September 2014

# SOUTHWEST MULTI-STATE

## RAIL PLANNING STUDY | SUMMARY REPORT

U.S. Department of Transportation
**Federal Railroad Administration**

*in collaboration with:*

Amtrak • Arizona Department of Transportation • BNSF Railway Company • California High-Speed Rail Authority • Caltrain • Caltrans • Capitol Corridor Joint Powers Authority • Denver Regional Council of Governments • Flagstaff Metropolitan Planning Organization • XpressWest • Los Angeles County Metropolitan Transportation Authority • Maricopa Association of Governments • Mid Region Council of Governments • Nevada Department of Transportation • Orange County Transportation Authority • Regional Transportation Commission of Southern Nevada • San Diego Association of Governments • Southern California Association of Governments • Union Pacific Railroad • Utah Transit Authority • Washoe County Regional Transportation Commission

# STUDY BACKGROUND

The Southwest Multi-State Rail Planning Study (SW Study) is the first high-performance rail (HPR) network planning study led by the Federal Railroad Administration (FRA).[1] FRA initiated the SW Study concurrent with its national planning effort to develop a toolkit for the conceptual planning of HPR networks at the multi-state and mega-regional level. The toolkit includes a newly developed CONceptual NEtwork Connections Tool (CONNECT) that can help analyze the performance of HPR corridors and networks. The SW Study is a test case for the guidelines, tools, and performance standards developed in FRA's national planning effort.

This document summarizes the SW Study process, planning context, recommendations, and lessons learned that can be a model for similar efforts in other regions.

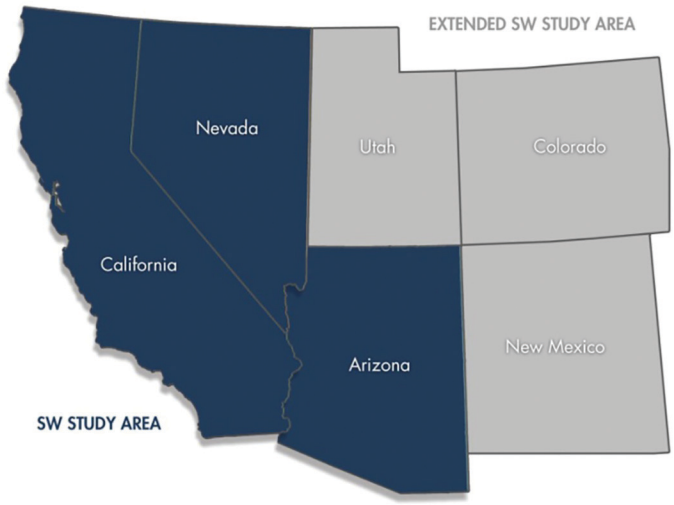
## Study Overview

As shown in Figure 1, the SW Study Area included the States of Arizona, California, and Nevada. The study area was extended to consider connections to the States of Colorado, New Mexico, and Utah. Representatives from key transportation organizations across these states worked through challenges of developing multi-state rail plans and outlined a common preliminary technical vision for HPR in the Southwest as part of this Study. The Study demonstrates an analytical framework for developing early-stage HPR network planning concepts and examining the institutional context for establishing and implementing a long-range rail vision.

## Why the Southwest?

The Southwest region was selected as the setting for the first, and prototype, multi-state rail planning study due to the longstanding interest in the development of rail services by the region's states and localities. Arizona, California, and Nevada have existing passenger rail services as well as plans to develop enhanced intercity passenger rail, commuter rail, and dedicated high speed rail (HSR) services.

**Figure 1:** SW Study Area & Extended Study Area




## Study Purpose and Objectives

The SW Study had two primary objectives:

1. Identify potential multi-state network of "candidate corridors" for further evaluation and planning, utilizing a new sketch-planning network planning tool.

