California High-Speed Rail Project

Economic Impact Analysis Report

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1) Introduction

This report analyzes corridor wide economic impacts – i.e., the jobs created from construction, the impacts on productivity, output, and competitiveness, and station area impacts. This includes longer term economic impacts of HSR on productivity, business competitiveness, market extension, and economies of specialization and business interaction (sometimes referred to as agglomeration effects). The report includes the following sections:

- Economic Impact Workshop Overview – describes the results of a series of workshops that were held across the state to gather input from industry experts and stakeholders on measuring the economic impacts of California High-speed Rail.
- Literature Review – looks into the full range of economic impacts studied and observed around the world and the methodologies for how they were measured.
- State of the California Economy – describes the state and trends of the California economy to provide background for the rest of the analysis.
- Jobs from Construction – provides the background and sources used to develop the construction jobs estimates in the 2012 Business Plan.
- Productivity, Output, and Employment Impacts – provides an overview of potential long-term transformational changes that the California economy could experience from high-speed rail.
- Station Area Impacts – examines the potential for stations to serve as catalysts for development.

Together, these studies are designed to provide an understanding of how the high-speed rail will transform the California economy and what long-term impacts it will have on California's economy and cities.

A formal benefit cost analysis of the HSR project was prepared and is available as a separate document in the *California High-speed Rail Benefit-Cost Analysis (BCA)* report available at www.cahighspeedrail.ca.gov.

2) Economic Impact Workshop Overview

The 2011 California High-Speed Rail Business Plan set out to answer a series of questions about the financing, economics, operations, and other elements related to the implementation of the California High Speed Rail System (HSR). In developing its economic analysis, the team held a series of workshops across the state to listen and gather feedback on the methodology being used to assess the economic impacts of the high-speed rail program. The regional workshops were held in Southern California on July 19, the Central Valley on July 20, Northern California on July 21, and Sacramento on July 22.

Close to 100 members of local governments, economic development corporations, transit agencies, legislative staff, universities, and other organizations were invited to attend the workshops. Each participant was asked to provide feedback on the methodology, critical issues for consideration, and available studies that would improve the analysis. Methodologies presented and discussed in the workshops included benefit cost analysis, wider economic impacts analysis, and station area economic impacts. The discussions that were generated helped the project team fine-tune its analysis and develop a more context-specific final product.

Attending Organizations

Southern California
July 19, 2011

Gateway Cities Council of Governments
Los Angeles County Metropolitan Transportation Authority
Los Angeles Economic Development Corporation
Orange County Transportation Authority
Southern California Association of Governments
University of Southern California

Central Valley
July 20, 2011

California State University, Fresno
County of Merced
Fresno Economic Development Corporation
Fresno Office of the Mayor
Kern County Council of Governments
Kern County Economic Development Corporation
San Joaquin County Council of Governments
Stanislaus County Council of Governments

Northern California
July 21, 2011

Metropolitan Transportation Commission
Bay Area Economic Institute
Public Policy Institute of California
University of California, Berkeley
Center of Continuing Study of the California Economy
City of Elk Grove

Sacramento
July 22, 2011

California Department of Finance
California Legislative Analyst's Office

a. Southern California Workshop

In general, the Southern California Workshop focused on the importance of local, context-specific analysis in the Business Plan, as well as a balanced portrayal that identified potential negative impacts,

especially at the local level. There were concerns that these impacts would be absent from the Business Plan.

Several specific key issues were noted for consideration in the Business Plan and the Economic Impact Analysis:

1. As noted, participants stressed the importance of identifying localized impacts. This was expressed in comments about the economic impact of station and alignment choices, as well as the importance to Southern California stakeholders of disaggregated benefit-cost and economic impact results by region.
2. The localities are being asked to contribute a lot of money. As a result, they want to know what return they get on their investment and when will they see the benefits? This is an important consideration in the station-area impacts analysis and in the allocation of benefits to different parts of the state. Cities and regions are looking carefully at what they are asked to contribute and what they will get in return. They want the Business Plan and the Economic Impact Analysis to more clearly identify both their costs and benefits.
3. While most of the representatives perceived large economic development potential from HSR, they wanted to know after the Central Valley construction was completed if there are plans to extend construction to the Bay Area or south to the Los Angeles basin and what factors would drive that decision. Consequently, in addition to a clearer discussion of the benefits they would receive from HSR, participants wanted guidance on what they needed to do to prepare and when they might start to realize some of those benefits. Ideally, they asked for those decisions to be clearly spelled out in the Business Plan and to be based on the economic impacts of these choices.
4. Another key topic raised by the participants of the Southern California Workshop was a request for the Authority to acknowledge potential negative impacts of the program. In particular, participants cited possible negative impacts at the local level, including loss of tax revenue from land appropriations that might have a significant impact on the budgets of small cities along the route. Additionally, participants wanted the Economic Impact Analysis to include an evaluation of the impact of the Grapevine versus Antelope Valley alignments and the numerous Southern California station options.
5. There was an extensive discussion of the linkages between the financial and Economic Impact Analyses. For example, with limited outside funds, can some of the economic benefits be monetized and used to pay for the construction of the system?

Overall, the workshop provided valuable insight into local factors that might affect what economic impacts HSR will have in Southern California. While largely affirming that the overall statewide methodology is appropriate, participants stressed the need to study the details of the system and its impacts more closely.

b. Central Valley Workshop

The participants in the Central Valley Workshop wanted the Business Plan to clearly identify the system's benefits to the Central Valley. They view HSR as a tremendous infusion of money into the Central Valley economy and hope that it can help spur growth and development. The following were the main issues raised in the Central Valley workshop:

1. The jobs numbers cited in the Business Plan need to be credible, easy to understand, and broadly accepted.
2. Mirroring some of the questions from the Southern California workshop, participants in the Central Valley workshop asked what they would need to do to prepare for HSR in terms of housing and training the labor force. While some of the needed housing might be available due to the depressed economy in the Central Valley, will the counties need to plan for more housing construction? Additionally, they raised the issue of what happens to the economy, housing market, and employment market after construction is complete and the temporary jobs are gone. What permanent jobs will HSR create for the Central Valley?
3. The participants also wanted the Business Plan to address some of the negative impacts that HSR will, directly and indirectly, have on the agriculture industry. They raised concern about how much land will have appropriated for construction, and how many farms will lose value if their fields are split. Will HSR create more sprawl and accelerate the loss of agricultural land? To combat some of the criticisms from the agriculture industry, the participants wanted additional analysis of the potential benefits to the agriculture industry from improvements in goods movement and lower levels of congestion on the highway system.[1]

Similar to the Southern California Workshop, the Central Valley Workshop helped frame some of the local issues that will need to be addressed in the Business Plan and in the Economic Impact Analysis. Although the participants highlighted issues involving goods movement, housing, agricultural impacts, and employment, on the whole they approved of the methodology used in the Economic Impact Analysis.

c. Northern California Workshop

The main theme of the Northern California workshop was the uncertainty of forecasting the impacts from HSR. The uncertainty was expressed both in discussions of the Business Plan components, such as the fare structures, ridership forecasts, and dates of construction completion, and through fluctuations in wider economic conditions, such as higher driving/flight prices in the future. The following are the key points from the Northern California Workshop:

1. Some participants saw HSR as an insurance policy to ensure that the California economy can adjust if other transportation modes become insufficient.
2. With numerous inputs and assumptions leading to varying results from investment in HSR, workshop participants wanted to see more sensitivity testing around some of the key assumptions going into the models.
3. Another important area of discussion centered on the costs of alternative investments. How much would it cost to build equivalent highway lanes and runways? How else could this money be spent to accelerate California's economic growth? Although some of these broader frameworks are beyond the scope of the Business Plan, they are important rationales for why HSR is the right investment at the right time for the state.

[1] Most of these impacts, including land takings and impacts on agriculture are addressed in the Environmental Impact Studies now being prepared for the Merced-Fresno and Fresno-Bakersfield sections.

4. Like the other workshops, the Northern California workshop discussed disaggregated negative impacts of HSR, specifically in those cities along the right-of-way that will not have stations. How will they be impacted by land appropriation, noise, and other environmental impacts?
5. Unlike the other workshops, the Northern California workshop participants did not express concerns about potential significant negative impacts in their communities.

With less focus on local issues, the Northern California workshop delved into the broader impacts on the state as a whole as a result of constructing the system. Although they wanted the Business Plan to be more cautious by testing different future scenarios, workshop participants mostly viewed HSR as an important element of the investment in California's infrastructure.

d. Sacramento Workshops

The two Sacramento workshops were geared toward getting feedback from legislative staff on the methodology for the assessment of economic impacts. The following were the main issues raised in the Sacramento Workshops:

1. Echoing the comments made in the Northern California Workshop, both Sacramento workshops suggested looking at different scenarios to provide a clearer picture of the likely outcomes from the construction of HSR. The emphasis on sensitivity analysis centered on the ridership, revenue, and capital cost assumptions.
2. Additionally, participants wanted the Business Plan to provide a more thorough financing plan that focused on initial construction in the Central Valley, the system as a whole, and the role of the private sector.
3. Building on the question from the Southern California Workshop, the participants asked if there are any plans to extend construction after the Central Valley and if so, where would the money come from?
4. The Sacramento workshops reemphasized the importance of credible assumptions feeding the Economic Impact Analysis. They actively supported more transparent methodologies and were interested in greater access to the models being used in the Economic Impact Analysis. In particular, they asked that assumptions include citations for sources.

Similar to the other workshops, the Sacramento workshops approved of the overall methodology being used in the Economic Impact Analysis. In addition, they wanted the Business Plan to provide more details on implementation options, including the sensitivity of the results to various future scenarios. By admitting a level of uncertainty and listing the assumptions that feed the best and worst case scenarios, the Business Plan should include different visions for the future and provide a more nuanced analysis of the program's impacts.

3) Literature Review

a. Capacity Benefits

Since Japan built the first high speed rail line between Tokyo and Osaka in 1964, largely motivated by congestion on the existing rail infrastructure, countries in Europe and Asia have been motivated to develop similar systems for a variety of reasons. As high speed rail systems around the world mature, there is an increasing amount of empirical evidence that supports these major investments based on a wide range of factors. These factors that motivate investment in high speed rail differ by country and generally include several of the following: time savings, safety, environmental concerns, road and air congestion, and impact on the regional economy and employment (SDG, 2004).

As in Japan, development of the original TGV line between Paris and Lyon was largely motivated by congestion on the existing rail line. It was also driven by the desire to divert the growing air market between Paris and Lyon to rail (Nash, 2009). Empirical evidence from Europe shows that this line, as well as other in France and Spain, has been successful in diverting air passengers to rail (Nash, 2009). With some of the largest regional air markets in the country, California is a good candidate for air to rail diversion. Los Angeles to San Francisco is by far the largest air market in the country of less than 500 miles, with more than 2,500 passengers per day traveling between the two markets. This is almost 50 percent more than the New York to Boston market, the second largest short-haul market in the country.

