FISCAL YEAR 2016-2017 ECONOMIC IMPACT ANALYSIS
TECHNICAL SUPPORTING DOCUMENT

Economic Impact Methodology Documentation

DECEMBER 2017
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<td>Fiscal Year 2016 - 2017 Analysis</td>
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<tr>
<td>APTA</td>
<td>American Public Transit Association</td>
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<td>ARRA</td>
<td>American Recovery and Reinvestment Act</td>
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<td>Authority</td>
<td>California High-Speed Rail Authority</td>
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<td>BEA</td>
<td>Bureau of Economic Analysis</td>
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<tr>
<td>Caltrain Electrification</td>
<td>Peninsula Corridor Electrification Project</td>
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<tr>
<td>CMGC</td>
<td>Construction manager / General contractor</td>
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<td>CP</td>
<td>Construction package</td>
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<td>CV</td>
<td>Central Valley</td>
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<td>DB</td>
<td>Design build</td>
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<td>DBE</td>
<td>Disadvantaged business enterprise</td>
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<td>DOF</td>
<td>Department of Finance</td>
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<td>DVBE</td>
<td>Disabled veteran business enterprise</td>
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<td>E&amp;E</td>
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<td>California Employment Development Department</td>
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<td>EIR/EIS</td>
<td>Environmental impact report/Environmental impact statement</td>
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<td>FEIS</td>
<td>Final environmental impact statement</td>
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<td>FRA</td>
<td>Federal Railroad Administration</td>
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<td>FTE</td>
<td>Full time equivalent</td>
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<td>FY</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
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<td>GSP</td>
<td>Gross state product</td>
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<td>Historical Analysis</td>
<td>July 2006 – June 2016 Economic Impact Analysis, Completed in September 2017</td>
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<td>MRP</td>
<td>Master resource pool</td>
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<td>MRIO</td>
<td>Multi-Regional Input/Output Analysis</td>
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<tr>
<td>ODC</td>
<td>Other direct cost</td>
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<td>PA</td>
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<tr>
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<td>Program management team</td>
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<tr>
<td>Program</td>
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<td>Authority Team consisting of the Business and Economic Branch</td>
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<td>Third party agreements</td>
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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. 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 delivery 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 report *High-Speed Rail: Investing in California’s Economy*, which was published in September 2017. This report detailed benefits that resulted from the historical investment in high-speed rail from July 2006 through June 2016 (Historical Analysis).\(^1\) To learn more about the methodology of the Historical Analysis, please review the Technical Supporting Document.\(^2\)

Building off the success of this initial effort, the Authority will be detailing and publishing economic impact reporting on a regular basis moving forward, beginning with this Fiscal Year 2016 – 2017 Analysis (current analysis).

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\(^1\) https://www.buildhsr.com/hsrinvestment/pdf/California_Economy_2017.pdf

This Fiscal Year 2016 - 2017 (FY 2016-2017) Technical Supporting Document outlines the methodology that was used in developing this 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. In this FY 2016-2017 Technical Supporting Document, the previous analysis that focused on July 2006 through June 2016 will be referenced as the Historical Analysis.

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 seventeen major construction sites are up and running - with the system’s first structures already complete. At the same time, planning and engineering continues across the system.

With nearly three 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 over $3 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. 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 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 FY 2016-2017 Analysis estimates the economic impact of the Authority’s expenditure from July 2016 through June 2017 including job-years, labor income, and economic output. 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 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

As described in the Historical Analysis Technical Supporting Document and repeated here, 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.

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3 Technical definitions of these economic impact metrics are provided in Section 3.1 of this report
4 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 Targeted Worker is an individual whose primary place or residence is within an Economically Disadvantaged Area or an Extremely Economically Disadvantaged Area in the United States.

A Disadvantaged Worker is an individual who prior to commencing work on the high-speed rail project meets the income requirements of a Targeted Worker and faces at least one of the following barriers to employment: Being a veteran, being a custodial single parent, receiving public assistance, lacking a GED or high school diploma, having a criminal record or other involvement with the criminal justice system, suffering from chronic unemployment, emancipated from the foster care system, being homeless or, being an apprentice with less than 15% of the required graduating apprenticeship hours in a program.

To learn more, visit:
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.

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 studies was conducted for the previous Historical Analysis Technical Supporting Document to provide analytical context, ensure a methodology consistent with industry standards, and benchmark results when applicable. The results of that literature review are included here.

#### 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 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 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.

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5 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_I4O_Ext_B_Req_051914_CLEAN.pdf


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.”

*Shovel Worthy: What the Recovery Act Taught Us about Investing in Our Nation’s Infrastructure – US Department of Transportation (January 2017)*

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.”

*The Economic Impacts of California’s Major Climate Programs on the San Joaquin Valley – University of California, Berkeley (January 2016)*

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.”

*California High-Speed Rail and the Central Valley Economy – Parsons Brinckerhoff in association with Oliveira Advisory Services (January 2015)*

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.

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11 Initial construction spending is estimated as direct spending from 2013-2015 Cap-and-trade investment for high-speed rail in San Joaquin Valley.
2.4 Review and Validation

For the Historical Analysis, 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. Reviewers included the University of the Pacific, the California High-Speed Rail Peer Review Group, the State of California Department of Finance, and the California Department of Labor. All reviewers were positive in their review that the methodology used met industry standards. This FY 2016-2017 Analysis followed similar methods and approaches as the Historical Analysis so the review and validation conducted at that time remains relevant. The results of that previous review are included here and have not been updated.

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 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:

“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

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 combined FY 2016-2017 Analysis and Historical Analysis considered historical, project-related spending over an eleven-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 job-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—that is, sales, other operating income, and change in inventory—and the cost of intermediate inputs required to produce that output—that is, the goods and services purchased from other firms or industries.

13 https://obamawhitehouse.archives.gov/administration/eop/cea/Estimate-of-Job-Creation/
14 https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/memoranda_2010/m10-08.pdf
15 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 (Historical Analysis), the Authority invested $2.3 billion in planning and constructing the nation’s first high-speed rail system. In FY 2016-2017, the Authority invested $1.3 billion, for a total investment of $3.6 billion from July 2006 to June 2017. These investments were made largely through the execution of more than 500 contracts that together resulted in 94% of total expenditure going to private sector firms (as opposed to public sector employees and agencies). 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 process, the category is used to encompass the majority of these activities.

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16 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.

17 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 2) 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 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.

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.

**Bookend Projects** – expenditure in this category reflects projects that are defined under SB 1029 (Item 2665-104-6043 as added to Section 2.00 of the Budget Act of 2012) to receive specific project investments from Prop 1A and other commitments that the Authority has made through agreements with local agencies. As of FY 2016 – 2017, the only Authority expenditure for these projects was for Peninsula Corridor Electrification Project (Caltrain Electrification). Moving forward, additional funds will may be allocated to additional bookend projects.

