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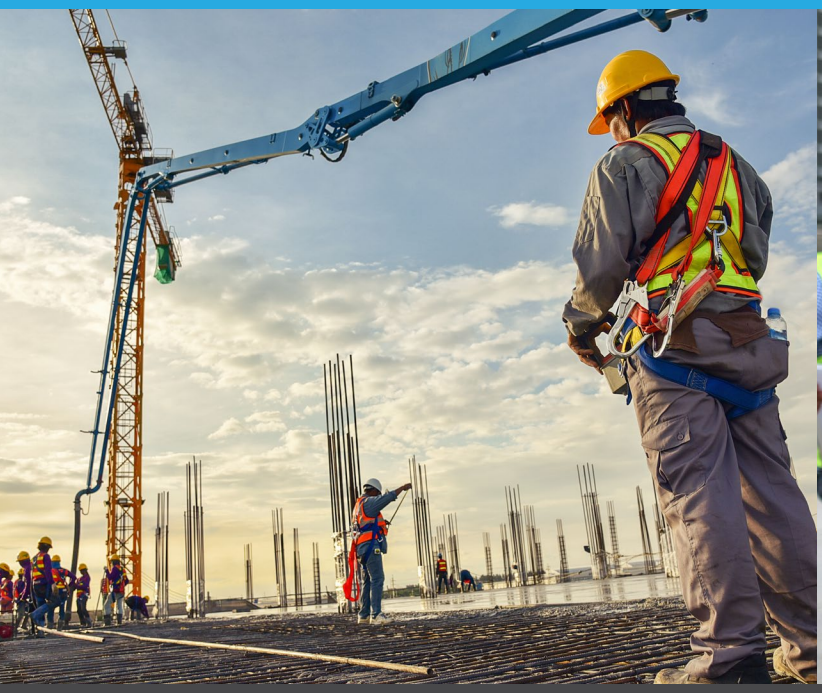
CONSTRUCTION: CLUSTER AND WORKFORCE NEEDS ASSESSMENT
SACRAMENTO REGION



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Important Disclaimer

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

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[1] Cooper, C. et. al. LAEDC Institute for Applied Economics, "Building the Future: Construction in Southern California: The Industry, Its Jobs, and Its Economic Contribution," (September 2016), https://laedc.org/2016/12/05/laedc-report-socal-construction-industry-forecast-market-update.

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The opening of the Golden 1 Center in downtown Sacramento in September 2016 marked a milestone in the return of construction projects to the region. For the last several years, the pages of The Sacramento Business Journal have been filled with news of ground breakings and grand openings.

Entertainment venues and restaurants cropped up around the arena. Mixed-use infill developments proliferated in midtown and along commercial corridors in outer-ring suburbs and along the riverfront. Cities announced partnerships for hospital expansions. School districts continued with bond-funded construction. Regional planned residential communities cropped up in the suburbs of Elk Grove, Rancho Cordova, Roseville and elsewhere. Regional districts issued proposal requests for water treatment plants.

In 2017, newly elected Mayor Darrell Steinberg reached a deal for public funding to support a renovated convention center, theater project and auditorium. Amazon opened a distribution center at the Sacramento Metro Air Park. The soccer club Republic FC partnered with the city and broke ground on a new stadium. And an incentive package approved by the Sacramento City Council could entice health care company Centene to bring several thousand jobs to the region with a new headquarters.

Much like the rest of California, the Sacramento region's construction industry has faced challenges during the economic recovery. Pent-up demand, lagging supply and tightened residential mortgage lending have led to a housing affordability crisis that has pushed many would-be buyers into an increasingly expensive rental market.

Jurisdictional mismatch for permitting confuses developers and contractors, causing delays. Federal and state regulations for building codes and other restrictions result in change orders and longer timelines for project completion. Economic developers often struggle to find commercial space suitable to meet the need of would-be employers.

Workforce shortages, especially for skilled tradespeople and new entrants to the field, produce cascading effects—delays in scheduling, quality and safety problems, and increased costs based on ad hoc, on-the-job training. The long shadow of the housing crisis continues to affect the state and the region's ability to grow.

These issues challenge the region's economic development efforts, which hinge on keeping housing prices down, building attractive office space and providing amenities that young members of the creative class desire. These items underscore boosters' clarion call to high-tech entrepreneurs in the Bay Area to relocate to the region, to transform a region dominated by government agencies into a Silicon Valley satellite hub.

Meanwhile, economists and industry stakeholders continue to monitor the economic recovery, expressing some concern about the economic cycle growing late, though the labor market and new projects continue to show strong signs of growth.

Next Economy initiative

In response to the global recession that began in the mid-2000s, regional leaders initiated Next Economy, research and planning to accelerate job creation and new investment in industry-advantaged clusters and priority clusters that hold additional priorities. (The six-county Sacramento region includes El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba counties.)

Valley Vision, a regional civic leadership organization, managed the Next Economy design, research and implementation process on behalf of a wide range of private- and public-sector partners. Valley Vision has received additional funding from JPMorgan Chase & Co. to continue the work and expand beyond the original six Next Economy studies. The original six reports focused on advanced manufacturing, clean economy, education and knowledge creation, food and agriculture, life

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sciences and health services, and information and communication technology (ICT).[2] The construction cluster study continues the research and goals of the previous studies. Valley Vision has partnered with the Centers of Excellence, an initiative of the California Community Colleges Chancellor's Office Economic and Workforce Development Program, to conduct the research.

In practice, Valley Vision leverages the Next Economy research to support regional stakeholder action planning among education and training institutions, workforce intermediaries, economic development organizations, local government and private industry.

Planning emphasizes setting priorities and developing strategies to address critical issues facing the region's public policy and needs of industry. Strategies address the alignment of workforce and economic development policies and resources and create public-private partnerships to accomplish those goals. The goal of the research and engagement effort is to encourage local economic transformation in line with the mission, vision and values of Valley Vision and the California Community Colleges Doing What Matters for Jobs and the Economy initiative.

On the economic development side, this means creating a thriving regional business climate with ample resources to foster attraction, innovation, growth and retention; on the workforce side, this means creating pipelines and pathways to long-term, local, high-road employment—careers with wages capable of supporting families and communities.

Report overview

The first section of the report investigates broad national and regional economic indicators to show how investments have shifted after the recession among various categories in residential and nonresidential construction. Comparisons to gross product show how the construction industry has shifted in relationship to the overall economy in the Sacramento region, the Bay Area and California. Permit data shows the change in amount of new housing coming online. Population and housing data shows the ongoing unmet need for housing in the region.

The report makes use of economics cluster research methods to compare the Sacramento region's industry activity to the Bay Area and California. The findings outline the major industry subclusters of opportunity where the Sacramento region is advantaged, and how the subclusters are impacted by workforce development gaps. Business lists indicate priority engagement targets for cluster-based action planning.

By comparing the projected occupational demand from new and replacements jobs (retirements and separations) and the available supply of potential candidates emerging from regional education and training programs (including apprenticeships), estimates were determined concerning the primary workforce gaps in the region, providing a roadmap for the specific occupations and subclusters that stakeholders should address. The study team developed a training and education asset map, occupational priority list by subcluster, and business list to support action planning.

The section on economic impacts provides estimates of the overall economic effects from the regional construction clusters. The estimates include direct effects from cluster activities, indirect impacts from suppliers hiring and spending, and induced impacts from household spending of employees in the industry.

The report also includes data on rates of union and non-union workers in the construction industry in the Bay Area and the Sacramento region. The analysis provides historical trend information in the Sacramento region. It also includes apprenticeship numbers by trade, demographic information and prevailing wage rates for California.

Executive interviews with a dozen key stakeholders—representatives from construction industry employers and industry

[2] Visit valleyvision.org or coeccc.net to access completed reports.

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associations—provide context and validation for other aspects of the research. The report summarizes the interview findings.

Given the study scope and available data, the research does not specifically address the following topics:

- Industry and occupation analysis specific to commercial, residential, or other types of buildings (though some measures can be put into those categories).
- Industry and occupational analysis specific to operations and maintenance, building management (like facilities managers), or retrofits.
- Occupational pathways (career ladders, linkages between job titles or occupations, entry-level feeder positions).
- Incumbent worker training or other on-the-job training.
- New and emerging technologies.

These may be items that stakeholders request for further research during cluster action planning engagement. Data summaries are presented in the main body of the text. More extensive data and methodology is included in the appendices.

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The charts in this section show how the value of construction put in place has changed from 2002 through 2016, the change in nonresidential construction value added by segment from 2006 (pre-recession) to 2016, the change in percent of spending on infrastructure in relation to total nonresidential construction and the percent of GDP derived from construction. These values include both public- and private-sector spending.

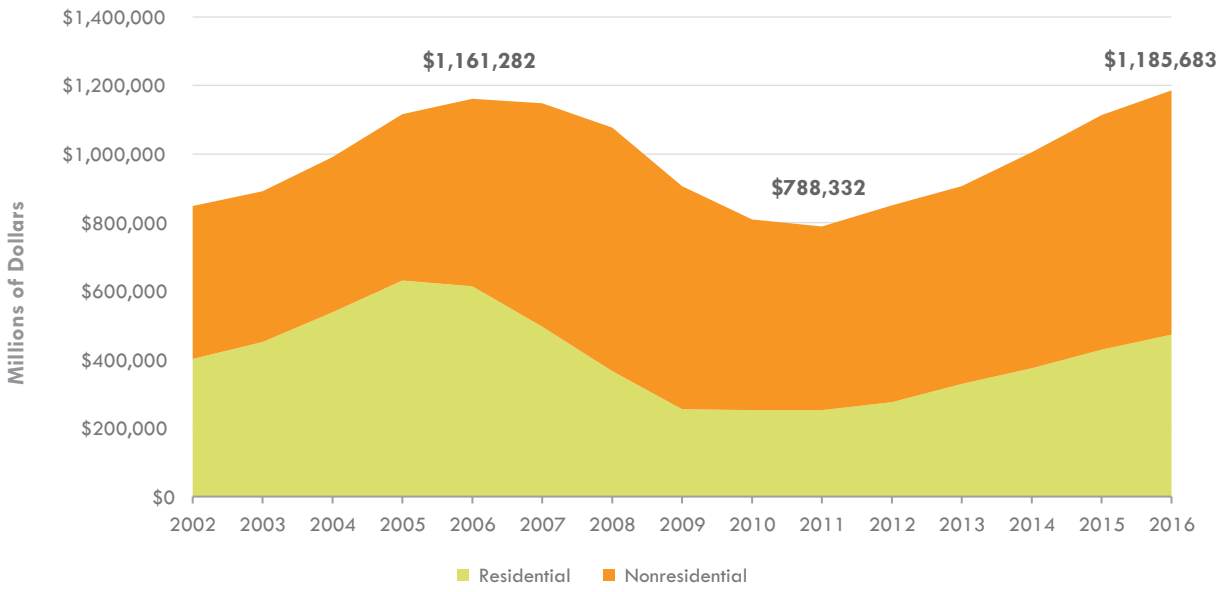
Value of construction put in place

The United States Census Bureau tracks the value of construction put in place monthly by geographic area and type of construction. The Census Bureau administers a monthly survey that asks owners to report the amount of work done on projects until complete and the actual costs incurred for that work. The annual value of construction put in place is the cumulative value of work done on projects (in labor and materials) active during the year.

Nationally, the value of all construction activity, both residential and nonresidential building, reached a high point in 2016 at $1.19 trillion, surpassing pre-recession levels in the mid-2000s, after falling to a low point of $788 billion in 2011 (Exhibit 1).

Residential building was particularly hard hit during the recession, falling from a peak of $630 billion in 2005 to $252 billion from 2009–2011. It has recovered somewhat from that time; however, at $473 billion in 2016, residential building remains below its pre-recession peak. Nonresidential activity accounts for a growing percentage of overall construction activity, accounting for much of the recovery of construction activity.

Exhibit 1: Value of construction put in place (United States)[3]



[3] U.S. Census Bureau. Data pulled from U.S. Census Bureau's Annual Value of Construction Put in Place. The start year of 2002 was used since this was the first year in which total construction was differentiated between private and public activity. This is true for all subsequent charts that utilize U.S. Census Bureau national data for construction put in place. Further detail regarding collection methodology is available from the Census Bureau's website: https://www.census.gov/construction/c30/c30index.html.

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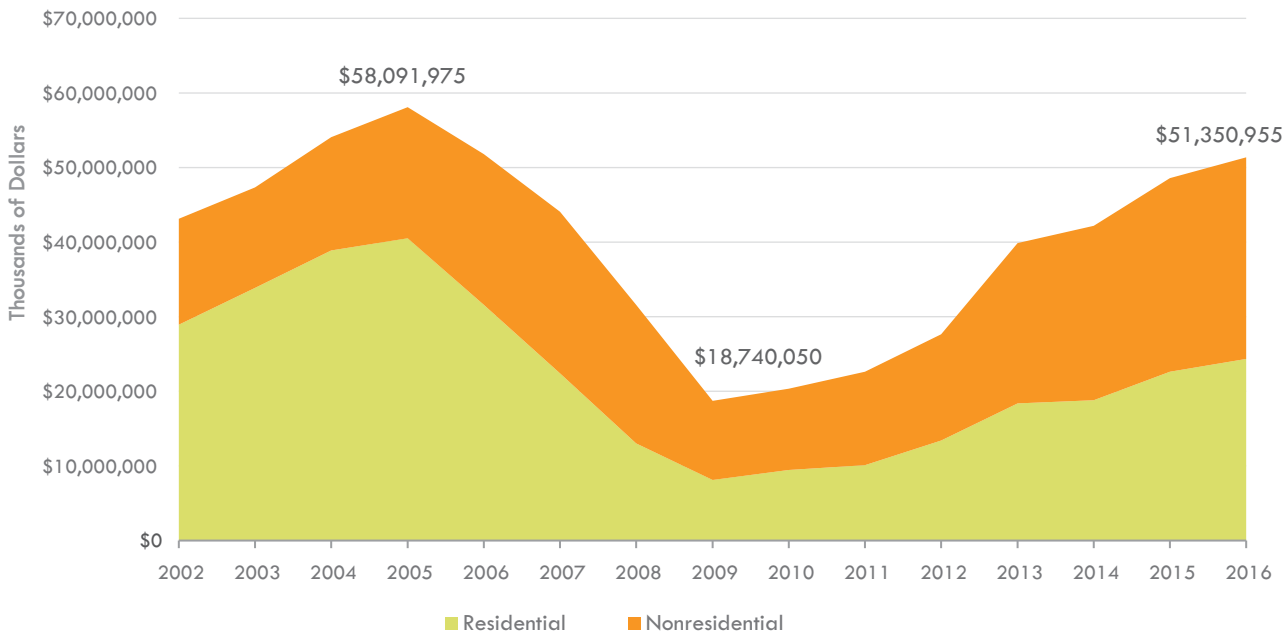
The value of construction put in place in California experienced a more precipitous decline during the 2002-2016 period (Exhibit 2).[4] Construction values have not surpassed pre-recession levels. After reaching a high point of $58 billion for all residential and nonresidential construction in 2005, the value of projects declined sharply to $18 billion in 2009. The majority of that decrease occurred in the residential sector.

Residential construction declined by more than $32 billion between the high point in 2005 of $40 billion and low point in 2009 of $8 billion. While residential construction value has increased steadily, it remains at less than 80% of the pre-recession peak.

Nonresidential construction also took a hit during the recession. The shock was less severe. Nonresidential activity fell from a peak of $21 billion in 2007 to $10 billion in 2010. Since then, it rebounded to nearly $27 billion in 2016, an increase of 125% from its pre-recession peak.

Exhibit 2: Value of construction put in place (California)[5]



[4] The following charts use data provided by the California Homebuilding Foundation's Construction Industry Research Board (CIRB). CIRB requests monthly permit data from all jurisdictions in the state and maintains a 90% positive rate of reporting. The cities that do not report permit data are believed to be in the respective county's unincorporated region.

[5] Construction Industry Research Board (CIRB) is a department of the California Homebuilding Foundation that tracks and reports residential and nonresidential building permit statistics statewide. The data for the statewide construction activity charts in this report came from CIRB and provides comparable construction value detail to that from the U.S. Census Bureau regarding national activity since both sources collect their information directly from municipalities based on permitting reports. The categories in which construction activity and amounts are reported were substantially the same as the national data, allowing for a direct comparison even though the data sources are different. More information on CIRB and their datasets are available at http://www.mychf.org/cirb-383887.html.

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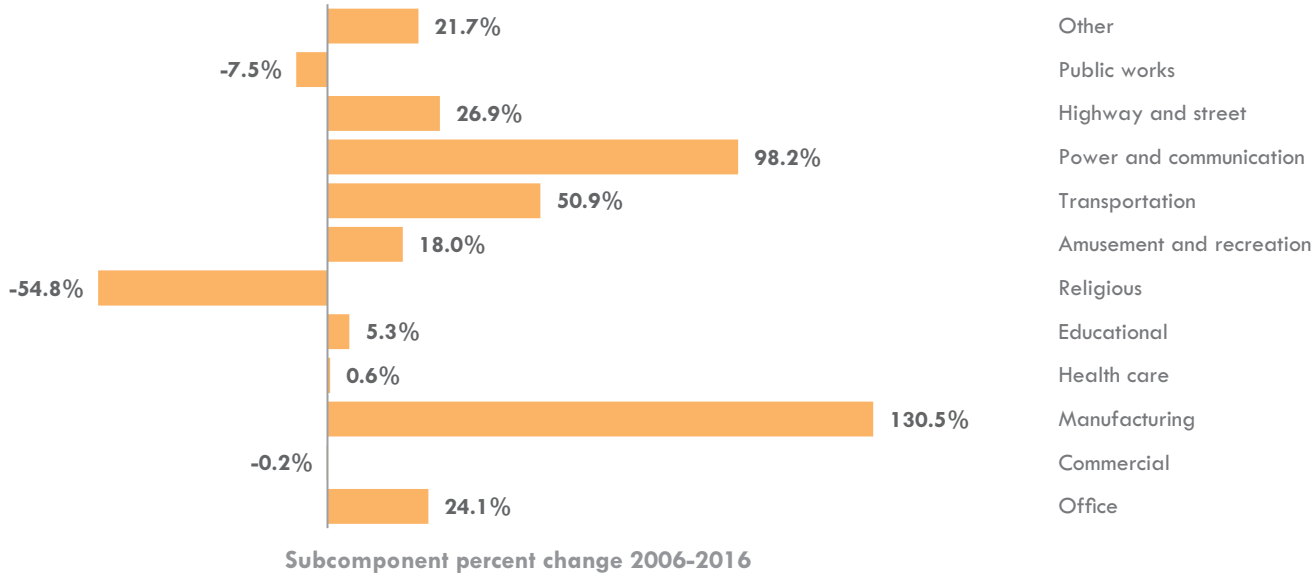
Value of nonresidential construction by subcomponents

The data lists subsets of nonresidential construction and values. Nationally, some construction subcomponents fared better than others during the economic recovery (Exhibit 3).[6] The four segments with the largest change in value added between 2006 and 2016 included:

- Manufacturing ($32 billion to $75 billion),
- Power and communication ($64 billion to $128 billion),
- Transportation ($28 billion to $42 billion), and
- Highway and streets ($72 billion to $91 billion).

Exhibit 3: Value of nonresidential construction put in place, by subcomponent (United States)[7]



There were significant differences in California in how various segments of construction activity performed in the same 10-year period (Exhibit 4).[8] A majority of segments underwent substantial improvement, except highways, religious buildings, office and manufacturing. The three segments with the largest change in value added between 2006 and 2016 in California included:

- Public works ($60 million to $518 million),
- Other ($8 billion to $13 billion), and
- Education ($300 million to $490 million).

[6] The subcomponents included in the charts have been adjusted to allow for direct comparison with state-level data presented below. The public works segment combines sewage/waste disposal and water supply while the other category combines public safety, conservation and development and alterations.

[7] U.S. Census Bureau. The time periods used for comparison here, 2006 and 2016, were chosen to show the difference in activity for the various construction subcomponents prior to and after the recession.

[8] The subcomponents included in the above chart have been adjusted to allow for direct comparison with national-level data presented earlier in this report. The public works segment combines sewage/waste disposal and water supply while the other category combines public safety, conservation and development and alterations.

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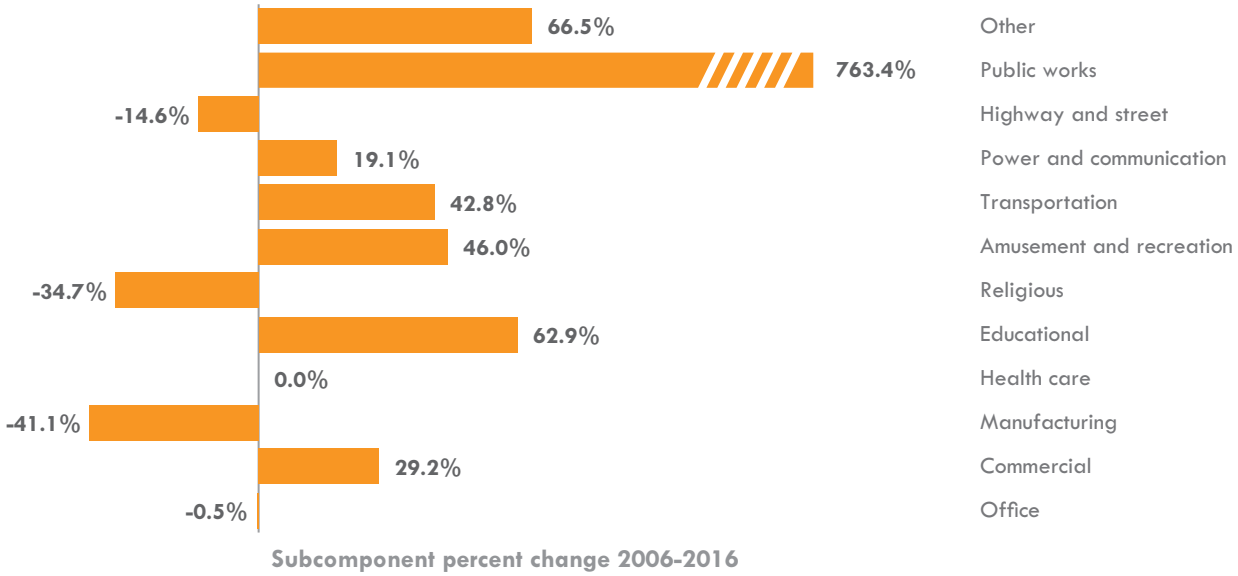
The "other" category includes public safety, conservation and development as well as the value for alterations on existing buildings. Alteration work, in particular, increased materially over the past three years as owners have chosen to improve their buildings to extend the useful life of existing assets.

While the total change in education value added from 2006 to 2016 was substantial, construction in this segment during those 10 years was erratic. Spending of $490 million in 2016 was a high point. During each of the previous two years, the value was $140 million.

Exhibit 4: Value of nonresidential construction put in place, by subcomponent (California)[9]



[9] California Home Building Foundation (CHBF), Construction Industry Research Board (CIRB).