Table 1: Before and After High Speed Market Shares

	TGV Sud-Est		AVE Madrid-Seville	
	Before	After	Before	After
Plane	31%	7%	40%	13%
Train	40%	72%	16%	51%
Car and Bus	29%	21%	44%	36%

Source: Nash 2009

These short haul flights occupy key air slots and gate capacity that could be better utilized by higher value transcontinental or international flights. A study of the New York Metro Region found that as a result of airport congestion over the next 18 years, 5,600 full-time jobs will not be created, resulting in over $16 billion in lost output and $5.5 billion in lost labor income (PFNYC, 2009). These losses are in addition to costs incurred by system users and reflect costs to the regional economy as a whole that result from productivity losses that are directly attributable to air traffic congestion. Similar conditions exist at the major airports in California, with flight delays threatening comparable losses to the regional economies in the Bay Area, Los Angeles, and San Diego. According to the Bureau of Transportation Statistics, over the first six months of 2011, flight delays in three major California airports were:

- SFO – 27% of flights delayed
- SAN – 25% of flights delayed
- LAX – 24% of flights delayed

These delays are indicative of the inability to handle the growth in regional air travel at the region's airports. Available slots at these airports are becoming an increasingly scarce commodity. Because of the scarcity of air slots and the focus on premium long-haul travel, several International airports have severe constraints on short-haul flights, including London Heathrow, Paris Orly and Milan Linate (SDG, 2006). All three of these cities have high speed rail links to important short-haul markets. The City of Los Angeles has limited the capacity of LAX by restricting the number of gates to 153, thus impeding its ability for the airport to handle the 156 million annual passengers expected for the region in 2015 (LAXMP, 2004). Given the capacity constraints at LAX and the demand for international flights, travel between Northern and Southern California will be pushed to outlying airports or reduced altogether if alternative new capacity is not provided between the two primary economic engines of the state.

b. Wider Economic Impacts

Economic development has also played an important role in motivating investment in high speed rail and is prominent in the evaluation criteria utilized in most countries (SDG, 2004). Although these major investments in high speed rail have the potential to greatly reduce travel time and improve market accessibility, attempts to quantify the economic impact that will result from changes in accessibility remain difficult to predict and quantify (Amos, 2010). These wider economic benefits that result from increased market accessibility can be described as the increase in total welfare above the measured increases in net user benefits. These impacts can be measured by the increase in GDP that occurs as a result of changes in economic activity due to the changes in transportation (de Rus, 2009).

A growing body of literature suggests that traditional economic models underestimate the economic impact of high speed rail investment associated with agglomeration benefits by 10 to 80 percent (Preston, 2006). Agglomeration benefits in an economy arise because of the advantages that result to firms from the spatial concentration of economic activities (Graham, 2007). Increasing the size of a labor market, by improving accessibility with the introduction of new transportation infrastructure, can increase productivity by allowing a greater degree of specialization. With larger labor sheds, firms have access to a greater number of potential workers, increasing the likelihood of filling jobs with the best candidates. Agglomeration benefits are also said to occur as increases in effective market reach and density reduce firms' barriers to entry, increasing competition and lowering costs (UK, Department for Transport, 2009).

The extent to which high speed rail will change the economic landscape is not fully understood, but investments in transportation infrastructure throughout history have created fundamental shifts in the spatial relationship between places.

> *"The Interstate System provided a new envelope of space, time, and cost, in which our economy could reorganize. No one who designed the Interstate Highway System could have predicted exactly what would happen to the overall economy as a result of the investment in the Interstate System" (NCHRP, 2006).*

Indeed, studies of the wider economic impacts of the Interstate System demonstrated rates of return and productivity gains that reached as much as 35 percent per year during the first 15 years after WW II – well above rates of economic return for private investments (Nadiri and Manuneas, *Contributions of Highway Capital to Industry and National Productivity Growth*, 1996 and *Contribution of Highway Capital to Output and Productivity Growth in the U.S. Economy and Industries*, 1998).

While the nation's transport system is far more complete now than it was 50 years ago, intercity rail has barely expanded and continues to operate mainly regionally and at relatively lower speeds. By completing this "gap" in the transportation network, benefits of high speed rail development can extend well beyond direct user benefits and diversions from air and highway. New economic relationships develop between places when they are brought within two to four hours by rail. In France, a two hour trip time has been critical to diverting air passengers to rail. It has also generated a significant amount of new trips that reflect new economic activities and synergies between Paris and Lyon (de Rus, 2009). Nearly fifty percent of the additional traffic between Paris and Lyons in the first four years was newly generated, not merely a redistribution of the existing travel market (Bonnafous, 1987). Accounting for these newly generated trips is becoming more important in the planning phase of these megaprojects. In the planned in the high speed rail corridor between Sao Paolo and Rio de Janeiro, twenty percent of total projected trips are estimated to be induced by the new service as a result of new economic opportunities and new developments in the corridor (Halcrow, TAV, 2009).

Research from Europe suggests that although the contribution to total EU GDP from high speed rail investment is relatively modest at 0.25 percent, regional impact can be much larger. Using a general equilibrium model to estimate regional impact, Preston estimates that total impact can equal up to three percent of regional GDP (Preston, 2006). Empirical evidence on wider user benefits from Europe using the LUTI (Land Use Transportation Interaction) and CGE (Computable General Equilibrium) models suggests that wider economic benefits will account for up to 40 percent of total benefits, with a likely range of 10 to 20 percent (Gines de Rus, 2009). These wider effects will also be greater in larger markets resulting from agglomeration effects (ibid). The main economic impacts from HSR in California will likely occur in the areas close to the major economic centers – the Peninsula and Los Angeles Metro areas. Whether these agglomeration benefits will be at the high end or low end of the estimated range will be determined by the level of integration between the San Francisco and Los Angeles economies (Landis, 2011).

Applying the method developed for the Department for Transport, KPMG, in a study performed for Greengauge21, estimated that the wider economic benefits from investment in a high speed rail network in the UK would add 10 to 20 percent of benefits in addition to the assessed impact and increase total GDP by up to two percent (Greengauge, 2010). With a total state GDP of $1.9 T in 2010, a two percent expansion in California's Gross State Product (GSP) would amount to an additional $38 billion in economic activity in the state directly attributable to the high speed network (data from Bureau of Economic Analysis).

In line with the French experience, high speed rail in the UK has "had substantial and demonstrable effects" in generating new economic activity in cities brought within two hours of London. (Lin, Hall, 2009). These benefits, however, have not been evenly distributed. Cities with service economies generate many more benefits from HSR development than cities with a primarily manufacturing based economy, which see relatively few agglomeration effects (Albalate, 2009). Research conducted for the OECD estimates an average agglomeration elasticity of 0.12 for the economy as a whole. These elasticities were highest for the banking, finance & insurance (.24), and other service-related industries; and lowest for manufacturing and construction (0.08) (Graham, 2007). This study confirms the 10 to 20 percent expectation in additional economic benefits that agglomeration impacts can add in addition to conventional user benefits.

Reducing travel time and improving the ease of travel between major economic centers will broaden the metro scale markets for companies in the service sector and facilitate an integrated statewide economy for these firms. Greengauge21 argues that in the UK high speed rail investments will support the long term structural change towards the knowledge economy, accelerating economic growth and enhancing productivity (Greengauge21, 2010). California is well positioned to leverage investments that enhance productivity in the service sector. Thirty-seven percent of the state's $1.9 trillion GDP is attributable to service industries, including information; finance and insurance; real estate; and professional and technical services (BEA). The share of these industries is even higher in Los Angeles and San Francisco, 44 percent and 42 percent respectively.

It is not only Los Angeles and San Francisco, however, that can benefit from this new economic geography created by high speed rail. The experience of smaller cities from Japan and Europe that lie along a high speed route between two major metropolitan regions can offer lessons for cities in the Central Valley. Kakegawa, Japan is a medium sized city of 72,000 people midway between Tokyo and Osaka. When Shinkansen was originally developed, the service did not stop in the city and, thus, generated no local benefits. Following the construction of a station in 1988, the city experienced an increase in employment, tourism, and conference activity (Okada, 1994). This experience could offer lessons for the Central Valley cities of Bakersfield and Fresno, both larger than Kakegawa (350,000 and 110,000 respectively) located between the major metropolitan areas of Los Angeles and San Francisco.

In general, Japanese cities with high speed rail stations achieved average population growth rates of 1.6 percent while bypassed cities grew at one percent. These increases were more pronounced in cities with information exchange industry and access to higher education (Albalate, 2010). Similarly, the German cities of Montabaur and Limburg, with populations of 12,500 and 34,000 respectively, have benefited from being connected via HSR to Frankfurt and Cologne. Counties in which these towns are located experienced a 2.7 percent increase in GDP due to the increase market accessibility to the larger cities (Ahfeldt, 2010).

Size and density also impact the extent to which a region can leverage investment in transportation infrastructure into economic gain. Effective density is a more important influence than absolute size in

the development of agglomeration. Large sprawling areas of low density development fail to show the benefits of agglomeration (Halcrow, Scotland, 2009). This suggests that similar levels of investment in California's transportation infrastructure in highways that will tend to further the development of low density sprawl and maintain the geographic isolation of existing economies of Southern, Central, and Northern California are unlikely to contribute the same agglomeration benefits as investments in the high speed rail network. Unlike investment in highways, rail is by its nature a nodal system that reinforces accessibility to key points on the network, connecting these points to each other.

c. Station Area Development

There is no grounded empirical work to date on the economic development impacts of high speed rail in the United States, since such services do not exist (Levinson, 2010). The theme of the literature available on the impacts of high speed rail and development of station areas recognize success is not certain. Examples from European and Japanese cities have demonstrated how a high speed rail station can be a catalyst for improved urban environments, both in the form of great architecture for the train stations and through well-designed new development in the surrounding area (SPUR Report, 2011). One uncertainty is the conditions under which HSR can cause accelerated economic growth in terms of jobs, households, or real estate values (generally), and further, the extent to which HSR results in new economic growth or shifting of growth from one area to another.

Levinson (2010) summarizes the effects of local transit systems on land use in a variety of US cases. Most of these cases find that commercial and residential values have been uplifted by rail transit access but findings are not uniform. For instance, Landis (1995) found no incremental increases in commercial property values around BART but did find residential impacts on land value and development densities. Others (Cervero, 1994; Weinberger, 2001) concluded that commercial properties near transit stations are likely to demand higher rents if transit users directly interact with the property (i.e. there are no impassable barriers to access like major roadways or sewer culverts).

Generally, specialty retail shops and office properties are most likely to realize higher rents compared to grocery or other big box retail centers, due to the difficulty of carrying large quantities of goods on the train; plus, larger retail centers are often located where auto access is not impeded by congestion and parking issues.