2. Identify institutional challenges and opportunities related to multi-state rail development and delivery.

[1] While this is the FRA's first regional rail planning study, it is not the first FRA study to analyze network effects in passenger rail planning. For example, FRA's 1997 document, High Speed Ground Transportation in America, examines the economics of bringing high-speed ground transportation to well-populated groups of cities throughout the U.S. The report can be found at **https://www.fra.dot.gov/eLib/details/L02519.**

## Study Process

Over a seven-month duration, the SW Study team:

- Created and analyzed an inventory of previous long-distance travel studies in the area,
- Identified recent trends and market underpinnings of potential future travel and economic activity,
- Applied an innovative network planning tool to undertake a sketch-plan evaluation of a range of options for serving 50-year forecasts of intercity travel needs, and
- Facilitated working sessions and workshops where an informal volunteer stakeholder group representing a broad sphere of interests helped shape the study's findings.

The SW Study was directed by a rich and ongoing program of stakeholder engagement. From the outset of the Study and throughout the effort, a diverse, volunteer group of executive leaders and staff representing state departments of transportation, metropolitan planning organizations, councils of government, transit agencies, Amtrak, freight railroads, and private rail developers (Table 1 on the next page) offered continuing support for the effort – reviewing interim reports and advising the Study Team on next steps. Stakeholder engagement covered a period of seven months, commencing with a kickoff teleconference, followed by five workshops timed with Study milestones and analysis steps. It should be noted that this preliminary phase of study was limited to technical staff. Future efforts will engage a broader audience and seek to identify local champions of a HPR network in the region.

The SW Study is the test case for one step in a larger potential approach to multi-state regional planning for HPR, as shown in Figure 2 below. The end result of this Study provides a model baseline for other regions of the US to use for illustrating current conditions, a multimodal context, and rail market potential as a baseline input to a FRA "Tier 0" Regional Rail Plan.

