 163-182.

Giuliano, G. and Small, K. 1993. Is the Journey to Work Explained by Urban Structure? *Urban Studies*, 20: 1485-1500.

Giuliano, G., Redfearn, C., Agarwal, A., Li, C., Zhung, D. 2007. Employment concentrations in Los Angeles, 1980-2000, *Environment and Planning A*, Vol. 39, pp. 2935-2957.

Goldberg, D. 2010. Retrofitting the Suburbs: The Next Boom, or the Last Decade's Megatrend? *On Common Ground*, Summer, pp. 40-45.

Heavens, A. 2008. How to Create Smart Growth Business Districts. *Realty Times*, August 8. http://realtytimes.com/rtpages/20020128_smart.htm

Kneebone, E. 2009. Job Sprawl Revisited: The Changing Geography of Metropolitan Employment. Washington: Brookings, Metro Economy Series for the Metropolitan Policy Program.

Lang, R. 2003. *Edgeless Cities: Exploring the Elusive Metropolis*. Washington, D.C.: The Brookings Institution.

Leinberger, C. 2007. *The Option of Urbanism: Investing in a New American Dream*. Washington, D.C.: Island Press.

Lukez, P. 2007. *Suburban Transformations.* New York: Princeton Architectural Press.

Masotti, L. and Hadden, J. eds., 1973. *The Urbanization of the Suburbs*. Beverly Hills: Sage Publications.

Metropolitan Transportation Commission (MTC). 2000. "Census Transportation Planning Package (CTPP2000)." http://www.mtc.ca.gov/maps_and_data/datamart/census/ctpp2000/

Metropolitan Transportation Commission (MTC). "Zone Correspondence & Equivalency Files." http://www.mtc.ca.gov/maps_and_data/datamart/gis/corr1.htm

Nelson, A. 2008. Where Will Everybody Live?". In *The Business Case for Smart Growth.* Washington, D.C.: U.S. Environmental Protection Agency

PB Placemaking, et al. 2008**.** *Transforming Tysons: Vision and Area Wide Recommendations*. New York: report prepared for the Fairfax County Planning Board.

Prud'homme, R. and G. Lee. 1999. Sprawl, Speed and the Efficiency of Cities. *Urban Studies*, Vol. 36, No. 11, pp. 1849-1858.

Sohn, D. and Moudon, A. 2008. The Economic Value of Office Clusters: An Analysis of Assessed Property Values, Regional Form, and Land Use Mix in King County, Washington. *Journal of Planning Education and Research*. Vol. 29, pp. 86-99.

Song, S. 1994. Modelling Worker Residence Distribution in the Los Angeles Region. *Urban Studies*, Vol. 31, pp. 1533-1544.

Thomas, J. 2009. *Residential Construction Trends in America's Metropolitan Regions.* Washington, D.C.: U.S. Environmental Protection Agency.

Urban Land Institute & PriceWaterhouseCoopers. 2004. *Emerging trends in real estate.* Washington, D.C.: Urban Land Institute.

U.S. Census Bureau. "Census Tract Relationship Files." http://www.census.gov/geo/www/relate/rel_tract.html

U.S. Census Bureau. "Occupation Crosswalks for Comparing Data from 1990 Census to Census 2000." http://www.census.gov/hhes/www/ioindex/occcross_menu.html