The share of each expenditure category in the total program investments in FY 2016 – 2017 and cumulatively is shown in Figure 3. The construction category has the largest share of total investments with 42% ($537M) with real property acquisition also making up significant share of the total expenditure in FY 2016 – 2017.

Figure 3. Detailed Program Expenditure by Category (July 2006 – June 2017)

Out of the nearly $1.28 billion total program investments in FY 2016-2017, $887 million was used as an input to the economic impact input-output modeling described in this report. The economic impact calculations in this study exclude over $318 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. Additionally,

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18 Source: Total Project Expenditures with Forecasts Reports, January 2017 and August 2017
19 Totals may not sum because of rounding.
20 $373 million includes all ROW expenditure in FY 2016 - 2017.
the nearly $77 million that went to Caltrain Electrification was analyzed separately as part of the analysis in Section 5.3.3.1 Caltrain Electrification.

The total program expenditures from July 2006 through June 2017 are outlined in Figure 4, showing the Authority’s transition from just planning towards construction related activity. As construction has ramped up, the share of program costs in the planning/environmental category has dropped to 18% over the lifetime of the project and just 7% of expenditure in FY 2016 – 2017.

### 3.2.2 Program Expenditure by Fiscal Year

Total program expenditures have grown steadily from $10 million in FY 2006-2007 to $1.28 billion in FY 2016-2017.

**Figure 4. Total Program Expenditure by Fiscal Year (July 2006 to June 2017)**

![Figure 4. Total Program Expenditure by Fiscal Year (July 2006 to June 2017)](image)

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, as can be seen in Figure 4. This trend continued in FY 2016-2017 as construction continued apace in the Central Valley while ROW acquisition for that portion of the work moved toward completion. 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 $1.28 billion spent on the system in FY 2016-2017 has come from both federal and state sources, with $902 million (70%) of funding from ARRA – continuing to infuse 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

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21 Source: Total Project Expenditures with Forecasts Report, August 2017
approved by California voters in 2008, provided $122 million (nearly 10%) while proceeds from the state’s Cap and Trade program provided $256 million (20%). All three funding sources have been used for project development activities and construction (Proposition 1A has been used for construction only in the past FY) while ARRA and Cap and Trade funds have provided the vast majority of construction funding thus far. Now that 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.\(^\text{22}\)

Figure 5. Total Program Funding by Source (July 2006 – June 2017)\(^\text{23}\)

Comparing the FY 2016-2017 funding breakdown with the combined historical result, ARRA funding has stayed relatively consistent, while Cap & Trade funding has historically been lower than Prop 1A, though this switched in FY 2016-2017.

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

\(^{22}\) http://www.hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf

\(^{23}\) Source: Capital Outlay Report, August 2017. Totals may not sum due to rounding.
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 during Fiscal Year 2016-17, from July 2016 through June 2017. Additionally, the results will include the total impacts supported by the program by adding the Historical Analysis to the FY 2016–2017 results. New analysis was only undertaken for the FY 2016 – 2017 time period.
4 Methodology

The impacts presented in this report were estimated using an industry-standard approach. To estimate a range for the statewide results, both a top-down and a bottom analysis was used. The top-down approach applied IMPLAN model multipliers to project expenditures. While the more in-depth, bottom-up approach was developed to estimate economic impacts at both the state level and also for smaller geographies, including counties and regions. Development of the bottom-up approach involved rigorous internal and external research on detailed project expenditures and customized geographic economic impact modeling using IMPLAN software.

The top-down and bottom-up approaches provide a reasonable range of outputs that can be used as benchmarks against other economic impact studies and as estimates for the spatial distribution of impacts resulting from project investments. Model inputs for both methodologies included expenditure and labor hours by industry sector, location, and fiscal year.

Figure 6. Inputs for IMPLAN Input-Output Models

| Expenditure (by industry sector, location and fiscal year) | + | Labor Hours (by industry sector, location and fiscal year) | = | Model Inputs |

4.1 Data Collection

As discussed above, in order to run the IMPLAN input-output model, expenditure and labor hours data were collected as model inputs. In order to add additional detail to the model outputs, expenditure and labor hours inputs were also categorized by industry sector, location (at the zip code level), and fiscal year. Sections 4.1.1 to 4.1.4 detail the data collection process used to develop model inputs for the to-date analysis.

24 In the Historical Analysis, both IMPLAN and RIMS II were used to show a range of results. For this FY 2016 – 2017 analysis, this same range was provided by IMPLAN alone. The top-down approach utilized expenditure only, while the bottom-up relied on more detailed labor hours data. The choice to utilize IMPLAN for this analysis as the lone model was made because of its more precise modeling methodology and to simplify the results shown.
4.1.1 Data Collection Strategy

Through the Historical Analysis, an inventory of all existing data sources on expenditure, labor hours and employee office locations was completed. Please see the 2016 Technical Supporting Document for more information.\(^{25}\)

The data collection process focused on review of invoices that have been approved and paid by the Authority, and additional data collected through 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.\(^{26}\) 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 study team and specific contract managers conducted outreach to prime contractors (mostly Regional Consultants) to gather invoice data in an easy-to-use format, with additional information on the location of work performed, when available. 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. When geographic data were not available for the FY 2016-2017 Analysis, assumptions derived from geographic breakdowns developed for the Historical Analysis were used (primarily from FY 2015-2016 when available).

The in-depth data collection effort focused on 15 of the largest contracts in FY 2016–2017, which comprised 85% of total contract expenditure. Total contract expenditure excludes Authority direct costs, ROW land acquisition payments, and Caltrain Electrification payments. Authority costs are analyzed and included separately. As discussed previously, ROW land acquisition payments are considered an economic transfer and are therefore excluded from evaluation of economic impacts.\(^{27}\) Caltrain Electrification, including the Authority’s $77 million contribution in FY 2016-2017, is discussed in Section 5.3.3.1 Caltrain Electrification.\(^{28}\)

The 15 major contracts from FY 2016-2017 comprise six regional consultant contracts, one project administration contract, three design-build construction contracts, one construction management / general contractor contract, three project and construction management contracts, and one financial advisory services contract (Table 1). These contracts include a prime contractor (sometimes a joint venture) and multiple subcontractors. The Authority’s Small Business Enterprise (SBE) goals (discussed in Section 2.2: California High-Speed Rail Authority Policies) apply to these contracts.

The Historical Analysis undertook a similar approach to focusing on the largest contracts from July 2006 – June 2016. The data collection effort focused on 20 of the largest contracts (out of 464 total contracts over that time period) representing 91% of expenditure on contracts from July 2006 to June 2016. The approach to focus on the largest contracts significantly reduced the number of invoices reviewed for


\(^{26}\) 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.

\(^{27}\) 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.

\(^{28}\) http://www.caltrain.com/projectsplans/CaltrainModernization/Modernization/PeninsulaCorridorElectrificationProject.html
employee-level data from over 9,000 to around 1,000, while still facilitating the capture of the majority of applicable program costs. The 20 major contracts were 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.

