This document has been prepared by WSP USA for the California High-Speed Rail Authority and for application to the California High-Speed Rail Project. Any use of this document for purposes other than this Project, or the specific portion of the Project stated in the document, shall be at the sole risk of the user, and without liability to WSP USA for any losses or injuries arising for such use.
Table of Contents

1 Introduction .......................................................................................................................... 6
  1.1 Project Update Overview .............................................................................................. 6

2 Context and Objective ........................................................................................................... 8
  2.1 Purpose of the Report ..................................................................................................... 8
  2.2 California High-Speed Rail Authority Policies ............................................................... 8
  2.3 Literature Review .......................................................................................................... 10
    2.3.1 California High-Speed Rail Related Studies .......................................................... 10
    2.3.2 Other Transportation Infrastructure Economic Impact Analyses ......................... 11
  2.4 Review and Validation ................................................................................................... 13

3 Economic Impact Overview ................................................................................................ 16
  3.1 Types of Economic Impacts ............................................................................................ 16
    3.1.1 Job-Years and Full-Time Equivalents .................................................................... 16
    3.1.2 Labor Income/Earnings ......................................................................................... 16
    3.1.3 Value Added/Gross Regional Product .................................................................... 16
    3.1.4 Direct, Indirect, and Induced Economic Impacts .................................................... 17
  3.2 Program Expenditure .................................................................................................... 17
    3.2.1 Program Expenditure by Category ........................................................................ 17
    3.2.2 Program Expenditure by Fiscal Year ..................................................................... 20
    3.2.3 Program Expenditure by Source of Funds .............................................................. 20
  3.3 Geographies Analyzed ................................................................................................... 21
  3.4 Analysis Horizons ......................................................................................................... 21

4 Methodology ......................................................................................................................... 23
  4.1 Data Collection ............................................................................................................... 23
    4.1.1 Inventory of Existing Data ...................................................................................... 24
    4.1.2 Data Collection Strategy ........................................................................................ 24
    4.1.3 Invoice Review ........................................................................................................ 26
    4.1.4 Contractor Outreach ............................................................................................... 28
    4.1.5 Data Gap Interpolation ............................................................................................ 29
    4.1.6 Data Quality Assurance / Quality Control ............................................................... 30
  4.2 Analysis Approach ......................................................................................................... 31
    4.2.1 RIMS & IMPLAN Methodology .............................................................................. 31
    4.2.2 Top-down Approach ............................................................................................... 34
    4.2.3 Bottom-Up Approach ............................................................................................. 34
  4.3 Choice of IMPLAN and RIMS II .................................................................................... 35

5 Results ................................................................................................................................... 37
  5.1 California Economic Impacts .......................................................................................... 37
    5.1.1 Fiscal Year 2016-2017 Forecast .............................................................................. 38
    5.1.2 Silicon Valley to Central Valley Line Forecast ......................................................... 38
  5.2 Employment Impact Overview ......................................................................................... 40
    5.2.1 Job-Years by Industry Sector .................................................................................. 41
  5.3 Breakdown by Region ..................................................................................................... 43
Appendixes

Silicon Valley to Central Valley Line Analysis RIMS and IMPLAN Codes
Figures

Figure 1. California High-Speed Rail System ................................................................. 6
Figure 2. Range of Economic Impact from Other Analyses ............................................. 13
Figure 3. High-Speed Rail by Project Section ................................................................. 18
Figure 4. Total Program Expenditure by Category (July 2006 to June 2016) .................. 19
Figure 5. Total Program Expenditure by Fiscal Year (July 2006 to June 2017) .............. 20
Figure 6. Total Program Funding by Source (July 2006 to June 2016) ......................... 21
Figure 7. Analysis Horizons Timeline............................................................................ 22
Figure 8. Inputs for RIMS and IMPLAN Input-Output Models ....................................... 23
Figure 9. Contracts Expenditure and Number of Invoices Received (July 2006 – June 2016) ............... 25
Figure 10. CP1 Alignment-Zip Code GIS Map Overlay ............................................... 29
Figure 11. Data Interpolation Methodology per Contract .............................................. 30
Figure 12. Top-down Approach Analysis Process ......................................................... 34
Figure 13. Bottom-up Approach Analysis Process ......................................................... 35
Figure 14. Statewide Total Job-Years per Fiscal Year, July 2006 – June 2017 ............... 41
Figure 15. Economic Impacts by California Region ...................................................... 43
Figure 16. Central Valley Construction Contracts ......................................................... 45
Figure 17. Central Valley Region Total Job-Years per Fiscal Year, July 2006 – June 2017 . 47
Figure 18. Sacramento Region Total Job-Years per Fiscal Year, July 2006 – June 2017 .... 48
Figure 19. Bay Area Region Total Job-Years per Fiscal Year, July 2006 – June 2017 ...... 49
Figure 20. Southern California Region Total Job-Years per Fiscal Year, July 2006 – June 2017 ...... 50
Figure 21. Historical Nonfarm Employment Growth, Fresno County, Central Valley, State of California, 2004-2016 ................................................................. 53
Figure 22. Active High-Speed Rail Construction Project Sites ....................................... 54
Figure 23. Total Job-Years by California Counties ......................................................... 55
Figure 24. CalEnviroScreen 2.0 Indicator and Component Scoring ............................... 56
Figure 25. Disadvantaged Communities in California and Project Alignment .................. 58
Figure 26. Small Business Participation in the California High-Speed Rail Program (as of October 2016) .................................................................................. 59
Tables

Table 1. 20 Major Contracts (July 2006 – June 2016) ................................................................. 26
Table 2. Example of Invoice Review Data Template ................................................................. 27
Table 3. Industry/Sector Allocations by Contract Category .................................................... 33
Table 4. California Economic Impacts, July 2006 – June 2016 ............................................. 37
Table 5. California Economic Impacts, FY 2016-2017 Forecast ........................................ 38
Table 6. Valley to Valley Line Economic Impacts, 2006 to 2025 ......................................... 39
Table 7. 2016 Business Plan Silicon Valley to Central Valley Line Capital Cost Estimate .... 40
Table 8. Largest Direct Job-Years per IMPLAN Sector, FY 2006-2007 to FY 2015-2016 .... 42
Table 9. Central Valley Economic Impacts, July 2006 – June 2016 ..................................... 46
Table 10. Sacramento Region Economic Impacts, July 2006 – June 2016 .......................... 47
Table 11. Bay Area Region Economic Impacts, July 2006 – June 2016 .............................. 49
Table 12. Southern California Region Economic Impacts, July 2006 – June 2016 ............. 50
Table 13. Major Employment Sectors for Select California Counties .............................. 51
Table 14. Fresno County Economic Impacts, July 2006 – June 2016 ............................... 52
Table 15. Madera County Economic Impacts, July 2006 – June 2016 .............................. 54
Table 16. US States with Highest Program Expenditure ....................................................... 60
## Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>2016 California High-Speed Rail Economic Impact Analysis</td>
</tr>
<tr>
<td>APTA</td>
<td>American Public Transit Association</td>
</tr>
<tr>
<td>ARRA</td>
<td>American Recovery and Reinvestment Act</td>
</tr>
<tr>
<td>Authority</td>
<td>California High-Speed Rail Authority</td>
</tr>
<tr>
<td>BEA</td>
<td>Bureau of Economic Analysis</td>
</tr>
<tr>
<td>CMGC</td>
<td>Construction manager / General contractor</td>
</tr>
<tr>
<td>CP</td>
<td>Construction package</td>
</tr>
<tr>
<td>CV</td>
<td>Central Valley</td>
</tr>
<tr>
<td>DB</td>
<td>Design build</td>
</tr>
<tr>
<td>DBE</td>
<td>Disadvantaged business enterprise</td>
</tr>
<tr>
<td>DOF</td>
<td>Department of Finance</td>
</tr>
<tr>
<td>DVBE</td>
<td>Disabled veteran business enterprise</td>
</tr>
<tr>
<td>E&amp;E</td>
<td>Environment and engineering</td>
</tr>
<tr>
<td>EDD</td>
<td>California Employment Development Department</td>
</tr>
<tr>
<td>EIR/EIS</td>
<td>Environmental impact report/Environmental impact statement</td>
</tr>
<tr>
<td>FEIS</td>
<td>Final environmental impact statement</td>
</tr>
<tr>
<td>FRA</td>
<td>Federal Railroad Administration</td>
</tr>
<tr>
<td>FTE</td>
<td>Full time equivalent</td>
</tr>
<tr>
<td>FY</td>
<td>Fiscal year</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GSP</td>
<td>Gross state product</td>
</tr>
<tr>
<td>MRP</td>
<td>Master resource pool</td>
</tr>
<tr>
<td>ODC</td>
<td>Other direct cost</td>
</tr>
<tr>
<td>PA</td>
<td>Program administration</td>
</tr>
<tr>
<td>PCM</td>
<td>Project and construction management</td>
</tr>
<tr>
<td>PM</td>
<td>Program management</td>
</tr>
<tr>
<td>PMT</td>
<td>Program management team</td>
</tr>
<tr>
<td>Program</td>
<td>California High-Speed Rail Program</td>
</tr>
<tr>
<td>RA</td>
<td>Resource agency</td>
</tr>
<tr>
<td>RC</td>
<td>Regional consultant</td>
</tr>
<tr>
<td>RDP</td>
<td>Rail delivery partner</td>
</tr>
<tr>
<td>ROW</td>
<td>Right of way</td>
</tr>
<tr>
<td>SBE</td>
<td>Small business enterprise</td>
</tr>
<tr>
<td>TPA</td>
<td>Third party contracts</td>
</tr>
</tbody>
</table>
1 Introduction

The California High-Speed Rail Authority (Authority) is responsible for planning, designing and building the first high-speed rail system in the nation. California’s high-speed rail system will connect the mega-regions of the state, contribute to economic development and a cleaner environment, create jobs and preserve agricultural and protected lands. By 2029, the system will run from San Francisco to the Los Angeles basin in under three hours at speeds capable of over 200 miles per hour. The system will eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations.

As construction has gotten under way and the Authority has transitioned from a planning to a project development organization, the economic impact of its activities has grown substantially. Starting with just a few employees a decade ago, the project has now employed thousands of people across all functions from planning and environmental clearance to engineering and construction. The investment has generated substantial economic benefits and has spurred further economic impacts around California and across the country. To understand those economic impacts, the Authority developed the 2016 California High-Speed Rail Economic Impact Analysis (Analysis).

This Technical Memorandum outlines the methodology that was used in developing the Analysis. This document serves as the methodological overview and provides the detailed data and assumptions supporting the results in the Analysis and other documents that may reference the results.

1.1 Project Update Overview

The California high-speed rail program (Program) broke ground in January 2015 and construction is underway through a series of design-build contracts. Along the way, right-of-way has been purchased, utilities have been relocated, and as of this writing nine major construction sites are up and running —
building the program’s first structures. At the same time, planning and engineering continues across the system.

With two years since the groundbreaking, there are now 119 miles of construction activities underway. The three design-build construction teams are working between Madera and Kern Counties on contracts valued at $3.24 billion. In addition, Caltrans is managing the realignment of a portion of State Route 99 in Fresno to make room for high-speed rail. Bridges, viaducts and grade separations are visible at multiple locations and the first complete structures are expected to be completed this year. Workers and residents of the Central Valley are already seeing the benefits of this monumental rail project as the project’s economic benefits continue to bolster the recovery.

Work is also advancing on every mile of the Phase 1 system – San Francisco/Merced to Los Angeles/Anaheim – and planning work is continuing on the Phase 2 sections – Merced to Sacramento and Los Angeles to San Diego. The Authority is working to environmentally clear every Phase 1 project section in order to provide clarity to local communities and jurisdictions as to the route that the system will take and to make them shovel ready as funding becomes available. This involves a variety of technical studies and analyses, public outreach, engineering, and other activities throughout the State.
2  Context and Objective

2.1  Purpose of the Report

The 2016 California High-Speed Rail Economic Impact Analysis (Analysis) estimates the economic impact of the Authority’s expenditure through June 2016, including job-years, labor income, and economic output.\(^1\) The Analysis also includes a short-term projection through the end of FY 2016-2017, when American Recovery and Reinvestment Act (ARRA) funds will have been fully spent. Lastly, the analysis includes a broader assessment of total economic impact of the completion of the Silicon Valley to Central Valley Line in 2025, as described in the 2016 Business Plan.\(^2\) For more details on these time horizons, please refer to Section 4: Methodology. This analysis reports the economic impacts of the project on the State of California, as well as at regional, sub-regional, and national levels. A summary of the geographic breakdown of impacts can be found in Section 3: Economic Impact Overview and Section 5: Results.