Residential properties tend to also have value premiums the closer they are to transit stations, so long as the trains or immediate station area activities are not overly disruptive to the residences (nuisance effects), though Chen et. al. (1998) found that positive benefits outweigh nuisance effects in the case of Portland Streetcar. Multifamily property and rental units may be less sensitive to station area noise due to the preferences of people living in these structures being oriented toward location rather than resale value.

Downtown HSR stations can experience , land use benefits in the form of higher local densities and higher local rents. However, the conclusion is widely held that enhanced transit alone may not cause a

significant change to the real estate within some proximity of a station. Existing land uses, the transit mode and service provided, and local planning policies, among other things, all contribute to the success or failure of a transit station's ability to positively affect its surroundings. The user market that the HSR facility serves and its relation to a given station area, perhaps more so than local transit, will help determine the magnitude of impacts to the station area.

In a study commissioned by Banco Interamericano de Desenvolvimento, HSR was found to increase property value when improved convenience of accessing other parts of the region is presented, and when intensified land uses are valued. The increased accessibility of railway station areas – especially the high speed railway stations due to the connectivity effect – leads to a higher attractiveness of railway station locations and therefore to a higher concentration of offices around stations (Willigers, et. al., 2005). Again, this report notes the importance of market factors and land use planning for positive station area (or sub-regional) real estate changes to occur.

Other research supports the notion that station area development alone will not bring about economic development. Simply providing high speed rail does not in itself strengthen the economy of the city, nor necessarily support it (Greengauge, 2006). In a study commissioned by the City of Birmingham (UK) and Greengauge21, HSR was found to reinforce existing conditions and hence had a "regeneration" effect. Increased commercial activity, real estate values and lower vacancy rates may be evident, but would not occur without displacement.

Cervero and Murakami's (2010) study also realized economic impacts concentrate in global cities. They found that increased density of jobs in knowledge industries had formed around stations (more so than control areas), suggesting that HSR can be more favorable to these particular types of industry sectors than commercial/service sectors in general.

Cervero and Murakami also found that large edge cities appear to benefit from increased knowledge industry activity and that intermediate cities require policy partnered development and intra-city connections to realize growth above the trend. Most of the decision-making powers regarding land use are held by local governments. Yet in order for the entire state's high speed rail system to work, each local community must support an appropriate land-use response. This means planning for growth, accumulating and rezoning parcels, and approving specific development projects (SPUR Report, 2011).

To further support our literature survey of station area impacts, we interviewed Professor John Landis at the University of Pennsylvania. Landis is one of the leading researchers in this area, and has conducted a number of important hedonic price studies of the impacts of rail station proximity on property values and development, including studies of BART. Landis felt that cities in the Central Valley could see a small amount of clustering around stations, as a result of better connections to San Francisco and Los Angeles, for selected uses such as business or medical services. This clustering, however, might represent a shift in demand which would otherwise be more dispersed around the region (Landis, 2011). Landis acknowledged the potential for manufacturing in the Central Valley for some types of higher value added products, and some possible synergies with the intermodal/logistics hubs being planned in the

Central Valley. These cities may also see some back office development, but major population growth was not foreseen, due to poor development patterns (Landis, 2011).

d. Implications for California

International experience suggests that the large regional air markets tied to large dynamic metropolitan areas in California will likely result in ridership levels on California's high speed rail network well in excess of 8 to 10 million passengers for a line of 500 km that de Rus and Nombela estimate is necessary to justify high speed rail investment (de Rus, Nombela, 2007). The state is also well positioned to leverage these investments in high speed rail. Unlike many European systems in which smaller provincial towns are connected to dominant economic centers (as is the case in France) the linking of two large relatively independent metro regions in California could result in agglomerations benefits at the high end of the estimated range.

Empirical evidence has shown that cities brought within two hours of a major economic center show the most economic benefit from rail. This has important implications for Bakersfield, Fresno, and other Central Valley cities, all of which will be within two hours by rail to both San Francisco and Los Angeles. The high speed rail network in California has the potential to increase business-to-business interaction between Southern and Northern California, integrate the economies of the Central Valley, and provide capacity in the congested airport hubs for higher value international connections.

The greatest volume of urban redevelopment attributable to HSR – together with other factors – will likely occur in the major metropolitan regions of the Bay Area and the LA Basin. Major economic centers such as San Jose and San Francisco will become more fully integrated with each other and with cities on the other side of the state such as Los Angeles and Anaheim. At the same time, cities in the Central Valley could see moderate clustering of development around stations and general downtown redevelopment , as a result of better connections to San Francisco and Los Angeles. In some areas, such as Fresno, formal downtown development plans and/or planning processes have been actively advanced and local support is strong. Moreover, HSR stations represent the single largest positive change factor in these downtowns in many years. Specific development opportunities include selected uses such as business or medical services, and back office development. There may also be good potential for manufacturing in the Central Valley for some types of higher value added products, and some possible synergies with the intermodal/logistics hubs being planned in the Central Valley. The extent of such downtown and station area redevelopment effects in the Central Valley cities will be a function of market factors, but equally, the extent to which local officials and planners create the right conditions, including planning and infrastructure support, zoning support, financial incentives, and other factors.

With six metro regions in the state with a population of over one million, high rates of service sector employment, and commitments throughout the state to supportive local and regional transit systems, international experience suggests that high speed rail in California is a worthwhile investment.

e. Methodologies for Wider Economic Benefits

Department for Transport

http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.5.14c.pdf

Accounts for:

- Agglomeration
- Increased or decreased output in imperfectly competitive markets
- Labor market impacts – more or less people working and the move to more or less productive jobs

HEATCO – Developing Harmonized European Approaches for Transport Costing and Project Assessment

http://heatco.ier.uni-stuttgart.de/

This is an attempt to standardize the guidelines for project assessment on EU level and to provide a consistent framework for monetary valuation.

Greengauge21: High Speed Rail Consequences for Employment and Economic Growth

http://www.greengauge21.net/wp-content/uploads/employment-methodology.pdf

Empirical estimates of impacts on wages from increased labor and firm market density. Wages are utilized as a proxy for productivity. The study includes econometric estimation of elasticities of wages, productivity, and output with respect to market density (effective market reach) for Great Britain, utilizing small area economic data for the entire country. Changes in effective market size/density are modeled against a no HSR option.

BRAZIL TAV PROJECT Halcrow – Sinergia Consortium Volume 3 Economic Benefits Appraisal

Method for wider economic development benefits: Using the "rule of half," new travelers experience the same travel time saving benefits as other users of TAV and are assumed to experience half of the average benefit accruing to other travelers.

Estimate these benefits by:

1. Extracting induced demand forecasts from our demand model for each forecast year
2. Multiplying these traffic forecasts by average time savings for both express and regional markets
3. Multiplying by the average value of time for each market (see earlier in this chapter)
4. Dividing by two

Graham (2007)

External benefits from transport investments related to agglomeration that can be quantified using elasticities of productivity.

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4) State of the California Economy

The economic impacts of the HSR project will take place in the context of the larger conditions and forces shaping California's economy now and into the future. This section provides a snapshot of the current conditions, industry structure, and recent trends in the California economy as a whole and the three major economic regions that will be impacted by Phase 1 of the high-speed rail system: the San Francisco Bay Area, the Central (San Joaquin) Valley, and Southern California (Los Angeles Basin). The main sources of data include the U.S. Census, the American Community Survey, Bureau of Economic Analysis, Bureau of Labor Statistics, the California Department of Finance, and the California Department of Labor.

a. Statewide

California is home to a vibrant and diverse economy. If California was a country, its $1.9 trillion economy in 2010 would rank 9th in the world[2]. California's Gross State Product (GSP) is 30% larger than the GDP of Russia, 143% larger than Holland, and 341% larger than Taiwan – all countries that have already built high-speed rail[3].

With 37.3 million residents or 12% of the U.S. population, California contributes 13%, or almost 10% more than the average per-capita, to U.S. GDP. California's larger contribution to GDP than population in large measure reflects a higher concentration of knowledge industries in the state, and the high value added associated with those industries[4]. The location quotients for all but one of the six knowledge industries in California are either 1 or higher with the information industry being the highest at 1.4[5]. This means that California has a 40% larger share of workers in the information industry than the country as a whole. While knowledge industries accounted for 18% of the jobs in California in 2008, they contributed 40% of the state GSP. Knowledge industries often depend on face-to-face communication for collaboration and productivity so they would stand to gain the most from the connectivity offered by high-speed rail.

Despite the bursting of the high-tech bubble in 2000 and the global financial crisis in 2008, California's economy grew by $530 billion or 40% from 2000 to 2009. However, the state as a

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[2] U.S. Bureau of Economic Analysis. GDP by State. 3 Aug. 2011. http://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=1.

[3] *The CIA World Factbook, 2011*. U. S. Central Intelligence Agency. Web. 3 Aug. 2011. <https://www.cia.gov/library/publications/the-world-factbook/index.html>.

[4] For purposes of this analysis, knowledge industries are defined as Information, Finance and Insurance, Professional and Technical Services, Real Estate, Management, and Education.

[5] Location quotients compare the concentration of something, in this case employment, in one area (California) to a larger area that it is a part of (the United States).

whole was outpaced by the knowledge industries, which grew by 49% or $244 billion over the same time period. The overall growth in GSP led to an increase in median household income from $47,500 to $59,000 or 24%[6].

While California prospered for most of the past decade, the recent recession has led to tremendous hardship for many Californians. As of February 2012, the California unemployment rate stood at 10.9%—third highest of any state in the nation. This is down from an all-time high rate of 12.5% in December 2010. There are currently over two million Californians looking for work. Out of all the industries, the construction industry was one of the hardest hit by this recession. The $6 billion investment in the first construction segment of the IOS over the next five years will put thousands of Californians back to work and provide much-needed relief while the rest of the economy continues to recover.

[6] *Table P53: Median Household Income*. U.S. Census Bureau, 2000. And *Table B19013: Median Household Income in the Past 12 Months*. American Community Survey, 2009.

Table 2 California Private Sector Employment and Productivity by Industry

Industry	Employees (thousands)	Industry Contribution to GSP ($ millions)
Total for all sectors	12834	$1,620,000
Agriculture, forestry, fishing, and hunting	25	$24,753
Mining	22	$16,723
Utilities	59	$30,652
Construction	669	$67,236
Manufacturing	1246	$206,152
Wholesale trade	827	$97,730
Retail trade	1544	$107,063
Transportation and warehousing	429	$42,918
Information	**528**	**$122,695**
Finance and insurance	**610**	**$104,761**
Real estate and rental and leasing	**283**	**$309,359**
Professional and technical services	**1134**	**$166,840**
Management of companies and enterprises	**265**	**$24,987**
Administrative and waste services	989	$50,690
Educational services	**341**	**$17,953**
Health care and social assistance	1679	$118,058
Arts, entertainment, and recreation	296	$22,010
Accommodation and food services	1333	$49,166
Other services, except government	551	$43,855

b. Bay Area

The California Economic Strategy Panel from the California Department of Labor breaks down California into nine analysis regions. The Bay Area region consists of Alameda, Contra Costa, Marin, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano and Sonoma Counties.