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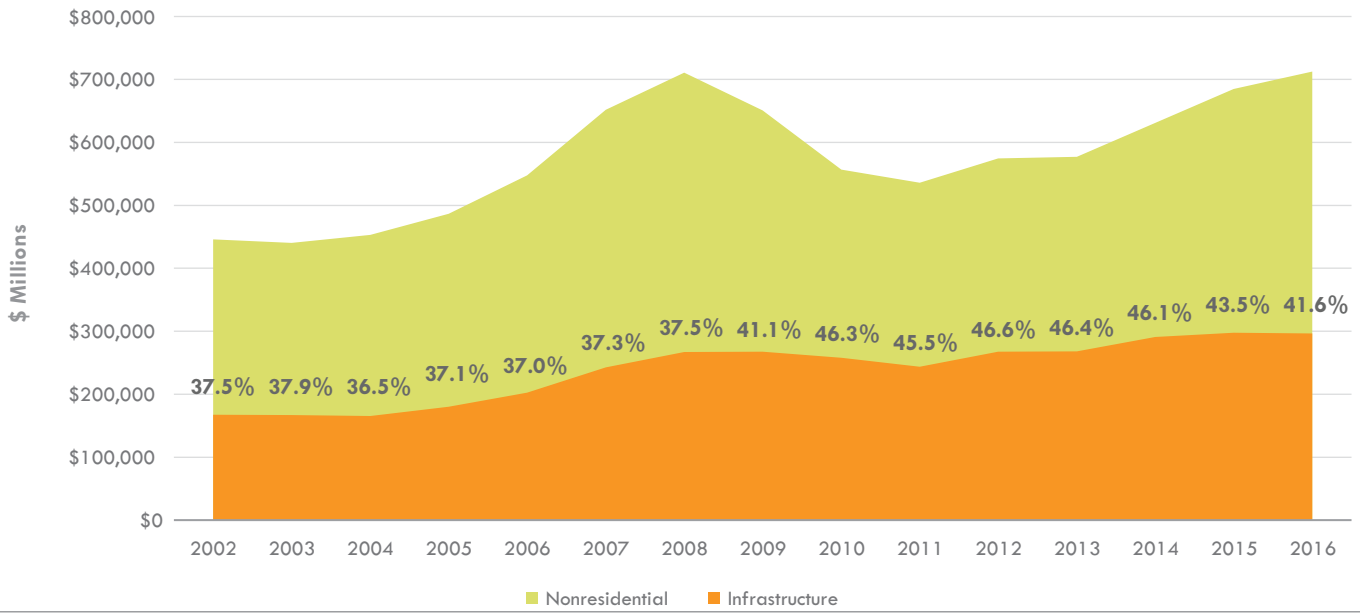
Value of infrastructure as a percent of construction

National

The percentage of construction value contributed by spending on infrastructure had a measurable increase after the onset of the recession. Infrastructure includes the transportation, power and communication, highway and street, and public works segments.

As a percent of all nonresidential construction value added, infrastructure increased from a pre-recession average near 37% to as high as 46% from 2010 to 2014, before declining slightly to 41% in 2016 (Exhibit 5).

Exhibit 5: Value of infrastructure as a percent of nonresidential construction put in place (United States)[10]



[10] U.S. Census Bureau. Infrastructure includes four construction activity subcomponents that were detailed in the base data: transportation, power and communication, highway and street, and public works.

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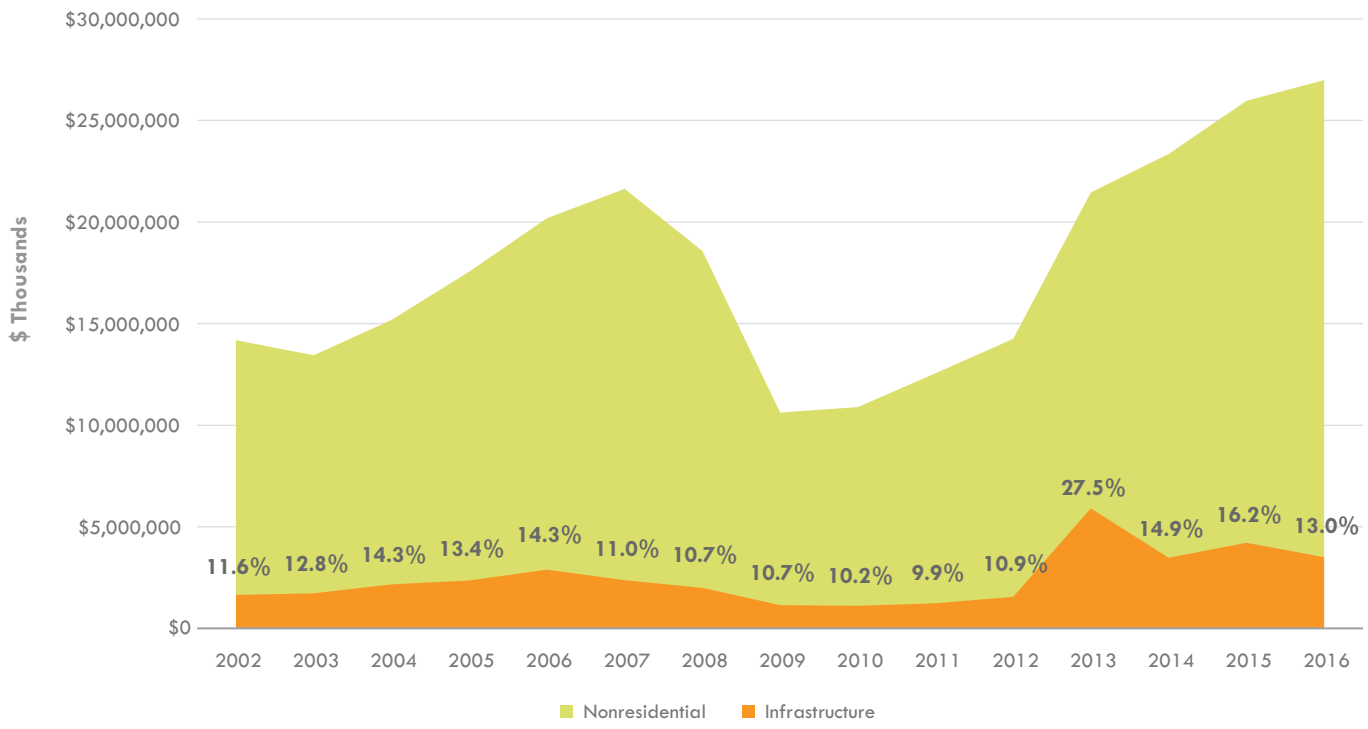
Infrastructure represents a much smaller percentage of overall nonresidential construction activity in California compared to the nation. There was a slight increase prior to the recession, with a peak in 2006 of 14.3%, before a decline to nearly 10% in the following years (Exhibit 6). Infrastructure activity jumped in 2013 due to public works and transportation investments. Though it declined in 2014, total nonresidential construction value during the past three years increased between 13% and 16%.

Exhibit 6: Value of infrastructure as a percent of nonresidential construction put in place (California)[11]



Value of construction as a percent of GDP and GRP

When measured as a percent of gross domestic product (GDP), total construction value added (residential and nonresidential) reached a high-water mark in 2005 at 8.6% (Exhibit 7). This level was directly related to the real estate market bubble that emerged in the run up to the recession. From this point, construction value as a percent of GDP declined quickly from 2008 to 2011 where it reached a low point of 5.1%. While it has increased steadily since that time, construction value added remains well below pre-recession levels.

[11] California Home Building Foundation (CHBF), Construction Industry Research Board (CIRB). Infrastructure includes four construction activity subcomponents that were detailed in the base data: transportation, power and communication, highway and street, and public works.

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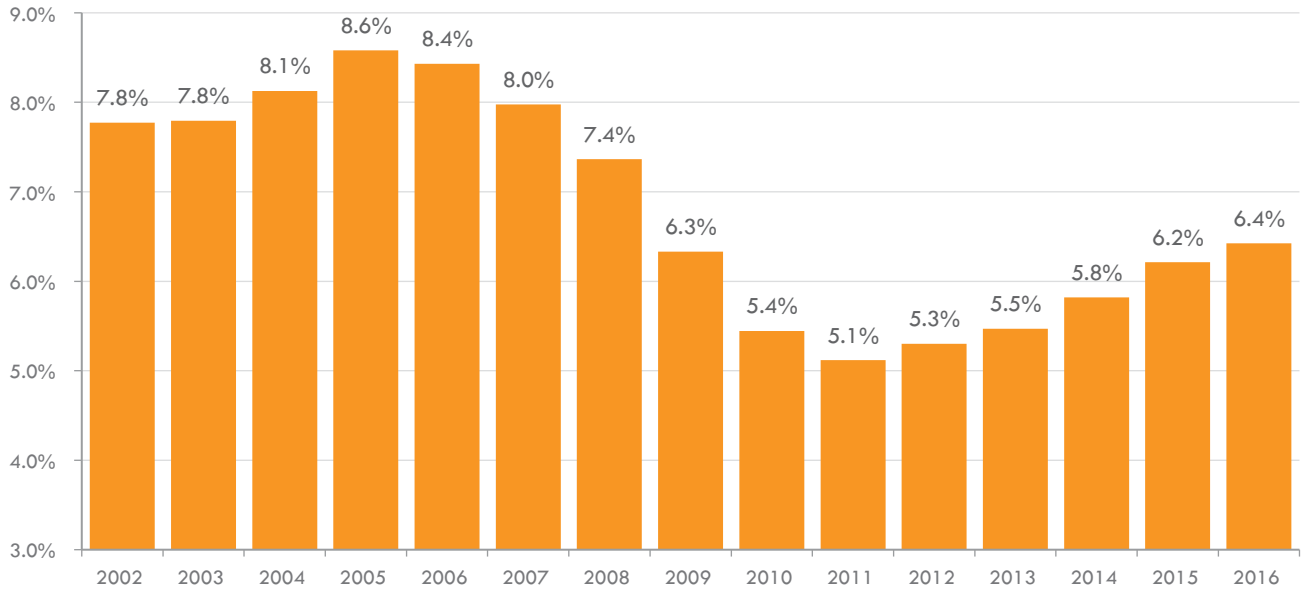
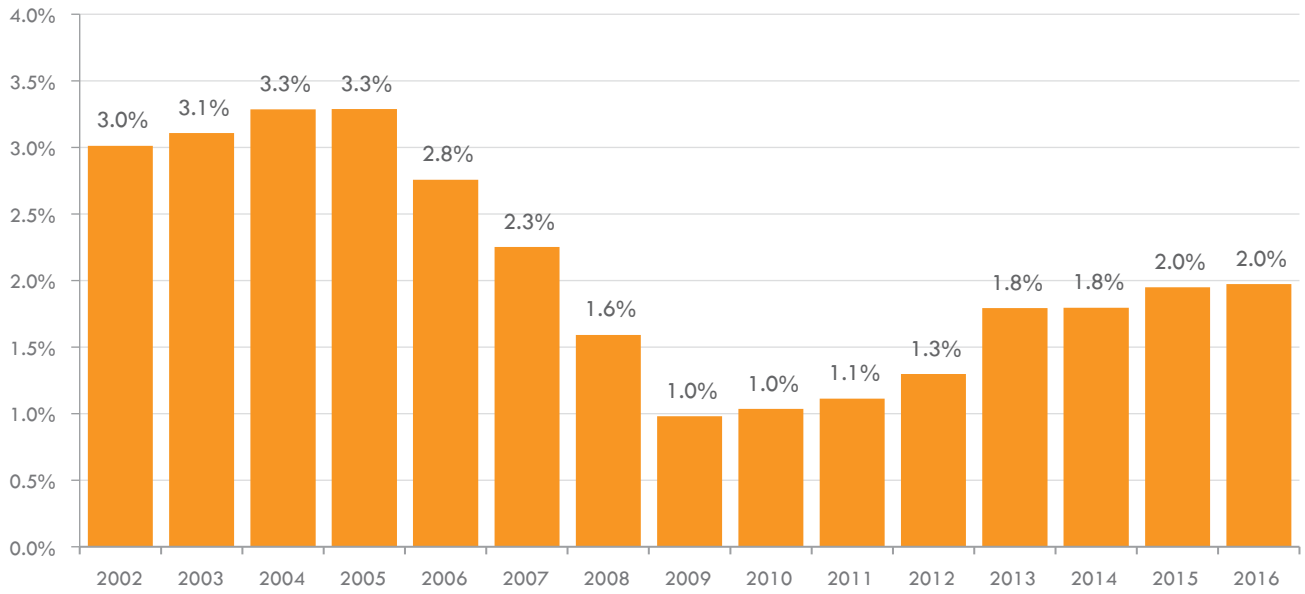
Exhibit 7: Construction value added as a percent of GDP (United States)[12]



The value of all construction (residential and nonresidential) as a percent of statewide gross regional product (GRP) is measurably lower than at the national level (Exhibit 8). Prior to the recession, construction value added in California reached a maximum of 3.3% of GRP before declining from 2006 to 2009 to 1.0%. Since that trough, the GRP has increased marginally to 2.0%.

Exhibit 8: Construction value added as a percent of GRP (California)[13]



[12] U.S. Census Bureau and Bureau of Economic Analysis (BEA). GDP information was pulled from the BEA dataset for the national economy. The value of construction per the U.S. Census data was calculated as a percent of economic activity from all industries for each year reported. Full details on collection methodology for GDP is available at the BEA website: https://www.bea.gov/national/index.htm.

[13] California Home Building Foundation (CHBF), Construction Industry Research Board (CIRB), Bureau of Economic Analysis. Construction value-add as a percent of GRP for California was calculated in a similar manner for the national chart in the previous section, with construction activity reported in the CIRB data used in place of U. S. Census data. A variety of factors contribute to the smaller percentage of gross product from construction in California including the wealth generated from information technology, professional and business services, government and other sectors. The continued effects on the residential housing market also contribute to the smaller share of the economy generated from construction.

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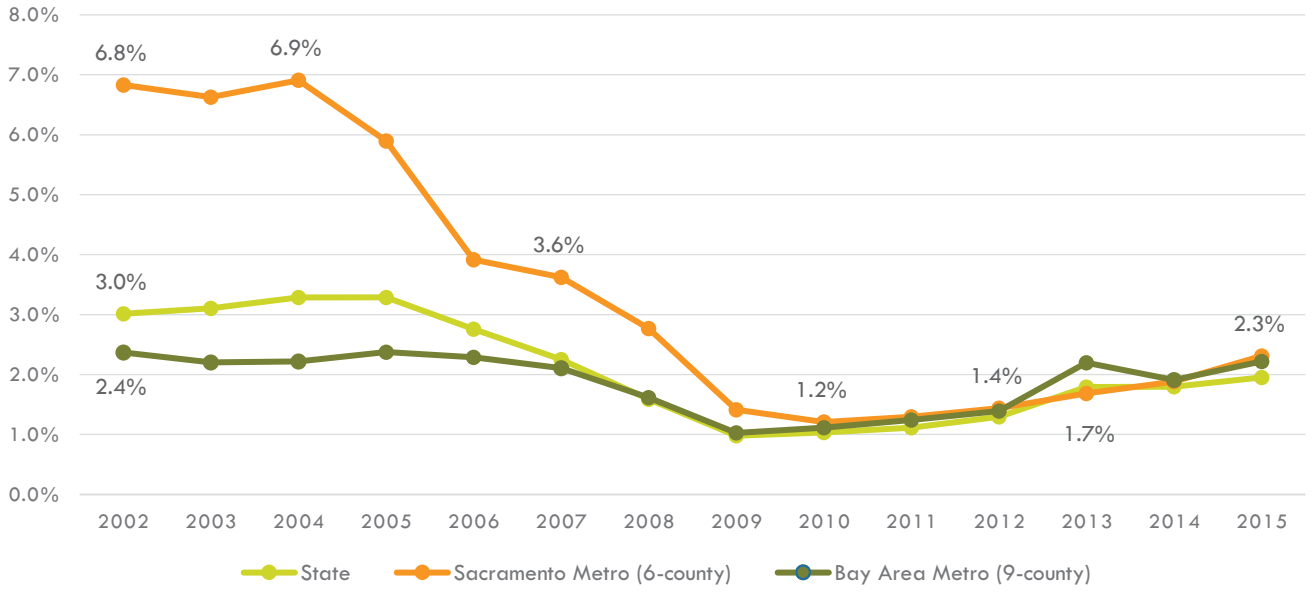
The chart below provides greater detail on construction value added (residential and nonresidential) as a percent of GRP.

Exhibit 9 compares the Sacramento metro region[14], Bay Area metro region[15] and California. The Bay Area closely followed the statewide data between 2002 and 2016.

Construction in the Sacramento metro region was a much larger percentage of GRP prior to the recession compared to the Bay Area or the state.

From 2002 to 2009, the percent of residential construction value added in the Sacramento metro region fell from 81.6% of all construction activity to 45.7%. Some residential value has returned, but it has not come close to pre-recession levels. Overall construction activity also remains below pre-recession levels.

Exhibit 9: Construction value added as a percent of GRP (California, Sacramento region and Bay Area)[16]



[14] Six-county Sacramento metro region includes: El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba.

[15] Nine-county Bay Area metro region includes: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma.

[16] The BEA reports GRP for metropolitan statistical areas throughout California. The Sacramento metro area includes the Sacramento—Roseville—Arden-Arcade MSA and Yuba City MSA. The Bay Area metro includes the San Francisco-Oakland-Hayward MSA, Napa MSA and San Jose-Sunnyvale-Santa Clara MSA.

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Regional residential construction activity

The California Department of Housing and Community Development's report "California's Housing Future" highlights key challenges affecting housing affordability across the state. The report shows that production averaged fewer than 80,000 new homes annually over the last 10 years.[17]

Looking forward, approximately 1.8 million new housing units, or 180,000 per year, are needed to meet projected population and household growth from 2015 to 2025. The report also suggests that the existing system of land-use planning and regulation creates barriers to residential and commercial development, due to lengthy development review, lack of certainty at the local level of economically and politically viable projects, and local opposition. These factors impact the type, quantity and location of housing development.

The Sacramento region shares in the undersupply woes. The lack of new housing inventory, both single and multifamily, is resulting in pricing pressure for both prospective homeowners and renters.

The Sacramento region is the fastest growing region in the state. The six-county region has more than 2 million residents and has been growing at approximately 1.5% annually. Demand for housing based on this population growth rate is more than twice the increased rate of supply from new construction in the region.[18]

Residential construction has not kept pace with population demand, particularly in the past three years. There is now approximately more than twice as much demand, as measured in new household formation yearly, than supply from homebuilding. This mismatch, coupled with a labor shortage of construction workers, is putting upward pressure on housing prices.[19]

Exhibit 10 highlights these key findings: The population of the metro region on a whole is growing at a faster rate than the increase in housing units. This mismatch between population and housing unit growth is not felt equally across the metro region. Placer, Sacramento and Yolo counties all have population growth rates that exceed housing unit growth rates while El Dorado, Sutter and Yuba counties have population growth rates that are below the housing unit growth rate.

The average household size has steadily increased over the last 10 years, increasing from 2.71 persons per household in 2007 to 2.83 persons in 2017. Assuming birth rates have remained consistent during this time, this would seem to indicate that more individuals are choosing to co-locate. This is likely due to the increased cost of housing in the region.

There was a substantial build up in housing inventory in the five years leading up to the financial crisis. This addition to supply has been slowly absorbed in subsequent years due to the fairly stable difference between population growth in excess of net new construction. As of 2017, the 16-year difference between new housing supply and demand reached equilibrium, with an aggregate 1,655 housing units demanded more than supplied.

[17] California Department of Housing and Community Development, "California's Housing Future: Challenges and Opportunities," January, 2017, http://www.hcd.ca.gov/policy-research/plans-reports/index.shtml.

[18] California Department of Finance, New State Population Report, May 1, 2017, http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/documents/E-1_2017PressRelease.pdf.

[19] Sacramento Area Council of Governments, Population, Housing and Household Estimates 1980-2017, https://www.sacog.org/publication/dof-e5-e8-population-and-housing-estimates-1980-2017.

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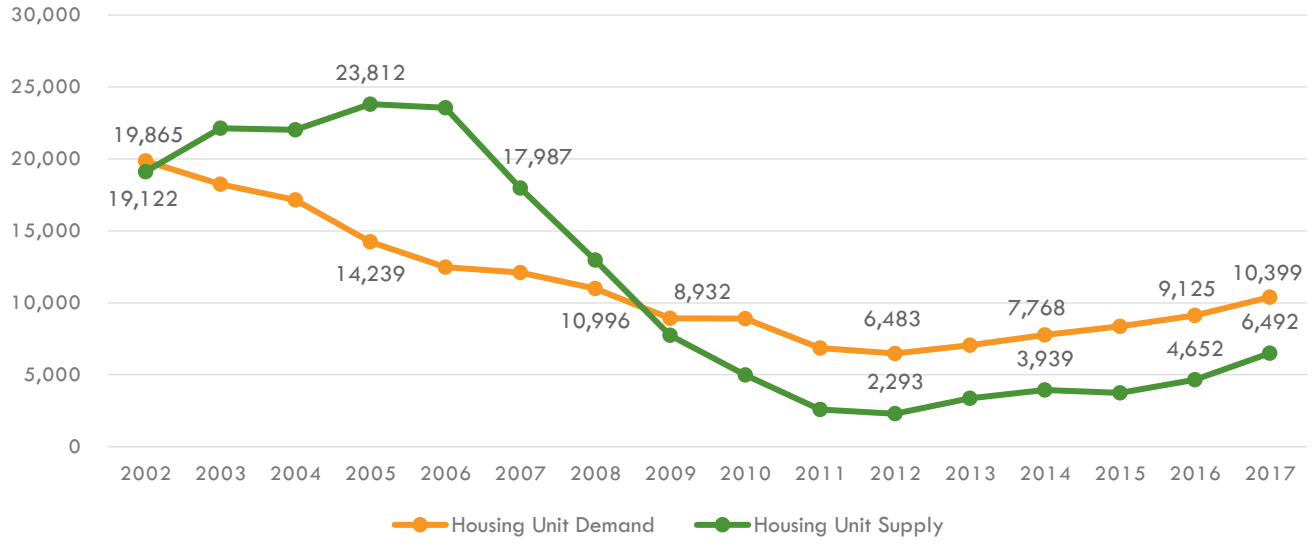
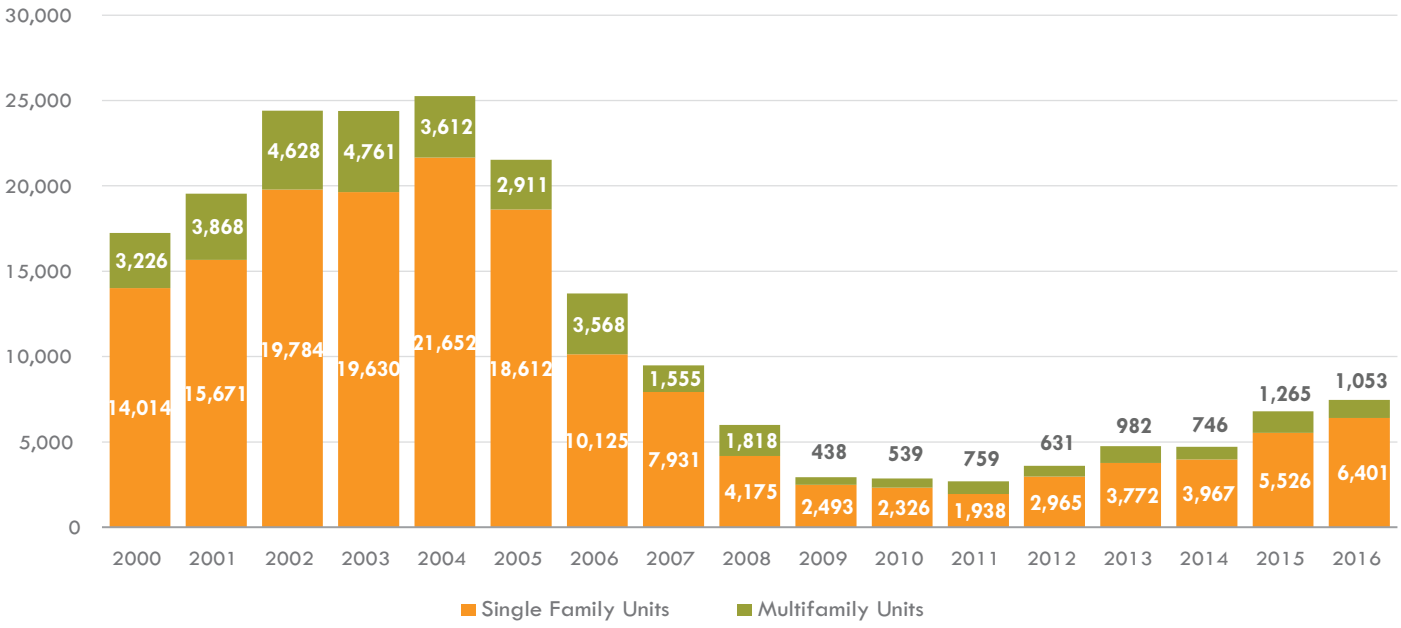
Exhibit 10: Housing unit supply versus demand in the Sacramento region



The trajectory of residential building in the Sacramento metro area followed a familiar pattern leading up to the recession, with a large increase in housing inventory in the early 2000s. Homebuilding started to decline between 2006 and 2007, prior to the housing market collapse. Building permit data indicates that construction dropped from a height of 25,264 units in 2004 to 2,697 units in 2011. Residential construction remains far below pre-recession levels. There were 7,454 units completed in 2016, the largest amount in nearly 10 years (Exhibit 11). [20]

Exhibit 11: Residential building units in the six-county Sacramento region (permit data)[21]



[20] California Home Building Foundation (CHBF), Construction Industry Research Board (CIRB).