The scope of this analysis is strictly limited to the economic impacts from historical and forecast project expenditures. It does not attempt to quantify the many long-term benefits and impacts associated with future rail operations, such as increased accessibility, reduced vehicle miles traveled and vehicular congestion, increased safety, greenhouse gas emission reductions, increased economies of agglomeration and other benefits. Additionally, this analysis does not consider the economic effects resulting from changes in consumption due to the collection of revenues. Lastly, the results of this analysis reflect the gross economic benefits of the project and do not consider the potential benefits of alternative uses of the state and federal funding sources used to pay for the project, including the potential benefit to other programs, services or the State of California if funds had not been allocated to the Program.

2.2  California High-Speed Rail Authority Policies

The Authority Board of Directors has adopted several goals and requirements that ensure the Program has a profound beneficial impact on California’s communities. The outcomes of these policies are reflected in the findings of the analysis and can be seen in more detail in Section 5: Results.

In 2012, the Authority established its Small and Disadvantaged Business Enterprise Program to ensure that small businesses, inclusive of Disadvantaged Business Enterprises (DBE) and Disabled Veteran Business Enterprises (DVBE), are afforded every practicable opportunity to participate in the Program. The Small Business Program is consistent with state and federal law and established a 30 % small business participation goal, to be attained in all contracts associated with the Authority.\(^3\)

---

\(^1\) Technical definitions of these economic impact metrics are provided in Section 3.1 of this report

\(^2\) http://www.hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf

\(^3\) For more information please see the Small Business Administration’s website: https://www.sba.gov/
Additionally, the Authority has a Community Benefits Agreement (CBA) which includes the Authority’s Disadvantaged Worker Program. This program ensures that 30% of project construction work hours are performed by National Targeted Workers and 10% of all hours are performed by Disadvantaged Workers.

**A Small Business** is a for-profit business concern that meets the certification requirements set forth in California Government Code Section 14837(d) and California Code of Regulations Section 1896.4 (Definitions) and 2894.12 (Eligibility) including but not limited to that its principal office is located in California, its owners reside in California, it not be dominant in its field and it have average gross revenue of $14 million or less over the previous three tax years. To be counted towards meeting the goals of the Small Business Program, a Small Business must be certified by the California Department of General Services.

**A Disabled Veteran Business Enterprise** is a for-profit business concern that meets the certification requirements set forth in California Military and Veterans Code Section 999(b)(7) including but not limited to at least 51% owned by a veteran of the United States Military who has at least a 10% service-connected disability. To be counted towards meeting the goals of the Small Business Program, a Disabled Veteran Business Enterprise must be certified by the California Department of General Services.

**A Disadvantaged Business Enterprise** is a for-profit business concern that meets the requirements of Title 49, Part 26.61 through 26.73 inclusive of the Code of Federal Regulations including but not limited to at least 51% owned by individuals who are both socially and economically disadvantaged. To be counted towards meeting the goals of the Small Business Program, a Disadvantaged Business Enterprise must be certified by the California Uniform Certification Program.

To learn more, visit:
[http://www.hsr.ca.gov/docs/newsroom/fact%20sheets/CBA_Factsheet_FINAL_0050415.pdf](http://www.hsr.ca.gov/docs/newsroom/fact%20sheets/CBA_Factsheet_FINAL_0050415.pdf)

In addition to the Authority’s requirements, the Federal Railroad Administration’s (FRA) Buy-America Act mandates that the Authority and its contractors ensure that any steel, iron, and manufactured goods
used in the project are produced in the United States. At the time of this report, detailed data identifying the location of manufacturers of materials purchased for the Program (to show compliance with the Buy-America Act) were not yet available since it is reported by the design-build contractors at achievement of contractual project milestones (such as completion of a structure).

These policies help provide opportunities on the Program to those who are in most need of them, including small businesses that have been able to expand by hiring new workers. Many workers who have faced barriers to employment are now able to find good middle class jobs through their roles on the Program.

2.3 Literature Review

Several studies have estimated the economic impacts and overall benefits of investment in transportation infrastructure in general, and of the Program specifically. A review of previous studies was conducted to provide analytical context, ensure a methodology consistent with industry standards, and benchmark results when applicable.

2.3.1 California High-Speed Rail Related Studies

40 Proposed U.S. Transportation and Water Infrastructure Projects of Major Economic Significance – US Department of Treasury (Fall 2016)

According to the report 40 Proposed U.S. Transportation and Water Infrastructure Projects of Major Economic Significance\(^5\) prepared by the United States Department of Treasury for the Build America Investment Initiative in 2016, out of a total of 40 large U.S. projects, California High-Speed Rail will generate the second highest amount of net economic benefits with nearly $200 billion (discounted 2015 dollars). Of projects where implementation has begun, the Program has the third highest benefit-cost ratio – with benefits outweighing costs by between four and seven times.

California & Metro Forecast 2017 – University of the Pacific (January 2017)

The University of the Pacific’s Center for Business and Policy Research publishes the California & Metro Forecast\(^6\) on a regular basis. Their January 2017 forecast estimates that 25,000 new construction jobs per year will be provided in the state of California (not just from high-speed rail), and with tremendous Authority investment in Fresno for construction activities, Fresno is expected to “receive a boost” from this spending – resulting in a 2% increase in job growth. In a previous iteration of their report, the University of the Pacific found that Fresno-area unemployment is now below 10% for only the fourth time in the last 25 years, with high-speed rail construction being a key factor in this improvement. The report went on to state that, “increasing construction activity on high-speed rail and improved drought conditions in the Fresno area will help keep the expansion [of job growth] going in 2016 and 2017.”

---

\(^4\) For more details on the FRA’s Buy America Act, please go to https://www.hsr.ca.gov/docs/about/doing_business/RFP_X034_14024/Amendment_No_009_ITO_Ex_B_Req_051914_CLEAN.pdf


\(^6\) http://www.pacific.edu/Documents/school-business/BFC/Forecasts/CA-Metro-Forecast-Jan2017-V2.pdf
Similarly, a United States Department of Transportation report Shovel Worthy: What the Recovery Act Taught Us About Investing in Our Nation’s Infrastructure makes mention of the significant federal investments in the Fresno area, including California High-Speed Rail, leading to benefits such as cutting the unemployment rate in half (9.3% in October 2016) and “…downtown revitalization, economic development and innovation, increased infill development, business development, neighborhood revitalization, and sustainable communities.”

A recently published analysis from the University of California, Berkeley Labor Center, The Economic Impacts of California’s Major Climate Programs on the San Joaquin Valley, estimated the potential economic impact of the initial construction spending on high-speed rail in the San Joaquin Valley and asserted that “the economic impact of this new spending will generate an additional $1.3-1.7 billion in economic activity, 5,200-6,800 new jobs, and $38-49 million in state and local tax revenue in the Valley.”

The January 2015 report California High-Speed Rail and the Central Valley Economy undertook a quantitative and qualitative approach to analyze the economic trends in the Central Valley. Key findings from economic and demographic data analysis and stakeholder interviews included the following:

- High-Speed Rail is an important part of the strategy to better connect the Central Valley to both the Bay Area and Southern California.
- Central Valley stakeholders generally see the benefit of High-Speed Rail, specifically in creating opportunities for small and disadvantaged businesses and workers.
- High-Speed Rail in the Central Valley could lead to increased business attraction and retention, and tourism and recreation.

2.3.2 Other Transportation Infrastructure Economic Impact Analyses

- In 2009, American Public Transit Association (APTA) updated a previous report 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 job impact estimates used for this study utilized a composite methodology, which tracked the pattern and mix of direct expenditures, and traces their indirect and induced impacts through capital and trade investment for high-speed rail in San Joaquin Valley.
and economic model. The analysis estimated that 24,000 jobs would be generated per $1 billion in capital spending on transit; 41,000 jobs per $1 billion in operations spending for transit; and an average mix of 36,000 jobs per $1 billion dollars of combined spending on transit.\textsuperscript{12} For the purposes of calculating the direct, indirect, and induced impacts from capital spending on transit, this study analyzed spending focused on construction services, and the manufacturing of buses, trains, tracks, and equipment.

- Using the Washington State Input-Output model, Washington Department of Transportation (2011) estimated 11,400 direct, indirect, and induced job-years per $1 billion in construction spending and 16,000 per $1 billion in transportation operations. The results use an input-output approach similar to an IMPLAN model and this Analysis, but use a model built by individual state agencies that are customized based on the Washington state economy. This state-specific input-output model is divided by various industrial sectors and used to estimate multipliers for direct, indirect and induced impacts on jobs, earnings, and overall economic activity. The multipliers are similar to the BLS RIMS II multipliers from the national input-output model that can be purchased for various states, counties, and regions.

- For the American Recovery and Reinvestment Act, the President’s Council of Economic Advisors estimated the likely jobs impact of increases in government 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 10,900 job-years created.\textsuperscript{13} This report applies a different approach than this Analysis and includes multiple types of government spending, including investments in transportation.

- In 2016, the Los Angeles County Economic Development Corporation’s Institute for Applied Economics published Construction Impact of Metro’s Measure R Transportation Projects. LAEDC’s analysis is very comparable to this Analysis, as the researchers utilized program expenditures as inputs to economic models using IMPLAN software. The results of this analysis were approximately 11,900 direct, indirect, and induced job-years per $1 billion spent on construction of transit projects.\textsuperscript{14}

\textsuperscript{13} https://obamawhitehouse.archives.gov/sites/default/files/microsites/Estimate-of-Job-Creation.pdf
\textsuperscript{14} http://laedc.org/wp-content/uploads/2016/04/Measure-R-Projects-SUMMARY_20160304.pdf
2.4 Review and Validation

The Authority requested review and validation from a number of industry experts both within and outside of government who reviewed inputs, assumptions, methodology, and outputs associated with the Analysis. The following details these reviewers’ processes as well as brief summaries of their responses.

University of the Pacific, Center for Business and Policy Research

The Center for Business and Policy Research at the University of the Pacific includes some of the foremost experts on the Central Valley economy and publishes the California & Metro Forecast, a comprehensive, economic forecast of the state and eight metropolitan areas in Northern California.

Jeffrey Michael, PhD, Executive Director, and Thomas Pogue, PhD, Associate Director, provided insights and advice in the early stages of the project and also reviewed the final results and methodology. This

“The Authority has conducted a thorough economic impact analysis on current and previous investments in high-speed rail across California. After reviewing the study, we believe that the methodology and assumptions used for this project are sound and in keeping with other economic impact reports of similar focus. As such, the findings appear valid and within an acceptable range. The economic impact modeling is based on an extremely comprehensive data collection process that we believe follows industry best practices. Their analysis shows substantial economic impacts from the program’s development across the Central Valley and the rest of the state, and how those impacts have grown as the project has entered the construction phase.”

Thomas Pogue
Associate Director, Center for Business and Policy Research
Eberhardt School of Business
University of the Pacific
review made suggestions regarding the completeness of the information presented (such as what year dollar values were in for modeling results) as well as clarifications on definitions used to describe the methodology used.

After their review, they concluded that:

**Peer Review Group**

Assembly Bill 3034 established a Peer Review Group whose duty is to evaluate the Authority's funding plans and prepare its independent judgment as to the feasibility and the reasonableness of the Authority's plans, appropriateness of assumptions, analyses and estimates, and any observations or evaluations the Group deems necessary.

There are currently four members of the Group, including: Dr. Martin Wachs (appointed by the State Treasurer); Gary Gallegos (appointed by the State Controller); Stacey Mortensen (appointed by the Secretary of Business, Transportation and Housing); and, Lou Thompson (appointed by the Secretary of Business, Transportation and Housing). Lou Thompson has served as Chairman since March 1, 2013.

The Authority requested that Dr. Martin Wachs and Lou Thompson review the methodology and results of the Economic Impact Study. Dr. Wachs provided a variety of suggestions on both the analysis and its presentation that were addressed in the study. Suggestions to the methodology included the addition of quantified impacts outside of the State of California, clarifications regarding the difficulty of using zip codes to geographically assign impact, inclusion of modeling multipliers for additional quality assurance, and additional clarification regarding the types of contracts analyzed and their similarity to other contracts not analyzed for this methodology. These suggestions were addressed in the analysis and in this Technical Supporting Document.