By almost every metric, the Bay Area is one of the most economically concentrated areas of both the state and the country. In 2010, the Bay Area population was 7.5 million or 20% of the state's 37.3 million people, but the region's three million jobs represented 24% of the state's

total. The weighted average median household income in the Bay Area was $75,000, 27% higher than the rest of the state. Throughout the recession, the Bay Area unemployment rate has been about 1-1.5% less than the state as a whole. The Bay Area is home to ten companies on the Forbes 100 list and 30 companies on the Forbes 500 list of the largest companies in the U.S.[7] Thus the Bay Area is producing more jobs per capita than the rest of the state at higher wages and with subsequently lower unemployment rates.

The Bay Area is known for the Silicon Valley and the high-tech sector. One of the main reasons for the Bay Area's economic strength is its disproportionately high level of employment in the knowledge industries. The location quotients for employment in all six knowledge industries are at least 1, with Professional Services and Management the highest at 1.4. Almost 30% of the state's knowledge industry workers are in the Bay Area, compared to 20% of the state's population. Many major knowledge industry companies are headquartered in the Bay Area including Google, Apple, Facebook, Hewlett Packard, Genentech, Visa, and Wells Fargo Bank, as well as newer startups such as Zynga and Dropbox. In 2009, $7 billion out of $9 billion in statewide venture capital investment was in the Bay Area. Through even the hard economic times of the early 2000s, the Bay Area has been able to maintain its edge as a leader in innovation thanks largely to the strengths of its knowledge industries—both in terms of professional services and manufacturing.

Despite the overall strength of the Bay Area economy, the region is growing slower than the rest of the state. While the California population grew by 9% from 2000 to 2009, the Bay Area only grew by 4%. Growth in median household income outpaced the state by about $1,000 but because incomes were significantly higher to begin with, the 20% growth in the Bay Area was slower than the 24% growth statewide. This might indicate that the Bay Area is reaching a plateau of growth and could benefit from greater integration with the rest of the state's economy to produce more synergies among firms and industries centered in different parts of the state.

c. Central (San Joaquin) Valley

The California Economic Strategy Panel includes eight counties in its San Joaquin Valley region: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare. These counties represent California's agricultural heartland but most have endured long periods of weak economic performance by many measures of economic well being.

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[7]"Fortune 500 2011: States: California Companies - FORTUNE on CNNMoney.com."*Business, Financial, Personal Finance News - CNNMoney*. Web. 08 Aug. 2011. <http://money.cnn.com/magazines/fortune/fortune500/2011/states/CA.html>.

In almost the reverse of the Bay Area, the Central Valley has underperformed by most economic metrics. With 10% of the state's population, the Central Valley has only 7% of the state's jobs and 4% of the state's knowledge industry employees. In 2009, average median household income in the Central Valley was $46,600, 21% lower than the median statewide. Unemployment rates in the Central Valley are the highest in the state and currently stand at close to 15%—over 4% higher than the state as a whole. No Forbes 500 companies are headquartered in the Central Valley and few of them even have offices in the region. The location quotients for all of the knowledge industries are below 1 and real estate is the highest at 0.7. In fact, the Central Valley economy is extremely concentrated in the extraction industries of agriculture and mining, both of which have location quotients close to 5.

The most promising aspects of the Central Valley economy are its trends over the past decade. The region's population grew almost twice as fast as the rest of the state (17% vs. 9%) and the Central Valley accounted for almost 20% of the total population growth in the state from 2000 to 2009. Additionally, the median household income grew by 27%, which is 3% higher than the rest of the state. However, in absolute terms, median income growth was still over $1,500 lower than the rest of the state. Thus while the Central Valley showed some promising growth in population and income, it remains the weakest region of California's economy.

The poor economic conditions in the Central Valley will not be turned around overnight and no one program will be enough on its own. However the almost immediate $6 billion of infrastructure investment in the region from the construction of high-speed rail will provide a much-needed infusion of capital into the regional economy, will create a significant number of jobs, and can help lay the groundwork for the Central Valley to catch up to the rest of the state. Additionally, the Central Valley might see some development of knowledge industry back offices or manufacturing activities thanks to its cheaper land and labor costs and improved connectivity from high-speed rail.

d. Southern California (Los Angeles Basin)

The Southern California region consists of five counties—Los Angeles, Orange, Riverside, San Bernardino, and Ventura—and makes up nearly half of the state's population. With such a large share of the state's population, the performance of the Southern California economy tracks closer to the state as a whole than any other region.

The characteristics of the Southern California economy are most representative of the state. With 48% of the state's population, Southern California is home to 49% of the state's workers and 49% of its employees in knowledge industries. The weighted average household income in

Southern California is 1% lower than the state as a whole but it grew by 7% more from 2000 to 2009. For the past several years, unemployment in Southern California has fluctuated within a one percent range of the statewide rate. The location quotients for all industries except the extraction industries—agriculture and mining—ranged from 0.9 to 1.2, again showing that the Southern California is markedly similar to the state. The Southern California region is home to three companies on the Forbes 100 list and 25 companies on the Forbes 500 list.

The size and diversity of the Southern California economy makes it an ideal partner for the more focused Northern California economy. High-speed rail will improve access and connectivity between the two megaregions and can create interconnected clusters of activities on both sides of the network. The areas in Southern California with quality connections to the system will be able to retain and attract businesses that l provide their services locally and to clients in the Bay Area. In turn, businesses in Northern California will have larger markets for their goods and reduced costs of production from competition among input providers. Improved access between the Bay Area and Southern California can potentially create specialization of activities around stations in each region focused on the linkages between the two economies. Knowledge industries will be the most likely to benefit from the improved connectivity and to subsequently group into clusters designed to promote collaboration and efficiency.

5) Jobs from Construction

This section estimates the range of employment impacts to the economy as a function of construction spending. Because the California High Speed Rail Project (CA HSR) is expected to be a significant investment, it is necessary to have an estimate of how many jobs the project is expected to generate as a result of capital construction. The CA HSR 2012 Business Plan uses a figure of 20,000 job-years of employment generated per $1 billion (in 2010 $) in capital expenditures, a figure that falls within the acceptable range of employment impacts cited by other sources. This employment factor should be compared to jobs estimates for construction / capital spending and not be mixed with O&M spending.

Job Estimation Methodology

There are various models used to develop job estimates, and most involve input-output modeling whereby industry-by-industry requirements and purchases through an economy are aggregated. By using employment-to-output ratios, the employment effects of additional spending in a certain industry can be identified.

Models may include three types of employment impacts:

- Direct: jobs created directly from the expenditure, such as hiring construction workers.
- Indirect: jobs created by secondary activity related to the expenditures, such as the jobs generated in the professional services industry in support of the larger construction project.
- Induced: jobs created by additional spending through the economy. These are the employment effects that occur when employees spend their money in other industries, such as wages being used for retail purchases.

While direct and indirect jobs are commonly produced, multiplier effects for induced jobs vary, resulting in differing estimates. Furthermore, because multipliers represent a snapshot in time of an economy, they represent only current or recent economic relationships and technologies. They do not capture structural changes to the economy, new technologies, or changes in wages that have occurred since those data were produced, or that may occur in the future. Thus, numbers can vary as differing sets of multipliers are used, and as costs are adjusted to reflect models from previous years.

Finally, jobs estimates always represent “job-years.” This refers to the idea that one person working a job for 20 years would represent 20 “job years.” Thus, these figures should be interpreted as employment in years, and not necessarily equated to the number of individuals.

Job impact estimates from different sources must be used with caution, as differences in methods can produce results that are not perfectly comparable. Among these methodological differences are the following:

- Different base years – Employment impacts per billion dollars (or any other fixed amount) will vary somewhat depending on the base year, as a result of inflation. Assuming constant technology and real dollar earnings per worker, a billion dollars in one year will be equivalent, in real terms, to something less than one billion in subsequent years. Workers per billion will decline somewhat over time as a result of this inflationary effect.
- Regional/state impacts vs. national impacts – In most cases, job estimates for the nation as a whole will be higher than a specific state or region, as most states do not produce every type of equipment needed for transit operations, and thus must procure these from out of state or even import them.
- Different input output (IO) models and multipliers – IO models require intensive data collection and manipulation. Most regional or state models are not developed from local surveys of actual economic data and relationships specific to the area, but are rather based on national input output inter-industry relationships, adjusted using various short cut techniques. Moreover, some input models are "closed" while others are open, interregional models which reflect regional input and output flows. Models are available form different sources, and these will generally differ.
- Choice of multipliers – A full set of IO based multipliers will disaggregate impacts into direct, indirect, and induced employment, and other economic impacts. Jobs per billion dollars of spending reported in various sources may not always include all three of these outcomes.
- Changes in technology and economic structures – Input output models and their associated multipliers are static – they reflect current or at least recent economic relationships among industries. However, as the economy and technologies evolve in the future, these relationships will change. For example, in the future, as construction becomes more heavily automated, fewer workers per dollar of construction output may be needed. Or as raw materials such as cement or steel may be imported from outside the US more than at present, domestic flows will change, and domestic effects will be reduced.

The following is a summary of jobs estimates from construction commonly referred to.

APTA (2009) – In a report for the American Public Transit Association (APTA), job impacts of public transportation expenditures (both capital and operations) were examined. This report serves as an update to a previous APTA study (1999) where the economic impacts and jobs estimates of capital and operations spending were estimated using a regional economic impact model from Regional Economics Models Incorporated (REMI). The allocations of expenditures were estimated given average FTA data.

In 2009, APTA updated the previous figures to reflect changes in producer price indices for transit costs. The analysis adjusted figures for 2007 producer prices, and estimated 24,000 jobs per $1 billion in capital spending in transit; 41,000 jobs for operations spending in transit; and an average mix of 36,000 jobs per $1 billion dollars of combined spending in transit.

It is important to note that the number that should be used for comparison is 24,000 jobs per $1 billion in capital spending. This is because these represent temporary construction jobs, while O&M jobs are long-term and occur over a period of many years of operations.

The APTA figures include direct, indirect and induced jobs.

American Association of Railroads (2011) – According the American Association of Railroads, a $1 billion dollar investment in railroad infrastructure leads to 20,000 job-years of employment. This is based off on "a U.S. Department of Commerce / Bureau of Economic Analysis model of the U.S. economy." The model is not specifically identified in this report, and it is not stated whether indirect and induced jobs are included. It is possible that the model referred to is the Department of Commerce's Bureau of Economic Analysis RIMS model. This model, which stands for Regional Input-Output Modeling System, is a commonly used source of economic multipliers, and is based on national input output tables, adjusted to a degree for local conditions. Various generations of RIMS models have been produced, including RIMS II, a second generation of models.