[21] Residential permitting information provided from CIRB included counts from 2000 through 2016 to show the increase in the early 2000s.

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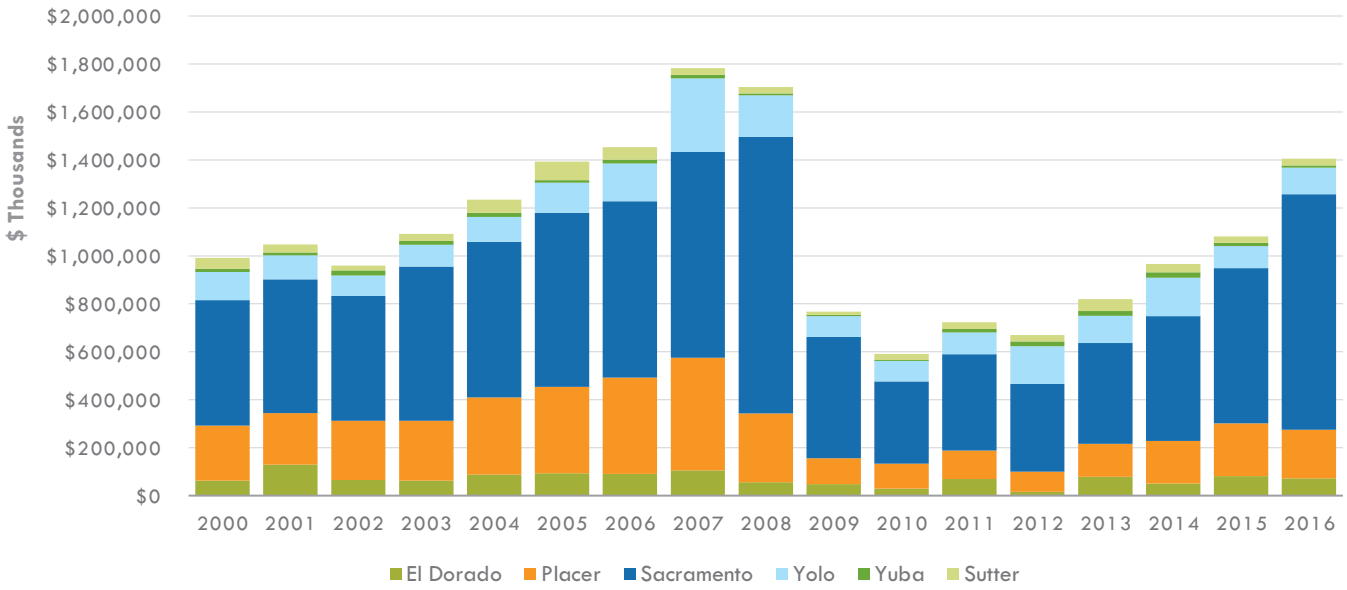
Despite the emphasis on dense, urban infill development, especially in downtown Sacramento, the regional share of multifamily units is smaller than a decade ago in the region and surrounding counties (Exhibit 12).

Exhibit 12: Single-family and multifamily share of residential housing, residential permits by county

	2006		2016	
County	Single	Multi	Single	Multi
El Dorado	8.3%	0.4%	10.7%	0.0%
Placer	18.7%	4.7%	28.2%	4.3%
Sacramento	31.5%	17.1%	35.9%	8.2%
Yolo	5.7%	3.5%	7.7%	1.6%
Yuba	7.3%	0.0%	2.5%	0.0%
Sutter	2.4%	0.3%	0.8%	0.0%
Total Metro	**73.9%**	**26.1%**	**85.9%**	**14.1%**

Sacramento County was historically and continues to be the area within the larger metropolitan region with the majority of nonresidential construction activity (Exhibit 13). Nonresidential construction from 2009 to 2012 was tepid at best. Since 2013, the pace of new activity has increased steadily with a significant jump in 2016. Value of nonresidential construction by the end of 2016 was on par with 2006. A main difference from 2006 is that the share of work happening in Sacramento County is much larger today than in pre-recession years.

Exhibit 13: Value of nonresidential construction in the six-county Sacramento region[22]



[22] California Home Building Foundation (CHBF), Construction Industry Research Board (CIRB).

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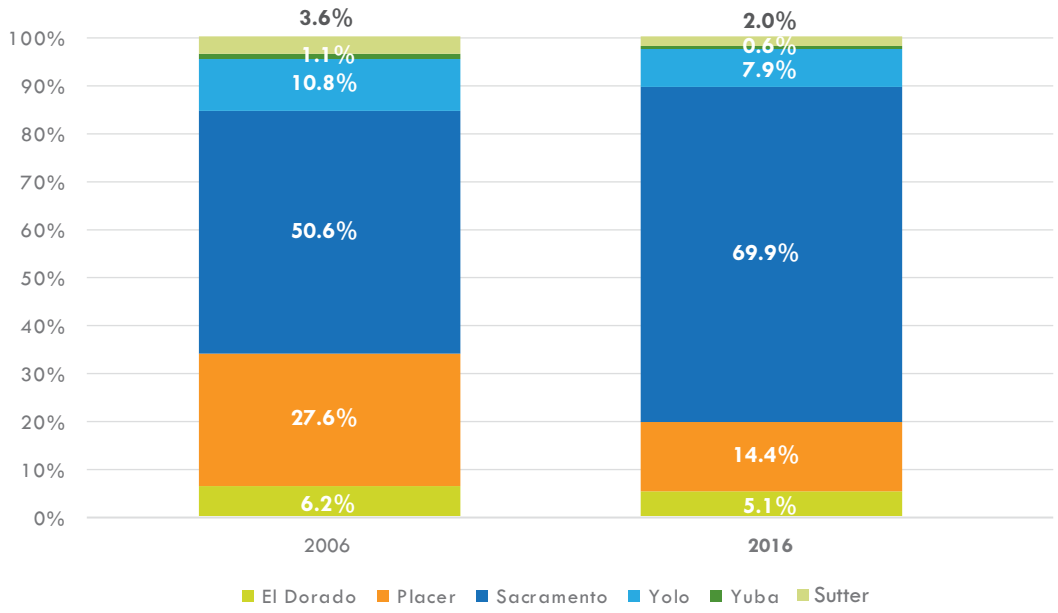
Sacramento County's share of nonresidential construction value added in the metro area grew from 50.6% in 2006 to 69.9% in 2016 (Exhibit 14).

Sacramento, as the state capital and the largest city in the metro region, is a primary economic driver in the region. As the sixth largest city in the state, it contains approximately 20% of the total population of the six-county metro area and is the fastest growing city in California.

Macroeconomic trends, such as a desire of the millennial and baby boomer generations for urban living experiences, are a leading factor for reinvestment in central cities, and thus a prime cause for the greater share of construction activity in Sacramento County compared to the larger region.

Exhibit 14: Percent of nonresidential construction value in the Sacramento region, by county[23]



[23] California Home Building Foundation (CHBF), Construction Industry Research Board (CIRB).

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Overview

The construction industry in California provides a wealth and diversity of firms and specializations. Multinational design and general contracting firms have headquarters and local offices throughout the state, engaging in infrastructure, industrial and commercial building contracts.

Large national homebuilders contract with numerous regional and local companies for subdivision buildouts. Small and medium-size firms lead projects and provide subcontracting services in a variety of trades and building types.

While most of the industry represents locally-serving (non-traded, non-basic) activity, some of the industry is export-oriented (traded, basic), producing high economic multipliers and spillover effects in the local economy. Export-oriented activities bring in revenue from outside the region through the sales of goods and services, and contribute to more spending within the region itself.

In the Sacramento region, construction manufacturing companies, such as Pabsco Gypsum (gypsum board) in Rancho Cordova, and engineering firms, such as Lund Construction (heavy civil engineering) in Galt, bring in revenue from outside the region. General contractors, such as Otto Construction in Sacramento, serve local clients, circulating economic activity inside the region.

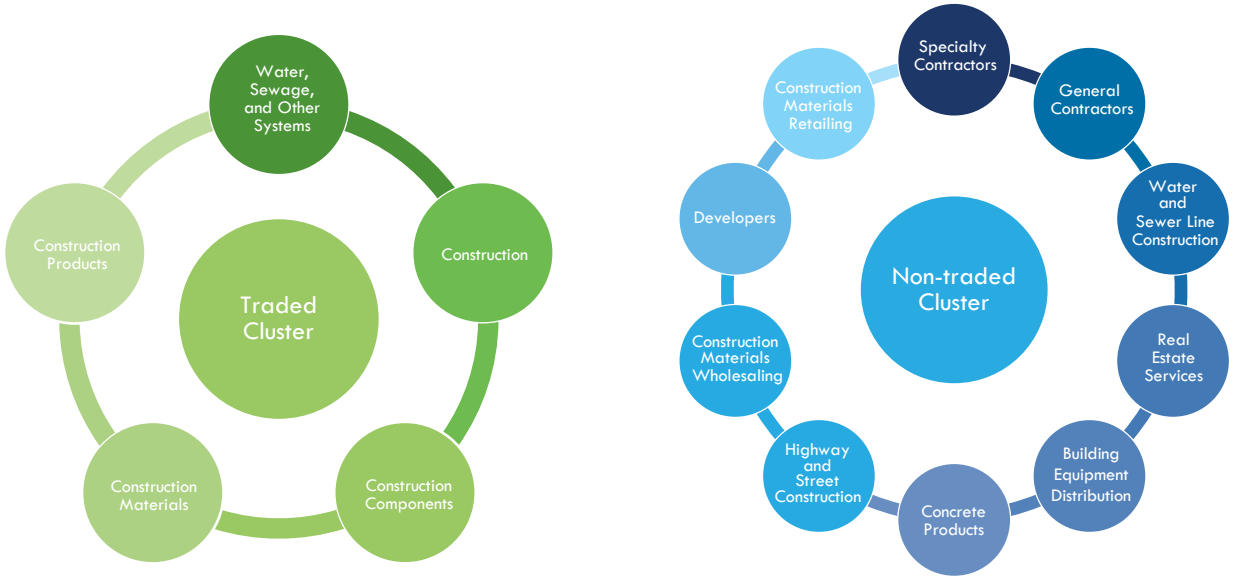
Economic cluster analysis gained popularity in the 1990s, and has remained an accepted practice for investigating regional advantages for economic and workforce development investment strategy.

Economic cluster theory says that similar or mutually beneficial firms locate in a region, prosper and generate new firms when they share supportive business climates (cluster-supporting public policy), supplier networks, workforce development resources and talent pool, innovation assets (R&D facilities, universities, investment), and social networks.

To investigate the areas of opportunity for supporting the Sacramento region's construction clusters, this report uses the cluster definitions from the U.S. Cluster Mapping Project.[24] Exhibit 15 provides an overview of the subclusters within the traded and non-traded cluster. The appendices provide detailed figures for the industries in each subcluster for the study regions.

Since each region holds its own advantages and market dynamics, the report compares the Sacramento region to the Bay Area and California. The analysis looks at industrial performance metrics over time, including employment levels, location quotients and earnings.

Exhibit 15: Traded and non-traded clusters and subclusters



[24] Institute for Strategy and Competitiveness, Harvard University and U.S. Economic Development Administration, https://www.clustermapping.us/.

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Traded cluster overview

The traded cluster consists of five subclusters: construction; water, sewage and other systems; construction products; construction components; and construction materials. The traded construction cluster includes 20 industries in utilities, construction and construction-related manufacturing. Even though Sacramento's traded cluster has a smaller number of employees, the cluster outperformed the Bay Area and California in the past 10 years for employment and earnings growth, and is projected to retain its advantage in the next five years. Between 2006 and 2016, the traded cluster in the Sacramento region added 1,105 jobs and employed 3,521 workers in 2016, exceeding its peak level in 2001 by 23% (Exhibit 16).

By contrast, the traded cluster lost over 650 jobs in the Bay Area and more than 4,000 jobs statewide over the past decade, representing declines of 5% and 6%.

The traded clusters are expected to grow in all three geographic regions over the next five years, with the most rapid pace in the Sacramento region—more than 30%, compared to 12% in the Bay Area and 9% in California.

Much of the growth in the Sacramento region's traded cluster is in the construction subcluster and water, sewage and other systems subcluster. In the construction subcluster, the Sacramento Municipal Utilities District (SMUD), Lund Construction and Vanir Construction Management represent the top three employers. In the water, sewage and other systems, irrigation districts and water agencies represent the major employers.

Exhibit 16: Traded and non-traded cluster historical employment change and location quotient[25]

Cluster	Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ
Traded Cluster	Sacramento Region	2,864	2,416	2,051	3,521	1,105	46%	0.55
	Bay Area	12,049	12,724	9,437	12,061	(663)	-5%	0.50
	California	66,874	66,978	54,349	62,647	(4,331)	-6%	0.58
Non-traded Cluster	Sacramento Region	100,591	125,603	76,910	98,083	(27,520)	-22%	1.19
	Bay Area	318,165	344,161	256,431	317,130	(27,031)	-8%	1.02
	California	1,369,649	1,693,223	1,185,525	1,430,131	(263,092)	-16%	1.02

Non-traded cluster overview

The recession severely impacted locally-serving construction industries in California and the nation. Employment levels mostly have not returned to their pre-recession levels. The non-traded cluster consists of 10 subclusters: real estate services, general contractors, specialty contractors, developers, highway and street construction, water and sewer line construction, concrete products, construction materials wholesaling, construction materials retailing, and building equipment distribution. Within these subclusters, there are 52 industries.

[25] EMSI 2017.3 – QCEW Employees, Non-QCEW Employees, and Self-Employed.

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Between 2006 and 2016, non-traded cluster employment fell by more than 20% (27,520 jobs) in the Sacramento region and 16% (260,000 jobs) statewide (Exhibit 16). The recession did not affect the Bay Area non-traded employment to the same extent; in 2016, employment was 8% below 2006 levels.

The non-traded cluster is projected to continue moderate growth in all three geographic areas over the next five years. By 2021, the non-traded cluster is expected to add 4,600 jobs (5%) in the Sacramento region, 22,000 jobs (7%) in the Bay Area, and 77,500 jobs (5%) in the entire state.

The Sacramento region's non-traded cluster has a higher concentration of employment despite the cluster's contraction in the past 10 years. In 2016, the non-traded cluster had a location quotient of 1.19. The location quotient in the Bay Area and California is on par with the nation, 1.0.

Cluster earnings

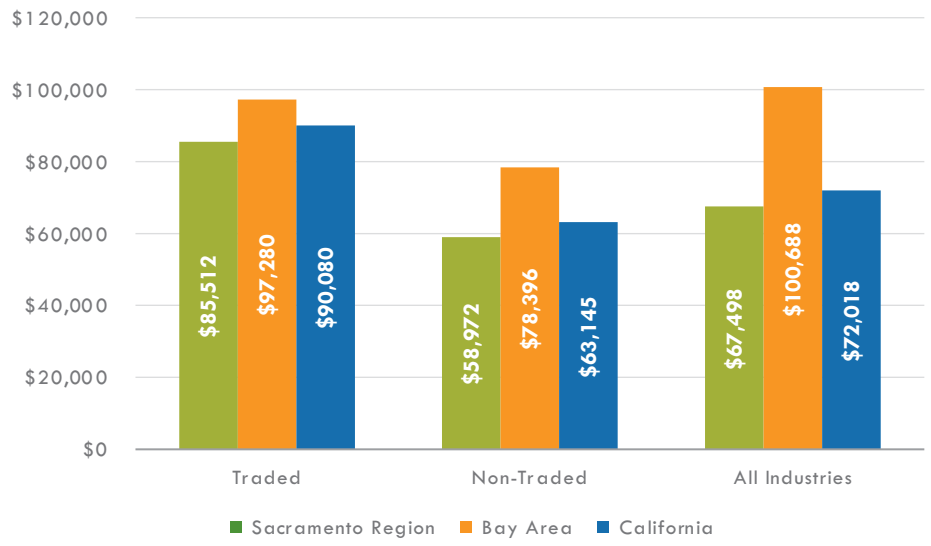
The traded cluster has significantly higher average annual earnings compared to earnings in all industries in the Sacramento region and the state, but not in the Bay Area. In the Sacramento region, the average annual earnings for the traded cluster was $85,500 in 2016, 30% higher than the annual average for all industries (Exhibit 17).

In the last 10 years, the traded cluster's average annual earnings in the Sacramento region increased at a higher rate (13%) compared to the Bay Area (8%) and California (11%). Additional research is required to investigate the source of the growth and performance metrics for the region; some portion of the growth could be attributed to the economic stimulus.

In 2016, non-traded cluster earnings were 2% lower than in 2006 (adjusted for inflation) in the Sacramento region. In the Bay Area, earnings in the non-traded cluster increased 13% over the same period. Statewide, earnings grew by 5%.

Compared to traded cluster and earnings in all industries, the non-traded cluster offers significantly lower pay throughout the three geographic areas. The non-traded cluster jobs paid on average $58,972 annually in the Sacramento region in 2016, 13% lower than the average annual earnings in the entire region ($67,498).

Exhibit 17: Average annual earnings in traded and non-traded clusters in the study regions (2016)



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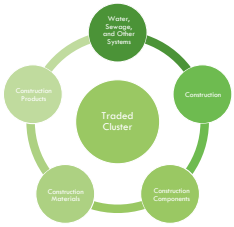
Analysis of traded subclusters

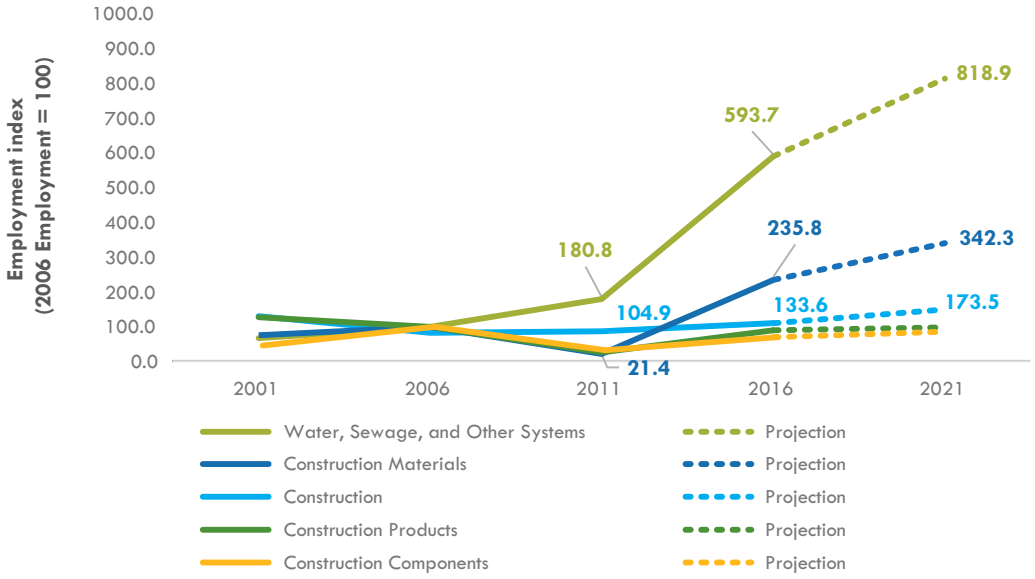


The story of the success of the traded cluster in the Sacramento region is the story of water systems (water irrigation, distribution and treatment) associated with the region's watershed and agriculture, and the Sacramento Municipal Utility District (SMUD). One additional subcluster, construction components, has two manufacturing industries, stone and tile manufacturing, that have exhibited competitive indicators.

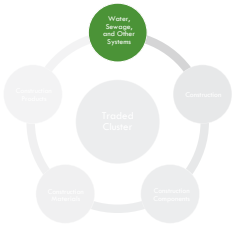
Two of the five traded subclusters made most of the contributions to the job growth in the traded cluster in the Sacramento region. These include construction, and water, sewage and other systems (Exhibit 18). The performance of construction materials appears significant; however, employment is low with 125 jobs in 2016.

Exhibit 18 shows growth and contraction within the subclusters compared to the 2006 baseline year. Water, sewage and other systems has grown nearly six times its employment level from 2006.

Exhibit 18: Traded subcluster employment index, Sacramento region (2001–2021)[26]



Water, sewage and other systems[27]



Water, sewage and other systems stands out as a main driving force for employment growth and concentration in the traded cluster. The subcluster added 750 jobs to the region between 2006 and 2016, accounting for 90% of all water, sewage and other systems employment added statewide.

The subcluster's location quotient in the Sacramento region is 2.8 times more concentrated than the national level. Even though the average earnings for water, sewage and other systems jobs in the Sacramento region remain lower than the Bay Area level and the state level, earnings have grown more than 60% in the past 10 years (Exhibit 19). Two industries comprise the subcluster: water supply and irrigation systems, and steam and air conditioning supply. Both industries accounted for growth in the subcluster in the Sacramento region. El Dorado Irrigation District, Placer County Water Agency and South Tahoe Public Utility District represent the top employers in the water supply and irrigation systems industry. The industry grew more than four times in the last 10 years. The steam and air conditioning supply industry accounted for some growth. The industry is highly concentrated, but small. No business data was available for this industry.

[26] EMSI 2017.3 – QCEW Employees, Non-QCEW Employees, and Self-Employed.

[27] 221310 Water Supply and Irrigation Systems; 221330 Steam and Air-Conditioning Supply.

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Exhibit 19: Water, sewage and other systems subcluster employment, location quotient and earnings (2001–2016)[28]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	103	153	276	908	755	493.7%	2.80	$83,389	62.2%
Bay Area	590	889	1,082	729	(160)	-18.0%	0.60	$90,202	-14.4%
California	5,250	4,536	5,065	5,366	830	18.3%	0.98	$90,800	7.3%

Construction[29]

The construction subcluster consists of over half of the traded cluster employment within the Sacramento region, nearly 2,000 workers (Exhibit 20). Employment in the subcluster grew by 34% between 2006 and 2016, adding nearly 500 jobs in the region. In the next five years, the construction subcluster is projected to grow, adding another 580 jobs in the region. Still, wage growth and employment concentration fall behind the Bay Area and the state, calling into question the competitive advantage of the subcluster.

A further examination of the subcluster's industries reveals the North American Industry Classification System (NAICS) code 237130, Power and Communication Line and Related Structures, comprises nearly 70% of the subcluster's employment in the Sacramento region and was the main driving force behind its growth in the last 10 years. More importantly, this industry offers high average annual earnings, $92,096 a year. The business list data suggests Sacramento Municipal Utilities District (SMUD) is the single employer responsible for growth in the region. The utility dwarfs all other subcluster companies in size.

Exhibit 20: Construction subcluster employment, location quotient and earnings (2001–2016)[30]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	2,303	1,454	1,525	1,942	488	33.6%	0.45	$87,827	7.4%
Bay Area	8,195	8,232	5,995	8,782	550	6.7%	0.54	$102,086	9.2%
California	40,635	40,720	35,689	40,634	(86)	-0.2%	0.56	$94,663	10.4%

[28] Ibid.

[29] 237130 Power and Communication Line and Related Structures Construction; 237120 Oil and Gas Pipeline and Related Structures Construction; 237990 Other Heavy and Civil Engineering Construction; 236210 Industrial Building Construction.

[30] Ibid.

CLUSTER ANALYSIS

Construction components[31]

Construction components is one of the two traded subclusters that have experienced job loss in the Sacramento region over the last decade. The Bay Area and California also experienced employment loss in the subcluster.

Overall, the subcluster has fewer than 500 jobs in the Sacramento region and a relatively low concentration, with a location quotient of 0.56, which is lower than the state, 0.71 (Exhibit 21). The subcluster's average annual earnings, $71,517 in 2016 in Sacramento, is 6% higher than all industries in the region.

All other miscellaneous nonmetallic mineral product manufacturing (135 jobs in 2016), and concrete block and brick manufacturing (160 jobs in 2016) represent the two largest industries in the regional subcluster.

All other miscellaneous nonmetallic mineral product manufacturing employment has doubled in the Sacramento region over the past decade and is more concentrated in the region than in the nation, with a location quotient of 0.56 compared to 1.5. Jobs in all other miscellaneous nonmetallic mineral product manufacturing also offer the highest average annual earnings, nearly $80,000 in 2016, among all construction components industries in the Sacramento region, a more than 60% increase from 2006.