After his review, Dr. Wachs provided this summary on behalf of himself and Lou Thompson:

> “The analysis that [the Authority] conducted seems consistent with standard practice for the estimation of economic impacts, and the models that were employed are widely used...The dual approach of top down and bottom up comparisons seemed appropriate as well.”

Martin Wachs, PhD  
Distinguished Professor Emeritus of Urban Planning  
UCLA Luskin School of Public Affairs

**The State of California Department of Finance**

The State of California Department of Finance (DOF), with a mission to promote long-term economic sustainability and responsible resource allocation, provided a peer review of the Analysis methodology and findings.

The Department of Finance’s review helped strengthen the analysis by suggesting the inclusion of additional information on small business requirements, more precisely portraying analysis results and
more clarity regarding what this report does not include analysis of the economic impacts associated with a theoretical different use of the funds than this program. Since such an analysis was outside of the scope of this work and since the decision to use the funds on high-speed rail has already been made, it is properly acknowledged that a theoretical different use of the funds would have different economic results than what is described here but what those would be cannot reasonably be quantified at this time.

**California Department of Labor / California Employment Development Department**
The California Department of Labor, and more specifically the California Employment Development Department (EDD) reviewed the analysis’ methodology and findings, confirming that the approach was standard and effective. Main feedback included the limitation of modeling programs like IMPLAN and RIMS II as static modeling systems, rather than using more dynamic programs like REMI. The Analysis includes a section on the choice to use IMPLAN and RIMS II later in this document.

Summary feedback included:

"The study uses primary data (e.g., project costs, contract expenditure, etc.) and two of the most widely known economic modeling software tools (e.g., RIMS II, IMPLAN) which provide excellent information regarding direct and indirect effects...The reports produced made great use of studying the direct, indirect, and induced effects of high-speed rail spending within California’s counties."

Brandon T. Hooker
Economist
California Employment Development Department
Labor Market Information Division - Applied Research Team
3 Economic Impact Overview

3.1 Types of Economic Impacts

The results of the Analysis are expressed in standard economic metrics including job-years, labor income, and value added. The following section provides definitions of these metrics.

3.1.1 Job-Years and Full-Time Equivalents

In the context of the Program’s economic impacts, job-years are defined as the equivalent number of one-year-long, full-time jobs supported by the project. For example, if one full-time job is supported for two years, it therefore represents two job-years. In 2009, the White House Council of Economic Advisers (CEA) produced estimates of job creation that would result from ARRA; those estimates were expressed in job-years because, as the report describes, “for some purposes, looking at the effects at a single point in time is not the most useful approach.” The Analysis considered historical, project-related spending over a ten-year period. Because the volume of spending was highly variable from year to year throughout the analysis period, and because the types of services procured with that spending changed substantially over the life of the project, reporting the results of this analysis as jobs-years is most appropriate.

Full-time equivalent (FTE) is a term frequently employed by agencies and other public employers. As described by the U.S. Government Accountability Office, an FTE is a measure of employment relative to the full-time hourly obligation for a given job. That is, if a job entails a 35-hour workweek with 15 days of paid time off, the FTE for that role would be equal to 1,700 annual hours—therefore, an employee who worked 850 hours in that role in a given year would be described as 0.5 FTE. This allows for standardization between full-time and part-time positions to create one easy-to-understand estimate of the total amount of employment generated. As further described in section 4.3.2 Bottom-Up Approach, for certain contracts, FTEs directly supported by the project were estimated based on a detailed review of historical invoices detailing employee hours worked. For the purposes of this analysis, FTEs calculated from this data review represent the equivalent of job-years as defined above. In other words, one FTE supported on a contract is equal to one direct job-year supported.

3.1.2 Labor Income/Earnings

In addition to jobs supported, input-output models also report the labor income generated by the project. This figure includes all forms of employment income, including compensation (wages, benefits, and payroll taxes) firms paid to employees, and income earned by self-employed workers or unincorporated sole proprietorships.

3.1.3 Value Added/Gross Regional Product

For a specific firm or an entire industry, value added is the difference between total output—i.e., sales, other operating income, and change in inventory—and the cost of intermediate inputs required to produce that output—i.e., the goods and services purchased from other firms or industries.

---

15 https://obamawhitehouse.archives.gov/administration/eop/cea/Estimate-of-Job-Creation/
16 https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/memoranda_2010/m10-08.pdf
17 See Section 4.2.1 RIMS & IMPLAN Methodology for more information on input-output models
In this context, value added represents the contribution the Program has made to the Gross Domestic Product (GDP) of the United States, or the Gross State Product (GSP) of California.

3.1.4 Direct, Indirect, and Induced Economic Impacts

Direct impacts are the economic effects generated by direct spending on a project. In the case of California high-speed rail, these impacts result from the Authority’s spending on Authority employees as well as its contractors (including both construction contractors and professional services).

Indirect impacts are the economic effects that occur in the next step in the supply chain. These impacts are dispersed among the industries that supply intermediate goods and services to firms with direct impacts. For California high-speed rail, these impacts can be observed in a diverse range of industries across the state—including, for example, the materials producers who supply the construction firms, as well as the technology vendors who service the professional service firms.

Induced impacts are the economic effects that result when income earned by direct and indirect employees gets spent elsewhere in the economy. For example, both the civil engineer working full-time on California high-speed rail and the software engineer who codes a new version of AutoCAD spend their household income on housing, groceries, and other expenses in California.

3.2 Program Expenditure

From July 2006 through June 2016, the Authority invested over $2.3 billion in planning and constructing the nation’s first high-speed rail system. These investments were made largely through the execution of more than 460 contracts within the private sector, with around 93% of total expenditure through private contracts. Funding for these contracts has been provided by a mix of federal and state sources.

3.2.1 Program Expenditure by Category

Program investments can be broken down into five general expenditure categories:

Construction – expenditure in this category includes the Design-Build (DB) contractors, California State Route 99 Relocation project being undertaken by Caltrans (through a contractor) and Project and Construction Management (PCM) contracts. Tasks under the construction category include final design, construction administration, utility relocation, site clearing and civil works construction.

Planning/Environmental – expenditure in this category includes Regional Consultant (RC) and Environmental and Engineering (E&E) contract costs. Tasks under the planning/environmental category cover the preparation of project site-specific Environmental Impact Report/Environmental Impact Statement (EIR/EIS) documents and preliminary engineering for all the project sections. Although other parts of the organization also perform duties related to the planning and environmental clearance...

---

18 The categories used in this analysis and described in this section are meant to be a summary for purposes of this analysis. The Authority’s financial reporting may provide different breakdowns to manage and report on the program.

19 The environmental review process must comply with the standards set forth in both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) review process. As such, both EIR and EIS documents are required.
processes, this simplification of the variety of services provided is appropriate for this kind of economic analysis.

The project has been divided into ten separate sections along the alignment. Each of the sections will go through the EIR/EIS process before permitting, right-of-way (ROW) acquisition, and construction can begin in the area. The project sections (shown in Figure 3) include:

1. San Francisco to San Jose
2. San Jose to Merced
3. Merced to Sacramento
4. Merced to Fresno (Central Valley Wye Supplemental Analysis)
5. Fresno to Bakersfield (Locally Generated Alternative Supplemental Analysis)
6. Bakersfield to Palmdale
7. Palmdale to Burbank
8. Burbank to Los Angeles
9. Los Angeles to Anaheim
10. Los Angeles to San Diego

**Program Administration** – expenditure in this category includes Authority expenses and the Rail Delivery Partner (RDP)/Program Management Team (PMT) contracts costs. Tasks under the program administration category cover program management, program integration and coordination, and overall program delivery tasks. Although the Authority and RDP/PMT perform work across the other categories, for this analysis they are included separately in this summary category.

**Real Property Acquisition** – expenditure in this category includes right-of-way (ROW) support services (mapping, surveying, appraisal, negotiation and acquisition) contracts costs, relocation expenses, and land acquisition purchase payments.

---

20 The PMT contract began in 2006 to assist the Authority with program management consisting of engineering, environmental and construction management services. In 2015, there was a recompete for the program management contract, and is now referred to as the “RDP” contract.
Other – expenditure in this category includes Resource Agencies (RA), Third-Party Agreements (TPA), legal, financial services, and other miscellaneous contracts costs.

- RA contracts are agreements with local, state and federal government agencies for station design, permits, review fees, etc.
- TPA contracts are agreements with utilities, railroads and other stakeholders for utility relocation work along the alignment.
- Legal contracts are for various legal advisory services for the Program.
- Financial services contracts are for accounting and financial advisory services for the Program.

The share of each expenditure category in the total program investments from July 2006 to June 2016 is shown in Figure 4. The construction category has the largest share of total investments with 30% ($692 million), with planning/environmental, program administration and real property acquisition also making up significant shares of the total expenditure to date. As construction continues to ramp up, the construction category’s share will continue to grow as a percentage of the total expenditure.

Figure 4. Total Program Expenditure by Category (July 2006 to June 2016)

Out of the $2.3 billion total program investments from July 2006 to June 2016, $1.9 billion was used as an input to the economic impact input-output model discussion in this report. The economic impact calculations in this study exclude over $372 million spent on ROW land acquisition payments. Payment to property owners for land acquisition is considered an economic transfer and is excluded from the economic impact analysis. However, support activities for land acquisition, such as appraisal, surveying and geotechnical services, do generate economic impacts and are included in the analysis.
3.2.2 Program Expenditure by Fiscal Year

Total program expenditures have grown steadily from $10 million in FY 2006-2007 to $968 million in FY 2015-2016, with forecast expenditure in FY 2016-2017 further increasing to $1,313 million.

The composition of program expenditures has evolved over time. From FY 2006-2007 to FY 2012-2013 the majority of expenditure included planning/environmental and program management work. Starting in FY 2013-2014, real property acquisition and construction work steadily increased as a share of the total annual expenditure. This trend will continue as the bulk of the environmental planning work will be completed during the course of FY 2017-2018 while the design-build contracts in the Central Valley will continue to ramp up civil works construction. In the medium term, construction work will extend beyond the current design-build contracts both horizontally (to cover the rest of the Silicon Valley to Central Valley Line geography) and vertically (to include the track and systems necessary to run high-speed trains).

3.2.3 Program Expenditure by Source of Funds

Funding for the $2.3 billion spent on the system from July 2006 to June 2016 has come from both federal and state sources, with $1.7 billion (73%) of funding from ARRA - infusing the state’s economy with federal grant dollars. The remainder of the funding came from State sources. Proposition 1A, also known as the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, a ballot measure approved by California voters in 2008, provided $424 million (18%) while proceeds from the state’s Cap and Trade program provided $199 million (9%). All three funding sources have been used for project development activities while only the ARRA and Cap and Trade funds have been used for construction thus far. After ARRA funds are expended, the State will provide its matching funds before tapping into
the remaining federal funds. The 2016 Business Plan outlines the funding plan for the Silicon Valley to Central Valley line and Phase 1 in more detail.\textsuperscript{21}

**Figure 6. Total Program Funding by Source (July 2006 to June 2016)**

As discussed in *Section 2.1: Purpose of the Report*, the Analysis does not attempt to quantify the opportunity costs associated with the expenditure of these federal and state government funds for the high-speed rail program. It does not analyze what the economic impacts would be of spending the same amount of money on other projects. Further, the study does not attempt to quantify and/or “net out” the possible reduction in private consumption due to the collection of taxes to finance program expenditures. Although federal funds are often viewed as “free” from a local/state perspective, they do include some taxes paid by California residents and businesses. The analysis of these impacts includes significant uncertainty and was beyond the scope of this analysis.

### 3.3 Geographies Analyzed

The report analyzes the impact of program investments over a number of different geographies – ranging from statewide to specific regions and counties within California. Further, the report also analyzes expenditure impacts to Disadvantaged Communities and to states outside of California. See *Section 5: Results* for detailed analysis.