Some of the contracts analyzed in the FY 2016-2017 Analysis were the same contracts included in the Historical Analysis. However, several of the larger contracts analyzed for the Historical Analysis were no longer active, so it was necessary to update the list of large contracts, seen in Table 1.

Table 1. 15 Major Contracts (Fiscal Year 2016 - 2017)

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Prime Contractor</th>
<th>Contract Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSR13-06</td>
<td>TPZP</td>
<td>Construction</td>
</tr>
<tr>
<td>HSR13-57</td>
<td>Dragados-Flatiron, JV</td>
<td>DB</td>
</tr>
<tr>
<td>HSR06-12</td>
<td>Caltrans (SR-99)</td>
<td>CMGC</td>
</tr>
<tr>
<td>HSR14-32</td>
<td>California Rail Builders</td>
<td>DB</td>
</tr>
<tr>
<td>HSR11-12</td>
<td>Wong-Harris</td>
<td>PCM</td>
</tr>
<tr>
<td>HSR13-106</td>
<td>Arcadis</td>
<td>PCM</td>
</tr>
<tr>
<td>HSR 15-01</td>
<td>HNTB</td>
<td></td>
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<tr>
<th>Planning/Environmental</th>
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<table>
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<tr>
<th>Contract Number</th>
<th>Prime Contractor</th>
<th>Contract Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSR08-03</td>
<td>AECOM</td>
<td>RC</td>
</tr>
<tr>
<td>HSR15-34</td>
<td>HNTB</td>
<td>RC</td>
</tr>
<tr>
<td>HSR13-44</td>
<td>T.Y. Lin</td>
<td>RC</td>
</tr>
<tr>
<td>HSR14-39</td>
<td>STV</td>
<td>RC</td>
</tr>
<tr>
<td>HSR14-42</td>
<td>SENER</td>
<td>RC</td>
</tr>
<tr>
<td>HSR 13-43</td>
<td>CH2MHIll</td>
<td>RC</td>
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<tr>
<th>Program Administration</th>
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<table>
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<tr>
<th>Contract Number</th>
<th>Prime Contractor</th>
<th>Contract Category</th>
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<tbody>
<tr>
<td>HSR14-66</td>
<td>WSP</td>
<td>PM</td>
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<th>Other</th>
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<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Prime Contractor</th>
<th>Contract Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSR15-92</td>
<td>KPMG</td>
<td>Financial</td>
</tr>
</tbody>
</table>

The expenditures from other contracts, with expenditure over $100,000 in FY 2016-2017 were individually captured at the contract level, by fiscal year, using the Authority financial office’s existing contract expenditure database. Contracts with less than $100,000 in total expenditures from July 2016 – June 2017 were combined for this Analysis into a single expenditure line item.
4.1.2 Invoice Review

The invoice review process entailed extracting monthly expenditure and labor hours data from each of the 15 major contracts. Building off the methodology discussed in the Historical Analysis, the study team was able to work with contract managers to receive a spreadsheet accounting of the majority of invoices in a usable format directly from the prime contractors. Some invoice review was used when data was not provided in an easy-to-use format. The invoice data mining process varied slightly depending on the contract category, as different contractors have somewhat different requirements for the information contained in their invoices.

The Historical Analysis Technical Supporting Document details the types of invoices by contract, and invoice review process in Section 4.1.3 Invoice Review.\(^{29}\)

As discussed above, for many of the RCs, PCMs, and other non-Design Build contracts, the study team was able to receive most information directly from the contractor, without needing to review each invoice individually. However, different contractors responded to the study team’s data requests differently so individualized approaches to gather the data for some contracts had to be developed. Overall, 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 Program’s investments yielded.

4.1.3 Additional Data Requests and Assumptions

As mentioned previously, the study team worked with contract managers of the major contracts to receive as much information as possible in spreadsheet format, focused on the specific geographic detail on where work was completed, or where local offices were located. 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 15 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, when possible. For the Regional Consultant Contracts that did not provide detailed geographic breakdowns of their employees’ office locations, the geographic spending profile from FY 2015-2016 was applied to the expenditure of that contract. The study team assumed that work had not changed significantly for the professional services contracts and that the FY 2015-2016 geographic breakdowns would closely match the FY 2016–2017 breakdown.\(^{30}\)

For design-build contracts, the study team first isolated payments to subcontractors. Unlike in the Historical Analysis, subcontractor expenditure was allocated to the main regional office of that subcontractor. Targeted outreach to subcontractors for geographic data was a major piece of the


\(^{30}\)Out of the 15 major contracts reviewed for the FY 2016-2017 Analysis, geographic breakdowns were estimated using FY 2015-16 breakdowns for 5 contracts, primarily Regional Consultants.
Historical Analysis but it was not undertaken for the FY 2016-2017 analysis because the historical data collected in the fall of 2016 was deemed still valid by the study team. The study team then separated final design and construction administration costs from construction costs of the prime contractor to properly categorize spending in the economic impact analysis.

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 8 shows an example of the CP1 alignment-zip code GIS map overlay from the Historical Analysis.

The location of work for costs not included in the 15 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. ROW relocation costs were allocated to the parcel being acquired. For ROW services firms, Resource Agencies, Third-party Agreement expenditures, and other contracts the study team researched the location of prime contractor offices separately.
Unlike the Historical Analysis, the FY 2016-2017 Analysis did not require data gap interpolation because there were no gaps in invoice data.

4.1.4 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. This was especially important when considering the many formats that RC data was received. 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. There is no update to this quality assurance / quality control methodology from the Historical Analysis.

4.2 Analysis Approach

The Analysis was performed using both a top-down and bottom-up approach, providing a range of impacts and allowing for internal quality checks. The input-output modeling software IMPLAN was used to conduct both types of analysis.

Unlike the Historical Analysis, that utilized both IMPLAN and RIMS II analysis, the FY 2016 – 2017 Analysis relies on IMPLAN model alone. The study team determined that the use of IMPLAN alone would standardize results, as well as rely on the more precise model for all outputs.

4.2.1 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 ranging from concrete to carpenters. In addition, input-output modeling considers how the additional labor income generated by spending in a particular industry—e.g., the salaries earned by carpenters employed by the Program’s contractors—will translate into increased consumer spending in the form of household expenditures.

4.2.1.1 About IMPLAN

IMPLAN is a software tool and economic dataset published by MIG, Inc., a third-party provider based in Charlotte, North Carolina. The backbone of IMPLAN’s analysis tools consists of a pre-defined set of industry relationships that indicate how spending in one sector recirculates through industries that produce intermediate goods and services in a regional economy (such as a state, county, or other pre-defined geographic jurisdiction). IMPLAN is frequently used to perform economic impact analyses for the construction phase of major transportation projects. Examples include the following: 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.