Sacramento Stucco Company and Cortopassi Tile & Stone are two large employers in the region in the former industry; in the latter, Calstone Company is the largest employer in the region.

Exhibit 21: Construction components subcluster employment, location quotient and earnings (2001-2016)[32]

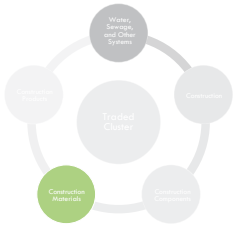
Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	304	667	215	466	(201)	-30.1%	0.56	$71,517	13.6%
Bay Area	2,503	2,836	1,771	1,939	(896)	-31.6%	0.62	$80,284	8.7%
California	12,749	14,595	7,898	9,938	(4,657)	-31.9%	0.71	$75,768	8.8%

[31] 327999 All Other Miscellaneous Nonmetallic Mineral Product Manufacturing; 327331 Concrete Block and Brick Manufacturing; 327420 Gypsum Product Manufacturing; 327310 Cement Manufacturing; 327332 Concrete Pipe Manufacturing; 327410 Lime Manufacturing; 327991 Cut Stone and Stone Product Manufacturing; 327993 Mineral Wool Manufacturing.

[32] Ibid.

CLUSTER ANALYSIS

Construction materials[33]



Construction materials represents an emerging traded subcluster in the Sacramento region. The sole industry with employment in the Sacramento region, asphalt paving mixture and block manufacturing, has a location quotient of 1.2 and has tripled in size in the last 10 years. The industry offers high average annual earnings, $130,987 in 2016, but only has around 100 jobs in the region (Exhibit 22). Valley Slurry Seal and Vulcan Materials are the two largest companies in the region, each employing between 20 and 25 workers.

Exhibit 22: Construction materials subcluster employment, location quotient and earnings (2001-2016)[34]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	40	53	11	125	72	135.8%	0.69	$130,987	-19.9%
Bay Area	560	423	205	217	(206)	-48.7%	0.32	$125,611	1.2%
California	1,695	1,913	1,334	1,348	(565)	-29.5%	0.44	$122,852	5.9%

Construction products[35]

Construction products represents the least competitive traded subcluster in the Sacramento region (Exhibit 23). Data analysis indicates the subcluster has low employment levels and employment concentration.

There is some employment in the fabricated pipe and pipe fitting manufacturing industry, but the industry is small and does not demonstrate competitive potential.

Exhibit 23: Construction products subcluster employment, location quotient and earnings (2001-2016)[36]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	114	89	23	81	(9)	-10.0%	0.11	$63,593	-3.7%
Bay Area	200	344	384	393	49	14.2%	0.14	$ 71,188	1.5%
California	6,545	5,215	4,363	5,361	147	2.8%	0.44	$ 72,911	11.1%

[33] 324121 Asphalt Paving Mixture and Block Manufacturing; 324122 Asphalt Shingle and Coating Materials Manufacturing.

[34] Ibid.

[35] 332410 Power Boiler and Heat Exchanger Manufacturing; 332420 Metal Tank (Heavy Gauge) Manufacturing; 332913 Plumbing Fixture Fitting and Trim Manufacturing; 332996 Fabricated Pipe and Pipe Fitting Manufacturing.

[36] Ibid.

CLUSTER ANALYSIS

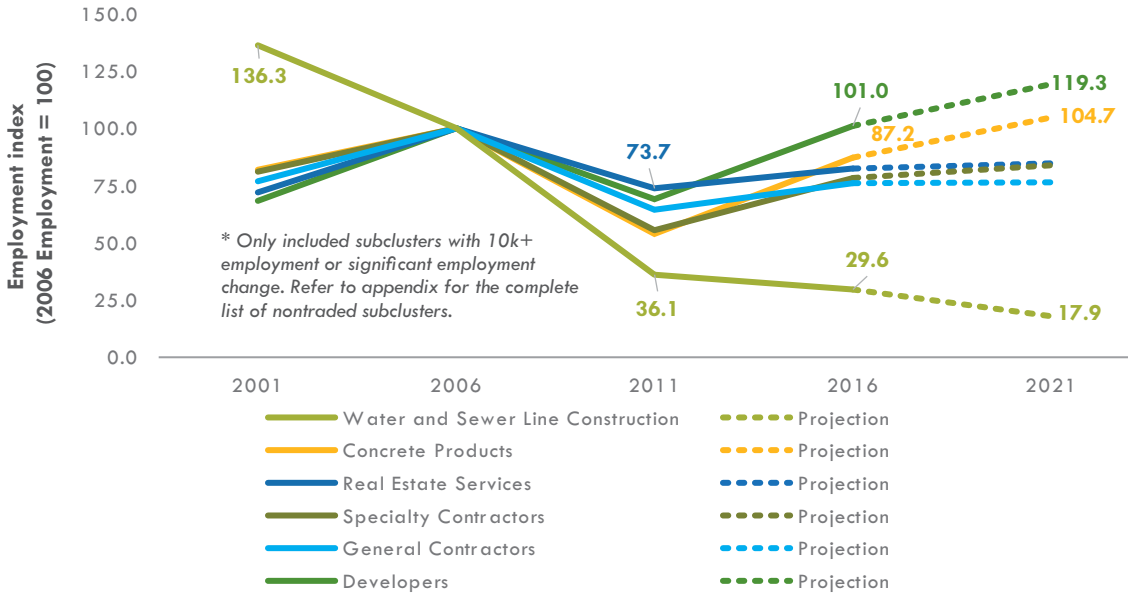
Analysis of non-traded subclusters

Most of California's locally-serving construction industries have employment levels on par with levels seen in the 1990s, despite economic and population growth and demand for housing and office space. Though the recovery has shown encouraging signs, employment indicators continue to highlight statewide and regional challenges to business growth.

Within the Sacramento region, water and sewer line construction is the only non-traded subcluster with employment levels comparable to the mid-2000s. The developers subcluster has suffered the most severe job loss over the past decade with employment only 30% of its 2006 level.

In the next five years, most non-traded subclusters are expected to add jobs in the Sacramento region. Still, only two subclusters are projected to surpass 2006 employment levels: water and sewer line construction, and concrete products (Exhibit 24). Industry-level analysis reveals that many industries have recovered. The appendices present industry-level data.

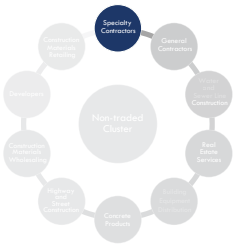
Exhibit 24: Non-traded subcluster employment index, Sacramento region (2001–2021)[37]



[37] Ibid.

CLUSTER ANALYSIS

Specialty contractors[38]



Specialty contractors remains the largest non-traded subcluster in the Sacramento region, with employment surpassing 50,000 jobs (Exhibit 25). Even though the Sacramento region subcluster has a location quotient higher than the Bay Area and the state, it has contracted by more than 20% since 2006. The Bay Area's specialty contractor subcluster, by comparison, has nearly returned to its 2006 employment level.

Several industries in the subcluster in the Sacramento region have recovered to 2006 employment and show sizable earnings and location quotient increases. These include: plumbing, heating and air-conditioning contractors; electrical contractors and other wiring installation contractors; and framing contractors.

Plumbing, heating and air conditioning contractors represent the largest specialty contractors industry in the Sacramento region, employing just over 10,000 workers in 2016. The framing contractors industry has a special advantage in the Sacramento region. Its jobs are more than five times concentrated in the region than in the nation.

The top regional employers in these industries include Villara Building Systems, Barnum & Celillo Electrical, Airco Mechanical, Syntrol Plumbing and Electrical, Royal Electric, and NMI Industrial.

Exhibit 25: Specialty contractors subcluster employment, location quotient and earnings (2001–2016)[39]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	52,735	65,008	36,065	50,899	(14,110)	-21.7%	1.26	$59,039	8.3%
Bay Area	155,401	156,678	113,843	151,826	(4,853)	-3.1%	1.00	$78,587	17.8%
California	687,605	834,275	539,312	692,597	(141,678)	-17.0%	1.01	$61,097	10.8%

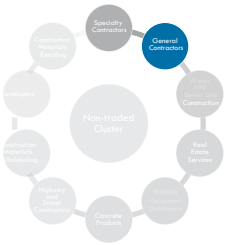
[38] 238220 Plumbing, Heating, and Air-Conditioning Contractors; 238210 Electrical Contractors and Other Wiring Installation Contractors; 238990 All Other Specialty Trade Contractors; 238990 All Other Specialty Trade Contractors; 238130 Framing Contractors; 238310 Drywall and Insulation Contractors; 238320 Painting and Wall Covering Contractors; 238910 Site Preparation Contractors; 238110 Poured Concrete Foundation and Structure Contractors; 238160 Roofing Contractors; 238350 Finish Carpentry Contractors; 238340 Tile and Terrazzo Contractors; 238140 Masonry Contractors; 238330 Flooring Contractors; 238120 Structural Steel and Precast Concrete Contractors; 238150 Glass and Glazing Contractors; 238290 Other Building Equipment Contractors; 238390 Other Building Finishing Contractors; 332322 Sheet Metal Work Manufacturing; 238170 Siding Contractors; 238190 Other Foundation, Structure, and Building Exterior Contractors; 562991 Septic Tank and Related Services; 337212 Custom Architectural Woodwork and Millwork Manufacturing.

[39] Ibid.

CLUSTER ANALYSIS

General contractors[40]

Several industries serving the residential construction market comprise the general contractors subcluster: new single-family construction, multifamily construction and residential remodeling.



The subcluster also has one industry serving commercial and institutional construction. Overall, the subcluster lost nearly a quarter of its jobs, 5,300, in the Sacramento region between 2006 and 2016 (Exhibit 26). In the Bay Area, the figure was 11% and statewide, 16%. Specialty contractors remains Sacramento's most concentrated non-traded subcluster with a job concentration 1.3 times higher than the national level.

New multifamily housing construction (except for-sale builders) outperformed all other general contractors industries due to employment (more jobs in 2016 than in 2006), current employment concentration and recent growth, and higher than average annual earnings.

Residential remodeling employment has also recovered compared to its mid-2000s peak. The industry has a sizable concentration, though the average annual earnings are low, $39,202 in 2016.

Top regional employers in the leading subcluster industries include Premier Pools and Spas, S.D. Deacon Corporation, Granite Construction, Dennis Blazona Construction and Swinerton Builders.

Exhibit 26: General contractors subcluster employment, location quotient and earnings (2001–2016)[41]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	17,034	22,151	14,269	16,843	(5,307)	-24.0%	1.30	$59,993	-8.9%
Bay Area	60,285	71,164	49,762	63,553	(7,611)	-10.7%	1.30	$80,572	10.4%
California	223,354	298,040	204,675	249,512	(48,528)	-16.3%	1.14	$64,743	-1.2%

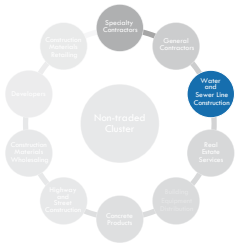
[40] 236116 New Multifamily Housing Construction (except For-Sale Builders); 236117 New Housing For-Sale Builders; 236118 Residential Remodelers; 236220 Commercial and Institutional Building Construction; 236115 New Single-Family Housing Construction (except For-Sale Builders).

[41] Ibid.

CLUSTER ANALYSIS

Water and sewer line construction[42]

Water and sewer line construction is the single non-traded subcluster that has reached pre-recession levels of employment over the past decade (Exhibit 27). The subcluster is projected to grow through 2021 within the Sacramento region.



Compared to its counterparts in the Bay Area and the state, water and sewer line construction has a higher job concentration in the Sacramento region. Employment is 1.26 times more concentrated in the Sacramento region than at the national level. Water and sewer line construction also offers higher than average annual earnings, $85,108, than all industries in all three geographic areas. Its employment size, job concentration and average annual earnings have all experienced continuous growth in the past decade and are projected to grow through 2021.

The top regional employers by employment size include Eaton Drilling Company, Cascade Drilling Company and Diamond Well Drilling Company. Most of these companies are small, having fewer than 20 employees.

Exhibit 27: Water and sewer line construction subcluster employment, location quotient and earnings (2001–2016)[43]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	1,124	1,645	1,137	1,662	17	1.0%	1.26	$85,108	9.9%
Bay Area	4,245	4,589	3,441	3,942	(647)	-14.1%	0.79	$108,147	8.8%
California	19,235	21,833	15,476	20,210	(1,624)	-7.4%	0.90	$90,377	9.9%

[42] 237110 Water and Sewer Line and Related Structures Construction.

[43] Ibid.

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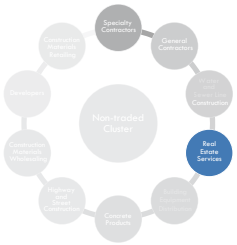
Real estate services[44]

Real estate services employment in the Sacramento region saw an 18% employment reduction (a loss of 3,300 jobs) in the past 10 years (Exhibit 28). Reductions totaled 11% in the Bay Area and 9% statewide.



In the next five years, the subcluster is projected to grow slightly across all three geographic areas. Like other non-traded subclusters, real estate services employment generally has earnings lower than average earnings in all three geographic areas. In the Sacramento region, average earnings in the subcluster decreased by 14% over the past decade.

At the industry level, nonresidential property managers is the strongest real estate services industry within the Sacramento region. The industry's employment has surpassed 2006 levels; earnings grew nearly 20% in the same interval ($76,324 in 2016).

Residential property managers also showed strong employment growth, but earnings are lower than average. KW Commercial, Keller Williams Realty and Coldwell Banker represent major subcluster employers in the region.

Exhibit 28: Real estate services subcluster employment, location quotient and earnings (2001–2016)[45]

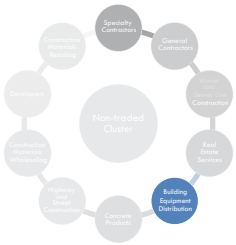
Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06-16)	10-YR Job % Change (06-16)	2016 LQ	2016 Avg. Earnings	06-16 Avg. Earnings % Change
Sacramento	13,523	18,779	13,848	15,475	(3,303)	-17.6%	1.07	$52,518	-14.2%
Bay Area	56,570	68,734	57,441	61,473	(7,261)	-10.6%	1.12	$78,105	16.5%
California	249,135	315,582	265,826	286,091	(29,491)	-9.3%	1.16	$65,668	6.1%

[44] 531311 Residential Property Managers; 531210 Offices of Real Estate Agents and Brokers; 531110 Lessors of Residential Buildings and Dwellings; 531390 Other Activities Related to Real Estate; 531312 Nonresidential Property Managers; 531120 Lessors of Nonresidential Buildings (except Miniwarehouses); 531190 Lessors of Other Real Estate Property; 531320 Offices of Real Estate Appraisers; 541191 Title Abstract and Settlement Offices; 541370 Surveying and Mapping (except Geophysical) Services.

[45] Ibid.

Building equipment distribution[46]

Compared to many other non-traded subclusters, the building equipment distribution subcluster experienced less of an impact. In the Sacramento region, building equipment distribution has lost 11% of its employment in the past 10 years (Exhibit 29). It has grown by 18% in the Bay Area and has seen a slight reduction of 3% statewide. In addition, the subcluster offers competitive wages that are higher than the average annual earnings for all industries for all study regions.



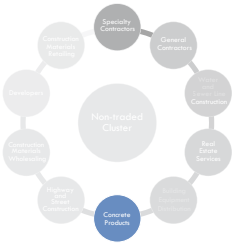
At the industry level, plumbing and heating equipment and supplies (hydronics) merchant wholesalers, and refrigeration equipment and supplies merchant wholesalers have established some advantage in the Sacramento region. American Refrigeration Supplies, Park Mechanical and Mainstream Energy Corporation are among the largest employers in the region.

Exhibit 29: Building equipment distribution subcluster employment, location quotient and earnings (2001–2016)[47]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	1,084	1,362	943	1,207	(155)	-11.4%	1.00	$72,122	-9.3%
Bay Area	2,564	2,572	2,733	3,043	471	18.3%	0.67	$107,347	11.4%
California	13,448	16,251	14,111	15,727	(525)	-3.2%	0.77	$81,318	3.5%

Concrete products[48]

Concrete products in the Sacramento region experienced less of an impact from the recession than the Bay Area and the state. While employment declined by 40% in the Bay Area and 32% in the state in the past 10 years, the subcluster declined by 11% in the Sacramento region over the same period (Exhibit 30).



Concrete products jobs are much more concentrated in the Sacramento region than in the Bay Area and the state. Subcluster jobs in the Sacramento region offer average earnings higher than all industries at the regional level.

The concrete products subcluster in the Sacramento region is mostly supported by the other concrete product manufacturing industry. This industry has many positive indicators: sizeable employment levels and growth, employment concentration and growth, high earnings and growth.

[46] 423720 Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers; 423740 Refrigeration Equipment and Supplies Merchant Wholesalers; 423730 Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers.

[47] Ibid.

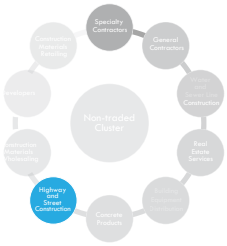
[48] 327390 Other Concrete Product Manufacturing; 327320 Ready-Mix Concrete Manufacturing.

Exhibit 30: Concrete products subcluster employment, location quotient and earnings (2001–2016)[49]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06-16)	10-YR Job % Change (06-16)	2016 LQ	2016 Avg. Earnings	06-16 Avg. Earnings % Change
Sacramento	1,054	1,288	694	1,123	(165)	-12.8%	1.06	$83,446	4.5%
Bay Area	3,667	3,799	1,867	2,303	(1,496)	-39.4%	0.57	$92,599	13.3%
California	16,495	18,565	10,364	12,583	(5,982)	-32.2%	0.70	$73,199	-0.3%

Highway and street construction[50]

Highway and street construction is represented by one industry of the same name. The subcluster lost one third of its jobs, 1,100, in the Sacramento region between 2006 and 2016 (Exhibit 31). Employment losses were also severe in the Bay Area and the state. Regional average annual earnings in the subcluster are high, $98,147 in 2016.



The following companies are among the largest in the Sacramento region: Meyers & Sons Construction, Telfer Highway Technologies, Central Valley Engineering and Valley Precision Grading.

Exhibit 31: Highway and street construction subcluster employment, location quotient and earnings (2001–2016)[51]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	3,292	3,372	2,291	2,268	(1,104)	-32.7%	0.98	$98,147	0.7%
Bay Area	7,529	6,691	4,830	5,910	(781)	-11.7%	0.67	$108,247	7.8%
California	31,092	29,795	21,317	24,495	(5,300)	-17.8%	0.62	$98,254	5.5%

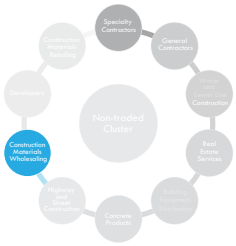
[49] Ibid.

[50] 237310 Highway, Street and Bridge Construction.

[51] Ibid.

Construction materials wholesaling[52]

Construction materials wholesaling does not demonstrate competitive indicators. The subcluster lost more than one-third of its jobs in the Sacramento region between 2006 and 2016 (Exhibit 32). Projected growth in the next five years is moderate. The subcluster also pays low average annual earnings compared to all industries for each of the three study regions.



The roofing, siding and insulation material merchant wholesalers industry outperforms all other construction materials wholesaling industries in the Sacramento region. It is the sole industry in the subcluster that has 10-year job growth, a high employment concentration and above-average annual earnings.

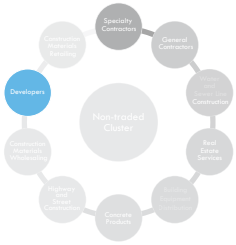
The largest employers in the region include Teichert Aggregates, Building Material Distributors, Jeld-Wen Interior Door Division, BMC and Setzer Forest Products Inc.

Exhibit 32: Construction materials wholesaling subcluster employment, location quotient and earnings (2001–2016)[53]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	2,134	2,479	1,297	1,647	(832)	-33.6%	1.05	$59,591	-11.0%
Bay Area	4,379	5,015	2,891	3,616	(1,400)	-27.9%	0.61	$75,050	6.6%
California	21,495	27,631	16,858	21,423	(6,207)	-22.5%	0.81	$69,105	-3.1%

Developers[54]

The recession decimated the developers subcluster. Employment went down more than 70% in the Sacramento region (Exhibit 33). Though the region's employment concentration is above the national level, the figure was cut in half over 15 years from 2.23 to only 1.18 in 2016. This means employment went from being more than two times more concentrated than the national level to about the same concentration.



The developers subcluster is expected to experience employment declines in the next five years. This is the only non-traded subcluster that pays six-figure wages throughout all geographic areas.

The Village at Squaw Valley, Interland Corporation and Tim Lewis Communities represent a few of the largest developers in the region.

[52] 423330 Roofing, Siding, and Insulation Material Merchant Wholesalers; 423320 Brick, Stone, and Related Construction Material Merchant Wholesalers; 423310 Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers; 423390 Other Construction Material Merchant Wholesalers.

[53] Ibid.

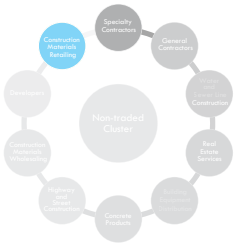
[54] 237210 Land Subdivision.

Exhibit 33: Developers subcluster employment, location quotient and earnings (2001–2016)[55]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06-16)	10-YR Job % Change (06-16)	2016 LQ	2016 Avg. Earnings	06-16 Avg. Earnings % Change
Sacramento	1,866	1,370	494	405	(964)	-70.4%	1.18	$126,718	3.5%
Bay Area	3,807	2,859	1,601	1,512	(1,347)	-47.1%	1.16	$139,124	4.0%
California	18,597	19,819	9,098	8,630	(11,188)	-56.5%	1.48	$120,680	5.9%

Construction materials retailing[56]

Construction materials retailing is one of the least competitive non-traded subclusters in all three geographic areas. In the Sacramento region, construction materials retailing lost 20% of its employment during the past decade (Exhibit 34). The subcluster's employment is expected to remain at the same level over the next five years. The subcluster has the lowest average annual earnings, $39,919 in 2016, among all subclusters in the Sacramento region.



Home Depot, Lowe's, Erickson Framing, Edges Electrical Group and Silverado Building Materials are among the largest employers in the region's subcluster.

Exhibit 34: Construction materials retailing subcluster employment, location quotient and earnings (2001–2016)[57]

Geographic Area	2001 Jobs	2006 Jobs	2011 Jobs	2016 Jobs	10-YR Job Change (06–16)	10-YR Job % Change (06–16)	2016 LQ	2016 Avg. Earnings	06–16 Avg. Earnings % Change
Sacramento	6,745	8,149	5,873	6,552	(1,597)	-19.6%	0.94	$39,919	-12.8%
Bay Area	19,717	22,060	18,022	19,952	(2,108)	-9.6%	0.76	$46,140	-9.1%
California	89,194	111,431	88,489	98,862	(12,569)	-11.3%	0.84	$41,403	-11.9%

[55] Ibid.

[56] 444120 Paint and Wallpaper Stores; 444110 Home Centers; 444190 Other Building Material Dealers.

[57] Ibid.

ECONOMIC IMPACTS

The economic impact represents a quantitative calculation that estimates the overall economic effect from a project, industry or group of industries such as a cluster (or subcluster). The impacts from an industry cluster are not limited to those direct effects that occur from the industry activities and/or business operations. They also represent the multiplier effect from the ancillary activities created by those industry activities. Impact analysis typically comprises direct, indirect and induced impacts:

- Direct impacts result from expenditures of operations within that industry cluster.
- Indirect impacts result from suppliers of that cluster spending money and hiring employees.
- Induced impacts are the combined value of employees of the industry cluster spending money at a household level.

Combined, these three variables equate to the total economic impact of a project or industry cluster.

The construction cluster has multiple economic impacts on the Sacramento region. The IMPLAN input-output model was used to measure the cluster's total economic impacts. The construction cluster directly benefits the regional economy through business operations and jobs supported by establishments within its subclusters. On an overall basis, the construction cluster directly generates about $18.2 billion in industry output, with over 101,600 jobs within the Sacramento region.