### 3.4 Analysis Horizons

This study analyzes economic impacts of expenditure to date. It also forecasts economic impacts of projected program investments in the short-term and long-term. The expenditure to-date analysis includes actual historical project investments from July 2006 to June 2016. The short-term forecast analyzes the impact of future project investments through FY 2016-2017. The short term forecast looks at the economic impact of project investments through the complete expenditure of the ARRA grant that is expected by the summer of 2017. Lastly, the long-term forecast analyzes the impact of total project investments for the Silicon Valley to Central Valley line from inception to completion. The Silicon Valley to Central Valley line is the first initial operating segment of the California High-Speed Rail system.

\textsuperscript{21} http://www.hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf
that will be in operation by 2025. Figure 7 shows the timeline for the three analysis horizons for the study.

**Figure 7. Analysis Horizons Timeline**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>To-date Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FY2016-17 Forecast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valley to Valley Line Forecast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ARRA Full-drawdown

<sup>1</sup>
4 Methodology

The range of impacts for this report was estimated using industry-standard approaches. A top-down approach, applying RIMS input-output multipliers to project expenditures was used to estimate economic impacts at the state level. In addition, a more in-depth, bottom-up approach, involving rigorous internal and external research on detailed project expenditures and customized geographic economic impact modelling using IMPLAN software, was used to estimate economic impacts below the state level.

The combination of these approaches provides a reasonable range of outputs that can be benchmarked against other economic impact studies and used to estimate the spatial distribution of project investment impacts. Model inputs for both of these methodologies included expenditure and labor hours by industry sector, location and fiscal year.

Figure 8. Inputs for RIMS and IMPLAN Input-Output Models

4.1 Data Collection

As discussed above, in order to run the RIMS and IMPLAN input-output models, the collection of expenditure and labor hours data are required as model inputs. Further, in order to add detail to the model outputs, expenditure and labor hours inputs were categorized by industry sector, location (at the zip code level) and fiscal year.

Sections 4.2.1 to 4.2.6 below detail the data collection process for the model inputs of the to-date analysis. The model inputs for the FY 2016-2017 short-term forecast analysis leverages the FY 2015-2016 spending location profile of contracts during the contractor outreach phase of the data collection process (see Section 4.2.4: Contractor Outreach), and matches it with the FY 2016-2017 contract-by-contract forecast in the January 2017 Total Project and Expenditures with Forecast Report. Lastly, the

---

model inputs for the Silicon Valley to Central Valley line long-term forecast analysis were pulled from the 2016 Business Plan Capital Cost Estimate for the Silicon Valley to Central Valley line.

4.1.1 Inventory of Existing Data

Prior to starting data collection, an inventory of all existing data sources on expenditure, labor hours and employee office locations was completed. The data inventory revealed that historical expenditure was captured in the Authority database of contract information and expenditure by contract and fiscal year, but not by firm/subconsultant or employee within each contract. The Authority’s financial office keeps a log of total monthly expenditure invoiced per contract. This information serves as the back-up data for the Contracts Expenditure Report and Capital Outlay and Expenditure Report submitted monthly to the Finance & Audit Committee of the Authority Board of Directors.

Additionally, the Authority database does not capture data on labor hours besides those that are necessary for specific reporting purposes (e.g. dispatched labor hours). Further, although data on employee office locations was collected for some individual contracts (a list referred to as the contract’s “master resource pool”), a comprehensive, master list of past and present employees billing to the program together with their office locations did not exist for the majority of existing contracts.

In order to obtain the required model inputs for the Analysis, the team had to supplement existing data through a detailed review of historical invoices submitted by the Authority’s contractors. The team also reached out to prime contractors to gain a more detailed understanding of where their operations and services related to the Program occur.

4.1.2 Data Collection Strategy

As discussed above, the data collection process focused on review of invoices that have been approved and paid by the Authority, and external data collected from outreach to prime contractors. Invoices submitted by most contractors contain the labor hours and fully-burdened labor cost for each employee working on the contract for a given month. Mining the data in these invoices resulted in a database of contract-specific labor hours by employee, industry, and date. With this information collected, the team then conducted outreach to prime contractors to gather information on office locations of employees who work on the program. The complementary data from invoice review and prime contractor outreach were used as model inputs for the analysis and resulted in the necessary level of detail to estimate impacts at more specific geographies below the state level.


25 Dispatched labor hours refer to work hours performed by workers that are part of the Community Benefits Policy – National Targeted Workers and Disadvantaged Workers commitment of the design-build contractors (essentially this is the construction-related work that has been performed). See Section 2.2 California High-Speed Rail Authority Policies for more information.

26 Labor burden is the actual cost of a company to have an employee, aside from the salary the employee earns. Labor burden costs include benefits that a company must, or chooses to, pay for employees included on their payroll.
The data collection effort focused on 20 of the largest contracts (out of 464 total contracts) representing 91% of expenditure on contracts from July 2006 to June 2016 (see Figure 9). Total contract expenditure excludes Authority direct costs and ROW land acquisition payments. Authority costs are analyzed and included separately. As discussed previously, ROW land acquisition payments are considered an economic transfer and excluded from evaluation of economic impacts. The approach to focus on the largest contracts significantly reduced the number of invoices reviewed for employee-level data from over 9,000 to around 1,000, while still facilitating the capture of the vast majority of applicable program costs.

Figure 9. Contracts Expenditure and Number of Invoices Received (July 2006 – June 2016)

The 20 major contracts are comprised of 10 regional consultant contracts, two project administration contracts, three design-build construction contracts, one construction manager / general contractor contract, two project and construction management contracts, one legal services contract and one financial advisory services contract (Table 1). These contracts are comprised of a prime contractor (sometimes a joint venture) and multiple sub-contractors. The Authority’s Small Business Enterprise (SBE) goals (discussed in Section 2.2: California High-Speed Rail Authority Policies) apply to all of these contracts.

---

27 Contracts expenditure of $1,798 million from July 2006 to June 2016 is equal to total program expenditure of $2,306 million minus $372 million of ROW land acquisition payments and $136 million of Authority costs.
The expenditure from other contracts, with cumulative total expenditure through June 2016 greater than $250,000, were individually captured at the contract level by fiscal year using the Authority financial office’s existing contract expenditure database. Contracts with less than $250,000 in total expenditure through June 2016 were combined per fiscal year.

4.1.3 Invoice Review

The invoice review process entailed extracting monthly expenditure and labor hours data from each of the 20 major contracts. Approximately 1,000 invoices were reviewed for the study. The invoice data
mining process varied slightly depending on the contract category, since different contractors have somewhat different requirements for the information contained in their invoices.

Invoices from professional services contractors (e.g. planning/environmental, program administration, project and construction management, legal and financial) generally have employee-level expenditure and labor-hours data. This is because professional services contractors bill the Authority based on the number of hours their employees work on the program.

On the other hand, invoices from design-build contractors do not have employee-level data, because design-build contractors bill the Authority by contract milestones completed (e.g. design element finished, civil structure built, etc.), not by the amount of labor hours or construction materials they use for the contract. However, design-build contract invoices have firm/subconsultant level expenditure data, because the prime contractor has to show proof to the Authority that it pays its sub-contractors in the contract. Additionally, the design-build contract invoices code invoice items by work type (e.g. final design, construction administration and management, construction, etc.).

With the volume of data collected in the invoice review process, it was important to have a uniform method for capturing all the necessary data. Table 2 is a snapshot of the template used to collect invoice data information.

**Table 2. Example of Invoice Review Data Template**

<table>
<thead>
<tr>
<th>Contract Invoice No</th>
<th>Month</th>
<th>Year</th>
<th>WBS Task</th>
<th>Prime Name</th>
<th>Contract Category</th>
<th>Contract Subcategory</th>
<th>Section</th>
<th>Type</th>
<th>Hours</th>
<th>Invoice Cost</th>
<th>Contractor Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSR08-04 011-46037</td>
<td>9</td>
<td>2009</td>
<td>5</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>2.5</td>
<td>$182</td>
<td>B Inc 94597</td>
</tr>
<tr>
<td>HSR08-04 011-46038</td>
<td>9</td>
<td>2009</td>
<td>5</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>0.5</td>
<td>$25</td>
<td>B Inc 94597</td>
</tr>
<tr>
<td>HSR08-04 011-46039</td>
<td>9</td>
<td>2009</td>
<td>3</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>60</td>
<td>$15,749</td>
<td>C Inc 95113</td>
</tr>
<tr>
<td>HSR08-04 011-46040</td>
<td>9</td>
<td>2009</td>
<td>3</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>60</td>
<td>$7,560</td>
<td>C Inc 95113</td>
</tr>
<tr>
<td>HSR08-04 011-46041</td>
<td>9</td>
<td>2009</td>
<td>3</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>40</td>
<td>$7,560</td>
<td>C Inc 95113</td>
</tr>
<tr>
<td>HSR08-04 011-46042</td>
<td>9</td>
<td>2009</td>
<td>3</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>65</td>
<td>$8,872</td>
<td>C Inc 95113</td>
</tr>
<tr>
<td>HSR08-04 011-46043</td>
<td>9</td>
<td>2009</td>
<td>3</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>88</td>
<td>$20,809</td>
<td>D Inc 94612</td>
</tr>
<tr>
<td>HSR08-04 011-46044</td>
<td>9</td>
<td>2009</td>
<td>3</td>
<td>A Inc</td>
<td>Professional Services</td>
<td>RC</td>
<td>SF to SJ</td>
<td>Labor</td>
<td>190</td>
<td>$38,048</td>
<td>D Inc 94612</td>
</tr>
</tbody>
</table>

- **WBS Task** – type of work performed (work breakdown structure)
- **Prime name** – name of the firm that holds the contract
- **Contract category** – type of contract (e.g. professional services or construction)
- **Section** – system’s geographic section (shown in Figure 3)
- **Contract subcategory** – specific type of contract (regional consultant, design-build, etc.)
- **Type** – indicates whether the expenditure is a labor cost or other direct cost (ODC), such as materials or travel expenses
- **Hours Invoice Cost** – expenditure per line of data
- **Name (under contractor information)** – name of prime or subcontractor
- **Zip code** – location of where work took place, typically refers to an office location

The result of the invoice review process was a detailed database of information that provided information on when, what type and how much expenditure and how many labor hours the investments of the Program yielded. The only other missing data point to complete the required model inputs was the geographic location of program expenditures and labor hours. This was captured in the contractor outreach portion of the data collection process.
4.1.4 Contractor Outreach

The team contacted the prime contractors of the 20 major contracts and worked with contract managers of other contracts with cumulative total expenditure through June 2016 above $250,000. This outreach was conducted to match expenditure and labor hours data from the invoice review to the locations of where the work occurred. Similar to the invoice review process, the contractor outreach process varied slightly depending on the contract category.

For professional service contracts that belong to the 20 major contracts, the goal was to match employees that billed the program with an office location. This was done by obtaining a list from the prime contractor that contained employee names and office locations for their direct employees and the employees of their subcontractors, or a master resource pool (MRP). The MRP list was used to match the billed amounts and hours from the invoice review to the office location of those individuals. For contracts that already maintain an MRP list with the Authority, the study team worked with contract managers to obtain an updated list. However, for contractors that did not provide an MRP list to the Authority, the study team submitted a list of employees who have billed the program to the Authority contract manager overseeing that specific contract. The contract managers then asked their contractor counterparts to provide information on office locations for the employees on the list.

For design-build contracts, the study team first isolated payments to subcontractors, and researched the work locations of each subcontractor. If the total invoiced amount from a particular firm exceeded $250,000 through the life of the contract, the study team called the subconsultant office and verified where the work was performed or materials purchased. If the subcontractor fell below the $250,000 threshold, the study team referred to the address in the subcontractor invoice. The study team then separated final design and construction administration costs from construction costs of the prime contractor to properly categorize spending in the impact analysis. The prime contractors helped identify what percentage of their design and construction administration staff are located in specific office locations.

Based on the information gathered by the study team, design and construction administration costs were all assigned to their respective construction package (CP) project offices. CP1’s project office is in Fresno, CP2-3’s project office is in Selma and CP4’s project office is in Wasco. For the remaining construction costs, the RDP GIS team allocated construction/civil works costs by linear miles per zip code along the alignment for each construction package. This was done by plotting each of the CP alignments over a zip code map, and then calculating what percentage of the alignment length falls within each zip code. Figure 10 shows the CP1 alignment-zip code GIS map overlay.
The location of work for costs not included in the 20 major contracts (such as Authority costs, ROW services, ROW relocation, Resource Agencies, Third-party Agreements, and miscellaneous) were obtained through a variety of outreach and data gathering methods. Location of Authority costs were allocated based on the number of staff for each of the Authority’s offices by fiscal year. ROW relocation costs were allocated equally between the location of the parcel being acquired and the location of the replacement parcel where the residents or businesses are relocating to. For ROW services firms, Resource Agencies, Third-party Agreement expenditures, and other contracts the team worked with contract managers to request the office locations of each of the prime contractors where work was being done on the Program.