**Figure 2:** "TIER 0" Regional Rail Plan Inputs

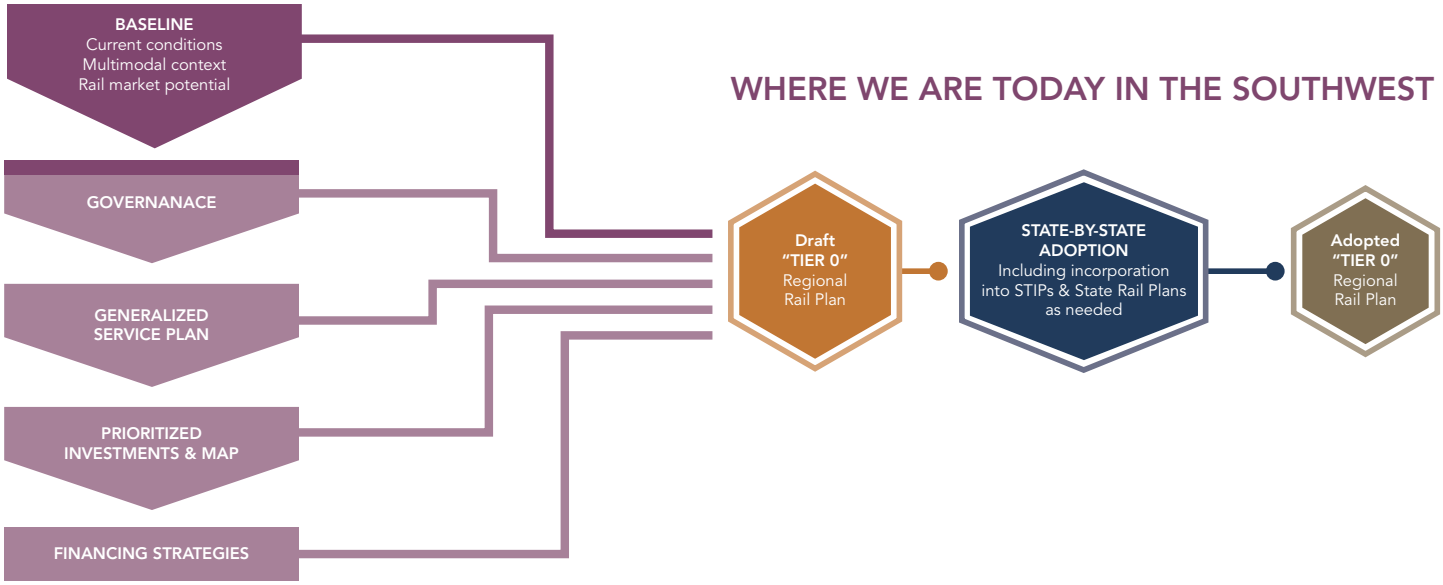


**Table 1:** Stakeholder Organizations

- Amtrak
- Arizona Department of Transportation
- BNSF Railway Company
- California High-Speed Rail Authority
- Caltrain
- Caltrans
- Capitol Corridor Joint Powers Authority
- Denver Regional Council of Governments
- Flagstaff Metropolitan Planning Organization
- DesertXpress (a.k.a., XpressWest)
- Los Angeles County Metropolitan Transportation Authority
- Maricopa Association of Governments
- Mid Region Council of Governments
- Nevada Department of Transportation
- Orange County Transportation Authority
- Regional Transportation Commission of Southern Nevada
- San Diego Association of Governments
- Southern California Association of Governments
- Union Pacific Railroad
- Utah Transit Authority
- Washoe County Regional Transportation Commission

## Guiding Principles

The SW Study involved an integrated program of technical analyses and stakeholder input, framed by four Guiding Principles prepared through early stakeholder input. The Principles below are the public investment themes and rail service goals that set a broad interagency policy context for the effort.

1 **SUPPORT**

Support development of safe, reliable, efficient, and inter-connected multi-modal travel options.

2 **BALANCE**

Balance providing a premier transportation system with the duty to be responsible stewards of public dollars. Consider factors such as return on investment, cost effectiveness, and modal alternatives when developing the network.

3 **ENVISION**

Envision a preliminary multi-state rail network that supports environmental, social, and economic sustainability.

4 **ENCOURAGE**

Encourage cross-state coordination to achieve the most optimal outcomes in network planning.

# PLANNING CONTEXT

Regional land development patterns, demographics, and intercity economic linkages define the context for intercity passenger travel demand, the market for rail service, and the prospects for HPR success.

## Land Development Patterns

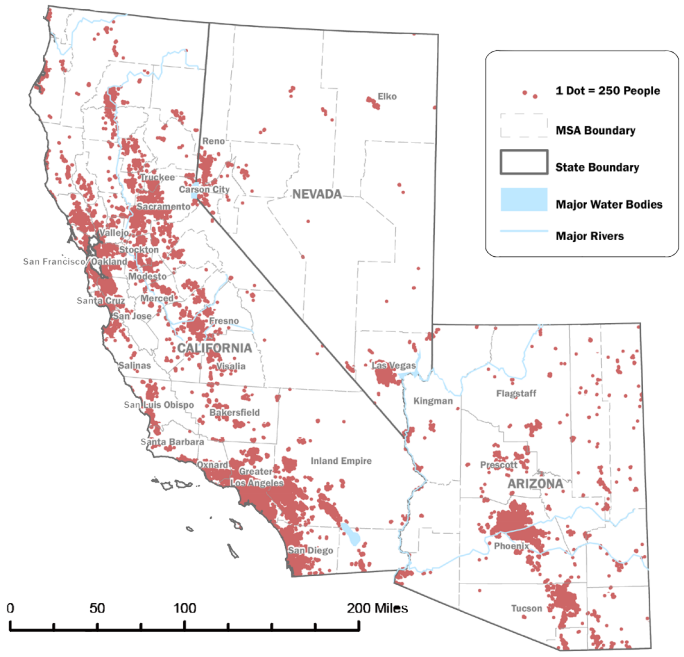
The primary study area for the SW Study Area encompasses over 379,000 square miles and also includes 3 of the nation's 11 megaregions—Northern California, Southern California, and the Arizona Sun Corridor. With a concentration of multiple metropolitan areas and their central business districts within corridors or networks of 100 to 600 miles, these megaregions are representative of areas where HPR networks could be successful. HPR could strengthen connectivity, and a dramatic reduction in travel times could help improve the economies of each megaregion and foster linkages for one supermegaregion.