The industry linkages defined in IMPLAN are based on RIMS II multipliers, which are published by the U.S. Bureau of Economic Analysis, but build upon them to offer greater flexibility and more detailed analytical results. For example, IMPLAN allows for greater flexibility in customizing underlying inter-industry relationships; provides re-calibrated multipliers for sub-regional economies, including at the zip-code level; and delineates economic impact results by industry sector. 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. The expenditure data used for inputs were expressed in nominal dollars; IMPLAN is capable of interpreting inputs from different dollar-years and performing the conversion to constant dollar-years.\(^{31}\) Similarly, IMPLAN is able to generate outputs in any desired dollar-year. For this analysis, all inputs and outputs were expressed in 2016 dollars.

\(^{31}\) The base year for IMPLAN’s multipliers is 2014, meaning that the multipliers reflect industry relationships as observed in 2014. This is industry standard and has little effect on the results.
### Table 2. Industry/Sector Allocations by Contract Category

<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Prime Contractor</th>
<th>Contract Category</th>
<th>IMPLAN Sector</th>
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</thead>
<tbody>
<tr>
<td>HSR13-06</td>
<td>TP2P</td>
<td>DB</td>
<td>Construction</td>
</tr>
<tr>
<td>HSR13-57</td>
<td>Dragados-Flatiron, JV</td>
<td>DB</td>
<td>Sector 56 “Construction of new highways and streets”</td>
</tr>
<tr>
<td>HSR06-12</td>
<td>Caltrans (SR-99)</td>
<td>CMGC</td>
<td>“Construction of new highways and streets”</td>
</tr>
<tr>
<td>HSR14-32</td>
<td>California Rail Builders</td>
<td>DB</td>
<td>“Architectural, engineering, and related service”</td>
</tr>
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<td>Wong-Harris</td>
<td>PCM</td>
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<td>Program Administration</td>
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<td>HSR14-66</td>
<td>WSP</td>
<td>PM</td>
<td>“Architectural, engineering, and related services”</td>
</tr>
<tr>
<td>HSR15-92</td>
<td>KPMG</td>
<td>Financial</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“Accounting, tax preparation, bookkeeping, and payroll services”</td>
</tr>
</tbody>
</table>

### 4.2.2 Top-down Approach

The top-down approach used total expenditure data to calculate impacts at the state level. Expenditures were used as the “Industry Change” input in IMPLAN. This method is considered the more conventional approach to estimating the economic impacts of a project and incorporates top-line project expenditures by category. It was useful to compare top-down results with those generated by 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 study team took the following steps (Figure 8) to estimate the economic impacts of project investments in the top-down approach.

**Figure 8. Top-down Approach Analysis Process**

Applicable IMPLAN 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, rather than relying on total expenditure data, used inputs for full-time equivalent jobs (FTEs) to estimate economic impacts. These FTEs were either provided directly by the contractor or were converted from contract expenditures based on estimates for average hourly rates.

A core analytical assumption embedded within the input-output models used for this analysis is the direct output per worker ratio—that is, for every $1 million of economic output for a particular industry, how many direct job-years are supported? Because the data collection tasks for this analysis yielded more precise calculations 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, 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 performed for all geographies included in this report. While the top-down approach was used only for the statewide analysis, the bottom-up approach was used to calculate economic impacts at the statewide, regional, and county levels.

The study team took the steps in Figure 9 to estimate the economic impacts of project investments in the bottom-up approach.
As described in Section 4.2.1, IMPLAN is used to quantify the aggregate economic impact of direct spending in a predefined local economy. Using data on industry relationships, IMPLAN describes how spending in one sector recirculates throughout that predefined local economy, producing second-order economic impacts in that specific geography. However, a standard IMPLAN analysis fails to capture economic impacts resulting from “leakage” expenditures—that is, spending that is recirculated outside the boundaries of the predefined local economy. For example, if $1 million is spent on construction expenditures in County A, some of the resulting second-order impacts will be felt in the neighboring County B; those impacts comprise the “leakage” effect.

To account for leakage, IMPLAN is capable of performing Multi-Regional Input/Output (MRIO) analysis, a function that calculates the proportion of total economic impact that would be expected to “leak” from the reference region to neighboring economies. While direct effect economic impacts of an MRIO analysis will be the same as those of a single-region analysis, the second-order economic impacts will typically be greater, as the model now captures recirculated spending that leaks outside the model region.

In this analysis, the study team ran a MRIO analysis to specifically evaluate the leakages between Fresno and Madera counties, which were home to most of the construction activities in FY 2016-2017. Results of this analysis are presented in Section 5.4.3.
5 Results

This section details the results of the FY 2016 - 2017 Analysis as well as total impacts to date, including the Historical Analysis. Please see the Technical Supporting Document for the Historical Analysis for details on the first 10 years studied. Impacts are shown over a variety of geographies and results detail specific impacts in more depth, including the number of job-years and the economic impacts in Disadvantaged Communities. Lastly, the results detail impacts outside of the State of California.

As discussed in the previous section, this analysis shows geographic outputs based on location of the work being performed or where companies are located, rather than where those doing the work live.

5.1 California Economic Impacts

From July 2016 through June 2017 the Authority invested nearly $1.3 billion in planning and construction of the high-speed rail system. This investment has supported 8,600 to 9,600 job-years of employment (including direct, indirect, and induced impacts) and generated $1.6 to $1.8 billion in total economic activity. Additionally, over the life of the project, the Authority has invested nearly $3.6 billion, has supported 28,500 to 33,200 job-years of employment, and generated $5.1 billion to 5.9 billion in total economic output.

The vast majority of this economic activity has taken place in the State of California, with 97% of FY 2016 – 2017 spending going to companies and workers 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 codes only). From analysis inception (FY 2006 – 2007) until June 2017, about 95% of the project expenditure has taken place in the State of California.

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33 This percentage of spending within the state was estimated using the total expenditure for FY 16/17 minus ROW acquisition and Bookend Project expenditure.
Table 3. California Economic Impacts, FY 2016-2017 & Program Total

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY16/17 Direct</td>
<td>3,900 – 4,400</td>
<td>$280M – $340M</td>
<td>$780M - $850M</td>
</tr>
<tr>
<td>FY 16/17 Indirect</td>
<td>2,300 – 2,500</td>
<td>$160M – $170M</td>
<td>$460M - $480M</td>
</tr>
<tr>
<td>FY 16/17 Induced</td>
<td>2,400 – 2,800</td>
<td>$130 - $150M</td>
<td>$390M - $450M</td>
</tr>
<tr>
<td>FY 16/17 Total</td>
<td>8,600 – 9,600</td>
<td>$570M – $650M</td>
<td>$1,600M – $1,800M</td>
</tr>
<tr>
<td>Program Total (July 2006 – June 2017)</td>
<td>28,500 – 33,200</td>
<td>$1,950M – $2,330M</td>
<td>$5,100M – $5,900M</td>
</tr>
</tbody>
</table>

As part of the Historical Analysis, forecasted impacts were developed for the Silicon Valley to Central Valley Line, which is planned to be the first operating segment of high-speed rail in California. This forecast was not updated in this FY 2016-2017 Analysis. Please see the 2016 Technical Supporting Document for a more in-depth analysis of the Silicon Valley to Central Valley Line.