4.1.5 Data Gap Interpolation

Most of the data gathered in the detailed invoice review matched with the overall expenditure data, but some gaps were identified. The Analysis interpolated available data when gaps in invoice data existed. The majority of data gaps were due to missing employee-level information in older invoices from contracts executed prior to 2010. Because many of these older contracts have since expired, it was in some cases not possible to request back-up employee-level data from the contractor. Overall, the study team interpolated approximately 30% of the total expenditure. This approach is considered reasonable given that the location of work conducted for a particular contract generally tends to remain static over time and the team had at least partial information for each of the 20 major contracts, and other contracts with total expenditure above $250,000, through June 2016.
Interpolation for missing expenditure data was aimed at reconciling the difference between total expenditure captured by the invoice data review and total spending within each contract. Since total spending on each of the contracts was known, total expenditure captured by the invoice review could be compared against the known total. For most contracts and in most fiscal years, the numbers from the invoice data review matched the known total expenditures. This provided an additional assurance that the invoice review provided reliable data and helped identify areas where additional analysis was necessary. In places where gaps were identified (due to missing detailed data), the team first reviewed the available invoice data to make sure that any differences were based on data gaps and not data input errors. For further information on the data collection quality assurance process see Section 4.1.6 Data Quality Assurance/Quality Control.

After correcting any errors identified and confirming data gaps, the study team took the following steps to fill data gaps by interpolation of available data.

**Figure 11. Data Interpolation Methodology per Contract**

To fill in any data gaps the team used the location profiles of the total contract expenditure from the invoice review process and the information obtained from each of the contractors. To determine the total contract expenditure by fiscal year per firm, the team relied on end-of-fiscal-year (June) invoices from the contracts with data gaps in their invoices. With this data, a top-down, fiscal year breakdown of total contract expenditure by firm (including subconsultants) was created. In order to create the spending location profile per firm, the team organized the invoice data and matched all expenditures and zip code locations by firm. The share of expenditure per zip code for each firm (per contract) was then calculated to create a location profile (i.e. what office(s) conducted what share of the work on the program for that firm). Lastly, the spending location profile was applied to the total expenditure by fiscal year per firm breakdown – which then interpolated the missing expenditure for the entire contract.

**4.1.6 Data Quality Assurance / Quality Control**

In every step of the data collection process (invoice review, contractor outreach and data gap interpolation) the study team conducted thorough quality assurance / quality control procedures in order to ensure the reliability of the data. During the invoice review step, the study team assigned a validator to spot-check the data per contract once the invoice review data sheet was completed. The validator randomly chose certain months to confirm that the numbers in the data sheet matched with those of the invoice. Also, the validator confirmed that the total expenditure in the data sheet matched with the known total cumulative expenditure based on the June 2016 invoice. For the contractor outreach step, the study team confirmed the office locations received from the contractor through search engine validations, making sure that companies (prime contractors and subcontractors) do have offices in the locations that they provided. Lastly, for the data gap interpolation step, the study team
performed spot-checks of the interpolation results to ensure accuracy. This process confirmed that there were no calculation errors found and that the invoice data details and expenditure totals used for the interpolation calculations were based on the correct invoice review data sheets and invoices.

4.2 Analysis Approach

The Analysis includes both a top-down and bottom-up approach, providing a range of impacts based off two methodologies and allowing for internal quality checks.

4.2.1 RIMS & IMPLAN Methodology

Following the data-collection tasks detailed in Section 4.1 Data Collection, the expenditure database was analyzed using input-output modeling, a technique that quantifies the aggregate economic impact of direct spending in a local economy. Input-output models describe how relationships between different industries determine the total economic impact of a particular type of spending, for example, how new expenditures in the construction sector will cycle through the intermediate steps in the supply chain and generate increased demand for intermediate goods and services like concrete and carpenters. In addition, input-output modeling considers how the additional labor income generated by spending in a particular industry, i.e. the salaries earned by carpenters employed by the Program, will translate into increased consumer spending in the form of household expenditures. To translate the expenditure database compiled for this study into estimates for value-creation and job-years supported, two input-output models were used: RIMS II and IMPLAN.

4.2.1.1 RIMS II

Published by the United States Bureau of Economic Analysis (BEA), RIMS II is an industry-standard regional economic model used to assess the potential economic impacts of various projects. RIMS II is based on the national benchmark input-output accounts the BEA publishes for use by academic and professional economists across the country, and is therefore the starting point for any input-output model currently in use.

As described above, the RIMS II model centers on the concept that an initial change in economic activity results in diminishing rounds of subsequent spending (not always in the same year). The economic effects of the initial spending, as well as the subsequent purchases of intermediate goods and services, can be determined using a set of multipliers for each of the economic sectors analyzed by BEA. RIMS II is frequently used to estimate the economic impacts resulting from the construction phase of transportation investments. For example, the Final Environmental Impact Statements (FEISs) for the LYNX Blue Line Extension in Charlotte, North Carolina and for the Alaskan Way Viaduct Replacement Project in Seattle, both of which are currently underway, include results from economic impact analyses that were performed using RIMS II multipliers.

The RIMS II multipliers translate a change in final demand associated with project expenditures—i.e., direct spending in a particular industry—into the resulting direct, indirect, and induced effects on Gross State Product (value added), output, and employment. The multipliers are ratios between the initial spending and the final result; for example, an output multiplier of 2.0 for the construction sector would
indicate that every dollar spent on construction generates two dollars of total economic output across all sectors in the state economy.

For this analysis, expenditures were allocated to the relevant economic sectors—listed by RIMS in accordance with the North American Industrial Classification System (NAICS) sector codes—and analyzed using the corresponding RIMS II multipliers for the state of California. Because the expenditure data used as inputs were reported in nominal (or year-of-expenditure) dollars, historical Consumer Price Index (CPI) data were used to convert all figures into constant 2013 dollars to correspond with the base year for the most-recently published RIMS II multipliers. We then adjusted all output results to 2016 dollars.

4.2.1.2 IMPLAN

IMPLAN is a software tool and economic dataset published by MIG, Inc., a third-party provider based in Charlotte, North Carolina. Like RIMS II, the backbone of IMPLAN’s analysis tools consist of a pre-defined set of industry relationships that indicate how spending in one sector will recirculate through industries that produce intermediate goods and services in a regional economy (such as a state, county, or other pre-defined geographic jurisdiction). The relationships described by the RIMS II multipliers are augmented by employment, business activity, and other economic data gathered by IMPLAN’s economists. Like RIMS II, IMPLAN is frequently used to perform economic impact analyses for the construction phase of major transportation projects. In 2015, an IMPLAN analysis published in connection with Salt Lake City’s TRAX light rail system indicated that constructing the project would support 2,800 new jobs; a separate analysis of the Ohio River Bridges Project in Indiana and Kentucky estimated that over 5,000 jobs would be supported by that project’s construction expenditures.

Unlike RIMS II, which consists simply of a static set of multipliers for a given geography, IMPLAN allows much greater flexibility in customizing the underlying inter-industry relationships; provides re-calibrated multipliers for sub-regional economies, including at the zip-code level; and delineates the resulting economic impacts by industry sector. As described earlier, RIMS II is the starting point for any input-output model for the American economy; IMPLAN’s commercial product builds upon the BEA product to offer not only greater flexibility to the user than RIMS II, but also more detailed analytical results, like estimates for supported job-years by industry. As a result, IMPLAN is more capable of incorporating into its analysis the real-world direct effects observed from the bottom-up analysis, therefore translating expenditure data for the program into highly-localized results for employment, value added, and output.

For this analysis, IMPLAN was used to calculate economic impacts at the statewide level, at the regional level, and at the county level (for select counties). The analyses used pre-defined regional economies for states and counties embedded within IMPLAN. As with the RIMS-based analysis, the expenditure data used for inputs were expressed in nominal dollars; unlike RIMS, IMPLAN is capable of interpreting inputs from different dollar-years and performing the conversion to constant dollar-years. Similarly, IMPLAN is able to generate outputs in any desired dollar-year; therefore, all outputs from IMPLAN are expressed in 2016 dollars.\(^{28}\)

\(^{28}\) The base year for IMPLAN’s multipliers is 2014
<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Prime Contractor</th>
<th>Contract Category</th>
<th>RIMS NAICS Code</th>
<th>IMPLAN Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Construction</td>
</tr>
<tr>
<td>HSR13-06</td>
<td>TPZP</td>
<td>DB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR13-57</td>
<td>Dragados-Flatiron, JV</td>
<td>DB</td>
<td>233293</td>
<td>Sector 56 “Construction: Highways and Streets”</td>
</tr>
<tr>
<td>HSR06-12</td>
<td>Caltrans (SR-99)</td>
<td>CMGC</td>
<td></td>
<td>“Construction of new highways and streets”</td>
</tr>
<tr>
<td>HSR14-32</td>
<td>California Rail Builders</td>
<td>DB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR11-12</td>
<td>Wong-Harris</td>
<td>PCM</td>
<td>541300</td>
<td>Sector 449 “Architectural, engineering, and related service”</td>
</tr>
<tr>
<td>HSR13-106</td>
<td>Arcadis</td>
<td>PCM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Planning/Environmental</td>
</tr>
<tr>
<td>HSR06-03</td>
<td>URS, HMM and Arup, JV</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR06-04</td>
<td>HMM, URS and Arup, JV</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR06-05</td>
<td>STV</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR06-07</td>
<td>AECOM</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR08-03</td>
<td>AECOM</td>
<td>RC</td>
<td>NAICS Code 541300</td>
<td>IMPLAN sector 449 “Architectural, engineering, and related services”</td>
</tr>
<tr>
<td>HSR08-04</td>
<td>HNTB</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR08-05</td>
<td>PTG</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR13-44</td>
<td>T.Y. Lin</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR14-39</td>
<td>STV</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSR14-42</td>
<td>SENER</td>
<td>RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Program Administration</td>
</tr>
<tr>
<td>HSR06-01</td>
<td>Parsons Brinckerhoff</td>
<td>PM</td>
<td>500A00 “Other Government Enterprises”</td>
<td>Sector 523 “Other State Government Enterprises”</td>
</tr>
<tr>
<td>HSR14-66</td>
<td>WSP</td>
<td>Parsons Brinckerhoff</td>
<td>PM</td>
<td>541300 “Architectural, engineering, and related services”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>HSR08-10</td>
<td>Nossaman, LLP</td>
<td>Legal</td>
<td>541100 “Legal Services”</td>
<td>Sector 447 “Legal Services”</td>
</tr>
<tr>
<td>HSR10-34 / HSR14-01</td>
<td>KPMG</td>
<td>Financial</td>
<td>541200 Accounting, tax preparation, bookkeeping, and payroll services</td>
<td>Sector 448 “Accounting, tax preparation, bookkeeping, and payroll services”</td>
</tr>
</tbody>
</table>
4.2.2 Top-down Approach

The top-down approach used the total expenditure data to look at impacts at the state level. This method is considered the more conventional approach to estimating the economic impacts of a project and incorporates top-line project expenditures by category. While the top-down approach does not provide the geographic level of detail afforded by the bottom-up approach, it was useful to compare it with the results of the bottom-up approach and to benchmark the top-down approach results to other similar top-down studies estimating the economic impacts of infrastructure spending.

The team took the following steps (Figure 12) to estimate the economic impacts of project investments in the top-down approach.

![Figure 12. Top-down Approach Analysis Process](image)

Project-level spending is captured by the Authority on a regular basis and reported through a variety of financial reports, so it did not require any additional data gathering that was necessary for the bottom-up approach. Applicable IMPLAN and RIMS II multipliers were then used to determine the economic impacts of various categories of spending, including job-years, labor income, and economic output.

4.2.3 Bottom-Up Approach

The bottom-up approach was used to estimate zip code-level impacts and included a significant amount of detailed data collection derived from monthly contract invoices as well as data provided directly from contractors, as described in detail previously in Section 4.1: Data Collection. The information gathered assisted in determining the specific location of expenditures within the state of California to allow impact estimates to be aggregated to various geographic levels, such as at the county and region level.