Federal Highway Administration (2011) – The FHWA estimates that for every $1 billion in highway spending (including right of way purchases), approximately 27,800 job-years of employment would be created. This includes direct, indirect, and induced jobs. Of these jobs, 14,975 are direct and indirect jobs, while 15,094 are induced. This analysis was conducted using input-output modeling, though the specifics of which model used were not included.

Washington Department of Transportation (2011) – Using the Washington State Input-Output model, WSDOT estimates 11,400 job-years per billion in construction spending and 16,000 per billion in transportation operations. These figures include direct, induced and indirect jobs.

Council of Economic Advisors (2009)– For the American Recovery and Reinvestment Act, the President's Council of Economic Advisors estimated the likely jobs impacts of increases in governments spending. The methodology used was to take a typical reinvestment package and apply various GDP multipliers to the package in order to estimate the effects on the economy. Changes in GDP were then translated to increases in jobs. This report estimated that for every $1 billion in government spending there would be nearly 10,854 job-years created. This only includes direct jobs and not indirect or induced jobs.

Congressional Research Service (2009)- Levine (2009) examined the employment effects of infrastructure spending using the Bureau of Economic Analysis employment requirements table, as well as RIMS II tables.

Levine finds that the BEA Employment Requirements Table estimates 11,786 direct and indirect job-years per $1 billion in infrastructure spending. RIMS II, she finds that the U.S. as a whole produces 14,315 job-years per $1 billion in spending; and for California in particular, 12,289 job-years per $1 billion. These estimates do not include induced jobs.

Parsons Brinckerhoff (2008). For the California High Speed Rail Authority in 2008, Parsons Brinckerhoff conducted a jobs analysis of construction expenditures using RIMS II multipliers. Disaggregating construction costs into various industries and applying the RIMS II multipliers, this report estimated job impacts between 20,097 to 20,748 job-years per $1 billion in spending. These impacts reflect jobs at a national level, rather than specifically for California. In most cases, job estimates for the nation as a whole will be higher than a specific state or region, as most states do not produce every type of equipment needed for transit operations, and thus must procure these from out of state or even import them.

Results

The results presented in this section are broken down by each step in the implementation strategy. The full description of each step is available in the 2012 Business Plan, Chapter 2, *A Phased Implementation Strategy*.

- **Step 1**—Start construction of an Initial Operating Section with the first segment of it in the Central Valley.
- **Step 2**—Introduce the state's (and nation's) first fully operational high-speed service with the Initial Operating Section between the Central Valley and the San Fernando Valley through Sylmar, Burbank, or Santa Clarita.
- **Step 3**—Bay to Basin will complete the remaining extension from Step 2 to the north to San Jose.
- **Step 4**—Phase 1 will provide HSR service along a 520-mile route between San Francisco and Los Angeles/Anaheim. The estimates here are shown both for Phase 1 Blended as well as Phase 1 Full Build.

Starting in the Central Valley in 2013, construction of the first segment of the IOS will create 33,000 direct job-years and another 65,000 job-years from multiplier effects in the economy over the next five years. The Central Valley has some of the lowest incomes and highest unemployment rates in California, so early investment in that region will have a greater relative impact there than anywhere else.

Building the Phase 1 Blended system will generate an additional 900,000 job-years of employment over the next two decades (Exhibit). The program's long-term nature means that the employment impacts in construction will continue for years. Throughout that time, the system will continue to generate jobs in construction and through multiplier effects in the wider economy.

Exhibit 1. Incremental construction job-years and multipliers by step, spread over the implementation schedule

Step	Direct Construction Job-Years	Indirect Multiplier Job-Years	Total Employment Job-Years
IOS – first construction	33,000	65,000	98,000
IOS	135,000	271,000	406,000
Bay to Basin	92,000	184,000	276,000
Phase 1 Blended	72,000	145,000	217,000
Phase 1 Full	83,000	166,000	249,000
Total – Phase 1 Blended	**332,000**	**665,000**	**997,000**
Total – Phase 1 Full Build	**415,000**	**831,000**	**1,246,000**

Citations:

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6) Productivity, Output, and Employment Impacts

In California, HSR has the potential to help create a new economic geography. In the past, the Los Angeles and San Francisco Bay metropolitan areas have acted as prominent but generally separate economic engines. However, adding HSR to the state's transportation network will create new opportunities for collaboration and innovation that are currently more difficult to achieve. While advances in communications technology help to reduce effective distance and facilitate the flow of information and ideas, many businesses—including some of the most crucial high value-added sectors—require substantial in-person interaction. Connecting California's urban areas with efficient and reliable HSR will create economic synergies critical for success in the knowledge-based industries of today and tomorrow.

High-speed rail will increase productivity and specialization by giving businesses access to larger labor markets. Larger labor pools lead to better matching of skills, which means that firms are better able to find workers with the right qualifications.

High-speed rail service will improve market access; companies that operate locally or regionally will be able to expand their operations statewide. The increased market size will subsequently increase competition among businesses, lowering production costs and improving market efficiency. Research indicates that high value-added sectors benefit from the increased access and proximity brought about by HSR. Economists have identified business clusters within high value-added sectors that comprise combinations of businesses that benefit from increased interaction and proximity.

Through these processes, transportation economists have increasingly focused on these wider economic impacts, referred to as "agglomeration economies." This refers to benefits of bringing economic activities and markets closer by reducing travel times. As an example, if the available labor market within a one-hour travel time can be increased, the potential pool of workers grows, and workers have more employment options.

The HSR system will provide greatly improved connectivity and reduced congestion and, as a result, California's economy will become more efficient, productive, and competitive, and businesses will have much greater access to labor and other markets. Key economic sectors and clusters, such as technology, will expand output and hire more workers as businesses gain better access to legal, financial, and other services, and can work more effectively with research institutions, vendors, suppliers, and others. Job impacts will increase over the long term as highway and aviation congestion worsen and the travel benefits of high-speed rail service increase. The research is generally (but not uniformly) positive with respect to major long-term economic impacts, but methods and results can vary widely.

While results and methods vary greatly and cannot be considered precise, some consistency can be identified. For example, an oft-cited study conducted by the U.S. Conference of Mayors estimated creation of about 55,000 jobs in the Greater Los Angeles metropolitan area from the full California HSR investment (USCM 2010). That study did not provide a complete estimation of job creation for the entire

California HSR corridor, but if extrapolated based on the Los Angeles Basin's share of the corridor's economy, that study finding would imply a full corridor economic impact of about 100,000 to 150,000 jobs.

Other studies, indeed the majority of studies that attempt to estimate these impacts numerically, lead to similar conclusions while also indicating the variability in estimates and results. For example, a report by the APTA, *The Case for Business Investment in High-Speed and Intercity Passenger Rail*, cites the U.S. Conference of Mayors Report (as noted above) as well as academic studies (APTA 2011) to try to estimate impacts. One report noted prominently in APTA's business case is a case study of HSR impacts in the Frankfurt-Cologne corridor in Germany. As noted in the lessons from international experience above, Ahlfeldt and Feddersen of the London School of Economics in *From Periphery to Core: Economic Adjustments to High-Speed Rail, 2010,* the following two findings are reported by APTA:

Counties that are adjacent to intermediate rail stations in the Frankfurt-Cologne corridor were found to have a 2.7-percent premium in GDP compared to areas not having rail access.

For the much larger economic area served by the Frankfurt-Cologne HSR, the researchers found 0.25-percent growth in GDP for every 1-percent increase in access.

The initial finding, if assumed applicable in California and then extended to the entire California HSR economic impact area, would yield estimates of around 400,000 jobs created. The second finding—with the 0.25 elasticity—closely mirrors the estimate of about 100,000 jobs, as extrapolated from APTA's results.

7) Station Area Impacts

In the previous section, the potential for wider economic growth and transformation in California – as measured by total employment was considered, and evidence from other studies was presented. That analysis does not, however, consider more local impacts. This section addresses this, focusing in particular on the growth potential within an immediate "impact area" surrounding proposed High Speed Rail stations. Here, impacts may be experienced as higher property values, increased development and employment densities, different and higher value development, and higher local property tax revenues.

Station, development "impact areas" can vary among stations. For the two largest metropolitan areas (the LA Basin and the San Francisco Bay Area), impact zones are more clearly delineated, focusing on distances around stations of typically less than a mile in each direction. In a number of such cases, station areas are defined by existing development plans, such as the Transbay Terminal development area in San Francisco. Here, the station surroundings can be defined by formal development districts. In such zones, public and private sector interest, planning, and financing are concentrated and coordinated, and specific plans, while fluid, exist "on paper". In some cases, development authorities have been created specifically for the purpose. For the largest metropolitan areas, the ability to differentiate between development stimulated by the High Speed Rail and other development forces falls sharply as one moves beyond these formal development areas, as the station zone begins to merge with the general grid of the city itself, and the importance of the station declines relative to other ambient market forces.

In other cases, especially the smaller intermediate areas farther from the major metropolitan areas, station areas might be defined more broadly, with larger capture areas. Indeed, for some cities, such as Fresno, the zone of station influence is large relative to the City as a whole. Thus, the station development area might be conceived as extending to large sections of the entire downtown area, which is smaller and less subject to other development factors than the major cities. In these cases, development of a High Speed Rail station might constitute the single most important change in development conditions in years.

a. Key Literature Review Findings

High-speed rail projects in Europe and Japan have demonstrated that a station can be a focus and catalyst for new development in the surrounding area. Local station area development, which can include higher property values, more and denser development, and higher employment densities, relies on travel time savings and increased accessibility among city pairs (especially connectivity to the major metropolitan areas), availability of connecting transit and transportation services for local and regional distribution of riders, as well as available land, compatible land uses, and local planning policies and development incentives. Equally important, strong background market demand, including not just passenger demand but also strong development forces within the larger surrounding region, must already be present for increased station development to occur.

Specific findings from the literature review include the following:

- The improved accessibility offered by high-speed rail tends to concentrate development most intensively around stations in the largest metropolitan areas with the widest reaching economies. At the same time, evidence suggests that medium-sized cities located between major economic centers can significantly benefit, particularly "edge cities"; observations from high-speed rail systems in Europe indicate that cities brought within two hours of major economic centers receive the most economic benefit from high-speed rail service. Some evidence also exists that in some intermediate cities, HSR can siphon off development potential to the major metropolitan areas, but this effect is more likely to occur where no particular planning measures are undertaken to leverage development opportunities or where new market niche opportunities are neither identified nor supported.
- Evidence from Japan's Shinkansen shows strong premiums in development and employment densities around stations compared to similar areas not served by high-speed rail. This has important implications for Bakersfield, Fresno, and other Central Valley cities, all of which will be within two hours by rail to both San Francisco and Los Angeles. However, city/station visioning and planning will be critical to realizing such positive benefits in station areas.
- A significant share of job and population growth in station areas will result from regional or local shifts in location. More specifically, this means that a significant proportion of businesses and residences locating near HST stations would have occurred in other parts of the region regardless of the HSR station, but are shifting to the station area due to the new HST service.
- Empirical evidence has shown that cities brought within two hours of a major economic center show the most economic benefit from rail. This has important implications for Bakersfield, Fresno, and other Central Valley cities, all of which will be within two hours by rail of both San Francisco and Los Angeles. Central Valley cities also do not compete with low cost air service for within-California trips.