5.1.1 Number of Private Sector Firms on the Program

Although the Authority is responsible for developing the high-speed rail program, the Authority’s business model relies extensively on the private sector to perform substantial functions ranging from actual construction to preparing the detailed studies and reports necessary to clear the project environmentally. These private sector functions are essential to delivering high-speed rail and have resulted in hundreds of private sector firms bringing their expertise to the program.

The number of private sector firms contracted to work on the project has steadily grown from July 2006 to June 2017. For this analysis, the study team reviewed current and former contracts and contract-related databases to tabulate the number of private sector firms who have worked on the program since July 2006. While we have captured the majority of firms working on the program, there are likely some that this does not capture. In total, the study team was able to verify that at least 723 firms have worked on the program since 2006.

34 Note: totals may not sum due to rounding
36 The 723 unique firms for that period are derived from three different Authority data sources that combine to compile the unique contractor universe for the program. The data sources are: “The Contracts Number Log” which contains the master list of Authority Prime Contracts; the “Small Business Master List” which contains a comprehensive list of small businesses that are under prime or sub-contracts with the Authority; and the input data to the rest of the economic analysis presented in this memo that contains a list of Authority contractors and subcontracts that have billed the Authority since 2006. The 723 firms do not include Federal, State, County or City governments or other public entities or nonprofits, purchase orders for administrative goods, or second-tier subcontractors and suppliers.
5.2 Employment Impact Overview

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. Figure 10 shows this growth in job-years from FY 2006-2007 to the current analysis of FY 2016-2017, with a total growth rate of 200% from FY 2014-2015 to FY 2016-2017. The historical jobs analysis took the results of the top-down statewide approach for the total impact shown in the Historical Analysis for statewide impacts and allocated them to each fiscal year based on the share of total expenditures that took place in that fiscal year. The current FY 2016-2017 analysis was estimated separately and the analysis shows that the $1.28 billion in investment for this fiscal year supported the equivalent of around 9,600 full time jobs over the course of the year using the top-down approach.

Figure 10. Statewide Total Job-Years per Fiscal Year, July 2006 – June 2017

5.2.1 Job-Years by Industry Sector

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 has surpassed 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.

Table 4 shows the split of direct employment impacts by economic sector in FY 2016-2017 and since July 2006. 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 3

---

Note: includes direct, indirect, and induced
earlier in this section, direct job-years over FY 2016-2017 range from 3,900 – 4,400. The split of public versus private job-years over this time period is about 92% in the private sector and 8% in the public sector. Public job-years include the Authority and Resource Agencies, while private ranges from construction and engineering to legal services, etc.

Table 4. Largest Direct Job-Years per IMPLAN Sector, FY 2016-2017 & Program Totals 38

<table>
<thead>
<tr>
<th>IMPLAN Sector</th>
<th>FY 16/17 Job-Years</th>
<th>Program Total Job-Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(FY 06/07 – FY 16/17)</td>
</tr>
<tr>
<td>Construction of new highways and streets (Sector 56)</td>
<td>2,40039</td>
<td>5,600</td>
</tr>
<tr>
<td>Architectural, engineering, and related services (Sector 449)</td>
<td>900 – 1,400</td>
<td>4,700 – 6,900</td>
</tr>
<tr>
<td>Other state government enterprises (Sector 523)</td>
<td>200 – 300</td>
<td>1,300 – 1,700</td>
</tr>
<tr>
<td>Real Estate (Sector 440)</td>
<td>300 – 500</td>
<td>700 – 1,000</td>
</tr>
<tr>
<td>Accounting, tax preparation, bookkeeping, and payroll services (Sector 448)</td>
<td>40 – 130</td>
<td>90 – 230</td>
</tr>
<tr>
<td>Legal Services (Sector 447)</td>
<td>10</td>
<td>40 – 110</td>
</tr>
</tbody>
</table>

38 The range of job-years is from the bottom-up and top-down analysis.
39 Methodology for estimating construction impacts relies on expenditure only (top-down analysis). 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 11. Economic Impacts by California Region, FY 2016 – 2017 and Program Totals

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 three years in the region. However, as construction spending continues to ramp up, its effects are beginning to be seen in the Sacramento, Bay Area, and Southern California regions as local firms from those areas join construction teams in the Central Valley.
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 12. Central Valley Construction Contracts as of November, 2017

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 12 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.40

Program investments have had significant impact on the Central Valley economy, generating an estimated 4,500 job-years of employment and about $790 million in total economic activity from July 2016 to June 2017. Table 5 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 for both FY 2016–2017 and since 2006.

40 The CP1 project office is in Fresno, the CP2-3 project office is in Selma and the CP4 project office is in Shafter.
Table 5. Central Valley Economic Impacts, FY 2016 - 2017 & Program Total41

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 16/17 Direct</td>
<td>2,600</td>
<td>$140M</td>
<td>$480M</td>
</tr>
<tr>
<td>FY 16/17 Indirect</td>
<td>1,100</td>
<td>$60M</td>
<td>$190M</td>
</tr>
<tr>
<td>FY 16/17 Induced</td>
<td>900</td>
<td>$30M</td>
<td>$120M</td>
</tr>
<tr>
<td>FY 16/17 Total</td>
<td>4,500</td>
<td>$230M</td>
<td>$790M</td>
</tr>
<tr>
<td>Program Total</td>
<td>11,300</td>
<td>$560M</td>
<td>$2,000M</td>
</tr>
</tbody>
</table>

The Central Valley has seen 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, most Central Valley metro areas experienced job growth either at or exceeding the state average in 2016 and 2017. This trend is forecast to continue through 2020.42 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 three 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 13 shows the approximate job-years of employment generated in the Central Valley per fiscal year.

41 Note: totals may not sum due to rounding
42 http://www.pacific.edu/Documents/school-business/BFC/Forecasts/CA%20Forecast%20October%202017Web.pdf
Of the 2,600 direct job-years of employment supported in the Central Valley in FY 2016-2017, over 2,000 have been in the construction industry, representing over 75% of the direct job-years in the region.\textsuperscript{44} Real estate and architectural, engineering and related services, and local government represent a smaller portion of the investment in that region, at around 260 (10%), 85 (3%), and 66 (3%) job-years respectively. Of the program total 6,400 direct job-years supported in the Central Valley from July 2006 – June 2017, around 5,000 were in the construction industry, making up the majority of direct employment impacts in the region. This is expected to continue as construction investment will continue to be focused in the Central Valley for a number of years.\textsuperscript{45}

Additionally, the impact of the Authority’s total investment between July 2016 and June 2017 (4,500 job-years) has been equivalent to over 13% of the 33,700 jobs that the Central Valley economy added over the same period overall.\textsuperscript{46} This was a continuation of the similar effect that Authority investment had over the previous fiscal year. Please see Figure 13 for job-years supported over these fiscal years.

### 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. The Authority and RDP headquarters are co-located in downtown Sacramento 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.