The team took the steps in Figure 13 to estimate the economic impacts of project investments in the bottom-up approach.
As discussed previously, review of invoices combined with the information obtained from the contractors directly yielded hours worked and location of the work. For contracts with labor-hours detail, an average hourly rate was calculated to convert expenditures to FTEs.

A core analytical assumption embedded within the input-output models used for this analysis is the direct output per worker ratio—for every $1 million of economic output, how many direct job-years are supported? Because the analysis yielded more precise data for this metric than the assumptions embedded within the input-output models, and because indirect and induced jobs are calculated as a function of direct jobs, the calculated FTEs were used as a direct jobs “Industry Change” input for the IMPLAN input-output model. For contracts without detailed employee data, such as the design-build contracts for construction, expenditures were used as the “Industry Change” inputs for the IMPLAN model, thus relying on the default output per worker assumption embedded within the model for that industry (as with the top-down method described previously). Once these inputs were created, IMPLAN model runs were undertaken for all geographies included in this report.

### 4.3 Choice of IMPLAN and RIMS II

There are a variety of tools that academic and professional economists can use to estimate the likely impacts of a contemplated project or policy change. For a given analysis, the practitioner will select the model that best addresses the specific question being asked; that aligns best with the data available for the analysis; and that best represents the nature of the project or policy under consideration. Different tools have different strengths and weaknesses, all of which must be considered in selecting the appropriate analytical technique.

As described earlier, the RIMS II and IMPLAN models are frequently used for construction-period economic impact analyses, like that undertaken for the 2016 California High-speed Rail Economic Impact Summary Analysis. These multiplier-based input-output models are known as “static” models, indicating that they measure backward linkages, not forward linkages, and that they assume fixed purchasing patterns, input prices, and local supply conditions within an industry. For example, if a manufacturing firm were contemplating a factory-expansion project, RIMS II or IMPLAN could be used to estimate the change in demand for inputs required to build the factory, but would not account for the positive impact of increasing the factory’s throughput. In the context of California High-Speed Rail program, these models only capture the economic impact of the planning and construction phase project expenditures, not any economic benefits that would be realized from actually operating the system. In addition, the input-output model would assume that relationships between the construction and building-materials...
industries, for example, would not be affected by the additional demand for construction generated by the project.

“Dynamic” models like REMI, a product developed by Regional Economic Models, Inc., are able to combine traditional input-output modeling with econometric analyses that reflect the likelihood of price changes resulting from the initial change in spending. For example, if the theoretical factory-expansion project described above would result in an increase in throughput so substantial that it would alter patterns of demand for the good being produced, or for the intermediate inputs required to produce that good, a dynamic model would reflect these macro-level shifts and include their effects in the overall impact estimates.

As a result, REMI and other dynamic models are suitable for analyzing contemplated changes in public policy or other macroeconomic changes that would fundamentally alter the underlying industry relationships within a regional economy. For example, the completed high-speed rail system would introduce changes in the statewide transportation network that have the potential to generate this kind of fundamental structural change—and as a result, a REMI-based analysis would be appropriate for analyzing the economic effects of this new inter-regional mobility once operations begin.

For analyzing the predevelopment and construction phases of a major infrastructure project, however, a static input-output model is more appropriate. While direct spending on the program represents a significant source of revenue for a variety of industries across the state, the project’s construction alone has not generated direct and indirect effects on the order of magnitude required to alter the underlying structure of the state’s economy. Increased demand that may arise from additional direct spending and household income (i.e., induced effects) injected into the local economy is unlikely to substantially affect consumer prices, as those prices are largely tied to national and global markets. Aggregate demand will not change significantly at a national scale, and consumer prices are unlikely to be significantly affected. For example, prices at major retail chain stores like Walmart or e-commerce sites like Amazon will be relatively unaffected. For all of these reasons, this analysis relied on RIMS II and IMPLAN and not REMI.
5 Results

This section details the results of the analysis. Specifically, these impacts are shown over a variety of geographies, including statewide, regions, and some counties. Results also detail specific impacts in more depth, including looking at the number of job-years and the economic impacts in Disadvantaged Communities. Lastly, the results detail impacts outside of the State of California.

5.1 California Economic Impacts

From July 2006 through June 2016, the Authority invested over $2.3 billion in planning and construction of the high-speed rail system. Overall, this investment has supported 19,900 to 23,600 job-years of employment (including direct, indirect, and induced impacts) and generated $3.5 to $4.1 billion in total economic activity, with over 630 different private sector firms contracted to work on the program. See Table 4 for additional detail.

The vast majority of this economic activity has taken place in the State of California, with 94% of spending going to companies and people in the state. This is a direct estimate using the data in the bottom-up analysis (non-California zip codes were filtered out of the analysis and expenditure was tallied for California zip code s only). Additionally, as discussed in Section 3.2.3: Program Expenditure by Source of Funds, around 73% of the $2.3 billion spent was funded by ARRA, infusing the state’s economy with federal dollars.

What are Direct, Indirect, and Induced Impacts?

Direct impacts are the economic effects generated by direct spending on a project.

Indirect impacts are the economic effects that occur in the next step in the supply chain. These impacts are dispersed among the industries that supply intermediate goods and services to firms with direct impacts.

Induced impacts are the economic effects that result when income earned by direct and indirect employees gets spent elsewhere in the economy.

<table>
<thead>
<tr>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>$730M - $900M</td>
<td>$1,600M - $1,900M</td>
</tr>
<tr>
<td>Indirect</td>
<td>$330M - $390M</td>
<td>$900M - $1,000M</td>
</tr>
<tr>
<td>Induced</td>
<td>$320M - $390M</td>
<td>$1,000M - $1,200M</td>
</tr>
<tr>
<td>Total</td>
<td>$1,380M - $1,680M</td>
<td>$3,500M - $4,100M</td>
</tr>
</tbody>
</table>

Note: totals may not sum due to rounding
5.1.1 Fiscal Year 2016-2017 Forecast

For FY 2016-2017, the Authority total forecast expenditure is around $1.3 billion.\(^{30}\) Overall, this investment will support about 12,550 job-years of employment (including direct, indirect, and induced impacts) and generate $2.3 billion in total economic output. See Table 5 for further detail.

Federal dollars still finance most of the FY 2016-2017 expenditure, continuing to boost the state’s economy with federal funds. The remaining ARRA funds have been spent by June 2017.

### Table 5. California RIMS II Economic Impacts, FY 2016-2017 Forecast\(^{31}\)

<table>
<thead>
<tr>
<th>Employment (job-years)</th>
<th>Earnings(^{32})</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>5,000</td>
<td>$320M</td>
</tr>
<tr>
<td>Indirect</td>
<td>2,900</td>
<td>$170M</td>
</tr>
<tr>
<td>Induced</td>
<td>4,700</td>
<td>$190M</td>
</tr>
<tr>
<td>Total</td>
<td>12,550</td>
<td>$680M</td>
</tr>
</tbody>
</table>

5.1.2 Silicon Valley to Central Valley Line Forecast

The Silicon Valley to Central Valley Line will be the first operating segment of high-speed rail in California. It is scheduled to start providing high-speed rail passenger service between San Jose and north of Bakersfield in 2025. Apart from stations in San Jose and north of Bakersfield, there will be additional stations on the line located at Gilroy, Fresno and Kings/Tulare (see Figure 1). These cities are already working on station area plans to create vibrant, livable districts around high-speed rail stations. New inter-city connections will foster economic revitalization, affordable housing and workforce development by helping tie the Silicon Valley and Central Valley economies closer together.

While the mobility and connectivity benefits of the operations of the Silicon Valley to Central Valley Line are immense, the projected investment of over $18.7 billion\(^{33}\) during the planning and construction phase of the segment will generate continued and increasing economic benefits through 2025. Overall, this investment is estimated to result in a total of 198,700 job-years of employment and generate $36.2 billion in total economic activity.

---

30 Out of the $1.3 billion total forecast spending in FY 2016-2017, $1.1 billion was used as in input to the economic impact input-output model. The economic impact calculations in this analysis exclude the $233 million in estimated spending in ROW land acquisition payments.

31 Note: totals may not sum due to rounding

32 RIMS II results are in Earnings rather than IMPLAN’s Labor Income.

33 Total Silicon Valley to Central Valley line capital cost estimate in 2015$, inclusive of the $2.3 billion in total program expenditure through June 2016.
Table 6. Valley to Valley Line RIMS II Economic Impacts, 2006 to 2025

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Earnings</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>79,300</td>
<td>$5,100M</td>
<td>$17,500M</td>
</tr>
<tr>
<td>Indirect</td>
<td>43,500</td>
<td>$2,600M</td>
<td>$8,500M</td>
</tr>
<tr>
<td>Induced</td>
<td>75,800</td>
<td>$3,000M</td>
<td>$10,100M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>198,700</strong></td>
<td><strong>$10,700M</strong></td>
<td><strong>$36,200M</strong></td>
</tr>
</tbody>
</table>

Similar to project investments made to date, it is projected that the vast majority of expenditure will go to companies and people in California. The ramp up in civil works construction in the near future will spread to the Southern Central Valley towards north Bakersfield as CP2-3 and CP4 finish design and site preparation. This will be followed by the execution of civil works packages across the Pacheco Pass toward San Jose. These construction works will have generally similar spend profiles to the current civil works activities performed to date in the Central Valley, with some exceptions for specialized equipment like boring machines.

However, the procurement of high-speed rail trainsets and higher shares of manufactured equipment (for track, communications, signaling and electric traction systems) programmed towards the later end of the project, will require greater participation from manufacturing companies and their workers throughout the country. The Authority’s 2016 Business Plan capital cost estimate for the Silicon Valley to Central Valley Line projects that a total of $3.2 billion will be spent to purchase the high-speed rail trainsets and track, communications, signaling and electric traction systems (see Table 7). The manufacturing supply chains to produce these types of complex and high-tech equipment will require parts produced by various suppliers across diverse industries that will likely be headquartered in multiple states.

---

34 Note: totals may not sum due to rounding
35 RIMS II results are in Earnings rather than IMPLAN’s Labor Income.
Job-years supported by the Authority’s expenditures have grown significantly over the past several years as construction commenced and ramped up in the Central Valley. Table 8 shows this growth in job-years from FY 2006-2007 to the forecasted FY 2016-2017, with a total growth rate of 300% from FY 2014-2015 to FY 2016-2017. The analysis took the results of the top-down statewide approach for the total impact shown in Table 5 for statewide impacts and allocated them to each fiscal year based on the share of total expenditures that took place in that fiscal year. Running FY 2016-2017 separately, the analysis shows that the estimated $1.3 billion in spending forecast for that fiscal year will support the equivalent of around 12,550 full time jobs over the course of the year.

What is a Job-Year?
Job-years represent a combination of total jobs and the length of time of those jobs. For example, one job supported for five years equals five job-years; five jobs supported for one year also equals five job-years.
The analysis shows a direct correlation between the type of work completed during the analysis timeframe and the economic impacts in terms of job-years of employment. As construction has ramped up, it has increased as a share of overall project expenditures and industry impacts and will soon surpass architectural, engineering and other services as the largest category of direct employment on the program. This is consistent with the Authority’s transition from a historically planning organization to a project delivery organization, with active, large-scale construction contracts in the field.

Figure 5 (located in Section 3.3.2: Program Expenditure by Fiscal Year) shows the fiscal year breakdown in expenditure by expenditure category type, highlighting the Authority’s transition further. While planning and environmental work have been ongoing, showing the majority of expenditure from FY 2006-2007 to FY 2012-2013 (ranging from 44% to 75% of yearly expenditure), construction expenditure and job-years have increased dramatically in FY 2013-2014, with an increase in DB and PCM contract expenditures. In FY 2013-2014, construction expenditure was 28% of that year’s spending. In the fiscal years following (FY 2014-2015, FY 2015-2016 and forecasted FY 2016-2017) construction expenditure accounted for 27%, 49% and 51% of yearly expenditure respectively.37

Table 8 shows the split of direct employment impacts by economic sector from FY 2006-2007 to FY 2015-2016. The table does not include indirect and induced effects that would add additional support services beyond engineering, planning, construction and management related activities. As shown in Table 5 earlier in this section, direct job-years over this time period range from 8,900 – 10,500. The split of public versus private job-years over this time period is about 90% in the private sector and 10% in the public sector. Public job-years include the Authority and Resource Agencies, while private ranges from construction and engineering to legal services, etc.