France and Spain particularly offer important lessons on the potential of HSR to create development around stations. However, results are not uniform and rely on numerous factors including station location, transit connections, local market conditions, and others. Some cities, such as Lille and Lyon in France and Zaragoza in Spain, have created or expanded their business districts with the arrival of HSR. At the same time, others, such as Macon in France and Guadalajara in Spain have seen very little growth years or even decades after the introduction of HSR service.

- Albalate and Bel cite the concentration of economic activities in Paris and Lyon to assert that the improved accessibility offered by HSR tends to concentrate development in the strongest economic nodes. The introduction of the high-speed rail service in France (TGV) has increased business trip-making between the two cities and has given firms greater options for office locations (Albalate and Bel, 2010). These types of impacts could occur at major employment centers along the Phase 1 corridor, such as San Francisco, San Jose, and Los Angeles, though it's uncertain whether the HST

will induce new growth or capture growth which would otherwise have occurred in other areas of the respective cities.

- Additionally, there is evidence that some medium-sized cities located between major economic centers can also benefit. Zaragoza, which is located roughly half-way between Madrid and Barcelona, created a new business district centered on its high-speed rail station. Zaragoza benefited from its central location on the HSR network, the availability of publicly-owned land for development, the International Exposition, which was held in Zaragoza in 2008, and other local factors. See http://www.reconnectingamerica.org/assets/Uploads/TOD-HSR-Bakersfield-Fresno-Report.pdf Similar to Zaragoza, Lille has been able to generate development, in part because of its central location on the HSR network. Lille sits at the intersection of HSR lines going to three major economic and political hubs – Paris, London, and Brussels. In planning for HSR, Lille used publicly-owned land to redevelop its downtown into a mixed-use intermodal international business hub. The HSR connections in the city helped raise Lille's profile, which in turn increased overall economic activity in the city (Krause, 2010).
- However, some intermediate cities on the French and Spanish HSR networks have seen little to no development since HSR service was introduced. Almost all intermediate cities that sited their HSR stations outside their city centers saw little to no new development. Examples of such stations include Macon in France and Guadalajara and Segovia in Spain. Cordoba, which is located at the intersection of the Madrid-Seville and Madrid-Malaga lines, saw very little new development in part because the area around its station had little available land and aggressive redevelopment was not pushed.

- In a study commissioned by Banco Interamericano de Desenvolvimento, HSR was found to increase property value when improved convenience accessing other parts of the region was achieved, and when intensified land uses were valued by the market. The increased accessibility of railway station areas – especially the high-speed railway stations due to the connectivity effect – leads to a higher attractiveness of railway station locations and therefore to a higher concentration of development around stations (Willigers, et. al., 2005). Again, this report notes the importance of market factors and land use planning for positive station area (or sub-regional) real estate changes to occur.

- In Japan, studies by Robert Cervero and James Murakami (2010) suggested that economic impacts of HSR concentrate in largest measure in global cities – i.e., large metro areas with internationally reaching economies. They found that increased density of jobs in knowledge industries had formed around stations on Japan's Shinkansen (more so than control areas), suggesting that HSR can be more favorable to these particular types of industry sectors than commercial/service sectors in general. Cervero and Murakami also found that large edge cities (or shoulder cities near the largest cities in a corridor) appear to benefit from increased knowledge-industry activity and that other smaller cities further away from major metro areas (intermediate cities) require policy partnered development and intra-city connections to realize growth above the trend. In Japan, partnerships have been particularly direct, where the railroad operator/owner has the authority to develop around stations by land assembly and joint investments with developers.

Implications for California High Speed Rail station locations

Important implications for CHSR station development can be drawn from the above studies, and from the experiences in Europe and Japan.

- Businesses that are most likely to benefit from the expanded access offered by high-speed rail will locate near stations. As has been found in many cases around the world, with proper planning and complementary investments in local transit, high-speed rail can generate development in the vicinity of its stations. California's cities could leverage the increase in development and density around high-speed rail stations for urban regeneration and an increase in the local tax base.
- Proposed stations in the major metropolitan areas – especially within greater San Francisco and Los Angeles -- will experience the most significant development impact in terms of ***absolute*** volume of growth attraction.
- At the same time, intermediate cities brought to within about two hours rail travel time of major metropolitan areas have a very good opportunity to see significant economic development around their stations – provided other active local planning and land use actions are also brought into play. As noted, empirical evidence from existing HSR systems internationally has shown that cities brought within two hours of a major economic center show the most economic benefit from rail. This has important implications for Bakersfield, Fresno, and other Central Valley cities, all of which will be within two hours by rail of both San Francisco and Los Angeles. Central Valley cities also do not compete with low cost air service for within-California trips.
- Visioning and city planning, such as coordination with large businesses in San Francisco and Los Angeles, targeting of specific industries to form industry clusters, and making large developable attractive parcels available near the station area will be critical to realizing positive station area benefits.

b. Prior Studies of California High Speed Rail Station Impacts

Several studies focusing specifically on transit oriented station development potential in the Central Valley-- in Fresno, Bakersfield and Merced – were undertaken on behalf of the California High Speed Rail Authority by researchers from the University of California Berkeley.[8] These reports – "Sustainability: Design Concepts for Fresno" and "Sustainability: Design Concepts for Stockton and Merced", prepared with the financial support of the CHSRA, examine the potential for transit-oriented development (TOD) around high speed rail stations in the cities of Stockton, Merced, and Fresno. They present planning

[8] http://www.cahighspeedrail.ca.gov/CHSRTemplate_STDwoBanner.aspx?pageid=8895

approaches and design concepts for land use, urban design, and multimodal access and circulation in and around the proposed HSR station areas in these Central Valley cities.

The studies identified opportunities for substantially higher density transit oriented development in the downtowns of these cities. Fresno, for example, was found to have significant opportunities for high density mixed use, residential and commercial development, clustered around a transit hub incorporating the High Speed Rail station. Similar conclusions were drawn in Merced and Stockton. At the same time, these studies pointed out that the market for such higher density development has yet to be clearly demonstrated by detailed market studies.

In general, the UC Berkeley studies concluded that downtown high speed rail stations, as part of larger transit hub concepts, will "dramatically increase the accessibility of the Central Valley to the rest of California, but the extent to which Central Valley cities realize additional local benefits … is dependent upon their establishing a supportive framework of planning and development policies (including) transit-supportive land use designations and zoning in the station areas, downtown revitalization efforts, proactive parking policies, … and the creation of commerce incentive zones…The cit(ies) could take advantage of the accessibility benefits provided by the HSR station to reduce the costs of development, allowing higher densities with lower parking requirements and lower traffic mitigation fees.."

In addition to the UC studies, the planning firm Calthorpe, Inc. has undertaken extensive analysis on behalf of the Authority and the State of California to establish a "vision" for long term California land use and development. The Calthorpe analyses and associated programs of stakeholder outreach, which are described elsewhere in the Business Plan, are known collectively as Visions California. As the title suggests, Calthorpe's consulting and advocacy work reflects an expansive concept of the long time line potential for transformational effects in California, which would be stimulated and focused around a wide array of infrastructure, planning and policy changes, a key one of these being development of the California High Speed Rail.

c. Evidence for Potential CHSR Station Development

Making use of the insights from the literature review covering the European and Japanese experience, as well as the prior California High Speed rail station development research cited above, the fifteen proposed Phase I rail stations were examined according to a set of criteria that are key determinants of station area development potential. About half of these stations, including those in San Francisco, Millbrae, San Jose, Fresno, Bakersfield, LA Union Station, and Anaheim, are firmly planned at their respective cities; other stations, such as Fresno, have redevelopment processes in place but have not yet coalesced around a specific redevelopment plan; others do not yet have a set station location, but rather have narrowed the choice to two possible options. The main factors likely to effect station area development are:

- ridership levels forecast for each station (station boardings)
- existing and historic economic and demographic conditions and trends
- inter-modal connections, existing station area plans (including known build out potential); and
- real estate absorption potential

Based on these, real estate development potential around stations has been highlighted. Specific estimates of development potential on an annual basis have been made, focusing on the potential for more rapid construction and absorption of commercial and residential development, and a greater clustering of projected region wide development around the station itself. These estimates should be regarded as potential which ***could*** be realized, given the various criteria considered. Upside development potential reflects existing station area plans and development capacity, as well as anticipated real estate absorption rates. The forecasts are not based on rigorous modeling but represent potential assuming proactive public policies to support such development.

Regional Employment and Population Growth

An analysis of county-level job and population growth was performed to highlight growth trends at station locations. The data used in this analysis is from a third party forecasting service, Global Insight. This data was used in lieu of adopted MPO forecasts from various local agencies in order to maintain consistency of assumptions with regard to land use policies and anticipation of major project development, such as HST service.

Historical and forecast total population and employment data were examined for the period from 1990 to 2030 for nine counties where stations are planned in the corridor. The goal of this analysis was to identify which counties have grown vigorously in the past and are expected to experience steady growth in the future. These findings reveal the degree to which other underlying positive economic characteristics of the areas exist and will provide a solid base of economic activity for HST service to further catalyze them. The following bullets summarize relationships between population and job growth between the historical and forecast periods.[9]

1) All counties in the corridor are forecast to have higher average annual percentage job growth between 2010 and 2030 than they experienced between 1990 and 2010. Due to the recent recession and related job losses between 2007and 2009, zero growth was realized in the aggregated nine counties between 1990 and 2010. This area is forecast to grow by 0.9% annually between 2010 and 2030. It is notable that significant losses in Los Angeles County between 1990 and 2010 counterbalanced relatively small gains in most of the other counties.[10]

[9] Employment and population data from Global Insight, US Regional – 30 Year County Forecasts, 7/6/2011.
[10] It is notable that significant losses in Los Angeles County between 1990 and 2010 counterbalanced relatively small gains in most of the other counties. If Los Angeles County and the 365,000 jobs it lost between 1990 and 2010 are excluded from this calculation, the remaining 8 counties grew at a CAGR of 0.5%.

2) All counties in the corridor are forecast to have lower percentage population growth between 2010 and 2030 than they experienced between 1990 and 2010. The CAGR of the total of the nine counties was 0.8% between 1990 and 2010 and is forecast to be 0.6% between 2010 and 2030.
3) Between 1990 and 2010, all of the nine counties experienced higher average annual population growth than job growth. Seven of the nine counties are forecast to have higher job growth than population growth between 2010 and 2030 (Merced and Tulare do not).
4) Some of the most populous counties (including the SF peninsula counties, Los Angeles, and Orange counties) are expected to achieve slower percentage job and population growth than the other counties in the corridor, however, Los Angeles and Orange counties alone are expected to account for 51% of and 59% of total corridor population and job growth, respectively.