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\textsuperscript{43} Note: includes direct, indirect, and induced

\textsuperscript{44} According to IMPLAN sector

\textsuperscript{45} According to IMPLAN sector

\textsuperscript{46} Employment data was estimated using employment numbers reported by the California EDD. Change in employment was determined by looking at employment differences from July 2016 to June 2017. [https://data.edd.ca.gov/Industry-Information-/Industry-Employment-in-California-Counties/nt76-4rha](https://data.edd.ca.gov/Industry-Information-/Industry-Employment-in-California-Counties/nt76-4rha)
Table 6. Sacramento Region Economic Impacts, FY 2016 – 2017 & Program Total

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income ($M)</th>
<th>Economic Output ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 16/17 Direct</td>
<td>700</td>
<td>$60M</td>
<td>$130M</td>
</tr>
<tr>
<td>FY 16/17 Indirect</td>
<td>500</td>
<td>$30M</td>
<td>$70M</td>
</tr>
<tr>
<td>FY 16/17 Induced</td>
<td>400</td>
<td>$20M</td>
<td>$60M</td>
</tr>
<tr>
<td>FY 16/17 Total</td>
<td>1,600</td>
<td>$100M</td>
<td>$260M</td>
</tr>
<tr>
<td>Program Total (July 2006 – June 2017)</td>
<td>5,800</td>
<td>$400M</td>
<td>$970M</td>
</tr>
</tbody>
</table>

In FY 2016–2017, Sacramento direct impacts have included substantial job-years in architectural, engineering and related services and other state government enterprises at 58% and 28% of total direct jobs in the region, respectively. This is comparable to the proportion of job-years in these sectors from the Historical Analysis. Additionally, construction impacts made up 12% of direct job-years in the Sacramento region due to construction subcontractors located in the region working in the Central Valley. Indirect and induced impacts have been spread throughout a variety of support sectors.

Figure 14. Sacramento Region Total Job-Years per Fiscal Year, July 2006 – June 2017

47 Note: totals may not sum due to rounding
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 have begun to accrue as construction of Caltrain Electrification (which is partially funded by the Authority) ramps up. Please see Section 5.3.3.1 Caltrain Electrification for the results of that separate analysis.

Table 7. Bay Area Region Economic Impacts, FY 2016 – 2017 & Program Total

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 16/17 Direct</td>
<td>300</td>
<td>$30M</td>
<td>$50M</td>
</tr>
<tr>
<td>FY 16/17 Indirect</td>
<td>100</td>
<td>$10M</td>
<td>$20M</td>
</tr>
<tr>
<td>FY 16/17 Induced</td>
<td>200</td>
<td>$10M</td>
<td>$30M</td>
</tr>
<tr>
<td>FY 16/17 Total</td>
<td>600</td>
<td>$50M</td>
<td>$100M</td>
</tr>
<tr>
<td>Program Totals</td>
<td></td>
<td>$290M</td>
<td>$560M</td>
</tr>
<tr>
<td>(July 2006 – June 2017)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Around 80% of the Bay Area region’s direct-job years in FY 2016 – 2017 are in architectural, engineering and related services. For comparison, the July 2006 – June 2016 Historical Analysis had 97% of direct jobs in the architectural, engineering and related services. Construction activities made up 6% of direct job-years and accounting, tax preparation, bookkeeping, and payroll saw 5% of direct job-years in the region. Additionally, local government jobs also saw 4% of direct job-years. Indirect and induced impacts have been spread throughout a variety of other different sectors. Figure 16 shows the job-years by fiscal year from July 2006 – June 2017.

Figure 15. Bay Area Region Total Job-Years per Fiscal Year, July 2006 – June 2017

---

50 Note: totals may not sum due to rounding  
51 Note: includes direct, indirect, and induced
The California High-Speed Rail Authority is working in partnership with the Peninsula Corridor Joint Powers Board (Caltrain) and regional stakeholders to modernize the Caltrain corridor to keep pace with increasing ridership demands while also preparing its line for high-speed service. The San Francisco Bay Area will see the benefits of improved safety, reliability, efficiency and air quality through the long-awaited electrification of the Caltrain corridor.

Specifically, Caltrain Electrification will electrify the line between the 4th and King station in San Francisco and the Tamien Station in San Jose and provides signal and safety improvements that will allow Caltrain to operate an electrified fleet by 2022. This electrification project is a key component of the blended system that will accommodate high-speed rail service on the corridor. Once the electrification project is completed, it will result in faster commute service for the region while also preparing for the integration of high-speed rail service. The state’s commitment to this project will leverage funding to bring the total investment in the corridor to $2 billion. The Authority’s contributions for the project total $713 million.

In FY 2016 – 2017, the Authority’s share of the investment in development of the project was nearly $77 million, which was nearly 50% of the $163.5 million total expenditure for the project in FY 2016-2017. As mentioned previously, this investment was not included in measuring the impacts of the Authority.
expenditure in FY 2016 – 2017, and was removed from the total expenditure analyzed. However, a separate analysis was undertaken to estimate the impact of Caltrain Electrification as a whole (including funding provided by other sources).

The methodology used for estimating the impacts of Caltrain Electrification was modeled using the same methodology as the high-speed rail economic impacts. All data was collected by Caltrain and submitted directly to the study team, including spending by month and by contract and the type of work being completed by contract. Additionally, geographic location was also assumed from Caltrain sources and no additional work was undertaken by the study team to determine geographic location. A top-down approach based on project expenditures was used in conducting the IMPLAN analysis. For more information on the top-down IMPLAN approach, please see Section 4. Methodology.

Results of this analysis showed that of the $163.5 million that Caltrain spent in FY 2016 – 2017 on electrification, over 63% stayed in California. Of the $103 million that was spent in California, the vast majority (98.7%) was located in five counties: San Mateo (65%), Los Angeles (12%), San Francisco (10%), San Diego (7%), and Santa Clara (5%). Expenditure in the Bay Area region, specifically, accounts for 80% of the in-state spending ($83 million).

As shown in Table 8, the Statewide results show significant investment and impacts throughout California, making the case that investment in Caltrain Electrification has benefits across the Bay Area the entire state.

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FY 16/17 Direct</strong></td>
<td>700</td>
<td>$40M</td>
<td>$100M</td>
</tr>
<tr>
<td><strong>FY 16/17 Indirect</strong></td>
<td>200</td>
<td>$20M</td>
<td>$40M</td>
</tr>
<tr>
<td><strong>FY 16/17 Induced</strong></td>
<td>300</td>
<td>$20M</td>
<td>$50M</td>
</tr>
<tr>
<td><strong>FY 16/17 Total</strong></td>
<td>1,200</td>
<td>$80M</td>
<td>$200M</td>
</tr>
</tbody>
</table>

An MRIO analysis was undertaken to show the impact of Caltrain Electrification in the Bay Area region. These results are shown in Table 9. For more information on the methodology of MRIO IMPLAN analysis and why its results are more precise in this instance, please see Section 4.2.4 Multi-Region Input-Output Analysis.