## Demographics

The SW Study Area contains some of the highest growth areas in the US, as Nevada and Arizona were the two fastest-growing states in the country between 2000 and 2010, with population growth rates of 35 and 25 percent, respectively. California continues to be the most populous state in the country, with its 3.4 million new residents over the 2000-2010 period representing 12.4 percent of the Nation's total population growth.[2] Significant growth is expected through 2050.

As shown in Figure 3, within the Study Area, population is concentrated in relatively small percentages of the land area. In 2010, roughly 94 percent of the SW Study Area's population was located in the census-defined urbanized areas,[3] while those urbanized areas accounted for just three percent of the total land area in the three states.[4] Population density is important, as rail is often most efficient when it is serving dense concentrations of population and economic activity.

**Figure 3:** Population density




Source: 2010 Census data, U.S. Census Bureau. In many instances dots overlap in this map, which may give the appearance of a smaller than actual population.

## Economic Activity

With a combined gross domestic product of $2.3 trillion, the local, regional, and state economies of the SW Study Area represent 15.7 percent of the total U.S. economy.[5] If these three states were a country, they would be the sixth largest economy in the world, similar to the United Kingdom and 40 percent larger than Canada.[6] Viewed this way, **the Southwest is the largest economy in the world that does not currently have dedicated HSR**.

[2] U.S. Census Bureau, Population Distribution and Change: 2000 to 2010, March 2011

[3] For the 2010 Census, the Census Bureau defines urban areas as all urbanized areas and urban clusters. These are densely developed territory and encompass residential, commercial, and other nonresidential urban land uses. Urbanized areas have 50,000 or more people and urban clusters have at least 2,500 but less than 50,000 people.

[4] U.S. Census Bureau, Lists of Population, Land Area, and Percent Urban and Rural in 2010, Percent Urban and Rural in 2010 by State, **www.census.gov/geo/www/ua/2010urbanruralclass.html**

[5] U.S. Bureau of Economic Analysis, 2010 Gross Domestic Product

[6] Analysis based on 2010 GDP by country data from The World Bank, available at **http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries**

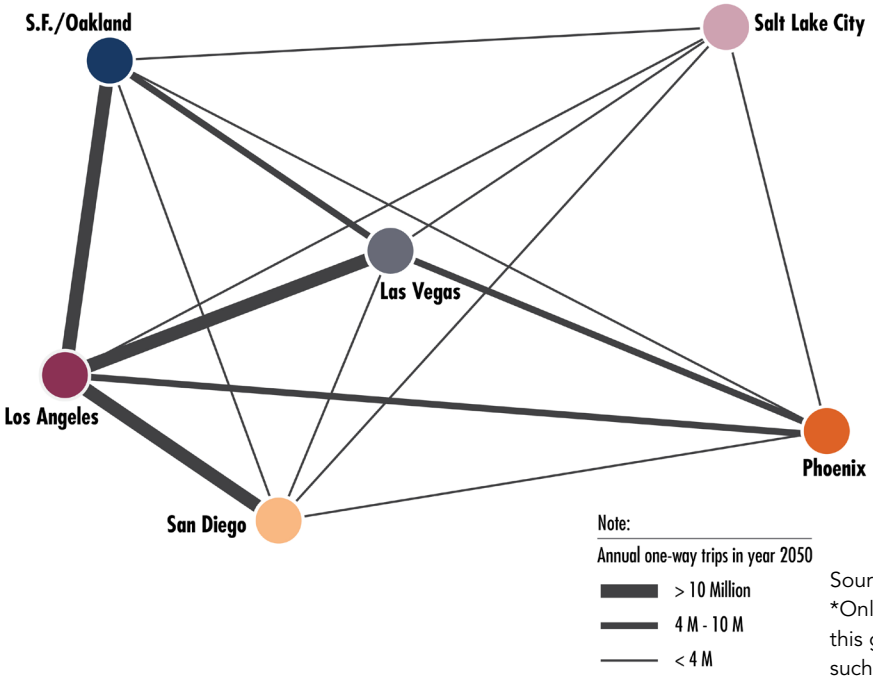
## Existing and Forecast Travel

With forecasts of sustained population growth and growing economic integration among metropolitan areas and States within the Study Area, there is great potential for significant growth in intercity travel across all modes between 2010 and 2050. This growth could be as high as 70 percent, increasing from 162 million to 273 million trips per year. Annual trips via air could more than triple over the period; from 27 million in 2010 to 84 million by 2050, with trips via auto possibly rising 42 percent over the period.[7] While auto will remain the predominant mode for intercity travel in the Study Area, increased travel over longer distances suggests that air travel could gain a larger share of the intercity market without new rail investments.