As noted in Figure 1, the highest quantity job growth is expected in Santa Clara, Los Angeles, and Orange counties which are expected to add 255,000, 553,000, and 344,000 jobs between 2010 and 2030, respectively. Higher percentage growth is expected in some of the San Joaquin Valley counties but these counties have relatively small bases from which to grow.

FIGURE 1: Historical and Forecast Job Growth in Phase 1 Corridor Counties

Surrounding County Employment Growth (thousands)		1990-2010 (historical)		2010-2030 (forecast)		
Station Name	**County**	**Absolute**	**CAGR**	**Absolute**	**CAGR**	**2030 Total**
San Francisco (Transbay)	San Francisco County	-28.8	-0.3%	106.8	0.9%	**634.9**
San Francisco (4th & King)	San Francisco County	-28.8	-0.3%	106.8	0.9%	**634.9**
Millbrae	San Mateo County	11.1	0.2%	49.5	0.7%	**357.7**
Mid-Peninsula	San Mateo County	11.1	0.2%	49.5	0.7%	**357.7**
San Jose	Santa Clara County	25.7	0.2%	254.5	1.3%	**1,093.4**
Gilroy	Santa Clara County	25.7	0.2%	254.5	1.3%	**1,093.4**
Merced	Merced County	12.4	1.3%	21.4	1.6%	**76.9**
Fresno	Fresno County	55.3	1.1%	83.6	1.3%	**363.3**
Visalia	Tulare County	22.9	1.2%	35.5	1.5%	**140.8**
Bakersfield	Kern County	53.7	1.4%	83.9	1.6%	**308.3**
Palmdale	Los Angeles County	-365.2	-0.5%	552.5	0.7%	**4,323.3**
San Fernando Valley	Los Angeles County	-365.2	-0.5%	552.5	0.7%	**4,323.3**
Los Angeles Union Station	Los Angeles County	-365.2	-0.5%	552.5	0.7%	**4,323.3**
Norwalk	Los Angeles County	-365.2	-0.5%	552.5	0.7%	**4,323.3**
Anaheim	Orange County	180.3	0.7%	343.9	1.1%	**1,696.9**
		-32.6	0.0%	**1,531.6**	0.9%	**8,995.6**

Source: Global Insight / PB Analysis

Forecast population growth trends by geography, shown in Figure 2, are similar to those of jobs outlined above. San Francisco and San Mateo counties are the only two of the nine with higher quantities of jobs expected between 2010 and 2030 than population.

FIGURE 2: Historical and Forecast Population Growth in Phase 1 Corridor Counties

County Population Growth (thousands)		1990-2010 (historical)		2010-2030 (forecast)		
Station Name	**County**	**Absolute**	**CAGR**	**Absolute**	**CAGR**	**2030 Total**
San Francisco (Transbay)	San Francisco County	82.1	0.5%	74.0	0.4%	**880.8**
San Francisco (4th & King)	San Francisco County	82.1	0.5%	74.0	0.4%	**880.8**
Millbrae	San Mateo County	68.6	0.5%	47.2	0.3%	**767.0**
Mid-Peninsula	San Mateo County	68.6	0.5%	47.2	0.3%	**767.0**
San Jose	Santa Clara County	289.0	0.9%	339.8	0.9%	**2,129.8**
Gilroy	Santa Clara County	289.0	0.9%	339.8	0.9%	**2,129.8**
Merced	Merced County	76.9	1.8%	104.9	1.7%	**362.4**
Fresno	Fresno County	260.5	1.6%	256.4	1.2%	**1,191.4**
Visalia	Tulare County	129.5	1.7%	165.4	1.6%	**610.2**
Bakersfield	Kern County	292.6	2.1%	294.8	1.5%	**1,139.3**
Palmdale	Los Angeles County	949.2	0.5%	734.6	0.4%	**10,569.5**
San Fernando Valley	Los Angeles County	949.2	0.5%	734.6	0.4%	**10,569.5**
Los Angeles Union Station	Los Angeles County	949.2	0.5%	734.6	0.4%	**10,569.5**
Norwalk	Los Angeles County	949.2	0.5%	734.6	0.4%	**10,569.5**
Anaheim	Orange County	598.6	1.1%	484.6	0.7%	**3,506.3**
		2,746.9	0.8%	**2,501.7**	0.6%	**21,156.5**

Source: Global Insight / PB Analysis

Ridership Potential and Multimodal Connections

Literature on HSR station development suggests that stations served by HSR in combination with other modes of transportation (including local and regional transit, automobiles, and bike/pedestrian access) are more likely to realize high concentrations of mixed use development in the immediate vicinity. This finding is supported by the market view that the more modes of transportation are present in a given area, the greater diversity of peoples' transportation needs can be met and the more valuable the area becomes from a development standpoint. Given this assertion and the potential ability to evaluate Phase 1 station development prospects based on the number of additional transportation modes that would be available, analysis was performed to test the value of multimodal connections using job growth in certain Bay Area counties.

Local transit connections are expected to be critical to the success of the HST service, with about 16% (13,910 trips) of Phase 1 Blended system boardings expected to be fed to the stations by regional and local transit, as noted in Figure 3. At stations where transit is more prevalent, such as San Francisco, San Jose, and Los Angeles, this percentage is expected to be high, e.g. 20% to 35%. Convenient transit connections will expand the catchment area for high-speed rail, allow travelers to easily get to their destinations, and attract more riders to the system. Generally, rail service and/or dense bus networks will serve to draw passengers out of their cars. Further, adequate transit connections will reduce the need for parking around stations, leaving more land for development. Finally, large inter-modal hubs have the potential to become destinations in their own right, beyond their function as a central node on the transportation network.

It is also important to note that parking and rental car facilities will also help increase ridership as shown in the figure below. The automobile will play an important role in bolstering HSR ridership, and parking facilities can also provide good joint development opportunities for the rail operators to capitalize on.

FIGURE 3: Forecast Daily Phase 1 Blended Station Boardings by Mode

Station Name	Pickup / Drop-off	Drive Parked Vehicle	Rental Car	Taxi	Transit / Shuttle	Bike / Walk / Other	Station Boardings
San Francisco (Transbay)	3,630	3,420	1,780	1,960	4,790	4,930	20,500
Millbrae	960	1,130	390	330	740	640	4,200
San Jose	1,360	1,650	570	490	1,090	940	6,100
Gilroy	1,390	2,010	130	210	100	60	3,900
Merced	1,830	3,330	510	530	530	270	7,000
Fresno	1,010	1,390	250	170	190	100	3,100
Visalia	490	670	120	80	90	50	1,500
Bakersfield	1,640	2,240	410	260	300	150	5,000
Palmdale	2,920	4,160	280	410	200	130	8,100
San Fernando Valley	1,900	2,380	130	190	120	80	4,800
Los Angeles Union Station	3,880	5,180	2,100	2,500	5,760	5,880	25,300

Source: CA HSR Travel Demand Model, March 2012

The stations in the Phase 1 system vary in their transit connectivity from those with diverse heavy-rail, light-rail, and bus connections to those with just a few regional bus route or shuttles.

The table on the following page summarizes the transit connections at each station area.

FIGURE 4 – Multimodal Connections

Station	Agency	Bus	Light Rail	Heavy Rail	Intercity Bus	Intercity Rail	Airport
San Francisco (Transbay)	SFMTA (Muni)						
	BART						
	Caltrain						
	AC Transit						
	Golden Gate Transit						
	Greyhound						
	Amtrak					Shuttle Likely	
San Francisco (4th & King)	SFMTA (Muni)		Weekday Only				
	Caltrain						
	Amtrak					Shuttle	
Millbrae	Caltrain						
	BART						
	SamTrans						
	SFO Airport						Via BART
Mid-Peninsula (Redwood City/Palo Alto/Mountain View)	Caltrain						
	SamTrans						
	VTA		Only if MV				
San Jose	Caltrain						
	VTA						
	MST						
	ACE						
	Amtrak						
Gilroy (ONLY FOR DOWNTOWN STATION)	Caltrain			Limited Service			
	VTA	Limited Service					
	MST	Limited Service					
	County Express						
	Amtrak						
	Greyhound						
Merced (Downtown Transportation Center)	The Bus						
	YARTS	Route to Yosemite					
	Greyhound						
	Amtrak				Yosemite Only		
Fresno	FAX						
	Clovis Stage Line	Limited Service					
	Coalinga Transit	Limited Service					
	Amtrak						
Visalia/Hanford/Tulare	KART/TCAT						
	Greyhound						
	Amtrak				Hanford & Visalia	Only if Hanford	
Bakersfield	GET Bus						
	Kern Regional Transit						
	Greyhound						
	Amtrak						
Palmdale	AVTA						
	Santa Clarita Transit	Limited Service					
	Metrolink						
	Greyhound						
	Amtrak						
	PMD Airport						Planned Access
San Fernando Valley (Sylmar/Burbank/Burbank Airport/Glendale)	LA MTA (Metro)						
	Burbank Bus/Beeline	Limited Service					
	Metrolink						
	Greyhound						
	Amtrak						
	BUR Airport						
Los Angeles Union Station	LA MTA (Metro)		LRT and BRT				
	Big Blue Bus						
	Foothill Transit						
	Torrance Transit						
	LA DOT	Limited Service					
	OCTA	Limited Service					
	AVTA	Limited Service					
	Santa Clarita Transit	Limited Service					
	Metrolink						
	California Shuttle Bus						
	Amtrak						
	LAX Airport						Via Shuttle

Planning and Development Capacity

To help evaluate potential development around stations on the California High-Speed Rail system, existing plans were identified and included in the analysis. Like the stations themselves, the station plans

vary greatly among the different cities. Some stations, such as the San Francisco Transbay Terminal and Anaheim Platinum Triangle, are part of larger redevelopment plans that encompass whole neighborhoods. Meanwhile, there are other cities, such as the Mid-Peninsula station and San Fernando station(s), where the station locations have not yet been finalized. Given the range of station locations (downtown or city edge), purposes (hub, terminus, or pass-through), and surrounding neighborhoods (commercial, residential, industrial, or mixed use), it was important to evaluate both the stations and the station plans in the context of their surroundings. The following is a summary of the existing status of station area plans for the Phase 1 corridor. It is important to note that these station area plans are likely to change in the near future as the Authority is preparing to sign several Station Area Planning Funding Agreements cities in the corridor.