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FY 16/17 Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

52 Note: totals may not sum due to rounding
53 Note: totals may not sum due to rounding
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 a growing number of Southern California firms working on the construction in the Central Valley. Additionally economic benefits have begun to accrue before high-speed rail construction starts in the region as connectivity and bookend projects in the region go through construction.

Table 10. Southern California Region Economic Impacts, FY 2016 – 2017 & Program Total54

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 16/17 Direct</td>
<td>500</td>
<td>$40M</td>
<td>$100M</td>
</tr>
<tr>
<td>FY 16/17 Indirect</td>
<td>300</td>
<td>$20M</td>
<td>$60M</td>
</tr>
<tr>
<td>FY 16/17 Induced</td>
<td>400</td>
<td>$20M</td>
<td>$60M</td>
</tr>
<tr>
<td>FY 16/17 Total</td>
<td>1,200</td>
<td>$80M</td>
<td>$220M</td>
</tr>
<tr>
<td>Program Totals</td>
<td>3,700</td>
<td>$270M</td>
<td>$640M</td>
</tr>
</tbody>
</table>

Historically, the Southern California region had been very similar in industry breakdown as the Bay Area. However, in the past fiscal year, the Southern California region has had a significant uptick in construction job-years. Over the course of FY 2016 - 2017, 47% of the direct job-years in the region have been in the Construction sector while the architectural, engineering, and related services sector makes up nearly 40% of the direct job-years in FY 2016-2017. This increase in construction jobs in the Southern California region is due to firms from that region working on the construction teams in the Central Valley. Additionally, 10% of direct job-years in FY 2016 - 2017 were in local government. In comparison, the Historical Analysis showed that architectural, engineering, and related services accounted for 85% of direct job-years.

54 Note: totals may not sum due to rounding
5.4 California County Impacts

The California counties that show the largest impacts in FY 2016-2017 include Fresno County, Sacramento County, Madera County, Los Angeles County, Kern County, Kings County, and San Francisco 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.

Fresno County has seen the biggest impacts with about 44% of total direct job-years supported as a proportion of the statewide analysis (bottom-up results). Sacramento County accounts for 16% of total direct job-years, with Los Angeles and Madera Counties each accounting for 10%, Kern accounting for 5% and Kings and San Francisco Counties each accounting for 3%.

Similar to the regions they fall within, Table 11 shows the breakdown of major employment sectors for direct job-years attributed to the highest impact counties.

Table 11. Major Employment Sectors for Select California Counties

<table>
<thead>
<tr>
<th>County</th>
<th>FY 16/17 Total direct job-years</th>
<th>Architectural engineering and related services</th>
<th>Construction</th>
<th>Other governmental enterprises</th>
<th>Real estate (ROW services)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresno</td>
<td>1,700</td>
<td>4%</td>
<td>82%</td>
<td>2%</td>
<td>11%</td>
<td>2%</td>
</tr>
<tr>
<td>Sacramento</td>
<td>600</td>
<td>57%</td>
<td>11%</td>
<td>29%</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Madera</td>
<td>400</td>
<td>92%</td>
<td>2%</td>
<td>5%</td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>400</td>
<td>27%</td>
<td>59%</td>
<td>11%</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Kern</td>
<td>200</td>
<td>4%</td>
<td>90%</td>
<td>3%</td>
<td></td>
<td>25%</td>
</tr>
<tr>
<td>Kings</td>
<td>100</td>
<td>1%</td>
<td>75%</td>
<td>3%</td>
<td></td>
<td>25%</td>
</tr>
</tbody>
</table>

Note: includes direct, indirect, and induced

Note: analysis of regions and counties does not capture spill-over effects from surrounding regions/counties that would be captured in the statewide analysis.
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.

Work in the Central Valley and Fresno has included planning, engineering and site-work preparation, including right-of-way acquisition, in preparation for construction as well as major construction itself. In FY 2016-2017, Fresno County accounted for an estimated 1,700 direct-job years in the Central Valley region, or 65% of total direct job-years generated in the region. As construction continues to expand across the Central Valley, this share is expected to decrease as new opportunities are created outside of Fresno County.

Table 12. Fresno County Economic Impacts, FY 2016-2017 and Program Total\(^7\)

<table>
<thead>
<tr>
<th></th>
<th>Employment (job-years)</th>
<th>Labor Income</th>
<th>Economic Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 16/17 Direct</td>
<td>1,700</td>
<td>$90M</td>
<td>$320M</td>
</tr>
<tr>
<td>FY 16/17 Indirect</td>
<td>700</td>
<td>$40M</td>
<td>$110M</td>
</tr>
<tr>
<td>FY 16/17 Induced</td>
<td>600</td>
<td>$30M</td>
<td>$80M</td>
</tr>
<tr>
<td>FY 16/17 Total</td>
<td>3,100</td>
<td>$150M</td>
<td>$520M</td>
</tr>
<tr>
<td>Program Totals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(July 2006 – June 2017)</td>
<td>9,000</td>
<td>$450M</td>
<td>$1,500M</td>
</tr>
</tbody>
</table>

\(^7\) Note: totals may not sum due to rounding
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 in Fresno county was 7.5% in September 2017, which has been helped along by the investment generated by high speed rail in 2017. Between July 2016 and June 2017, the Employment Development Department of California (EDD) estimates that 9,400 jobs were added in Fresno County. The job-years supported by Authority investment was equivalent to about 33% (or 3,100 job-years) of the jobs generated in Fresno County over that time period with direct jobs being equivalent to 18% (1,700 job-years) of the county total.

The EDD estimates that as of June 2017 there were 17,200 construction related jobs in Fresno County. Direct construction job-years generated by Authority investment in FY 2016 – 2017 (1,400 direct job-years) is equivalent to nearly 8% of construction industry jobs in the county. From June 2015 to June 2017, construction employment has grown by 11.7%, continuing the upward trend in construction employment since a distinct low in 2011.

Additionally, Fresno County experienced three consecutive years of annual employment growth over 3% from 2014 to 2016. Prior to 2014, Fresno County had just one year of 3% employment growth since 1990. Fresno’s growth has outpaced both that of the Central Valley as well as the State in the last three years. 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 7.5% growth throughout 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 once service begins.

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.

In FY 2016-2017, the program generated around 600 total job-years, $30 million in total labor income, and $100 million in total economic output in Madera County, nearly doubling all impacts the county saw prior to FY 2016-2017.

| Table 13. Madera County Economic Impacts, FY 2016-2017 and Program Total |
|-----------------|-----------------|-----------------|
| Employment (job-years) | Labor Income | Economic Output |

59 https://data.bls.gov/cgi-bin/surveymost?la+06
62 Construction job-years by IMPLAN sector designation.
63 http://www.labormarketinfo.edd.ca.gov/county/fresno.html
64 https://data.edd.ca.gov/Industry-Information-/Industry-Employment-in-California-Counties/nt76-4rha
65 Note: totals may not sum due to rounding
5.4.3 Combined Fresno County and Madera County Results

As described in Section 4.2.4, standard input-output analyses can fail to capture economic impacts resulting from spending that is recirculated outside the boundaries of defined local economies. This is known as “leakage.” For example, a standard IMPLAN analysis that uses spending taking place in a particular county will not capture the second-order economic impacts that “leak” into neighboring counties.