Within the entire Study Area, there is considerable concentration of travel among selected city pairs. Trips between just six metropolitan areas account for 44 percent of all intercity trip-making of 50 to 800 miles between all metropolitan areas in the extended Study Area.[8] Given the course of expected development, this pattern could continue into the future. Figure 4 below illustrates the potential future scale of travel between these large areas, within which, travel to/from Greater Los Angeles is the largest intercity travel market – suggesting significant potential for HPR.

[7] All travel demand figures presented in this report are for intercity trips between 50 and 800 miles. Trips less than 50 miles generally are not considered intercity travel and rail is typically not time-competitive with air on distances greater than 800 miles.
[8] CONNECT Beta Version, 2012

**Figure 4:** Total trips between selected MSAs




Source: CONNECT Beta Version, 2012
*Only a small number of MSAs are presented in this graphic to enhance visual clarity. Other MSAs, such as the Inland Empire and Sacramento, also generate a large number of trips to other MSAs.

## PRELIMINARY NETWORK VISION

The preliminary network vision for HPR in the Southwest was developed through a comprehensive stakeholder engagement process and a performance analysis informed by outputs from CONNECT. FRA convened representatives from a diverse range of entities in the Southwest with an interest in HPR to develop the preliminary vision. Over the course of multiple workshops, stakeholders collaborated to identify potential network connections through an analysis of the existing and forecast demographic trends and travel patterns, economic activity, and noted capacity constraints in the current and planned transportation network.

In 2009, FRA established classifications of the services contemplated in a multi-state rail plan.[9] The varying stages of development of HPR corridors across the country provide clear and consistent examples of HPR service levels. HPR corridors fall into three distinct service tiers—Core Express, Regional, and Emerging/Feeder. The three HPR service tiers encompass regular intercity passenger rail services as well as higher speed services. Each tier is defined by features including corridor length, top speeds, presence of dedicated track, population served, service frequency, and minimum reliability targets. The long-term HPR network vision presented in a multi-state plan defines each corridor within the overarching network in terms of the service tiers. Table 2 below describes these three general types of high-performance passenger rail service.

[9] Federal Railroad Administration, High-Speed Rail in America, High-Speed Rail Strategic Plan, April 2009, **http://www.fra.dot.gov/eLib/Details/L02833**

**Table 2:** Definitions of high performance rail (HPR) service tiers

| | TOP SPEEDS (MPH) | OTHER COMMON CHARACTERISTICS | PRIMARY MARKETS SERVED | MINIMUM RELIABILITY TARGET (ON-TIME PERFORMANCE) |
|---|---|---|---|---|
| Core Express Corridors | Over 125 | Frequent service; dedicated tracks, except in terminal areas; electric-powered | Serving major metropolitan centers | 99% |
| Regional corridors | 90-125 | Frequent service; dedicated and shared tracks; electric- and diesel-powered | Connecting mid-sized urban areas with each other or with larger metropolitan areas | 95% |
| Emerging/Feeder Corridors | Up to 90 | Shared tracks | Connecting mid-sized and smaller urban areas with each other or with larger metropolitan areas | 85%* |

*On-time performance target might increase in the future.

### Network Analysis Approach

CONNECT supports rail corridor studies by estimating at a coarse, sketch plan level, the relative impacts of alternative rail network and service plans on future ridership, revenue, capital, operating, and maintenance costs, as well as overall financial performance of each option. Focusing on markets separated by at least 50 miles, CONNECT is a low-resolution network analysis tool suitable for sketch planning at the mega-region/multi-state level and is intended for use at the very outset of the planning process, before decisions on alignments, service plans and exact station locations are made. It is used to reduce a wide range of options to a smaller subset of the most reasonable of alternatives for more detailed study.