FIGURE 5 - Station Area Development Plans

Station Name	Station Category	Station Specific Plan	Capacity
San Francisco (Transbay)	City Center	Yes - Advanced	- 2600 Residential DU - 3 million SF Office - 100,000 SF Retail
San Francisco (4th & King)	Urban Activity Center	No	Station site not identified
Millbrae	Urban Activity Center	Yes - Advanced	- 640 Residential DU - 1.1 Million SF Mixed Commercial (PB estimate)
Mid-Peninsula	Developed Urban Area	No	Station site not identified
San Jose	Urban Activity Center	Yes - Advanced	- 2590 Residential DU - 5 million SF Office - 420,000 SF Retail
Gilroy	Outlying Area - Rail Transit	No	Station site not identified
Merced	Outlying Downtown	No	Station site not identified
Fresno	Outlying Downtown	Yes - Preliminary	- 685 Residential DU - 320,000 SF Office - 141,000 SF Retail
Visalia	Outlying Area - No Rail Transit	No	Station site not identified
Bakersfield	Outlying Downtown	Yes - Preliminary	- 300 Residential DU - 900,000 SF Mixed Commercial (PB estimate)
Palmdale	Outlying Area - Rail Transit	No	Station site not identified
San Fernando Valley	Outlying Area - Rail Transit	No	Station site not identified
Los Angeles Union Station	City Center	Yes - Preliminary	- Residential DU - Entitlements for 5+ million SF of Commercial Space

San Francisco Transbay Terminal – Preliminary construction work has begun on the redevelopment of the old Transbay Terminal into the Transbay Transit Center. The plans call for a new inter-modal hub and

several new towers that will expand the Financial District south of Market Street. The plan includes 2,600 residential units, 3 million sq. ft. of commercial space, and 100,000 sq. ft. of retail. The Transbay Transit Center is located in a mature area of San Francisco County where very dense office, retail, and residential development already exists. The redevelopment being contemplated would add a significant amount of new space and could be large enough to impact residential and office rents in the extended station area.

San Francisco (4th and King) – The City of San Francisco is currently studying development opportunities in the 4th and King Station area. In 2010, the City embarked on a "Fourth and King Street Railyards" study which to-date has published a draft "Opportunities and Constraints" Report. Some of the stated goals of the Fourth and King redevelopment area are to: "…capitalize on the potential for air-rights development over the station in order to forge new connections in the fabric of the city, celebrate transit, promote a mixed-use 24-hour neighborhood center, provide much needed open space amenities and create a landmark gateway at the downtown's south-eastern entrance." San Francisco is delaying the completion of the analysis pending the completion of the high speed train environmental process which includes the 4th and King station area.

Millbrae – The Millbrae station is part of the Millbrae Station Area Specific Plan (MSASP), which promotes transit-oriented development around the BART and Caltrain station in Millbrae. The plan lays the groundwork for successful station-area development but will need to be updated to include HSR. In the immediate station area there are several surface parking lots and underdeveloped parcels totaling about 16 acres that could be developed at medium to high densities under a TOD plan. This station has a relatively high percentage of expected HST intra-regional boardings to San Francisco and San Jose. This could make the Millbrae station a candidate for higher density residential development supported by population serving commercial development at ground floors. Parking would need to be addressed with development, possibly through a joint development agreement. BART is currently looking into several development opportunities on the existing parking lot areas to the east side of the existing rail line. Hotel and other similar proposals are under evaluation by BART. BART, Samtrans, the City of Millbrae and the CHSTP project team have been conducting a detailed access study of the site to understand better the transportation issues and how they would possibly be affected by additional development and transportation options at the station.

Mid-Peninsula – Redwood City, Palo Alto and Mountain View are all under consideration as potential HST station locations. Each of the cities has investigated, to some degree, the implications of having a HST station in their downtowns. Redwood City has long planned for transit oriented development around its current Caltrain station. The Redwood City Caltrain station is one of the potential sites where the HST station would be located.

San Jose Diridon Station – San Jose has developed the Diridon Station Area Plan, which proposes the creation of a new multi-modal station and business center at the location. The plans call for a maximum development scenario of 4,950,000 sq. ft. of office/commercial, 420,000 sq. ft. of retail/restaurant; 2588

residential units; and 900 hotels rooms. This aggressive plan will require a significant amount of redevelopment of underutilized sites, including parcels currently containing residences. Coordination between land use and transportation will be crucial as there are many highway and other transit uses connecting near the station, along with existing land uses and recreational uses (baseball stadium) that could result in significantly higher than capacity peak demands during special events.

Gilroy – The station location has not been finalized. The options being evaluated are either a downtown station or a green-field station outside of Gilroy.

Merced –The HSR line through Merced is located in an industrial portion of the city that the city wishes to redevelop. The City has applied for station area development funding and will put up local funds. Is working with the Authority and supports the station and location of the station to promote economic growth in downtown Merced. California High Speed Rail has also been looking to connect to conventional rail service coming from the north, but not a rerouting of the San Joaquin.

Fresno – The city has developed a Downtown Plan centered on the HSR station. The plans call for an increase in density and new mixed-use development with up to 141,000 sq. ft. of retail, 320,000 sq. ft. of office space, and 705 new residential units.

San Joaquin Valley - The station location has not been finalized. Visalia, Hanford, and Tulare are possibilities so no concrete station plans have been developed. This is a unique case where the station is not viewed as promoting TOD, but rather will become a multi-modal hub for bus and ultimately rail service for Visalia, Tulare, Hanford, Lemore, and even Corcoran.

Bakersfield – Current plans call for the station to be located at the site of the existing Amtrak station on Truxtun Avenue. The plans point out the potential for concentrating business development in the area but stop short of identifying specific sites for development. Plans that are now somewhat aged suggest redevelopment areas that total over a million square feet of development, which would probably occur over a long horizon with little acceleration resulting from HST service, similar to expectations in Fresno.

Palmdale – Like Gilroy, there are two alternative station locations, and a selection is still to be made. New development will be dependent both on the success of the station and the new terminal as a reliever for LAX. There are existing TOD plans for the Metrolink Station about 2.5 miles away but they do not encompass HST plans.

San Fernando Valley - The station location has not been finalized. Current plans call for a single station in San Fernando, or near Burbank Bob Hope Airport. The Bob Hope Airport is currently creating development plans for available land next to the airport that may include HST. Research indicates that HSR stations can leverage airport serving locations to increase both ridership and development potential.

Los Angeles Union Station – Catellus, a private development LLC and former owner of LA Union Station sold the 38 acres and development rights totaling close to 6 million square feet of transit oriented

development to the Los Angeles County Metropolitan Transportation Authority (MTA) in 2011 for approximately $75 million. Currently three buildings totaling 728,000 square feet of office development and a small amount of multifamily residential development are located on the site. HST service in this market has the potential to drive further demand for development, but the relative (to San Francisco) lack of highly utilized local transit services in Los Angeles and the generally less dense development pattern may cause redevelopment in the station area to be spread over a longer period of time.

Gateway Cities - The station location has not been finalized. Options include the Norwalk/Santa Fe Springs or Fullerton Metrolink station sites. While at least some small-scale industrial redevelopment opportunities exist, the magnitude of large scale redevelopment potential in certain Gateway Cities communities may be limited.

Anaheim – The Anaheim Station (ARTIC intermodal station) is planned as part of the 20-plus million square feet Platinum Triangle redevelopment project, which currently has 15 projects at or past the design stage totaling over 8,000 new residential units, 600,000 square feet of commercial space, and 130 hotel rooms. The 17 acre portion of the Platinum Triangle in the ARTIC zone is expected to be office-oriented with some retail and residential space, specifically allowing for 520 residential units, 2.2 million square feet of office space, and 360,000 square feet of retail. Overall, the Platinum Triangle redevelopment program has momentum and is expected to continue regardless of HST access. This is one of the few stations that could see some more significant office density in the station vicinity with the addition of HST service, though the HST service is not expected to create demand for net new development in the area which is heavily developed with office space. One major attribute that the Anaheim station and HST ridership will benefit from is the concentration of recreational destinations within close proximity to the station, including Disney Land, Angeles Stadium and the Honda Center.

Summary of Findings

As summarized in Figure 6, known station area plans through the high speed rail corridor identify approximately 18 million square feet of potential commercial development, and over 7,000 potential dwelling units, combined for all stations with known plans. Virtually all of this planned development would be built in transit oriented, more clustered development configurations.

FIGURE 6: Planned Development Totals

Station Name	Development Type	Planned Development
San Francisco (Transbay)	Residential (DU)	2,600
	Commercial (SF)	3,100,000
Millbrae	Residential (DU)	640
	Commercial (SF)	1,100,000
San Jose	Residential (DU)	2,590
	Commercial (SF)	5,420,000
Fresno	Residential (DU)	685
	Commercial (SF)	461,000
Bakersfield	Residential (DU)	300
	Commercial (SF)	900,000
Los Angeles Union Station	Residential (DU)	
	Commercial (SF)	5,000,000
Anaheim	Residential (DU)	520
	Commercial (SF)	2,560,000

It is not known to what extent or how quickly these development targets would actually be achieved, nor is it possible to state with certainty how much such development can be attributed specifically to HSR. These would be a function of future market conditions, which are uncertain over the time horizon of the High Speed Rail project. However, development plans have for the most part been specifically created with high speed rail stations as their development focal points. In this sense, the high speed rail stations may be considered central – indeed necessary -- to the achievement of development targets.

As noted above, San Francisco, San Jose, Los Angeles, and Anaheim have the strongest combinations of employment and population forecasts, station positioning, existing complementary land uses, and multimodal connectivity. These 'hub' cities' stations are expected to be the most desirable from the development community's standpoint, and will likely attract the most development in total.

Other stations, especially those with local economic engines that complement one of the hub stations, have significant opportunities that can be leveraged; these stations can play a much larger role in the redevelopment of their downtowns. These cities should work to create a vision for their station area and develop station area attributes that (even without HST service) would make the station a desirable place to live or work. This will magnify the HST service's contribution to the area, helping it focus somewhat sporadic development around the station sites.

The following points summarize the potential development impacts:

- High-speed rail stations will greatly accelerate planned development, attract additional development, and enhance property values around the stations.

- The majority of development will occur at selected major downtown stations in the Bay Area (e.g., Transbay Center), around Union Station in Los Angeles, and in cities that are close to the hubs such as San Jose.
- Central Valley stations can capitalize on advantages from lower land and labor costs. New manufacturing, recreational, tourism, and residential development and back office uses can be especially suitable for Central Valley locations.
- Station area development will include acceleration of planned development, higher commercial densities, increased property valuation, and higher employment densities.

While the full development potential of the station sites is very large based on station area planning objectives, there are many external factors that must be coordinated for strong positive station area development impacts to occur, including:

- Proper station area land use planning to create capacity for development, either through redevelopment or supporting new local infrastructure development,
- Station identity and positioning within the rail system, for instance, developing a station as an origin, destination, or combination of both could help coordinate and guide development
- Provisions for tax relieve or other development incentives,
- Providing multimodal connections to the station site to increase ridership and user friendliness,
- Local economic strength, meaning that industrial diversity and a healthy job base are important for any community to grow, regardless of its transportation options to other areas.