Because of this leakage effect, single-region IMPLAN analyses typically underreport local results, and should be considered conservative estimates of overall economic impact. Further, the sum of county-level results will most likely be less than the results of a statewide analysis, by missing county-to-county leakage effects. To resolve this issue, IMPLAN allows for Multi-Regional Input/Output (MRIO) analysis – also described in Section 4.2.4 – to better capture leakages outside the model region.

To measure the magnitude of this effect, an MRIO analysis was conducted for Fresno and Madera counties. This county pair was selected because Fresno and Madera counties share highly interconnected economies and a high concentration of FY 2016-2017 construction activity. The leakage effect was expected to be particularly pronounced for this county pairing as compared to other counties across the state.

As shown in Table 14, employment results from that MRIO analysis indicate that approximately 100 job-years are supported by spending that is recirculated outside the boundaries of each county into the other, out of a total of 3,700 job-years. In other words, for the Fresno-Madera county pair, leakage effects are equivalent to approximately 2.5% of the total economic impacts as measured by single-county analyses.

If MRIO analyses were to be performed for each model region, it is likely that economic impacts would be marginally higher across the board. However, as illustrated by the Fresno-Madera MRIO analysis, the effect of leakages was determined to be small enough to not have a substantial effect on results, and so MRIO analyses were not undertaken for other model regions.
### Table 14. Fresno & Madera MRIO Employment Impacts, FY 2016-2017

<table>
<thead>
<tr>
<th></th>
<th>Fresno MRIO Model (Employment in Fresno)</th>
<th>Fresno MRIO Model (Employment in Madera)</th>
<th>Madera MRIO Model (Employment in Madera)</th>
<th>Madera MRIO Model (Employment in Fresno)</th>
<th>MRIO Total Employment (Fresno &amp; Madera)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>1,700</td>
<td>0</td>
<td>400</td>
<td>0</td>
<td>2,100</td>
</tr>
<tr>
<td>Indirect</td>
<td>700</td>
<td>20</td>
<td>100</td>
<td>50</td>
<td>900</td>
</tr>
<tr>
<td>Induced</td>
<td>600</td>
<td>5</td>
<td>80</td>
<td>20</td>
<td>700</td>
</tr>
<tr>
<td>Total</td>
<td>3,000</td>
<td>25</td>
<td>600</td>
<td>70</td>
<td>3,700</td>
</tr>
</tbody>
</table>

This analysis was not undertaken in the Historical Analysis.

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66 Note: totals may not sum due to rounding
Figure 18. Total Job-Years by California Counties

This map does not include the combined MRIO results for Fresno and Madera.
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.

California recognizes 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.

One of the advantages to starting construction on the high-speed rail system in the Central Valley is the opportunity that construction has generated 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 20 shows the locations of disadvantaged communities in the state.

Nearly 60% (58.6%) of the investment in the system in FY 2016-2017 occurred in designated disadvantaged communities throughout California, spurring economic activity in these areas.\(^{68,69}\) Of the

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\(^{68}\) The calculation excludes spending on right-of-way land acquisition payments and Caltrain payment.

\(^{69}\) 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.
total program investment from July 2006 – June 2017, over half (54%) occurred in designated disadvantaged communities.

Furthermore, for communities in the top 5% of CalEnviroScreen pollution burden and socioeconomic factors index ranking, the results show that 22% of total program investment from FY 2006 - 2007 to FY 2016 – 2017 occurred in the most disadvantaged communities in the State.\textsuperscript{70} This is consistent with the substantial investments that the program is making in the Central Valley region, where many of the most disadvantaged communities in the state are located.

\textsuperscript{70} 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 in 2012 through June 2017, more than $300 million has been paid to certified Small, Disadvantaged and Disabled Veteran Business Enterprises for their work on the high-speed rail program. Over that time 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 June 2017, 407 small businesses were either committed, utilized, or actively working on the project.

Figure 21. Small Business Participation in the California High-Speed Rail Program (as of June 2017)

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 project work hours are performed by National Targeted Workers, and at least 10% of those work hours shall be performed by Disadvantaged Workers, including veterans. As of October 2017, 1,525 construction workers were dispatched to work on the rail system, including 1,032 National Targeted Workers.

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71 Excludes contracts not part of the Small Business program (e.g. resource agency contracts, third-party agreement contracts, legal contracts, purchase contracts, etc.)

72 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.

73 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.)
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. Over the lifetime of the program, companies from at least 36 different states have worked directly on the program, contributing to everything from planning and engineering to construction.

In FY 2016-2017 specifically, out-of-state spending accounted for about 3% (nearly $28 million) of total fiscal year expenditures and includes spending across the United States (at least 30 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 $25 million). About 10% of out-of-state spending was international (about $3 million). The states with the highest program investment outside of California include Colorado, Texas, Washington DC, Oregon, Washington, New York, Pennsylvania, and New Jersey.

Table 15. US States with Highest Program Expenditure

<table>
<thead>
<tr>
<th>State</th>
<th>FY 16/17 Expenditure</th>
<th>FY 16/17 Percent of Non-California Expenditure within US (excludes international)</th>
<th>Total Program Expenditure (FY 06/07 – FY 16/17)</th>
<th>Percent of Non-California Expenditure within US (excludes international) (FY 06/07 – FY 16/17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>$4M</td>
<td>17%</td>
<td>$21M</td>
<td>16%</td>
</tr>
<tr>
<td>Texas</td>
<td>$2.5M</td>
<td>10%</td>
<td>$13M</td>
<td>10%</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>$2.5M</td>
<td>10%</td>
<td>$9M</td>
<td>7%</td>
</tr>
<tr>
<td>Oregon</td>
<td>$2M</td>
<td>9%</td>
<td>$10M</td>
<td>8%</td>
</tr>
<tr>
<td>Washington</td>
<td>$2M</td>
<td>8%</td>
<td>$13.5M</td>
<td>10%</td>
</tr>
<tr>
<td>New York</td>
<td>$2M</td>
<td>7%</td>
<td>$17.5M</td>
<td>14%</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>$2M</td>
<td>7%</td>
<td>$5.5M</td>
<td>5%</td>
</tr>
<tr>
<td>New Jersey</td>
<td>$1.5M</td>
<td>6%</td>
<td>$11.5M</td>
<td>9%</td>
</tr>
<tr>
<td>All other states</td>
<td>$7M</td>
<td>26%</td>
<td>$37M</td>
<td>21%</td>
</tr>
<tr>
<td>Total</td>
<td>$26M</td>
<td>100%</td>
<td>$133M</td>
<td>100%</td>
</tr>
</tbody>
</table>

74 Totals may not sum due to rounding.