### Rail Network Service Concepts

One potential conceptual regional rail network developed by Study stakeholders along with preliminary benefits is presented in Figure 5 (next page). These candidate proposals were developed in consideration of the early-stage, preliminary assessment of ridership potential within each corridor, as well as each corridor's potential contribution to the service quality of other corridors and for the SW Study Area as a whole. A comparison of the performance of all 11 corridors as a stand-alone corridor versus a full network showed that connectivity associated with the full network yields higher ridership and revenues and lower capital and O&M costs.

Several corridors are depicted as Regional, indicating that these might start as Regional corridors, potentially growing into Core Express based on other investments in the network. Alternatively, these could exist as hybrid corridors with Core Express equipment operating through service at reduced speeds mixed with commuter or traditional intercity service, sometimes labeled "blended service."

This map displays one possible approach to rail based on high-level sketch planning analyses. It also demonstrates that, when employed at levels appropriate to demand, rail can play an important role in meeting the Southwest's future transportation needs.

## GOVERNANCE CONSIDERATIONS

Concurrent to the development of the network vision, stakeholders identified key issues and potential governance structures needed for advancing a broad, multi-state vision and to help ensure the success of HPR projects that cross state lines. They also defined alternative governance models that could provide a flexible framework for making key decisions as projects are developed.

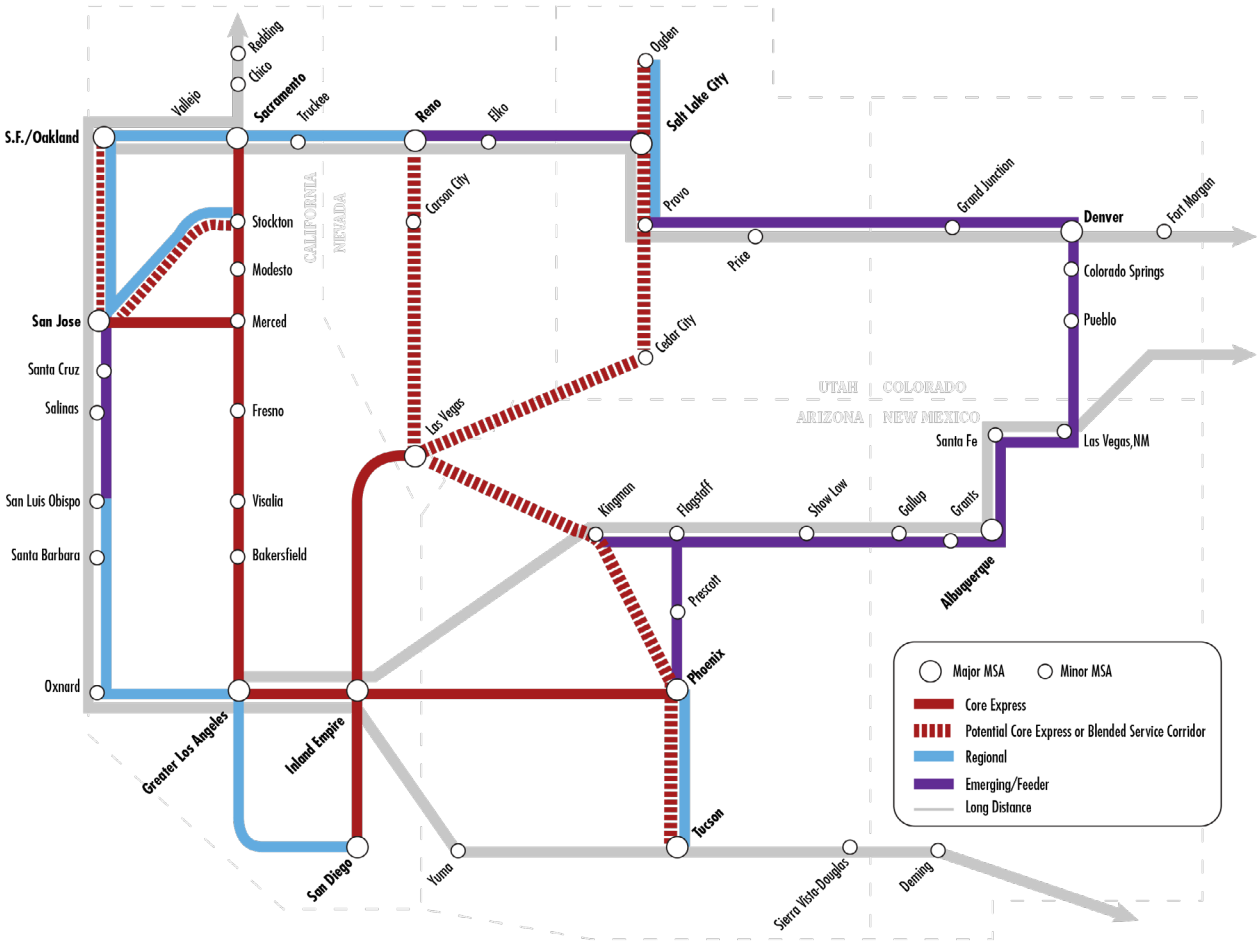
Two key recommendations emerged, focused on the relatively near-term:

**Convene a voluntary California-Arizona-Nevada Passenger Rail Policy and Planning Group.** Initial membership of the Policy and Planning Group might include stakeholders who participated in the SW Study. Among this group's charge could be implementing next steps emerging from the SW Study and developing, and potentially implementing, a broader strategy to engage elected officials, the business community, and the public in refining the preliminary vision.

**Form a Blue Ribbon Commission to guide a Phoenix–Southern California Corridor study over an 18-month schedule.** The Blue Ribbon Commission might include leaders such as local elected officials and gubernatorial appointees and be supported by a planning/technical committee including MPO and state department of transportation (DOT) staff for evaluation and analysis.

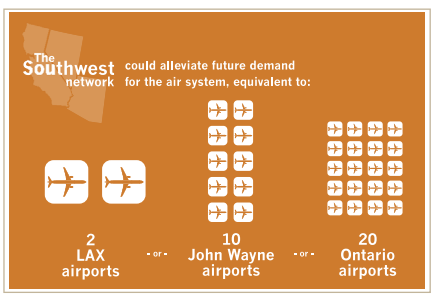
Additional detail on these recommendations is provided in the full SW Study Technical Background Report.

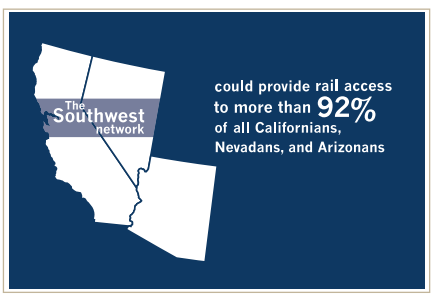
**Figure 5:** Corridor considerations for further study

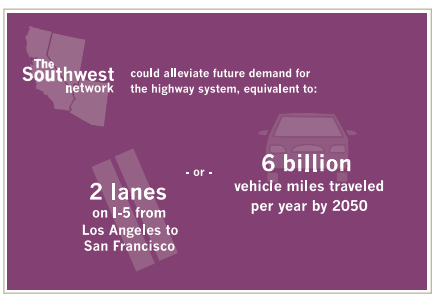



Source: CONNECT Beta Version, 2012
*Figure identifies desired connections between metropolitan areas. It does not identify alignment or station locations and does not preclude multiple alignments within a corridor segment.

## *Potential Benefits of Preliminary Network Vision*




*Data derived from CONNECT analysis of corridors identified in Figure 5.

# IMPLEMENTATION STRATEGIES

Conceptual planning analysis performed in the SW Study indicates there are several multi-state corridors in the Southwest that could address increasing constraints on the transportation network and thus warrant further study in advance of possible new rail investments. Together, the Preliminary Network Vision and Governance Considerations outline a broad, long term concept for a multi-state HPR network in the Southwest and coordination across state lines in its planning and delivery.

Stakeholders identified the two following strategies to sustain momentum in regional rail planning in the Southwest US and bridge the conclusion of this phase of study with potential future efforts.