Note: includes direct, indirect, and induced

Because these are design-build contracts, some of this expenditure was allocated to final design and construction administration costs. Not all expenditure in DB contracts is for hard construction.
Table 8. Largest Direct Job-Years per IMPLAN Sector, FY 2006-2007 to FY 2015-2016

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>Job-Years$^{38}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural, engineering, and related services (Sector 449)</td>
<td>3,800 – 5,500</td>
</tr>
<tr>
<td>Construction of new highways and streets (Sector 56)</td>
<td>3,200$^{39}$</td>
</tr>
<tr>
<td>Other state government enterprises (Sector 523)</td>
<td>1,100 – 1,400</td>
</tr>
<tr>
<td>Real Estate (Sector 440)</td>
<td>400 – 500</td>
</tr>
<tr>
<td>Accounting, tax preparation, bookkeeping, and payroll services</td>
<td>50 – 100</td>
</tr>
<tr>
<td>(Sector 448)</td>
<td></td>
</tr>
<tr>
<td>Legal Services (Sector 447)</td>
<td>30 – 100</td>
</tr>
</tbody>
</table>

$^{38}$ The range of job-years is from the bottom-up and top-down analysis, respectively.

$^{39}$ Both the top-down and bottom-up analysis provided the same amount of construction job-years after rounding. No range is available for this sector.
5.3 Breakdown by Region

The analysis breaks down the total expenditure by region to show the detailed impact throughout California. These regions include the Central Valley, Sacramento, Bay Area and Southern California.

Figure 15. Economic Impacts by California Region

The Central Valley has seen the largest overall impact in job-years of employment, labor income and economic output because of increased construction investment over the past two years in the region.
The Sacramento region also shows significant impact because of direct Authority expenditures at its Sacramento headquarters and other government spending.\textsuperscript{40} The Bay Area and Southern California show comparable impacts derived primarily from engineering and other professional services firms based there.

\textsuperscript{40} The most appropriate IMPLAN industry sector for CHSRA and other public spending is 523, “Other state government enterprises,” which is applied in the analysis of state-level impacts. However, because significant activity in this sector is primarily confined to the geographies containing Sacramento, the state’s capital, a similar sector was used for applicable expenditures in other counties/regions below the state-level analysis: 526, “Other local government enterprises.”
5.3.1 Central Valley Region

For this analysis (and as commonly defined), the Central Valley region includes the following counties: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern—running through the center of California. The Central Valley section of the system is considered the “back bone” of the project with its connections to the Bay Area and the Los Angeles Basin being critical to improving accessibility and the mobility options of the region’s population.

Figure 16. Central Valley Construction Contracts

Over the past 10 years, the Central Valley has been the fastest growing region in the state, with its population increasing by 17% compared to 10% statewide over this time. Moody’s Analytics predicts that by 2040 there will be close to 10 million people living in the Central Valley, adding 3 million more people to its current population. However, many communities in the Central Valley have been designated as disadvantaged based on a combination of economic and environmental conditions analyzed by the California Environmental Protection Agency. For more information on the Program’s effect on disadvantaged communities, see Section 5.5: Disadvantaged Communities and Small Business.

Civil works construction for the first 119 miles of the system is ongoing through the CP1, CP2-3 and CP4 design-build contracts. Figure 15 shows each of the construction package segments along the project alignment. Each team has set up a local project and construction

---

management office in the Central Valley and is doing the majority of their work locally and on the construction sites.\textsuperscript{42}

Program investments have already had significant impact on the Central Valley economy, generating an estimated 6,800 job-years of employment and about $1.2 billion in total economic activity from July 2006 to June 2016. Table 10 shows direct, indirect, and induced economic impacts of program investments in the Central Valley in terms of job-years of employment, labor income, and economic output generated during the analysis period.

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>3,800</td>
<td>$210M</td>
<td>$720M</td>
</tr>
<tr>
<td>Indirect</td>
<td>1,600</td>
<td>$80M</td>
<td>$290M</td>
</tr>
<tr>
<td>Induced</td>
<td>1,400</td>
<td>$60M</td>
<td>$180M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,800</strong></td>
<td><strong>$330M</strong></td>
<td><strong>$1,200M</strong></td>
</tr>
</tbody>
</table>

The Central Valley has shown the most benefit from the Program investments in the last several years. According to a recent report by the University of the Pacific’s Center for Business and Policy Research, all Central Valley counties experienced job growth either at or exceeding the state average in 2016. This trend is forecast to continue through 2017.\textsuperscript{44} In recent years, the Central Valley economy has lagged behind the rest of the state, but now investment in high speed rail is helping to close the gap.

Program investment in the Central Valley has surged in the past two years with the ramp up of right-of-way work and start of construction activities. Moving forward, it is expected that the program will continue to support thousands of jobs annually for the next several years as construction activities continue to expand. Figure 17 shows the approximate job-years of employment generated in the Central Valley per fiscal year during the study period.

\textsuperscript{42} The CP1 project office is in Fresno, the CP2-3 project office is in Selma and the CP4 project office is in Shafter.

\textsuperscript{43} Note: totals may not sum due to rounding

\textsuperscript{44} \url{http://www.pacific.edu/Documents/school-business/BFC/Forecasts/CA-Metro-Forecast-Jan2017-V2.pdf}
Of the 3,800 direct job-years of employment supported in the Central Valley, over 3,000 have been in the construction industry,\textsuperscript{46} representing about 80% of the direct job-years. Real estate and architectural, engineering and related services, and local government represent significantly less investment in that region, at around 200 (9%), 200 (5%), and 80 (2%) job-years respectively. The impact of the Authority’s total investment between July 2015 and June 2016 has been equivalent to about 14% of the 32,000 jobs that the Central Valley economy added over the same period overall.

5.3.2 Sacramento Region

For purposes of this analysis, the Sacramento region includes Sacramento, Yolo, Placer, El Dorado, Sutter, and Yuba counties all located north of the Central Valley. Co-located in downtown Sacramento are the Authority and RDP headquarters, comprising around 400 Authority and RDP staff members. Most of these staff have been in the government and professional services fields providing overall guidance and oversight for the program.

Table 10. Sacramento Region Economic Impacts, July 2006 – June 2016\textsuperscript{47}

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>1,600</td>
<td>$160M</td>
<td>$350M</td>
</tr>
<tr>
<td>Indirect</td>
<td>1,400</td>
<td>$70M</td>
<td>$190M</td>
</tr>
<tr>
<td>Induced</td>
<td>1,200</td>
<td>$60M</td>
<td>$170M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,200</strong></td>
<td><strong>$290M</strong></td>
<td><strong>$710M</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{45} Note: includes direct, indirect, and induced
\textsuperscript{46} According to IMPLAN sector
\textsuperscript{47} Note: totals may not sum due to rounding
The Sacramento Region has seen slightly more than 40% of the direct job-years as the Central Valley. This is because, as discussed previously, construction has been a rapidly growing part of the program’s economic impact, far outpacing the impact of planning, engineering, and oversight work taking place in Sacramento. Sacramento direct impacts have included architectural, engineering and related services and other state government enterprises at 60% and 35% of total direct jobs in the region, respectively. Other sectors have seen only minor direct impacts in Sacramento. Indirect and induced impacts have been spread throughout a variety of support sectors.

Figure 18. Sacramento Region Total Job-Years per Fiscal Year, July 2006 – June 2017

---

48 IMPLAN sectors
49 Note: includes direct, indirect, and induced
5.3.3 Bay Area Region

The Bay Area region includes the following counties: Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Sonoma, Napa, and Solano. These nine counties are part of the Metropolitan Transportation Commission region. The Bay Area has seen mostly planning, engineering, and environmental work with only a limited number of Bay Area firms working on the construction in the Central Valley. However, additional economic benefits will begin to accrue as the Caltrain electrification project (which is partially funded by the Authority) gets underway and construction ramps up (assuming the current federal funding situation for the project gets resolved).

Table 11. Bay Area Region Economic Impacts, July 2006 – June 2016\(^{50}\)

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>1,200</td>
<td>$150M</td>
<td>$240M</td>
</tr>
<tr>
<td>Indirect</td>
<td>600</td>
<td>$50M</td>
<td>$100M</td>
</tr>
<tr>
<td>Induced</td>
<td>700</td>
<td>$50M</td>
<td>$130M</td>
</tr>
<tr>
<td>Total</td>
<td>2,500</td>
<td>$240M</td>
<td>$460M</td>
</tr>
</tbody>
</table>

Around 97% of the Bay Area region’s direct-job years are in architectural, engineering and related services. Other sectors have seen only minor impacts direct impacts in the Bay Area. Indirect and induced impacts have been spread throughout a variety of other different sectors. Figure 19 shows the job-years by fiscal year over the time period of this analysis. As construction investment has increased in the Central Valley, expenditure and job-years have decreased in the Bay Area.

Figure 19. Bay Area Region Total Job-Years per Fiscal Year, July 2006 – June 2017\(^{51}\)

---

\(^{50}\) Note: totals may not sum due to rounding

\(^{51}\) Note: includes direct, indirect, and induced
5.3.4 Southern California Region

For purposes of this analysis, Southern California includes Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. These six counties are either in the Southern California Area Governments or San Diego Area Governments regions.

The Southern California region has seen mostly planning, engineering, and environmental work with only a limited number of Southern California firms working on the construction in the Central Valley. However, additional economic benefits will begin to accrue before high-speed rail construction starts as connectivity and bookend projects in the region go through construction.

Table 12. Southern California Region Economic Impacts, July 2006 – June 2016

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>1,100</td>
<td>$110M</td>
<td>$200M</td>
</tr>
<tr>
<td>Indirect</td>
<td>600</td>
<td>$40M</td>
<td>$90M</td>
</tr>
<tr>
<td>Induced</td>
<td>800</td>
<td>$40M</td>
<td>$130M</td>
</tr>
<tr>
<td>Total</td>
<td>2,500</td>
<td>$190M</td>
<td>$420M</td>
</tr>
</tbody>
</table>

The Southern California region is currently very similar in industry breakdown as the Bay Area. About 85% of the direct job-years in the region are attributed to the architecture, engineering, and related services, with construction (nearly 8%), real estate (about 4%), and legal services (nearly 3%) making up the majority of the remaining direct job-years. Indirect and induced impacts have been spread throughout a variety of other supporting sectors.

Figure 20. Southern California Region Total Job-Years per Fiscal Year, July 2006 – June 2017

52 Note: totals may not sum due to rounding
53 IMPLAN sector
54 Note: includes direct, indirect, and induced
5.4 California County Impacts

The California counties that show the largest impacts include Fresno County, Madera County, Sacramento County, Los Angeles County, San Francisco County, and Alameda County. As some of the most populous counties in both California and their associated regions, these counties include a large percentage of the direct and total job-years, as Figure 23 shows.

Fresno County has seen the biggest impacts with about 34% of total job-years supported as a proportion of the statewide historical analysis. Sacramento County accounts for 16% of total job-years, with Los Angeles and San Francisco Counties accounting for 7% each, Madera accounting for 3% and Alameda County accounting for 2%.

Similar to the regions they fall within, Table 13 shows the breakdown of major employment sectors for direct job-years attributed to the highest impact counties.

Table 13. Major Employment Sectors for Select California Counties

<table>
<thead>
<tr>
<th>County</th>
<th>Total direct job-years</th>
<th>%Architectural engineering and related services</th>
<th>%Construction</th>
<th>%Legal Services</th>
<th>%Other governmental enterprises</th>
<th>%Real estate</th>
<th>%Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresno</td>
<td>3,300</td>
<td>5%</td>
<td>83%</td>
<td>3%</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacramento</td>
<td>1,600</td>
<td>60%</td>
<td>3%</td>
<td>36%</td>
<td>1%</td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>660</td>
<td>84%</td>
<td>9%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>San Francisco</td>
<td>650</td>
<td>99%</td>
<td></td>
<td>1%</td>
<td>2%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Madera</td>
<td>270</td>
<td></td>
<td>96%</td>
<td></td>
<td></td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>Alameda</td>
<td>200</td>
<td></td>
<td>96%</td>
<td></td>
<td></td>
<td></td>
<td>4%</td>
</tr>
</tbody>
</table>

5.4.1 Key County – Fresno County

Fresno was the site of the system’s groundbreaking in 2015 and has seen significant construction and economic benefits from the project thus far. About one-half of CP1 and one-fourth of CP2-3 is in the County. Further, the Authority’s Central Valley regional office is located in the City of Fresno. As shown in Figure 16, there are currently five active CP1 construction sites in Fresno County (and four in Madera County):

1. San Joaquin River Viaduct – North Fresno;
2. State Route 99 Realignment – Central Fresno;
3. Fresno Trench & State Route 180 Passageway – Downtown Fresno;
4. Tuolumne Street Bridge Construction – Downtown Fresno; and
5. Cedar Viaduct – South Fresno.