In addition, the construction cluster generates over $784.6 million in output and 3,500 jobs in traded subclusters. Traded subclusters represent those groups of industries that primarily serve and compete for customers in national and international markets. Non-traded subclusters generate $17.4 billion in output and over 98,100 jobs. Non-traded subclusters include industries that largely serve local and regional markets.

In addition to the direct impacts, supplier relationships initiated by construction cluster establishments create indirect impacts totaling $6.4 billion in industry output and 47,000 jobs within the region. Local spending by employees creates an induced impact of $10.2 billion in industry output and 72,700 jobs.

When accounting for all the direct and multiplier effects, the construction cluster contributes about $34.8 billion in industry output, 221,300 jobs, and $17.4 billion in labor income (inclusive of both employee compensation and proprietor income) to the Sacramento regional economy. This means that for every job created by the construction cluster, an additional 1.2 jobs are created elsewhere within the region as a result of supplier relationships and employee spending.

Among the individual subclusters, contractors (specialty and general) and real estate services make up the largest share of the overall direct cluster employment, with each subcluster accounting for over 15,000 jobs. Specialty contractors alone make up over half of the direct and total jobs (inclusive of indirect and induced effects). Among traded subclusters, construction (which includes industrial, infrastructure and heavy construction) account for the largest share of jobs.

Exhibits 35 and 36 show construction cluster economic impacts by traded and non-traded subcluster. Exhibit 37 shows total construction cluster economic impacts by subcluster.

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Exhibit 35: Construction cluster economic impacts by traded industry subcluster (2016)[58]

Subcluster	Direct Jobs	Indirect Jobs	Induced Jobs	Total Jobs
Construction	1,942.3	473.0	1,190.8	3,606.1
Construction Components	465.7	348.4	477.7	1,291.8
Construction Materials	124.6	127.2	384.9	636.7
Construction Products	79.5	29.6	51.6	160.7
Water, Sewage and Other Systems	907.9	830.7	1,223.0	2,961.6
Cluster Total	**3,520.0**	**1,808.8**	**3,328.0**	**8,656.9**
Subcluster	**Direct Output**	**Indirect Output**	**Induced Output**	**Total Output**
Construction	$282,977,809	$72,385,889	$168,376,920	$523,740,617
Construction Components	$157,849,619	$59,896,383	$66,894,459	$284,640,461
Construction Materials	$97,394,208	$26,533,911	$51,556,139	$175,484,258
Construction Products	$19,871,028	$4,863,742	$7,074,900	$31,809,670
Water, Sewage and Other Systems	$226,496,806	$133,283,385	$167,543,755	$527,323,947
Cluster Total	**$784,589,469**	**$296,963,310**	**$461,446,173**	**$1,542,998,952**
Subcluster	**Direct Labor Income**	**Indirect Labor Income**	**Induced Labor Income**	**Total Labor Income**
Construction	$118,948,947	$26,319,617	$72,570,759	$217,839,323
Construction Components	$41,965,429	$26,083,230	$36,308,975	$104,357,634
Construction Materials	$8,114,629	$1,794,351	$4,652,573	$14,561,553
Construction Products	$5,908,571	$2,459,267	$4,291,663	$12,659,501
Water, Sewage and Other Systems	$9,012,479	$9,437,012	$13,936,898	$32,386,389
Cluster Total	**$183,950,055**	**$66,093,476**	**$131,760,869**	**$381,804,401**

[58] EMSI employment and 2014 IMPLAN coefficients.

Exhibit 36: Construction cluster economic impacts by non-traded industry subcluster (2016)

Subcluster	Direct Jobs	Indirect Jobs	Induced Jobs	Total Jobs
Building Equipment Distribution	1,206.8	463.8	621.3	2,292.0
Concrete Products	1,123.2	668.1	1,025.6	2,816.9
Construction Materials Retailing	6,552.1	1,411.8	4,393.2	12,357.2
Construction Materials Wholesaling	1,647.3	933.1	2,280.7	4,861.1
Developers	405.3	204.4	298.8	908.5
General Contractors	16,843.3	8,646.4	12,400.6	37,890.3
Highway and Street Construction	2,268.3	817.3	1,587.0	4,672.6
Real Estate Services	15,475.5	5,946.4	8,093.7	29,515.6
Specialty Contractors	50,898.6	25,556.5	37,535.6	113,990.6
Water and Sewer Line Construction	1,662.4	543.4	1,104.6	3,310.4
Cluster Total	**98,082.8**	**45,191.2**	**69,341.2**	**212,615.2**
Subcluster	**Direct Output**	**Indirect Output**	**Induced Output**	**Total Output**
Building Equipment Distribution	$211,809,404	$62,438,316	$87,311,290	$361,559,010
Concrete Products	$295,685,586	$102,823,642	$144,776,849	$543,286,077
Construction Materials Retailing	$685,413,852	$210,602,818	$594,525,721	$1,490,542,391
Construction Materials Wholesaling	$375,689,133	$133,213,751	$306,514,093	$815,416,977
Developers	$74,484,608	$27,629,611	$42,049,294	$144,163,513
General Contractors	$2,944,685,430	$1,120,248,869	$1,748,964,963	$5,813,899,262
Highway and Street Construction	$439,140,622	$136,030,544	$224,226,288	$799,397,454
Real Estate Services	$2,712,745,560	$799,922,667	$1,138,120,231	$4,650,788,457
Specialty Contractors	$9,367,937,746	$3,461,996,923	$5,281,715,437	$18,111,650,106
Water and Sewer Line Construction	$265,000,452	$81,053,902	$156,063,402	$502,117,756
Cluster Total	**$17,372,592,392**	**$6,135,961,042**	**$9,724,267,569**	**$33,232,821,003**
Subcluster	**Direct Labor Income**	**Indirect Labor Income**	**Induced Labor Income**	**Total Labor Income**
Building Equipment Distribution	$108,320,011	$68,902,197	$118,749,550	$295,971,759
Concrete Products	$102,861,187	$54,828,883	$81,579,542	$239,269,612
Construction Materials Retailing	$372,887,197	$94,958,346	$348,904,482	$816,750,025
Construction Materials Wholesaling	$165,998,629	$76,503,397	$210,201,288	$452,703,314
Developers	$167,615,524	$69,267,670	$126,908,764	$363,791,957
General Contractors	$1,459,160,666	$575,074,667	$1,102,520,099	$3,136,755,432
Highway and Street Construction	$328,706,087	$113,574,142	$227,475,085	$669,755,313
Real Estate Services	$1,149,783,599	$696,418,265	$1,218,528,335	$3,064,730,199
Specialty Contractors	$3,544,964,947	$1,461,210,778	$2,681,648,408	$7,687,824,133
Water and Sewer Line Construction	$127,428,042	$36,572,873	$84,380,263	$248,381,178
Cluster Total	**$7,527,725,889**	**$3,247,311,218**	**$6,200,895,816**	**$16,975,932,923**

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Exhibit 37: Total construction cluster economic impacts by subcluster (2016)

Subcluster	Direct Jobs	Indirect Jobs	Induced Jobs	Total Jobs
Building Equipment Distribution	1,206.8	463.8	621.3	2,292.0
Concrete Products	1,123.2	668.1	1,025.6	2,816.9
Construction	1,942.3	473.0	1,190.8	3,606.1
Construction Components	465.7	348.4	477.7	1,291.8
Construction Materials	124.6	127.2	384.9	636.7
Construction Materials Retailing	6,552.1	1,411.8	4,393.2	12,357.2
Construction Materials Wholesaling	1,647.3	933.1	2,280.7	4,861.1
Construction Products	79.5	29.6	51.6	160.7
Developers	405.3	204.4	298.8	908.5
General Contractors	16,843.3	8,646.4	12,400.6	37,890.3
Highway and Street Construction	2,268.3	817.3	1,587.0	4,672.6
Real Estate Services	15,475.5	5,946.4	8,093.7	29,515.6
Specialty Contractors	50,898.6	25,556.5	37,535.6	113,990.6
Water and Sewer Line Construction	1,662.4	543.4	1,104.6	3,310.4
Water, Sewage and Other Systems	907.9	830.7	1,223.0	2,961.6
Cluster Total	**101,602.8**	**47,000.0**	**72,669.2**	**221,272.1**
Subcluster	**Direct Output**	**Indirect Output**	**Induced Output**	**Total Output**
Building Equipment Distribution	$211,809,404	$62,438,316	$87,311,290	$361,559,010
Concrete Products	$295,685,586	$102,823,642	$144,776,849	$543,286,077
Construction	$282,977,809	$72,385,889	$168,376,920	$523,740,617
Construction Components	$157,849,619	$59,896,383	$66,894,459	$284,640,461
Construction Materials	$97,394,208	$26,533,911	$51,556,139	$175,484,258
Construction Materials Retailing	$685,413,852	$210,602,818	$594,525,721	$1,490,542,391
Construction Materials Wholesaling	$375,689,133	$133,213,751	$306,514,093	$815,416,977
Construction Products	$19,871,028	$4,863,742	$7,074,900	$31,809,670
Developers	$74,484,608	$27,629,611	$42,049,294	$144,163,513
General Contractors	$2,944,685,430	$1,120,248,869	$1,748,964,963	$5,813,899,262
Highway and Street Construction	$439,140,622	$136,030,544	$224,226,288	$799,397,454
Real Estate Services	$2,712,745,560	$799,922,667	$1,138,120,231	$4,650,788,457
Specialty Contractors	$9,367,937,746	$3,461,996,923	$5,281,715,437	$18,111,650,106
Water and Sewer Line Construction	$265,000,452	$81,053,902	$156,063,402	$502,117,756
Water, Sewage and Other Systems	$226,496,806	$133,283,385	$167,543,755	$527,323,947
Cluster Total	**$18,157,181,860**	**$6,432,924,353**	**$10,185,713,742**	**$34,775,819,955**

Continued

ECONOMIC IMPACTS

Exhibit 37: Total construction cluster economic impacts by subcluster (2016) (Continued)

Subcluster	Direct Labor Income	Indirect Labor Income	Induced Labor Income	Total Labor Income
Building Equipment Distribution	$108,320,011	$68,902,197	$118,749,550	$295,971,759
Concrete Products	$102,861,187	$54,828,883	$81,579,542	$239,269,612
Construction	$118,948,947	$26,319,617	$72,570,759	$217,839,323
Construction Components	$41,965,429	$26,083,230	$36,308,975	$104,357,634
Construction Materials	$8,114,629	$1,794,351	$4,652,573	$14,561,553
Construction Materials Retailing	$372,887,197	$94,958,346	$348,904,482	$816,750,025
Construction Materials Wholesaling	$165,998,629	$76,503,397	$210,201,288	$452,703,314
Construction Products	$5,908,571	$2,459,267	$4,291,663	$12,659,501
Developers	$167,615,524	$69,267,670	$126,908,764	$363,791,957
General Contractors	$1,459,160,666	$575,074,667	$1,102,520,099	$3,136,755,432
Highway and Street Construction	$328,706,087	$113,574,142	$227,475,085	$669,755,313
Real Estate Services	$1,149,783,599	$696,418,265	$1,218,528,335	$3,064,730,199
Specialty Contractors	$3,544,964,947	$1,461,210,778	$2,681,648,408	$7,687,824,133
Water and Sewer Line Construction	$127,428,042	$36,572,873	$84,380,263	$248,381,178
Water, Sewage and Other Systems	$9,012,479	$9,437,012	$13,936,898	$32,386,389
Cluster Total	**$7,711,675,944**	**$3,313,404,695**	**$6,332,656,685**	**$17,357,737,324**

OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

This section of the report builds on the analysis of industry clusters and assesses occupational demand and supply. The research focused on a priority list of occupations that serve the industries in the cluster analysis and narrowed down categories for analysis based on specificity to the construction industry and training and education programs in the region. By analyzing projected occupational demand and historical supply of workers in related programs, the research estimates the annual shortfall of workers to meet workforce demand in the Sacramento region's construction industry.

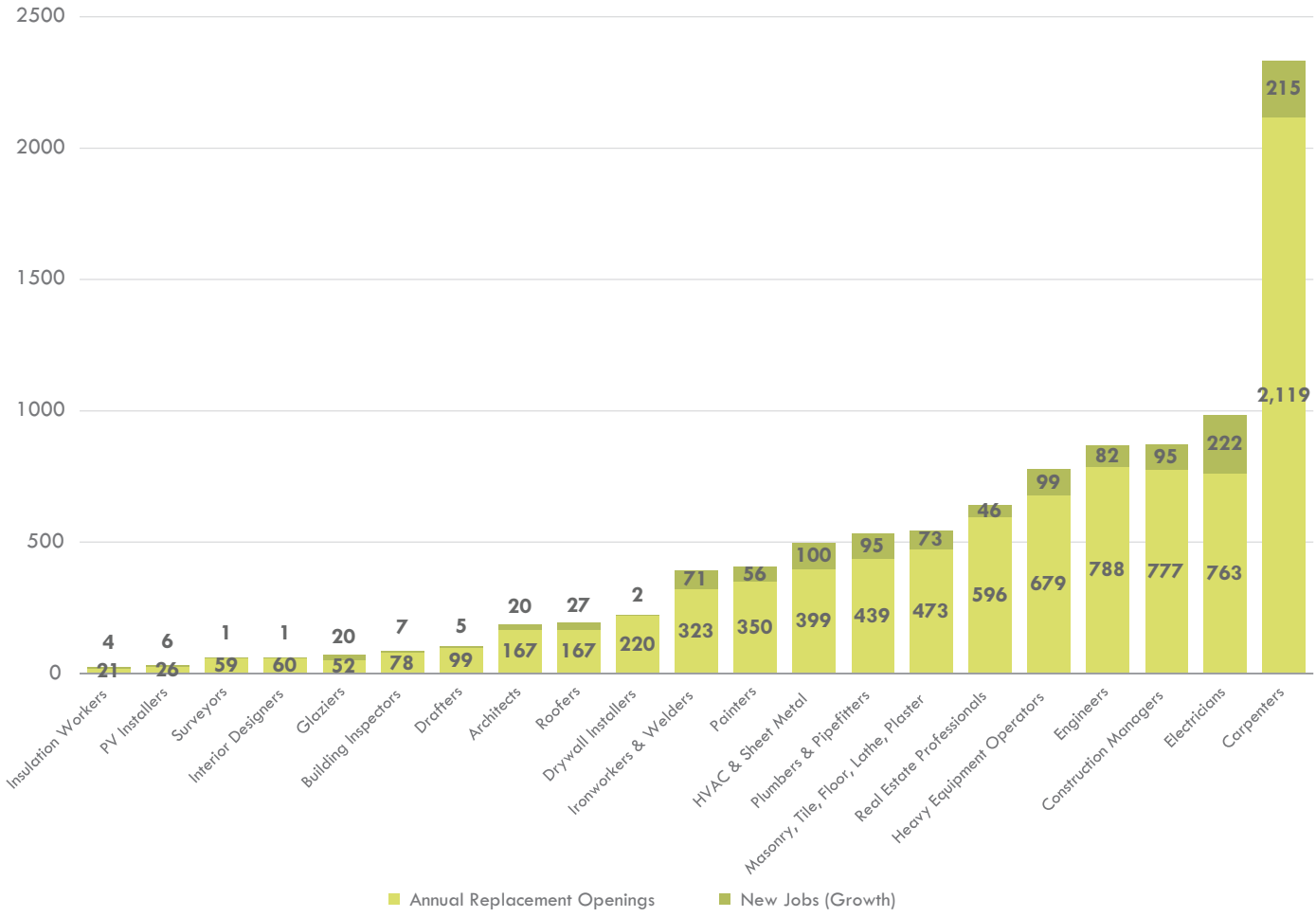
Occupational demand

The categories represented in the following charts represent categories of similar occupations and training programs. (The crosswalk developed for the analysis and sources, as well as the methodology employed for creating the categories, counting and performing calculations to arrive at the estimates can be found in the appendices.)

Not surprisingly, projections of annual openings over the next five years indicate high demand across a range of occupational categories. (The projections are for all industries; some occupational employment is outside the construction clusters.) Most of this demand is due to replacement workers, also called separations, including retirements and movement between occupations. Executive interviews provided a strong indication that retirements represent a large share of the expected replacements. The construction industry employs an aging workforce, and many workers often retire earlier than in other industries due to the physical nature of the work. Carpenters, electricians, construction managers, engineers and heavy equipment operators are projected to have the highest number of total annual openings (Exhibit 38). These categories along with plumbers and pipefitters, and HVAC and sheet metal occupations are anticipated to have the highest number of new positions due to growth.

OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Exhibit 38: Anticipated annual construction industry job openings by new and replacement jobs in the Sacramento region (2016–2021)[59]



[59] EMSI – 2017.3 QCEW, Non-QCEW, Self-Employed.

OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Occupational supply

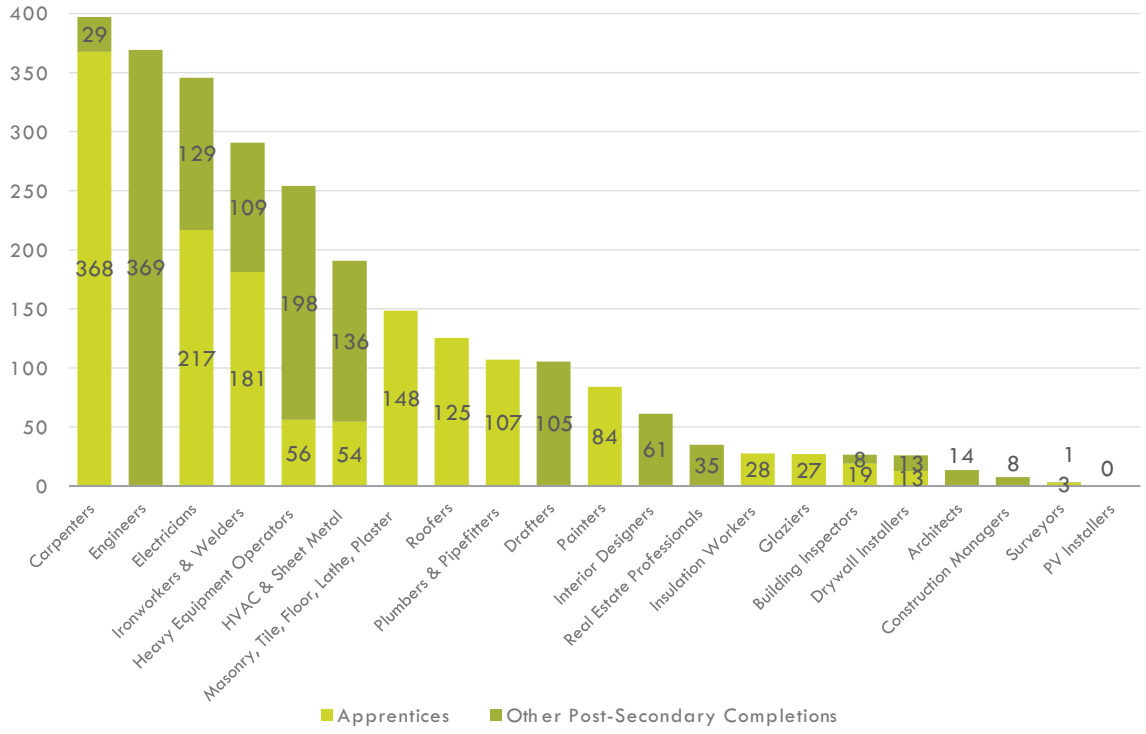
The Sacramento region possesses robust training and education assets to prepare the construction workforce. Local programs prepare hundreds of students on average annually. Using the categories developed in the crosswalk enables an estimate of training supply production. Some categories are served by apprenticeship training programs, such as plumbers and pipefitters; other categories are served by postsecondary institutions, including colleges, universities or other providers. (See the training maps and crosswalk tables in Appendix A). Still other occupational categories—such as HVAC and sheet metal, and electricians—are trained through a blend of apprenticeships and programs offered by other postsecondary training providers. In reality, workers may cross these category boundaries; in a few cases, the same workers may be counted in a similar category. Nonetheless, the categories and counts represent accepted labor market research practices and available data.

The numbers in Exhibit 39 reflect the aggregate numbers of completers of training programs and the number of students entering apprenticeships. The counts in each category combine a range of program types and duration. The range is justified due to a similar range of activity captured in the occupational data. The counts represent the average annual supply of workers in each category by type of education and training—postsecondary (community colleges, universities and private providers) and apprenticeships (union and non-union). The counts do not take into account workers who may enter the market from outside the region or local program participants who leave the region. In addition, the counts do not reflect participants from programs that are not accredited that are offered through community-based organizations, employer-led incumbent worker training or other third-party providers.

Carpenters, engineers, electricians, ironworkers and welders, and heavy equipment operators represent the categories with the largest number of construction workers available to enter the workforce.

OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Exhibit 39: Entering construction industry workers by type of education and training in the Sacramento region (annual average, 2014–2016)[60]



Training and education assets

The Sacramento region is home to a wide array of education and training providers, including apprenticeship programs, community colleges, four-year universities and private training providers. The following maps group training offerings in the Sacramento region by the type and duration of the program, as well as the training provider (apprenticeship or postsecondary program).

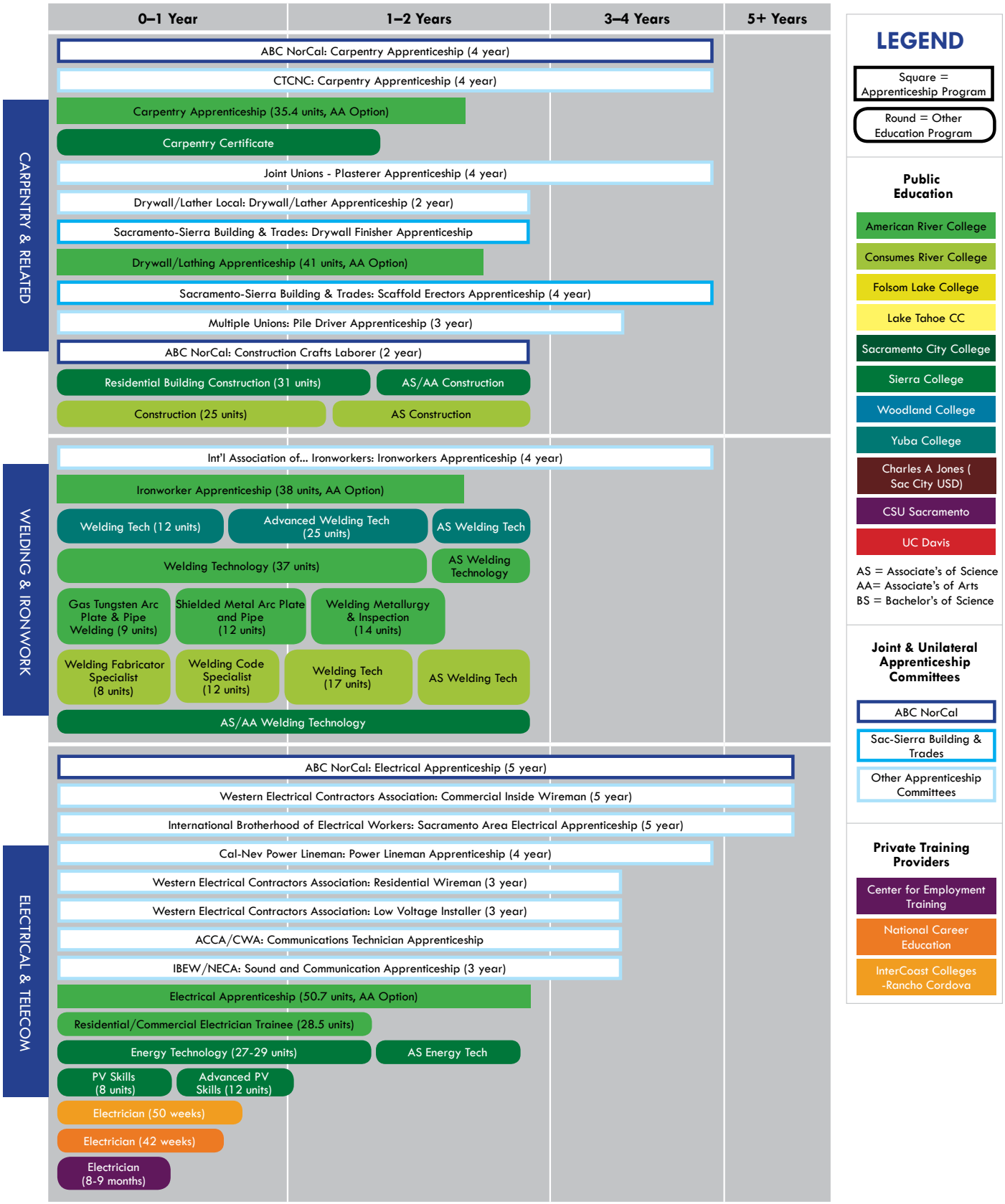
The asset maps reflect the organizations and institutions represented in the supply counts, and mostly reflect the categories in which they were counted. However, due to visual design choices, there are exceptions to the categorization counts (e.g., in the "other" categories). The crosswalk in Appendix A provides the specific methodology used to obtain the counts.