## STRATEGY #1

**Integrate the Southwest Multi-State Rail Planning Study into Existing and Ongoing Transportation Planning Efforts.** In the near term, findings and recommendations from this study could be considered in individual State Rail Plans as well as other ongoing state and regional planning efforts. In addition, while this study performed an initial assessment of rail corridor potential against a set of performance metrics, further study is needed to analyze whether other modes could present more cost-effective investment solutions, as well as the implications of not making new infrastructure investments. While this is a recommendation for subsequent phases of planning, it may also be incorporated into ongoing corridor planning studies.

## STRATEGY #2

**Establish a Southwest Rail Working Group to Initiate Implementation of the Study's Governance Recommendations.** This working group's charge might include:

- Developing a strategic implementation plan for advancing the study recommendations. This would include laying the groundwork for the California-Arizona-Nevada Passenger Rail Policy and Planning Group identified in the Governance Considerations, identifying participants, determining the need for a formal agreement mechanism (e.g., MOU), and refining roles and responsibilities.
- Crafting a mission statement and distinct goals and objectives for the Southwest rail network.
- Initiating development of a compelling business case for the Southwest rail network. This should include near-term "wins" that demonstrate the benefits of multi-state coordination.
- Exploring potential state and local funding sources to fund future multi-state planning efforts.
- Initiating a broad-based outreach program that engages stakeholders such as elected officials, the private sector, and the public in future rail network development efforts. Understanding changes in traveler preferences, cost efficiencies and sustainable options are important aspects to effective outreach.
- Championing the creation of the Blue Ribbon Commission for the Phoenix-Southern California corridor study.

# LESSONS LEARNED AND CONCLUSION

The SW Study demonstrates the importance of conducting long-range planning for high performance rail corridors within the context of an integrated multi-state or regional network. As a test case to develop an analytical framework and understanding of the institutional context for establishing and implementing a long-range rail vision, the Study yielded lessons learned that can be applied in other regions. If a similar effort was to be conducted elsewhere, the following could be considered:

- **Provide a clear definition for stakeholders of what can reasonably be accomplished within this level of study** and what topics may be more suitable for future phases. Future studies should communicate the limits of the study at the outset and clearly map out the intended outcome.
- **Incorporate other modes into multi-state rail planning** including potential involvement from other modal administrations.
- **Identify how and to what extent other entities can be engaged** during future initial multi-state planning efforts. Broader input may be needed before visions are formally adopted.
- **Recognize importance of federal involvement in multi-state rail planning**, with FRA continuing to serve as a facilitator and provide a forum for stakeholders to discuss key issues relevant to HPR network planning.
- **Initiate development of goals and a Purpose and Need for HPR early** in the multi-state rail planning process; a series of guiding principles can be used as a starting point to engage other stakeholders and develop distinct goal statements in future phases of study.
- **Focus stakeholder engagement efforts on in-person workshops**.Teleconferences and webinars proved not to be effective means for engaging stakeholders and furthering study progress relative to face-to-face meetings.
- **Introduce CONNECT in stages so stakeholders better understand its strengths and limitations** by the time the final results and network vision emerge. For future efforts, it is recommended that the introduction to CONNECT occur as early in the process as possible.
- **Recognize that for governance, there is not a one-size-fits-all approach.** While activities such as research and documentation of various governance typologies can be applied to other regions, the actual approach applied for future studies should be flexible enough to respond to a respective region's needs.

The SW Study is important for both the progress it made as a model for future multi-state rail development and for creating and applying new rail planning methodologies. The Study was conducted from a multimodal perspective, in recognition of the existing and projected development of highway and aviation facilities. Through a comprehensive planning process involving data assembly, network usage forecasting, and stakeholder engagement, the SW Study was successful in developing candidate options for further analysis towards a long-term vision.

State and local officials can renew partnership efforts to build on the information developed in the SW Study, through more detailed planning, to reach consensus on a Vision Plan for the region that can serve as a blueprint for future rail investment. This will include engaging a broader audience, including elected officials, and seeking to find local champions to advance this final Vision Plan.