Note: analysis of regions and counties does not capture spill-over effects from surrounding regions/counties that would be captured in the statewide analysis.
Work in the Central Valley and Fresno has included planning, engineering and site-work preparation, including right-of-way acquisition, in preparation for construction. Fresno County has accounted for an estimated 3,300 of the direct-job years in the Central Valley region, or about 87% of total job-years generated in the region thus far. However, as construction continues to expand across the Central Valley, it is expected this share to decrease as new opportunities are created outside of Fresno County. It is also important to note that this analysis looked at the location of the work being performed, not where those doing the work live.

Table 14. Fresno County Economic Impacts, July 2006 – June 2016

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>3,300</td>
<td>$180M</td>
<td>$620M</td>
</tr>
<tr>
<td>Indirect</td>
<td>1,400</td>
<td>$70M</td>
<td>$220M</td>
</tr>
<tr>
<td>Induced</td>
<td>1,200</td>
<td>$50M</td>
<td>$160M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,900</strong></td>
<td><strong>$300M</strong></td>
<td><strong>$1,000M</strong></td>
</tr>
</tbody>
</table>

The benefits listed in Table 14 are expected to grow in the coming years as CP1 construction continues and CP2-3 ramps up construction. In 2015, Fresno’s unemployment rate dipped below 10% for the first time since the recession of 2008 and only the fourth time in the last 25 years. The unemployment rate is projected to be 9.5% in 2017, which may partially be attributed to the forecasted $1 billion in investment generated by high speed rail spending in 2017. Between July 2015 and June 2016, the US Bureau of Labor Statistics estimates that 10,550 jobs were added in Fresno County. The job-years supported by Authority investment was equivalent to about 30% (or 3,090 job-years) of these additional jobs in Fresno County with direct jobs being equivalent to around 17% (1,758 job-years) of the county total.

In addition to reduced unemployment, the County has experienced three consecutive years of annual employment growth over 3%. Prior to 2014, Fresno County had just one year of 3% employment growth since 1990. As shown in Figure 21, this growth outpaced both that of the Central Valley as well as the State in the last three years.

---

56 Note: totals may not sum due to rounding
58 ibid
The benefits of high-speed rail in Fresno are further supported by the University of the Pacific’s forecast that the county’s leading sector for employment growth is expected to be Construction and Mining at 7.6% growth in 2017. Beyond the construction-related impacts being generated right now, the connectivity offered by high-speed rail service will connect Fresno and the Central Valley to the rest of the state like never before.

5.4.2 Key County - Madera County

Madera County is also located in the Central Valley Region and has similarly seen significant Program investment, as the other half of CP1 falls in Madera County. Like Fresno County, Madera County has seen planning, environmental and construction program activities occurring within its boundaries.

As shown in Figure 16, there are currently four active CP1 construction sites in Madera County (and five in Fresno County):

1. Avenue 8 Overcrossing;
2. Fresno River Viaduct;
3. Cottonwood Creek; and
4. Road 27 Overcrossing.

Between 2006 and 2016 the project has generated 400 total job-years, $19 million in total labor income, and $69 million in total economic output in Madera County.

---

60 Source: nonfarm employment data, California Employment Development Department, Labor Market Information Division; Central Valley defined as the counties of Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare.

61 ibid
Table 15. Madera County Economic Impacts, July 2006 – June 2016\textsuperscript{62}

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>270</td>
<td>$13M</td>
<td>$50M</td>
</tr>
<tr>
<td>Indirect</td>
<td>70</td>
<td>$3M</td>
<td>$11M</td>
</tr>
<tr>
<td>Induced</td>
<td>60</td>
<td>$2M</td>
<td>$8M</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>$19M</td>
<td>$69M</td>
</tr>
</tbody>
</table>

Note: totals may not sum due to rounding

Figure 22. Active High-Speed Rail Construction Project Sites

\textsuperscript{62} Note: totals may not sum due to rounding
Figure 23. Total Job-Years by California Counties
5.5 Disadvantaged Communities and Small Business

The Authority is committed to ensuring small businesses and disadvantaged communities throughout California benefit and play an active role in building the Program. Investments made by the Program have promoted employment and business opportunities for small and disadvantaged businesses and workers.

Over the past several years, California has begun to recognize specific areas as disadvantaged communities based on a combination of environmental and socioeconomic factors. This analysis is conducted by the California Environmental Protection Agency (CalEPA) using a tool called CalEnviroScreen. Disadvantaged communities are defined as those that score in the top 25% of the most impacted communities based on an index made up of four components in two broad groups. Exposure and Environmental Effects components comprise a Pollution Burden group, and the Sensitive Populations and Socioeconomic Factors components comprise a Population Characteristics group.

Figure 24. CalEnviroScreen 2.0 Indicator and Component Scoring

One of the advantages to starting construction on the high-speed rail system in the Central Valley is the opportunity that construction can generate for residents of disadvantaged communities that are disproportionately (though not exclusively) located in the Central Valley. Under the guidelines of the ARRA grant, one of the priorities to be considered for project selection was whether the project was in an Economically Distressed Area. Project investments in the Central Valley have positively affected the local economy, stimulating economic activities and generating employment. Figure 25 shows the locations of disadvantaged communities in the state.

Over half (52%) of the $2.3 billion program investment\(^63\) in the system through June 2016 occurred in designated disadvantaged communities throughout California, spurring economic activity in these communities.

\(^63\) The calculation excludes over $372 million in spending on right-of-way land acquisition payments.
areas. Furthermore, for communities in the top 5% of CalEnviroScreen pollution burden and socioeconomic factors index ranking, the results show that almost a quarter (23%) of program investment through June 2016 has occurred in the most disadvantaged communities in the State. This is consistent with the substantial investments that the program is making in the Central Valley region, where most of the disadvantaged communities in the state are located.

To come up with the share of disadvantaged communities in program investments the study team applied and aggregated the share of disadvantaged community census tracts per zip code to the total expenditure per zip code determined through the data collection process.

The communities that fall within the top 5% of CalEnviroScreen index rankings do not have an official designation outside of the overall Disadvantaged Communities designation but the results of this analysis are provided for purposes of additional information related to the location of expenditures and economic impacts.
From the implementation of the Authority’s Small and Disadvantaged Business Enterprise Program (from August 2012 to June 2016) more than $196 million has been paid to certified Small,
Disadvantaged and Disabled Veteran Business Enterprises for their work on the high-speed rail program. For the same period, professional services contractors have collectively met the 30% small business utilization target, while design-build contractors are working to attain their utilization target as construction activities ramp-up. As of October 2016, 334 small businesses were either committed, utilized, or actively working on the project. One-fifth (68 out of 334) of these small businesses are doing work on the program from offices located within designated disadvantaged communities, providing much needed employment opportunities to workers in those areas where they are most needed.

Further, the Authority Board of Directors approved a Community Benefits Policy in 2012 to ensure that jobs created through program investments benefit disadvantaged communities. The Authority’s Community Benefits Agreement contains a Targeted Worker Program which ensures that 30% of all

---

66 Excludes contracts not part of the Small Business program (e.g. resource agency contracts, third-party agreement contracts, legal contracts, purchase contracts, etc.)
project work hours are performed by National Targeted Workers\textsuperscript{67}, and at least 10% of those work hours shall be performed by Disadvantaged Workers\textsuperscript{68}, including veterans. As of January 2017, there have been 910 dispatched construction workers, of which 574 are considered disadvantaged.

### 5.6 National Impacts

Despite the majority of expenditure taking place in California, Program expenditure has also impacted the economies of other states through material purchases, companies based in other states working on the program, and other spillover effects. Companies from 35 different states have worked on the program, contributing to everything from planning and engineering to construction.

Out-of-state spending has accounted for about 6% (around $121 million) of total expenditure and includes spending across the United States as well as some expenditures for specialized services that could only be provided from experts abroad (since certain high-speed rail expertise is lacking in the United States). Of this out of state spending, nearly 90% of it stayed within the US (around $109 million). About 10% of out-of-state spending was international (nearly $13 million). The states with the highest program investment outside of California include Colorado, New Jersey, New York, Oregon, Texas, Washington and Washington DC.

#### Table 16. US States with Highest Program Expenditure\textsuperscript{69}

<table>
<thead>
<tr>
<th>State</th>
<th>Expenditure</th>
<th>Percent of Non-California Expenditure within US (excludes international)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>$17M</td>
<td>16%</td>
</tr>
<tr>
<td>New York</td>
<td>$16M</td>
<td>14%</td>
</tr>
<tr>
<td>Washington</td>
<td>$11M</td>
<td>11%</td>
</tr>
<tr>
<td>Texas</td>
<td>$11M</td>
<td>10%</td>
</tr>
<tr>
<td>New Jersey</td>
<td>$10M</td>
<td>9%</td>
</tr>
<tr>
<td>Oregon</td>
<td>$8M</td>
<td>8%</td>
</tr>
<tr>
<td>Washington DC</td>
<td>$7M</td>
<td>6%</td>
</tr>
<tr>
<td>All other states</td>
<td>$30M</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$109M</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{67} A Targeted Worker is an individual whose primary place of residence is within an Economically Disadvantaged Area or an Extremely Economically Disadvantaged Area in the United States.

\textsuperscript{68} A Disadvantaged Worker is an individual who meets the income requirements of a Targeted Worker, and faces other barriers to employment (e.g. being a veteran, lacking a GED or high school diploma, being homeless, etc.)

\textsuperscript{69} Totals may not sum due to rounding.
## Appendix 1 — Silicon Valley to Central Valley Line Analysis RIMS and IMPLAN Codes

<table>
<thead>
<tr>
<th>SCC Code</th>
<th>RIMS NAICS Code</th>
<th>RIMS Code Name</th>
<th>IMPLAN Sector</th>
<th>IMPLAN Sector Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications &amp; Signaling</td>
<td>334290</td>
<td>&quot;Other communications equipment manufacturing&quot;</td>
<td>54</td>
<td>&quot;Construction of new power and communication structures&quot;</td>
</tr>
<tr>
<td>Electric Traction</td>
<td>2211A0</td>
<td>&quot;Electric power generation, transmission, and distribution&quot;</td>
<td>49</td>
<td>&quot;Electric power transmission and distribution&quot;</td>
</tr>
<tr>
<td>Professional Services</td>
<td>541300</td>
<td>&quot;Architectural, engineering, and related services&quot;</td>
<td>449</td>
<td>&quot;Architectural, engineering, and related services&quot;</td>
</tr>
<tr>
<td>Site work, Right of Way, Land, Existing Improvements</td>
<td>233293</td>
<td>&quot;Highways and streets&quot;</td>
<td>56</td>
<td>&quot;Construction of new highways and streets&quot;</td>
</tr>
<tr>
<td>Stations, Terminals, Intermodal</td>
<td>2332C0</td>
<td>&quot;Nonresidential structures&quot;</td>
<td>58</td>
<td>&quot;Construction of other new nonresidential structures&quot;</td>
</tr>
<tr>
<td>Support Facilities: Yards, Shops, Admin. Bldgs</td>
<td>2332C0</td>
<td>&quot;Nonresidential structures&quot;</td>
<td>58</td>
<td>&quot;Construction of other new nonresidential structures&quot;</td>
</tr>
<tr>
<td>Track, Track Structures</td>
<td>233293</td>
<td>&quot;Highways and streets&quot;</td>
<td>56</td>
<td>&quot;Construction of new highways and streets&quot;</td>
</tr>
<tr>
<td>Vehicles</td>
<td>336500</td>
<td>&quot;Railroad rolling stock manufacturing&quot;</td>
<td>362</td>
<td>&quot;Railroad rolling stock manufacturing&quot;</td>
</tr>
</tbody>
</table>