The design indicates training and education pathways, although pathway analysis was not part of the research scope. Program asset maps are organized into two sets of maps—key supports and staple trades (Exhibits 40-42).

[60] EMSI – 2017.3 IPEDS, Division of Apprenticeship Standards (DAS).

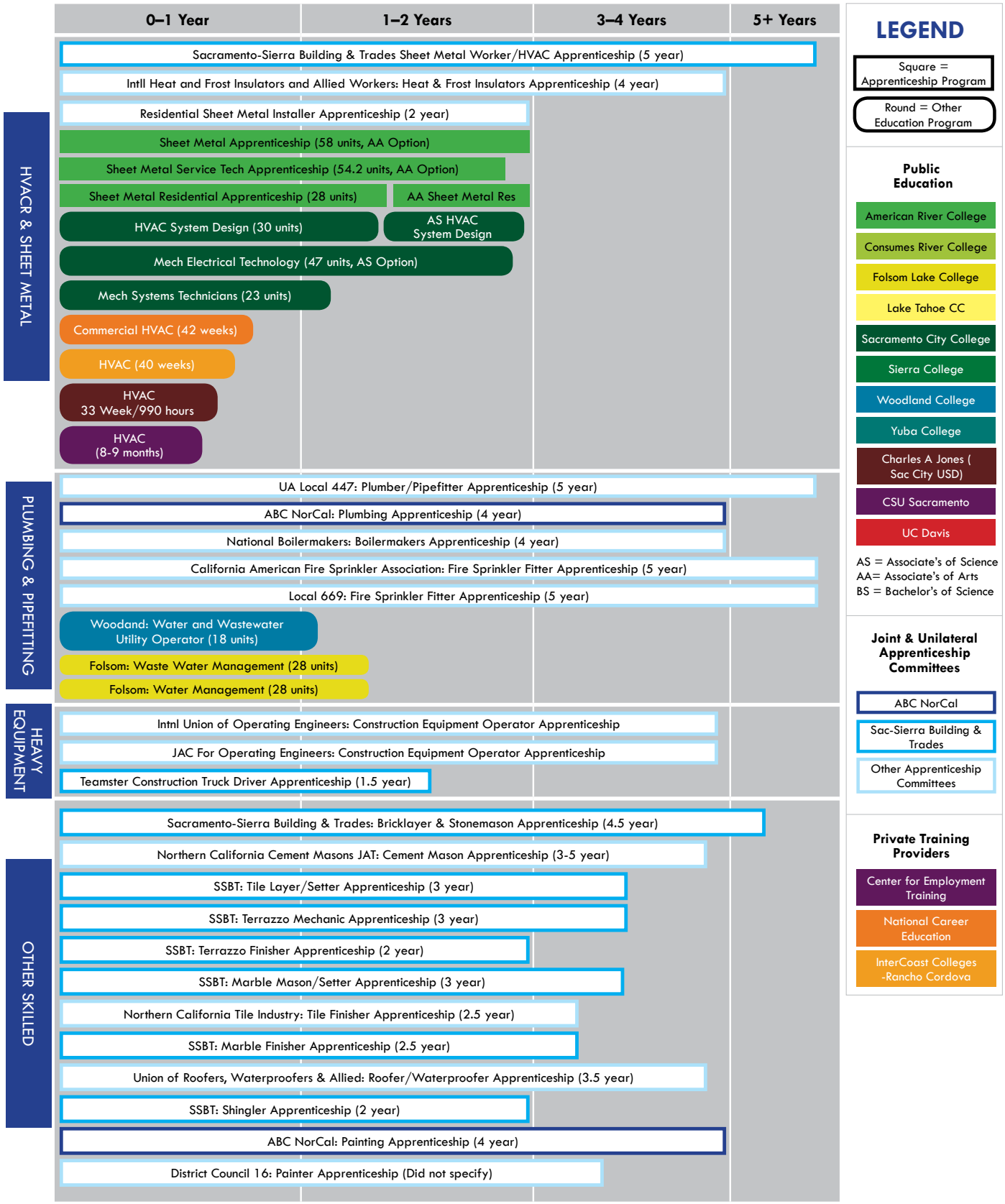
OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Exhibit 40: Sacramento region construction training offerings, staple trades



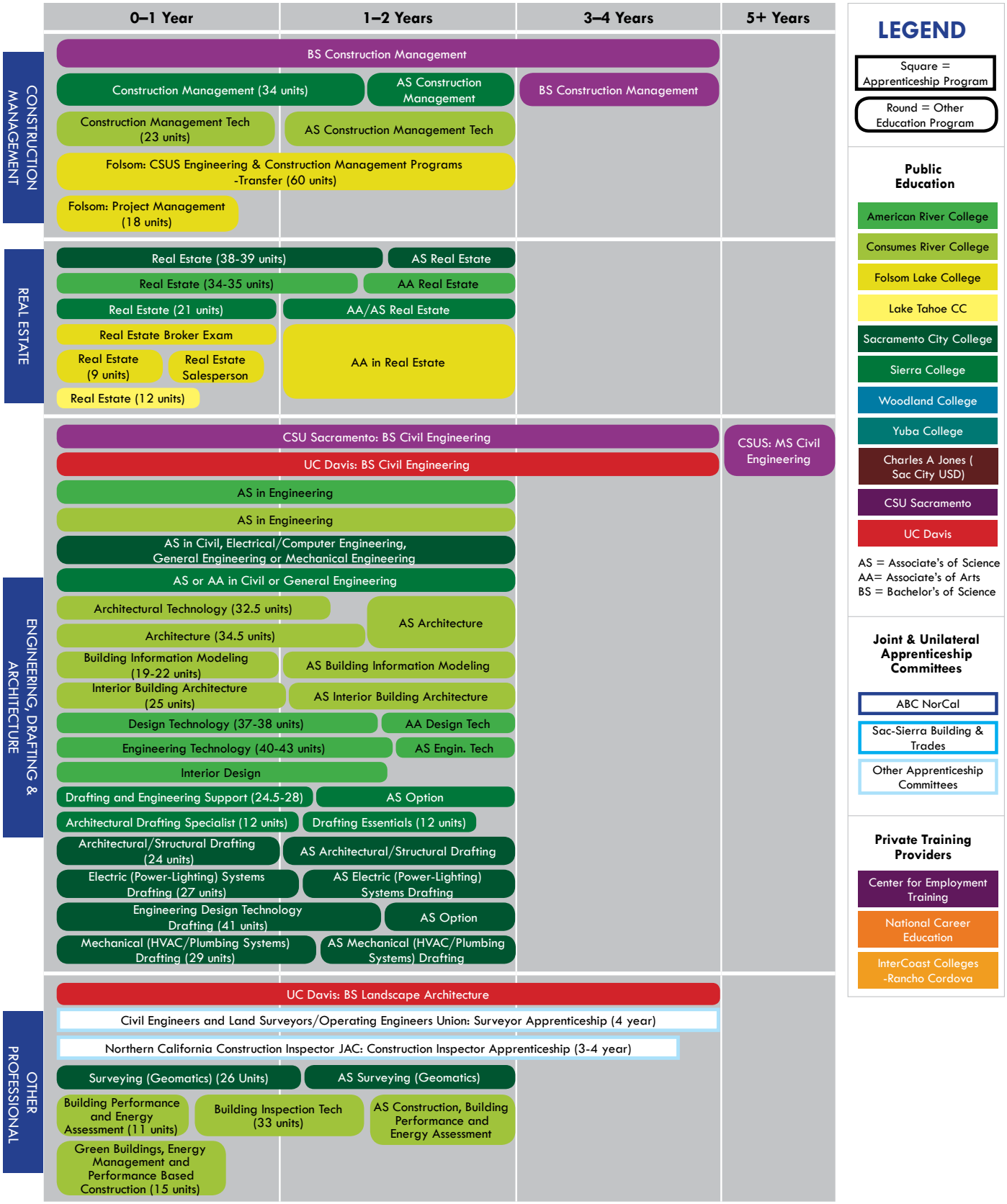
OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Exhibit 41: Sacramento region construction training offerings, staple trades



OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Exhibit 42: Sacramento region construction training offerings, key supports



OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

The study did not explicitly provide training and education pathway analysis linking programs to specific jobs. Instead, the short-term training programs shown previously and pre-apprenticeship training programs identified in the research suggest entry points for pathways. Exhibit 43 highlights key pre-apprenticeship programs identified in the Sacramento region.

Exhibit 43: Pre-apprenticeship programs in the Sacramento region

California Conservation Corps (CCC)
Northern California Construction Training (NCCT)
Sacramento Job Corps
Sacramento Regional Conservation Corps
IBEW/NECA - Sacramento Area Electrical Pre-Apprenticeship
Youth Build
American River College:
Utility Worker Pre-apprenticeship
Construction Pre-apprenticeship
Infrastructure Pre-apprenticeship
Green Technology
Multi-Craft Core Curriculum (MC3) Pre-Apprenticeship
Consumes River College:
Construction Pre-apprenticeship
Sierra College:
Multi-Craft Core Curriculum (MC3) Pre-Apprenticeship

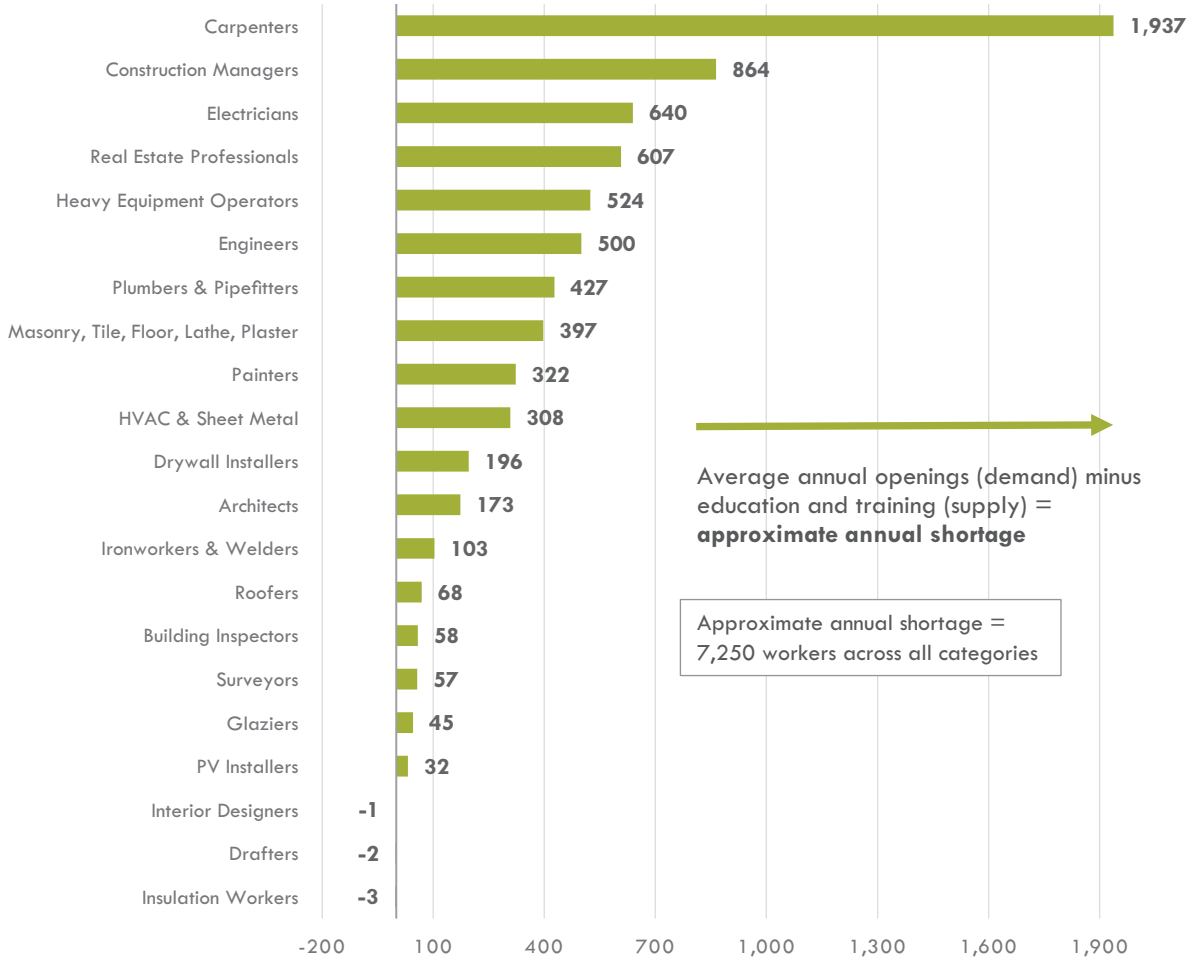
OCCUPATIONAL DEMAND, TRAINING & EDUCATION SUPPLY GAP ANALYSIS

Supply & demand workforce gaps

Measuring the average annual openings (workforce demand) against new entrants to the field (education and training supply) provides key indications for focusing workforce development efforts. Exhibit 44 compares current average annual supply with projected demand in the Sacramento region.

Nearly every category of staple trade and key support is severely undersupplied and expected to continue experiencing troublesome shortages. Data analysis indicates that the region faces a projected shortage of about 7,250 workers annually over the next five years. Many categories show serious differences between supply and demand. The findings and recommendations section offers strategies to address these concerns.

Exhibit 44: Projected annual construction industry occupational gaps in the Sacramento region (2016–2021)[61]



[61] Based on projected annual job openings (including new and replacement jobs), 2016-2021, and current pace of average annual educational program completions and apprenticeship program starts, 2014-2016. Sources: Department of Apprenticeship Standards Apprenticeship Data, EMSI 2017.3 QCEW, Non-QCEW, Self-Employed Data Release of Quarterly Census of Employment and Wages Data, IPEDS.

OCCUPATIONAL GAP IMPACTS ON CLUSTERS

To assist workforce development engagement with employers, the study analyzed occupations by the severity of impact on specific subclusters using staffing patterns and projected annual openings over the next five years (2016-2021). Exhibits 45 and 46 display occupations by the level of severity of the projected shortfall in each subcluster. Similarly, the analysis rated subclusters with a large number of occupations that have gaps or acute gaps for one or more occupations.

The data suggests that pipelayers will be needed in the construction subcluster and water sewage and other systems cluster (Exhibit 45). These subclusters also have projections of a moderate gap for heavy equipment-related occupations for earth moving and site preparation. The occupation of electrical power-line installers and repairers represents the most acute occupational need identified in the traded cluster. The methodology used did not reveal projected gaps for the priority occupations in the construction products or construction materials subclusters, so they were not included.

Exhibit 45: Occupational gap by cluster and subcluster, traded cluster

Most Impacted Subcluster
Moderately Impacted Subcluster
Subcluster w/ Slight Impact

Subcluster column key

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Traded	Construction	49-9051 Electrical Power-Line Installers and Repairers	47-2073 Operating Engineers and Other Construction Equipment Operators	47-2031 Carpenters
			47-2151 Pipelayers	47-2061 Construction Laborers
			47-5021 Earth Drillers, Except Oil and Gas	11-9021 Construction Managers
			53-7032 Excavating and Loading Machine and Dragline Operators	13-1051 Cost Estimators
				47-1011 First-Line Supervisors of Construction Trades and Extraction Workers
				47-2111 Electricians
				49-1011 First-Line Supervisors of Mechanics, Installers, and Repairers
				17-2051 Civil Engineers
				17-2071 Electrical Engineers
				49-3042 Mobile Heavy Equipment Mechanics, Except Engines

Continued

OCCUPATIONAL GAP IMPACTS ON CLUSTERS

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Traded (Continued)	Construction (Continued)			53-3032 Heavy and Tractor-Trailer Truck Drivers 51-4121 Welders, Cutters, Solderers, and Brazers 47-2051 Cement Masons and Concrete Finishers 47-2141 Painters, Construction and Maintenance 47-2231 Solar Photovoltaic Installers
	Water, Sewage and Other Systems		47-2151 Pipelayers	47-2061 Construction Laborers 53-3032 Heavy and Tractor-Trailer Truck Drivers
	Construction Components			53-3032 Heavy and Tractor-Trailer Truck Drivers 47-2044 Tile and Marble Setters

In the non-traded cluster, the specialty contractors subcluster and real estate services subcluster are expected to experience severe occupational shortfalls (Exhibit 46). General contractors, water and sewer line construction, highway and street construction, and concrete products subclusters all have moderate to severe occupational gaps projected. Many of the occupations listed are common among more than one non-traded subcluster. The specialty contractors and general contractors clusters are expected to have major needs for carpenters, laborers, construction managers, cost estimators, and a host of other occupations. Pipelayers and earth drillers represent acute needs in the specialty contractor and water and sewer line construction clusters. Numerous other occupations are projected to have severe and moderate hiring needs. The methodology used did not reveal significant projected shortfalls in the priority occupations studied in concrete products, construction materials wholesaling, construction materials retailing, or building equipment distribution subclusters.

OCCUPATIONAL GAP IMPACTS ON CLUSTERS

Exhibit 46: Occupational gap by cluster and subcluster, non-traded cluster

Most Impacted Subcluster
Moderately Impacted Subcluster
Subcluster w/ Slight Impact

Subcluster column key

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Non-traded	Specialty Contractors	47-2031 Carpenters	47-2081 Drywall and Ceiling Tile Installers	47-4011 Construction and Building Inspectors
		47-2061 Construction Laborers	47-2082 Tapers	47-2231 Solar Photovoltaic Installers
		47-3019 Helpers, Construction Trades, All Other	49-1011 First-Line Supervisors of Mechanics, Installers, and Repairers	47-2181 Roofers
		51-7011 Cabinetmakers and Bench Carpenters	49-9051 Electrical Power-Line Installers and Repairers	
		11-9021 Construction Managers	17-2051 Civil Engineers	
		13-1051 Cost Estimators	17-2071 Electrical Engineers	
		47-1011 First-Line Supervisors of Construction Trades and Extraction Workers	17-2072 Electronics Engineers, Except Computer	
		47-2111 Electricians	17-2141 Mechanical Engineers	
		47-2071 Paving, Surfacing, and Tamping Equipment Operators	17-2199 Engineers, All Other	
		47-2073 Operating Engineers and Other Construction Equipment Operators	17-3023 Electrical and Electronics Engineering Technicians	
		47-2151 Pipelayers	47-2121 Glaziers	
		47-5021 Earth Drillers, Except Oil and Gas	49-3031 Bus and Truck Mechanics and Diesel Engine Specialists	

Continued

OCCUPATIONAL GAP IMPACTS ON CLUSTERS

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Non-traded (Continued)	Specialty Contractors (Continued)	53-7021 Crane and Tower Operators	49-3042 Mobile Heavy Equipment Mechanics, Except Engines	
		53-7032 Excavating and Loading Machine and Dragline Operators	53-1031 First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	
		47-2211 Sheet Metal Workers	53-3032 Heavy and Tractor-Trailer Truck Drivers	
		49-9021 Heating, Air Conditioning, and Refrigeration Mechanics and Installers	47-2171 Reinforcing Iron and Rebar Workers	
		47-2021 Brickmasons and Blockmasons	47-2221 Structural Iron and Steel Workers	
		47-2022 Stonemasons	51-2041 Structural Metal Fabricators and Fitters	
		47-2041 Carpet Installers	51-4121 Welders, Cutters, Solderers, and Brazers	
		47-2042 Floor Layers, Except Carpet, Wood, and Hard Tiles		
		47-2043 Floor Sanders and Finishers		
		47-2044 Tile and Marble Setters		
		47-2051 Cement Masons and Concrete Finishers		
		47-2053 Terrazzo Workers and Finishers		
		47-2161 Plasterers and Stucco Masons		
		47-3011 Helpers—Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters		
		47-2141 Painters, Construction and Maintenance		

Continued

OCCUPATIONAL GAP IMPACTS ON CLUSTERS

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Non-traded (Continued)	Specialty Contractors (Continued)	47-3014 Helpers—Painters, Paperhangers, Plasterers, and Stucco Masons 47-2152 Plumbers, Pipefitters, and Steamfitters		
	General Contractors	47-2031 Carpenters 47-2061 Construction Laborers 11-9021 Construction Managers 13-1051 Cost Estimators 47-1011 First-Line Supervisors of Construction Trades and Extraction Workers	11-9041 Architectural and Engineering Managers 17-1011 Architects, Except Landscape and Naval 47-2111 Electricians 17-2051 Civil Engineers 47-2073 Operating Engineers and Other Construction Equipment Operators 47-2151 Pipelayers 49-3042 Mobile Heavy Equipment Mechanics, Except Engines 53-7032 Excavating and Loading Machine and Dragline Operators 47-2211 Sheet Metal Workers 49-9021 Heating, Air Conditioning, and Refrigeration Mechanics and Installers 47-2021 Brickmasons and Blockmasons 47-2022 Stonemasons 47-2041 Carpet Installers	47-4011 Construction and Building Inspectors 47-2081 Drywall and Ceiling Tile Installers 47-2082 Tapers 47-2171 Reinforcing Iron and Rebar Workers 47-2221 Structural Iron and Steel Workers 51-2041 Structural Metal Fabricators and Fitters 51-4121 Welders, Cutters, Solderers, and Brazers 47-2161 Plasterers and Stucco Masons 47-3011 Helpers—Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters 41-9022 Real Estate Sales Agents

Continued

OCCUPATIONAL GAP IMPACTS ON CLUSTERS

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Non-traded (Continued)	General Contractors (Continued)		47-2042 Floor Layers, Except Carpet, Wood, and Hard Tiles 47-2044 Tile and Marble Setters 47-2051 Cement Masons and Concrete Finishers 47-2141 Painters, Construction and Maintenance 47-2152 Plumbers, Pipefitters, and Steamfitters	
	Real Estate Services	11-9141 Property, Real Estate, and Community Association Managers 13-2021 Appraisers and Assessors of Real Estate 41-9021 Real Estate Brokers 41-9022 Real Estate Sales Agents	51-8021 Stationary Engineers and Boiler Operators	47-4011 Construction and Building Inspectors
	Water and Sewer Line Construction	47-2151 Pipelayers 47-5021 Earth Drillers, Except Oil and Gas	47-2031 Carpenters 47-2061 Construction Laborers 11-9021 Construction Managers 13-1051 Cost Estimators 47-1011 First-Line Supervisors of Construction Trades and Extraction Workers 49-3042 Mobile Heavy Equipment Mechanics, Except Engines 53-7032 Excavating and Loading Machine and Dragline Operators	51-4121 Welders, Cutters, Solderers, and Brazers 47-2051 Cement Masons and Concrete Finishers 47-2152 Plumbers, Pipefitters, and Steamfitters

Continued

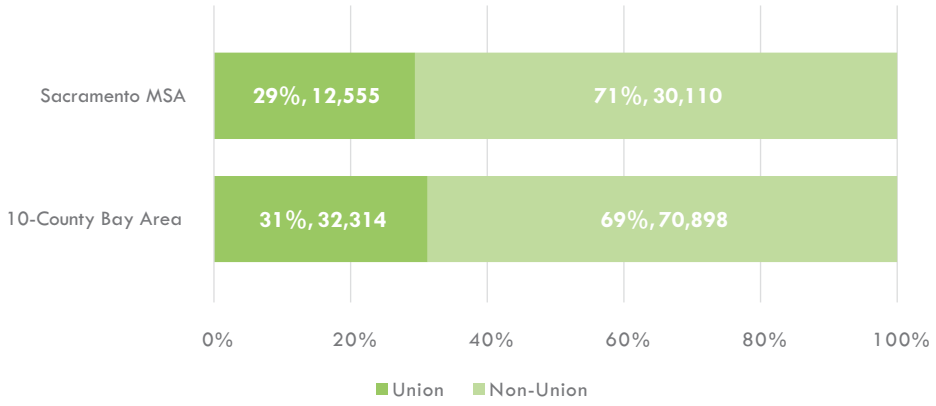
OCCUPATIONAL GAP IMPACTS ON CLUSTERS

Cluster	Subcluster	Occupations in subcluster w/ severe gap	Occupations in subcluster w/ moderate gap	Occupations in subcluster w/ slight gap
Non-traded (Continued)	**Highway and Street Construction**		47-2031 Carpenters 47-2061 Construction Laborers 11-9021 Construction Managers 13-1051 Cost Estimators 47-1011 First-Line Supervisors of Construction Trades and Extraction Workers 49-3042 Mobile Heavy Equipment Mechanics, Except Engines 53-7032 Excavating and Loading Machine and Dragline Operators 53-3032 Heavy and Tractor-Trailer Truck Drivers	47-2051 Cement Masons and Concrete Finishers
	Concrete Products		53-3032 Heavy and Tractor-Trailer Truck Drivers	
	Developers			11-9141 Property, Real Estate, and Community Association Managers

UNIONIZED CONSTRUCTION WORKFORCE

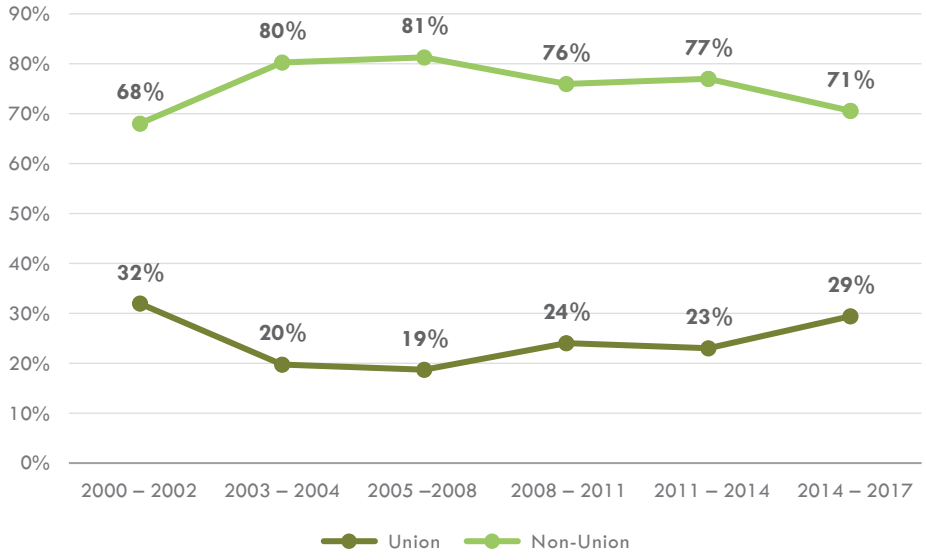
The rates of residents reporting union memberships in the Bay Area and the Sacramento region are nearly identical (Exhibit 47). Unionized members represent a third of the construction workforce in both regions.

Exhibit 47: Unionized and non-unionized workforce, Sacramento—Arden-Arcade—Roseville MSA and 10-county Bay Area (annual average, 2014–2017)[62]



Unionized workers in the construction industry increased by 10% during the last 10 years and increased more than 5% during the last three years in the Sacramento metropolitan statistical area (Exhibit 48). The most recent unionization rates are lower than rates in the early 2000s.

Exhibit 48: Unionization in the construction workforce as an annual average percent of total employment, Sacramento—Arden-Arcade—Roseville MSA (2000–2017)[63]



[62] U.S. Census Bureau, Current Population Survey. Note, the Sacramento—Roseville—Arden-Arcade MSA consists of El Dorado, Placer, Sacramento and Yolo counties.

[63] Ibid. Note: historical data has some inconsistencies in the way the data is categorized. The chart presents the data for which annual averages are comparable.

EXECUTIVE INTERVIEW FINDINGS

The COE study team conducted 12, one-hour executive interviews in March and April 2017. Interviewees provided a cross section of the industry, representing union and non-union industry associations and contractors; the study team also sought companies from a range of crafts (mechanical, electrical, plumbing, property management), and types of construction (public works projects, small commercial, large industrial and residential construction). The interviews sought to better understand the major market and policy issues facing the industry and its workforce in the months and years to come.

The interviews revealed some common findings and themes which are outlined below. These themes inform the overall findings and recommendations of the study.

Regional development challenges and opportunities

- The Golden 1 Center was widely cited as a catalyst for wider downtown development. Interviewees discussed multiple downtown projects that will continue to impact the construction industry and its workforce. These include:
  - Railyards
  - R Street corridor
  - Convention Center and associated developments
  - Community Center Theater and Memorial Auditorium
  - Downtown Commons (DoCo)
  - Numerous mixed use, high-density infill development in downtown Sacramento and West Sacramento
- Many projects were cited as having the potential for ongoing construction contracts in the region. These include:
  - Roseville area construction, including the Adventist Health campus
  - Sacramento County Courthouse
  - Wilton Rancheria in Elk Grove, and associated hotels, convention center
  - Water treatment plants in Stockton, Elk Grove, Sacramento County
  - School district construction bonds across the region
  - Residential development in Roseville, Rancho Cordova, Elk Grove, Placer County
  - CalTrans road and bridge projects
  - Repairs to the Oroville dam
  - Industrial food and agricultural facilities
  - Health care and pharmaceuticals (hospitals and processing facilities)
  - Custom homes and remodeling
- Several employers indicated they are booked out 6-12 months for projects and anticipate demand beyond the near term.
- Local quarries enable robust supply for the concrete, ready-mix and pre-fab concrete industries.

Regional construction companies partner and contract locally

- Large national and multinational companies have local offices and use local subcontractors—the number of local contractors and local workers vary by project.
- Many interviewees suggested that even large public works, commercial and infrastructure projects that are served by out-of-area general contractors have a sizeable local contractor presence to complete the work.
- As the market improved during the recovery, one interviewee commented that the effect was for many contractors to stay local for projects; fewer contractors from out of the area sought bids locally.
- Contractors achieve efficiencies by working with local partners with whom they have relationships and who have relationships with local regulatory officials.

EXECUTIVE INTERVIEW FINDINGS

- The Sacramento region is home to a diverse range of design and engineering firms, general contractors and specialty contractors, and wholesale suppliers who have the capacity to facilitate many types of projects, including public works, infrastructure, hospital, municipal, school, single-family residential and multifamily housing projects. The interviewed firms all reported having extensive local contractual relationships within the region.

Talent gap, workforce shortages and recruitment

- Many interviewees cite using staffing agencies and head hunters to recruit candidates. They also use job fairs, recruiting events and word of mouth.
- Employer associations and some employers report a willingness to engage with workforce intermediaries and education and training programs. Some have formalized recruitment and outreach programs to market the construction industry. Some sponsor and participate in extracurricular activities like design competitions, recruitment and job fairs, classroom presentations, summer academies and internships.
- Many interviewees remarked that employers were "stealing" workers from other firms to complete projects.
- Others cited the pull from Bay Area wages as a contributing factor to the labor shortage; one interviewee cited success recruiting commuters back to the Sacramento area, even though it meant taking a pay cut.
- Several employers cited delays in starting and completing projects due to labor shortages. They similarly cited cost overruns, quality control problems, and safety concerns with the lack of a ready, trained workforce.
- Every interviewee who responded to the question on temporary or contract workers remarked that they strongly preferred to bring someone on full time and to keep them. None reported using more than a few temporary workers.
- A few interviewees discussed the seasonality of projects, that work slows down with inclement weather. They noted that hiring can pick up again with the arrival of spring and summer months.

Workforce pathways and pipelines

- Many interviewees reported a general lack of mid-level, skilled candidates with three to nine years of experience. Many attributed the gap to the severe reduction of entrants into construction training programs and apprenticeships during the recession. One union official agreed, saying that longer-term, commercial-oriented apprenticeships have not had sufficient completers to meet demand; the representative suggested that shorter apprenticeships (typically for residential applications) have adequate completions to meet demand.
- With the lack of available skilled labor, several employers indicate they are starting or reigniting internal programs for training entry-level workers. Some seek partnerships with workforce intermediaries and publicly-funded workforce training programs to broaden their recruitment and training sources.
- Most interviewees expressed concern that ongoing retirements pose a challenge. Many interviewees recalled how the recession accelerated a wave of retirements that contributed to the contraction of the workforce pipeline alongside declining training and education enrollments for construction-related programs.
- There are a number of pre-apprenticeship programs at local community colleges to prepare students to enter apprenticeships: multi-craft core curriculum (MC3) at American River College, Cosumnes River College; National Center for Construction Education and Research (NCCER) in West Sacramento and Fruitridge; and Association of Builders and Contractors (ABC) Nor Cal. Some of these programs target special populations—ex-offenders, veterans and low-income groups through intermediaries. The Sacramento Employment and Training Agency (SETA) uses funding from Proposition 39 to encourage MC3 training at American River College.
- Some employers report successfully recruiting interns from high schools, community colleges and four-year universities, and some interns go on to become full-time employees. Some of these recruitments are ad hoc, others

result from ongoing networking. Sacramento State University's Construction Management program was the most often cited program that resulted in internships and hires. Other institutional relationships include:

- Chico State Construction Management
- Sacramento City College Mechanical Electrical Technology
- Welding programs at American River College, Sierra College, Butte College
- Cosumnes River College Construction
- American River College Pre-Apprenticeship
- Rio Americano High School
- Sheldon High School
- Elk Grove High School
- Burbank High School
- Center for Employment Training
- National Center for Construction Education and Research (NCCER)

- The interviewees nearly all expressed concern regarding the historical disinvestment in industrial arts programs in the public schools. They expressed concern that a shift toward four-year degrees detracted from the construction industry as a viable career path, and that the lack of preparation of basic skills meant that employers or postsecondary programs were left to provide preparatory training. Some acknowledged recent efforts to create pathways between high schools and community colleges, and between high schools and apprenticeships.
- Several unionized and non-unionized interviewees noted the necessity of keeping projects local to foster a local workforce pipeline.
- One interviewee commented that projects can be rapidly halted in a market downturn, even after permits have been issued.
- Though several interviewees commented on the length of the economic recovery and market cycle, none expressed pressing concerns about an impending downturn. One interviewee remarked that the workforce training and education system has never adequately addressed the cycles of the construction industry.

Regional workforce stakeholder connectivity

- Even though most interviewees acknowledged the importance of school partnerships for recruitment, only a few whose mission it is to make such connections reported ongoing engagement with education and training programs. Several employers perceive a lack of systematic connectivity between regional leadership organizations, schools and employers. Most employers remarked that they did not know where to go to connect with the education system. Those who had dedicated efforts suggested the regional array of stakeholders challenged their efforts—these interviewees experienced uneven and disorganized outreach.

EXECUTIVE INTERVIEW FINDINGS

Hard-to-fill positions

- Interviewees suggest that any skilled trade presents a challenge to fill. Positions that were cited include:
  - HVAC and sheet metal workers
  - Low-voltage technicians
  - Pre-fab manufacturing workers
  - Welders
  - Plumbers and pipefitters
  - Solar installers
  - Journey-level electricians
  - Estimators
  - CAD drafting
- Construction managers (Project engineers, superintendents and foremen) represent an especially acute area of need for many interviewees.
- A few interviewees cited hiring challenges across the board, but noted that finding entry-level workers in the residential construction industry represented a major pain point.

Unionized and non-unionized contractors

- Interviewees generally suggested that the size and type of a project determined the prevalence of unionized contractors on a job. Large projects and project type (for example, public works projects which require prevailing wages) often encourage unionized contractor bids. Union representatives and a couple non-unionized contractors indicated that some general contractors will be willing to spend premiums for specialized contracts for which they have reliable, known unionized partners.
- A few interviewees remarked that they have partnerships with unionized contractors and non-unionized contractors.
- Interviewees affiliated with unions said that competing in the residential market is challenged by low bids and insurance requirements.

Project labor agreements (PLAs) and community workforce agreements

- Some regional stakeholders view the PLA and community workforce agreement (local hire, low income and barrier eligibility criteria) connected to contracts for the Golden 1 Center as a beneficial and scalable model that had measurable impacts for program participants and regional workforce connectivity. More than one interviewee suggested that the process created new relationships between unions, workforce intermediaries, employers and other stakeholders that can serve as a foundation to create new community workforce agreements.
- Others voiced concerns that the agreements prevented many contractors from bidding, who are not able to meet the requirements for the contract. These critics suggest that the policies block small, non-unionized businesses from the bidding process, and the policies ultimately hurt the local economy and employers.

Building complexity and technology trends

- Design-build approaches, automated, remote-building systems, and 3D computer modeling, among other technology and practices, require workers with capabilities and skills to address multiple buildings systems at once. A few interviewees remarked that workers with a broad range of skills that can address integrated building approaches, multiple building systems, and policies and incentives are valuable and hard to find. They also indicated that these trends challenge the capacity of an already impacted construction workforce, whose existing workers are stretched thin.

EXECUTIVE INTERVIEW FINDINGS

Regulatory challenges and environmental policies

- Several interviewees suggested that increasing complexity and a need for systems thinking carries over into regulatory issues. They suggest that increasing requirements from the federal and state government, and jurisdictional variation, continue to challenge staff. Most suggested that new regulatory requirements continually burden staff; some appear to navigate new regulations well; others report having to rely heavily on subcontractors with expertise in regulatory compliance.
- With a few exceptions, interviewees remarked that environmental policies had not, by themselves, caused a significant need for retraining. Many lumped in environmental regulations (for example, CalGreen requirements in Title 24 mandates) with other regulations they currently navigate. Several suggested that environmental practices (for example, energy efficiency) had already been normalized into standard construction practices. They acknowledged the wider benefit of enacting these policies, but grouped the policies in with other regulations that they perceived as challenging a standard way of doing projects and adding costs.
- A few interviewees acknowledged efforts to streamline permitting in some jurisdictions.
- One interviewee mentioned the California Advanced Lighting Controls Training Program (CALCTP). Another interviewee remarked on challenges to finding qualified training providers to meet energy-efficiency code requirements related to the Acceptance Test Technician (ATT) for lighting in non-commercial buildings.
- Several interviewees cited the Office of Statewide Health and Planning Development (OSHPD) as presenting burdensome regulatory challenges for constructing hospitals.

SUMMARY REPORT FINDINGS

The report is intended to serve as a reference for regional stakeholder action planning. The section below summarizes the main findings from each section of the report.

Market indicators

- The impact of the recession that began in the late 2000s has cast a long shadow on the construction industry in California and its regions. Overall, value added has not returned to pre-recession levels. Residential construction, especially, was hard hit.
- Nonresidential construction is largely responsible for a return of investment and projects; public works, transportation, educational buildings and commercial buildings represent the subcomponents with the largest change in California between 2006 and 2016. Nonresidential construction value added in California in 2015 and 2016 surpassed the peak of investment in 2006 and 2007. The American Recovery and Reinvestment Act (ARRA) and other factors, such as lower cost municipal bonds, shored up nonresidential construction recovery after the recession nationally and in California. The share of infrastructure spending declined in 2016 to historical norms, about 13% of all nonresidential investment. Nonresidential construction appears to have returned to pre-recession levels in the Sacramento region, but only in the latest year of available data, 2016. Much of the investment is in Sacramento County, in an apparent shift of projects to the urban core.
- Residential construction represents a troubling phenomenon for the state and the region. The share of residential investment for the state is far lower than it was in the first half of the 2000s. Analysis of regional permit data, housing supply data and population data indicates housing is woefully undersupplied in the region. Perhaps surprisingly, the share of residential housing that is multifamily housing is 12% lower than it was 10 years ago in the Sacramento region.

Regional cluster opportunity areas

- The Sacramento region demonstrates impressive competitive metrics in the traded cluster, export-oriented industries that bring investment into the region from outside. The region shows a net gain in jobs since pre-recession levels; this trend is not shared by the Bay Area or California, which showed net job losses. While employment levels in the Sacramento region are not large, the data suggests the region possesses competitive advantage with respect to water distribution, treatment, conveyance and irrigation systems; public works and utilities play a strong role. SMUD, along with water and irrigation districts and agencies, represent special areas for focus. Some industries and companies in the construction components subcluster also merit attention for their competitive metric, including companies that produce stucco, tile and stone components.
- The non-traded, locally-serving cluster was hard hit by the recession in the Bay Area, the Sacramento region and the state as a whole. The Sacramento region was hardest hit among these three geographies, showing a contraction of more than 20% of its non-traded construction workforce between 2006 and 2016. Still, employment levels in the Sacramento region have grown by 20,000 jobs since 2011, and the region shows an above-average employment concentration, higher than the Bay Area and California. Specialty contractors and general contractors represent the largest subclusters in the region. Though showing overall contraction, there are bright spots at the industry level including plumbing, heating and air conditioning contractors, electrical contractors, framing contractors, new multifamily housing construction and residential remodeling. Following the story of water-related construction opportunities in the traded cluster, the water and sewer line construction subcluster has returned to pre-recession levels in the Sacramento region. Building equipment and distribution, and concrete products represent two non-traded subclusters that recovered most of their employment.

- Lower earnings pose a special challenge for the Sacramento region's construction workforce. Sacramento's regional earnings are lower than the Bay Area and the state. The Sacramento region has a lower cost of living than the Bay Area, but the housing shortage poses concerns for workforce housing and pricing pressures overall. The upward pressure on prices has not resulted in higher earnings for most industries studied. Employer representatives confirm that recruitment and retention is highly challenging, with some employers stealing employees from competitors, and others citing employment losses to the Bay Area and other industries.

Economic impacts

- For every job created in the construction cluster in the Sacramento region, 1.2 jobs are created elsewhere in the economy as a result of supplier relationships and employee spending. Considering all the direct and multiplier effects, the construction cluster contributes about $34.8 billion in industry output, 221,300 jobs and $17.4 billion in labor income to the Sacramento region.

Education and occupational gaps

- The Sacramento region is home to an array of training and education assets that serve the construction cluster. The community colleges provide programs in construction, welding, electrical, HVAC, solar photovoltaics (PV), drafting and architecture, engineering, building inspection, pre-apprenticeship and construction management. Four-year universities provide construction management, facilities management and engineering programs. A variety of union and non-union apprenticeship programs serves the region and beyond. Private training providers offer electrical and HVAC programs. The report provides data on private training providers, but the list is not exhaustive. The report did not investigate regional high school programs or adult schools. Similarly, the research did not examine employer-led training programs.
- The report provides metrics that account for the "supply" of eligible workers and uses apprenticeship starts, and training and education completions to make the estimation. On the employment demand side, occupational annual openings due to new job growth, separations and replacements account for the demand. Taking both these metrics into account, the region is woefully undersupplied in terms of the number of skilled workers available. There is a projected shortage of about 7,250 workers in the cluster annually over the next five years, including a shortfall of nearly 2,000 carpenters, 860 construction managers, 640 electricians, 600 real estate professionals, 520 heavy equipment operators and 500 engineers.
- Executive interviews indicate the workforce shortage poses a critical concern for the region and the industry. Executive interviews highlight not only challenges for new entrants to the field, but an especially acute shortage of mid-level workers who possess three to nine years of experience. There was universal agreement that the workforce shortage is causing project delays and adding costs for numerous reasons. While some employers choose to recruit employees from competitors, others have revived internal training programs that existed prior to the recession and have sought partnerships with schools and workforce intermediaries for recruitment and training.
- Subcluster analysis reveals occupational pain points. The report highlights these occupations by subcluster and level of severity in the shortage. The occupations with the largest shortages include pipelaying, heavy equipment operation and earth moving, drilling, staple trades (carpenters, electricians, estimators, sheet metal workers, HVAC installers and mechanics, welders, painters, tile and floor workers), architects and engineers, stationary engineers, real estate service providers, and construction managers. The occupations most in need are specific and narrow in a few subclusters. For most, there is a widespread, general shortage in the traditional construction trades.

RECOMMENDATIONS

Recommendations emphasize building regional coordination capacity for near-term tactical efforts, and long-term strategic planning for workforce development and industry-supporting public policy that increases building supply and provides high road employment.

Policymakers, workforce and economic development stakeholders should target high-performing and at-risk cluster industries for developing policy and investment strategies.

High-performing subclusters in the traded cluster in the Sacramento region include construction, construction materials, and water, sewage and other systems. These represent areas deserving attention from economic and workforce developers. The industries in these subclusters have demonstrated employment growth, a high concentration of employment over time, high annual earnings and earnings growth. The industries in these subclusters generate a disproportionate amount of wealth in the region, though employment levels are low.

While the recession's impact on the non-traded cluster was extreme, the region cannot succeed in meeting its population and development prerogatives without a robust, locally-serving industry. Many industries demonstrate bright spots, having successfully recovered to pre-recession levels. Others have struggled, but their importance in the region remains. Many industries serving the cluster merit attention from regional workforce and economic development stakeholders for economic and business development strategies, and as key partners in meeting regional building needs. Successful industries in the subclusters can provide key partners to help address workforce and equity goals in the region.

Link construction workforce development strategies to other policy agendas for increasing building supply.

The availability of a skilled workforce has a direct impact on the ability of the construction cluster to increase the supply of housing and other projects to meet regional population and economic development needs. Strengthening the region's skilled workforce should be at the forefront of industry and public-sector priorities for long-term investment. Connecting workforce development stakeholders to those working on other regional and state policy agendas concerned with supporting housing affordability, infrastructure development, economic development, and streamlining permitting and code requirements is of primary importance. Stakeholders should engage, promote, and invest in regional employers who sponsor innovative and successful workforce partnerships that lead to placement into middle-skill jobs, wage gains for incumbent workers, and program development that supports cluster-wide efforts.

Reinforce and streamline convening capacity and approaches between target industry employers and workforce development stakeholders.

Many employer partners interviewed for the study said they did not know whom to contact in the workforce system to address hiring and training needs. Others voiced a perception that workforce stakeholders are disorganized, holding dozens of advisory meetings for individual education and training providers. Some efforts, such as Align Capital Region and the Valley Vision Next Economy initiative, seek to address these concerns. Industry associations, such as the Sacramento Builders' Exchange and the North State Building Industry Association, have staff capacity for employer-school engagement. These efforts may need additional, specific regional capacity to address the scale of the construction cluster's workforce challenges. Stakeholders should first agree on a framework for engagement and the staff capacity needed to engage on an ongoing basis.

Support off-the-shelf, rapid-deployment workforce tactics to address workforce shortages in the near term; identify slack in the existing system to boost enrollments.

Coordinated regional efforts will rapidly deploy off-the-shelf programs and identify existing slack in the education and

training system for opportunities to add program participants for a near-term approach. Coordination capacity should seek to support employer-led training programs, community-based programs, high school and adult education programs, preparatory programs and private training providers with additional capacity for recruitment and program development. Existing pre-apprenticeship programs or other curricula may offer resources that can be quickly adopted.

Medium- and long-term planning should use cluster methods to develop measurable performance goals for workforce training feedback.

Medium- and long-term planning and program development will involve multi-year strategic efforts that engage regional stakeholders systematically and regularly. Engagement efforts can use the cluster research in this report as a touchstone for creating engagement strategies to organize partner participation and address specific needs for jobs and skills. These efforts will establish goals for program investment and track specific areas for targeted investment with performance metrics for student enrollment, completion, credentialing, job placement and promotion. Engagement should emphasize employer feedback and strive to leverage existing partnerships and reduce overlap. These efforts should align with workforce policy goals from the community colleges, adult education providers, federal and state workforce development agencies, the City of Sacramento and regional conveners, such as Valley Vision and Align Capital Region.

Medium- and long-term planning should emphasize pipeline and pathway development.

Pipeline program development will involve addressing recruitment and progressive stages of training, from career exploration to upskilling opportunities for journey-level technicians in the field. Regional pre-apprenticeship programs, employer-led primary and secondary school outreach, and after-school and summer programs are building blocks that can support these activities. Increasing capacity and participation in existing, successful programs merits consideration for investment.

The program mapping conducted by the cluster research team provides a starting point for further research and regional action planning to identify existing and potential areas. Several pathways already exist, but further research is needed to identify more pathways. Existing and past efforts, including the regional California Career Pathways Trust program and Guided Pathways may provide a foundation for these efforts. The Career Ladders Project can provide resources and serves as a model for conducting regional pathway mapping and planning.

Planning and development should take the economic cycle into account.

The previous economic cycles in the region and nation can inform near-term and long-term planning. Further research should explore case studies and best practices with respect to building a flexible construction workforce infrastructure capable of absorbing and retraining workers during economic downturns. The system also must be able to recruit, train and supply the workforce when the market is strong and labor shortages become a concern.

Use education mapping and occupational gap analysis for cluster engagement and partnership development.

The occupational gap impacts on subclusters presented in this study provide a starting point for engaging employers to develop workforce strategies and planning. Regional stakeholders and employer partners should verify and add to key targets. Education and training stakeholders should collaborate to plan investments, coordinate training and recruitment, and marketing, for example. The education asset map in this report can be used to identify areas where additional programs are warranted. Some areas identified through the gap analysis and targeted subcluster occupational gap analysis that deserve attention include construction management, utility-scale electricians, heavy equipment operators and numerous staple trades.

APPENDIX A: METHODOLOGY NOTES

Methodology for cluster analysis and priority occupation list

The cluster methodology draws on the U.S. Cluster Mapping Project, a partnership between Michael Porter at the Institute for Strategy and Competitiveness at Harvard University and the U.S. Economic Development Administration. Counts and calculations in the report are based on the lists of NAICS codes published by the Cluster Mapping Project.[64] The baseline traded and non-traded clusters published there result from measurements of the relationship between industries (input-output analysis, occupational analysis and co-location measurements), to determine groupings of industries that are similar, and that share common resources, such as labor (training and skills), or other externalities. The method enables a more complete picture of the areas where the Sacramento region possesses competitive advantage, and what overall economic impact comes from industries with strong connectivity.

The research team used the NAICS cluster definitions to perform a scoring of the industries in the traded and local clusters according to a number of variables. The scoring methods borrowed on the Regional Industry Clusters of Opportunity (RICO) methods developed by Collaborative Economics and the California Economic Strategy Panel.[65] Scored variables included:

- Total employment (2016)
- Employment annual adjusted growth rate (2006-2016)
- Employment projected annual adjusted growth rate (2016-2021)
- Total average earnings (2016)
- Total average earnings growth rate (2006-2016)
- Location quotient (2016)
- Location quotient growth rate (2006-2016)
- Location quotient projected growth rate (2016-2021)

The team designated scoring thresholds for each variable and then added a simple score for each variable that met or exceeded the threshold. A maximum score of eight was possible. Low scoring industries were eliminated for performing staffing patterns.

Staffing patterns for the priority list of industries were performed for each traded and non-traded subcluster. Then, the team scored the occupations to prioritize a list of occupations based on the following metrics:

- Number of subclusters in which the occupation appears
- Total number of employed workers in the occupation for all cluster industries (2016)
- Median hourly occupational earnings (2016)
- Whether the occupation is categorized as middle skill or above (based on education and experience required)

Using these methods, the team prioritized a list of occupations. The priority list of occupations was then used as the basis for the following crosswalk for the supply-demand gap analysis.

Methodology for occupational demand: Training and education supply gap analysis

Identifying workforce supply and demand using crosswalks between occupational and educational codes is a widely used method for applied workforce analysis. The method presents some challenges to create exacting measures. A specific training program may train mostly for one occupation, but partly for others, for example. Conversely, an occupation may list skills and knowledge taught in more than one training program area across codes. To allow for some leeway in counting between codes, the research team put similar occupations and training program codes into larger categories.

[64] This webpage at the U.S. Cluster Mapping Project offers a summary of the methodology and supporting papers. The analysis uses the traded cluster, "Construction Products and Services," and the non-traded cluster, "Local Real Estate, Construction, and Development" for analysis, https://clustermapping.us/content/cluster-mapping-methodology.

[65] Collaborative Economics, "California Regional Economies Project: Industry Clusters of Opportunity User Guide," California Economic Strategy Panel (July 2007).

APPENDIX A: METHODOLOGY NOTES

The research team created the crosswalks using a combination of quantitative and qualitative analysis. The method incorporates several crosswalks, industry partner feedback and internal judgement based on specificity to the clusters and applicability between occupations and training programs. Three crosswalks were used to align Standard Occupational Classification (SOC) codes, Classification of Instructional Programs (CIP) codes and Apprenticeship Program codes. The crosswalks included the U.S. Department of Education's National Center for Education Statistics' (NCES) CIP-SOC crosswalk,[66] the CIP-TOP-SOC crosswalk created by the Centers of Excellence,[67] and DAS Apprenticeship's O*Net coding system. The outcome from the applied analysis yields an estimate that provides actionable findings and recommendations. The gap assessment provides a starting point for partner verification and feedback. (See the crosswalk in the exhibit below.)

Occupational supply and demand gap analysis compares the most recent three-year average annual supply of new workers in construction cluster-related education and training programs to the projected demand for occupations in the Sacramento region.

Supply of new workers was estimated by summing new apprentices (who begin work with the apprenticeship) with completions in identified education and training programs, and averaging these for the 2014-2016 period. New apprentice data is sourced from the California Department of Apprenticeship Standards (DAS) and reflects the start year of apprenticeship, and includes all apprentices residing in Sacramento. Some apprentices reside in Sacramento, though are apprenticed by Joint Apprenticeship Committees or Unilateral Apprenticeship Committees based outside of the region.

Education and training completions data is sourced from the NCES via the IPEDS database (Emsi), and includes private and public training providers in the Sacramento region. The dataset does not include training programs through K-12 schools or non-accredited, community-based organizations.

Demand for workers reflects projected average annual job openings by occupational group for the 2016-2021 period, sourced from Emsi, including new jobs (growth) and replacement jobs (retirements and separations). For the occupational gap analysis, the research team used the occupational annual openings for all industries, rather than perform a calculation to determine the percent of openings specific to the construction clusters. (However, the cluster gap assessment section did employ staffing pattern formulas to estimate the amount of occupational demand for each subcluster.)

Several categories in the gap analysis merit additional explanation.

Construction managers represents the second-ranked category of supply-demand workforce gap in the Sacramento region, with a projected shortage of more than 850 construction managers annually. The construction managers category encompasses a few types of jobs, including professionals who manage construction project timelines and budgets, estimate project costs, as well as supervisors of construction workers. The latter category is the most striking area of demand.

Several general management occupational codes were eliminated from counts to not create noise in the estimates and to maintain a relevance to the education and training programs that are likely to serve the clusters. Other general-management-related occupations that were removed from analysis included sales, finance, management analysts, purchasing, buyers, service managers and market research. However, the removal of many of these codes could mean the projected shortfall is even worse than estimated.

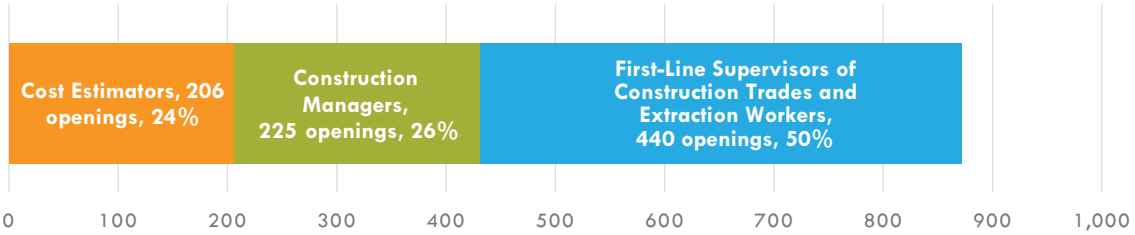
The training trajectory for supervisors of construction workers and that of construction managers may differ, with some receiving formal training, and others rising through the ranks to the level of foreman or superintendent. While there are several formal construction management training programs in the region, including at California State University-Sacramento, Sierra College, Consumes River College and Folsom College, according to IPEDS data, the data suggests the number of students completing those programs is low. Exhibit 1A shows the breakdown for the three occupations that were chosen for the construction management category.

[66] "SOC 2010 to CIP 2010 Crosswalk," https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=55.

[67] Centers of Excellence, http://www.coeccc.net/.

APPENDIX A: METHODOLOGY NOTES

Exhibit 1A. Construction managers projected annual openings, n = 871 (2016–2021)[68]



Another significant gap concerns heavy equipment operators and is driven largely by retirements of heavy-truck drivers. On the worker supply side for truck-driver-related occupations, there are a number of private training providers not incorporated in this analysis, so this gap is likely somewhat overstated; the counts do not indicate a large number of completions.

On the demand side, because truck drivers serve many more industries than construction, the analysis bounds the demand for truck drivers by the national proportion of these workers serving the construction industry. To adjust for this, heavy and tractor-trailer truck driver demand was limited to the share of employment for the following NAICS codes, based on the Bureau of Labor Statistics' National Staffing Patterns: 220000, 230000, 237000, 238000, 238200 and 238300.[69]

While OSHA Specialists, construction product manufacturing and "other" construction occupations/training programs were also identified as priority occupational categories, these groupings presented challenges to analysis and were excluded from the gap analysis.

[68] EMSI 2017.3 – QCEW Non-QCEW, Self-Employed.

[69] October 2017 release, Table 1.8 2016-26 Industry-occupation matrix data, by occupation.

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program[70]

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
Architects		
11-9041 Architectural and Engineering Managers	040201 Architecture	
17-1011 Architects, Except Landscape and Naval	040401 Environmental Design/Architecture	
	040901 Architectural Technology/Technician	
	040902 Architectural and Building Sciences/ Technology	
	040999 Architectural Sciences and Technology, Other	
	049999 Architecture and Related Services, Other	
Building Inspectors		
47-4011 Construction and Building Inspectors	460403 Building/Home/Construction Inspection/ Inspector	5073 Northern California Construction Inspector Joint Apprenticeship Committee
Carpenters		
47-2031 Carpenters	460201 Carpentry/Carpenter	8 Southern California Carpenter J.A.T.C.
51-7011 Cabinetmakers and Bench Carpenters	480703 Cabinetmaking and Millwork	38 Carpenters Training Committee for Northern California
47-3019 Helpers, Construction Trades, All Other		5219 N/A
47-2061 Construction Laborers		19161 San Diego Associated General Contractors J.A.C.
		19950 Associated Builders & Contractor Northern California Chapter Carpentry U.A.C.
Construction Managers		
11-9021 Construction Managers	460412 Building/Construction Site Management/ Manager	
13-1051 Cost Estimators	522001 Construction Management	
47-1011 First-Line Supervisors of Construction Trades and Extraction Workers	460499 Building/Construction Finishing, Management, and Inspection, Other	
Drafters		
17-3011 Architectural and Civil Drafters	151301 Drafting and Design Technology/ Technician, General	
17-3013 Mechanical Drafters	151302 CAD/CADD Drafting and/or Design Technology/Technician	
	151303 Architectural Drafting and Architectural CAD/CADD	
	151304 Civil Drafting and Civil Engineering CAD/ CADD	
	151305 Electrical/Electronics Drafting and Electrical/Electronics CAD/CADD	
	151306 Mechanical Drafting and Mechanical Drafting CAD/CADD	
	151399 Drafting/Design Engineering Technologies/Technicians, Other	

Continued

[70] Apprenticeship program lists include programs outside Sacramento, because some apprentices in those programs reside in the Sacramento region. Only residents of the Sacramento region were counted in the gap analysis.

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program (continued)

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
Drywall Installers		
47-2081 Drywall and Ceiling Tile Installers	460404 Drywall Installation/Drywaller	76 District Council 16 Drywall Finisher Joint Apprenticeship Training Committee
47-2082 Tapers		17444 Southern California Drywall/ Lather Joint Apprenticeship and Training Committee
Electricians		
47-2111 Electricians	460301 Electrical and Power Transmission Installation/Installer, General	30 San Francisco J.A.T.C. for the Electrical Industry - Inside Wireman
49-9051 Electrical Power-Line Installers and Repairers	460302 Electrician	58 San Diego Electrical J.A.T.C.
	460303 Lineworker	65 San Joaquin & Calaveras Counties Electrical J.A.T.C.
	470101 Electrical/Electronics Equipment Installation and Repair, General	98 San Mateo County J.A.T.C. for the Electrical Construction Industry
	460399 Electrical and Power Transmission Installers, Other	113 Contra Costa County Electrical J.A.C.
		119 Tri-County Electrical J.A.T.C.
		137 Santa Clara County Electrical Trades J.A.T.C.
		139 Fresno, Madera, Kings & Tulare Counties Electrical Industries J.A.T.C.
		146 Alameda County J.A.T.C. for the Electrical Inside Wireman Trade
		152 Solano & Napa Counties Electricians J.A.T.C.
		494 Orange County Electrical J.A.C.
		2012 Riverside Area Electrical J. A. C.
		8685 Kern County Electrical Joint Apprenticeship & Training Committee
		9333 Reno Electricians J.A.T.C for the Electrical Industry
		16435 Sacramento Area Electrical Apprenticeship
		19602 Western Electrical Contractors Assoc., Inc. (Weca) Apprenticeship and Training Committee
		19885 Associated Builders & Contractors Northern California Chapter Electrical U.A.C.
		99120 Cal-Nev Power Lineman J.A.T.C.

Continued

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program (continued)

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
Engineers		
11-9041 Architectural and Engineering Managers	140101 Engineering, General	
17-2051 Civil Engineers	140102 Pre-Engineering	
17-2071 Electrical Engineers	140401 Architectural Engineering	
17-2072 Electronics Engineers, Except Computer	140801 Civil Engineering, General	
17-2199 Engineers, All Other	140802 Geotechnical and Geoenvironmental Engineering	
17-3023 Electrical and Electronics Engineering Technicians	140803 Structural Engineering	
17-3029 Engineering Technicians, Except Drafters, All Other	140804 Transportation and Highway Engineering	
17-2141 Mechanical Engineers	140899 Civil Engineering, Other	
	141001 Electrical and Electronics Engineering	
	141004 Telecommunications Engineering	
	141099 Electrical, Electronics and Communications Engineering, Other	
	141201 Engineering Physics/Applied Physics;	
	143301 Construction Engineering	
	149999 Engineering, Other	
	150000 Engineering Technology, General	
	150101 Architectural Engineering Technology/ Technician	
	150399 Electrical and Electronic Engineering Technologies/Technicians, Other	
	151001 Construction Engineering Technology/ Technician	
	151502 Engineering Design	
	159999 Engineering Technologies and Engineering-Related Fields, Other	
	151501 Engineering/Industrial Management	
Glaziers		
47-2121 Glaziers	460406 Glazier	370 Northern California District Council 16 Glaziers, Architectural Metal and Glass Workers J.A.T.C.
		1403 Southern California Glaziers & Glassworkers Industry J.A.C.

Continued

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program (continued)

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
Heavy Equipment Operators		
47-2071 Paving, Surfacing, and Tamping Equipment Operators	470302 Heavy Equipment Maintenance Technology/Technician	9431 Joint Apprenticeship Committee for Operating Engineers for the 46 Northern Counties
47-2073 Operating Engineers and Other Construction Equipment Operators	470605 Diesel Mechanics Technology/Technician	
47-5021 Earth Drillers, Except Oil and Gas	490202 Construction/Heavy Equipment/ Earthmoving Equipment Operation	
49-3031 Bus and Truck Mechanics and Diesel Engine Specialists	490205 Truck and Bus Driver/Commercial Vehicle Operator and Instructor	
49-3042 Mobile Heavy Equipment Mechanics, Except Engines	520203 Logistics, Materials, and Supply Chain Management	
53-3032 Heavy and Tractor-Trailer Truck Drivers	470399 Heavy/Industrial Equipment Maintenance Technologies, Other	
53-7032 Excavating and Loading Machine and Dragline Operators	470613 Medium/Heavy Vehicle and Truck Technology/Technician	
53-1031 First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators		
47-2151 Pipelayers		
47-2072 Pile Driver Operators		
53-7021 Crane and Tower Operators		
53-7031 Dredge Operators		
HVAC & Sheet Metal		
49-9021 Heating, Air Conditioning, and Refrigeration Mechanics and Installers	150501 Heating, Ventilation, Air Conditioning and Refrigeration Engineering Technology/Technician	10 Bay Area Sheet Metal J A C
47-2211 Sheet Metal Workers	150503 Energy Management and Systems Technology/Technician	23 U.A. Local 38 Joint Apprenticeship & Training Committee of The Plumbing & Pipe Fitting
	470201 Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	37 Plumbing & Pipefitting Industry of Sacramento & Yolo District J.A.C.
	480506 Sheet Metal Technology/Sheetworking	61 Pipe Trades Dc #36 Trust Funds J.A. & T. C.
		123 Northern California Valley Sheet Metal Industry Jatc
		156 United Association Local Union 342 J.A.T.C.
		10 Bay Area Sheet Metal J A C
		20 Southern California Sheet Metal J.A.&T.C.
		123 Northern California Valley Sheet Metal Industry Jatc
		19421 Air Conditioning Trades Association U.A.C.
		19821 Associated Builders & Contractors of San Diego, Inc. Sheet Metal U.A.C.

Continued

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program (continued)

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
Insulation Workers		
47-2132 Insulation Workers, Mechanical	460414 Insulator	38 Carpenters Training Committee for Northern California
47-2131 Insulation Workers, Floor, Ceilings, and Wall		16427 Northern California Heat & Frost Insulators and Allied Workers J.A.C.
Interior Designers		
27-1025 Interior Designers	500408 Interior Design	
	040501 Interior Architecture	
Ironworkers & Welders		
47-2171 Reinforcing Iron and Rebar Workers	460411 Metal Building Assembly/Assembler	1501 Int'L Association of Bridge, Structural, Ornamental And Reinforcing Ironworkers, Local 11
47-2221 Structural Iron and Steel Workers	480509 Ironworking/Ironworker	7205 Intl. Assoc. of Bridge, Structural, Ornamental & Reinforcing Ironworkers Local 378 Oakland
51-2041 Structural Metal Fabricators and Fitters	480511 Metal Fabricator	7646 Intl. Assoc. of Bridge, Structural, Ornamental & Reinforcing Ironworkers Local 377 San Franc
51-4121 Welders, Cutters, Solderers, and Brazers	480508 Welding Technology/Welder	8885 Intl Assoc. of Bridge, Structural, Ornamental & Reinforcing Ironworkers L416 J.A.T.C.
	150614 Welding Engineering Technology/ Technician	9076 International Assoc. of Bridge, Structural, Ornamental & Reinforcing Ironworkers Local 155
		9271 Intl. Assoc. of Bridge, Structural, Ornamental & Reinforcing Ironworkers Local 377 Santa Clara
Masonry, Tile, Floor, Lathe, Plaster		
47-2021 Brickmasons and Blockmasons	460101 Mason/Masonry	88 Northern California Tile Industry Joint Apprenticeship Training Committee
47-3011 Helpers—Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	460402 Concrete Finishing/Concrete Finisher	5087 Northern California District Council of Laborers Hod Carrier J.A.C.
47-2051 Cement Masons and Concrete Finishers	460413 Carpet, Floor, and Tile Worker	10121 Bricklayers & Allied Crafts Local 3 J.A.T.& E.C.
47-2041 Carpet Installers		10999 Sacramento Area Tile, Terrazzo & Marble Trades J.A.T.C.
47-2042 Floor Layers, Except Carpet, Wood, and Hard Tiles		18496 Northern California Cement Masons J.A.T.C.
47-2043 Floor Sanders and Finishers		
47-2044 Tile and Marble Setters		4789 Northern California Floor Covering J.A.T.C.
47-2053 Terrazzo Workers and Finishers		10121 Bricklayers & Allied Crafts Local 3 J.A.T.& E.C.
		10999 Sacramento Area Tile, Terrazzo & Marble Trades J.A.T.C.

Continued

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program (continued)

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
Masonry, Tile, Floor, Lathe, Plaster (Continued)		
47-2161 Plasterers and Stucco Masons		14 Southern California Plastering Institute Apprenticeship Trust & Joint Apprenticeship Committee
47-3014 Helpers—Painters, Paperhangers, Plasterers, and Stucco Masons		18 Northern California Plasterers' Joint Apprenticeship and Training Committee
47-2022 Stonemasons		5087 Northern California District Council of Laborers Hod Carrier J.A.C.
		10121 Bricklayers & Allied Crafts Local 3 J.A.T.& E.C.
Painters		
47-2141 Painters, Construction and Maintenance	460408 Painting/Painter and Wall Coverer	16 Painter, Paperhanger and Decorator Jatc
47-3014 Helpers—Painters, Paperhangers, Plasterers, and Stucco Masons		40 Painters & Decorating J.A.T.C. of the Bay Area Inc.
		5115 Traffic Control Painter Automotive Marine & Specialty Painters Local #1176
		19731 Southern California Painting and Decorating Contractors of America, Uac
		19912 Associated Builders & Contractors Northern California Chapter Painting U.A.C.
Plumbers & Pipefitters		
47-2152 Plumbers, Pipefitters, and Steamfitters	460503 Plumbing Technology/Plumber	11 Los Angeles Metropolitan Plumbers J.A.T.C.
51-8021 Stationary Engineers and Boiler Operators	460502 Pipefitting/Pipefitter and Sprinkler Fitter	12 J. A. & T. C., Plumbing, Pipe Fitting & Refrigeration Industry of San Mateo
47-2011 Boilermakers	460599 Plumbing and Related Water Supply Services, Other	15 Napa/Solano Counties Plumbers and Steamfitters J.A.T.C.
	480801 Boilermaking/Boilermaker	23 U.A. Local 38 Joint Apprenticeship & Training Committee of The Plumbing & Pipe Fitting
		37 Plumbing & Pipefitting Industry of Sacramento & Yolo District J.A.C.
		61 Pipe Trades Dc #36 Trust Funds J.A. & T. C.
		125 Pipe Trades J.A.T.C. Of Santa Clara And San Benito Counties
		156 United Association Local Union 342 J.A.T.C.
		163 San Bernardino & Riverside Counties Plumbing & Steamfitter Trade J.A.C.
		4391 Sprinkler Fitters U. A. Local 483 Joint Apprenticeship Committee
		10043 Associated Builders & Contractors Northern California Chapter Plumbing U.A.C.
		19570 California American Fire Sprinkler Association, U.A.C.
		19699 Northern California Local 355 J.A.T.C.
		19810 P.H.C.C. of the Greater Sacramento Area Plumbers U.A.C.
		99100 Road Sprinkler Fitters U. A. Local 669 J.A.T.C.

Continued

APPENDIX A: METHODOLOGY NOTES

Exhibit 2A: Crosswalk for major measurement categories by occupation (SOC), training program (CIP) and apprenticeship program (continued)

Occupation (SOC)	Training Programs (CIP)	Apprenticeships*
PV Installers		
47-2231 Solar Photovoltaic Installers	150505 Solar Energy Technology/Technician	
Real Estate Professionals		
11-9141 Property, Real Estate, and Community Association Managers	521501 Real Estate	
41-9021 Real Estate Brokers	041001 Real Estate Development	
41-9022 Real Estate Sales Agents		
13-2021 Appraisers and Assessors of Real Estate		
47-2051 Cement Masons and Concrete Finishers		
Roofers		
47-2181 Roofers	460410 Roofer	109 West Bay Counties Roofers and Waterproofers J.A.T.C.
		2898 East Bay and North Bay Counties Roofers/Waterproofers J.A.T.C.
		9028 Valley Roofers & Waterproofers J.A.T.C.
		9069 Santa Clara Valley Area Roofers and Waterproofer J.A.T.C.
		19704 Independent Roofing Contractors of California, U.A.C.
Surveyors		
17-1022 Surveyors	151102 Surveying Technology/Surveying	9442 Northern California Surveyors Joint Apprenticeship Committee
17-3031 Surveying and Mapping Technicians	143801 Surveying Engineering	

APPENDIX A: METHODOLOGY NOTES

Methodology for occupational gap impacts on subclusters

The report uses the percentages of occupations in each industry from staffing patterns, the occupational projected annual openings and the supply-demand gap analysis to identify the occupational shortfalls specific to each subcluster. The analysis enables measuring the severity of the shortfall of specific occupations in each subcluster. The priority occupations that appear in the severe shortage column have sizeable employment shortfalls in the subcluster in total numbers; the occupation has a significant amount of employment in the subcluster; and the projected shortfall overall is substantial. To make these determinations, the methodology established a scale to group occupational gaps as "severe," "moderate," and "slight."

Similarly, a scale was used to assess the severity of occupational gaps in subclusters. Subclusters ranked as "severe" have acute shortfalls in one or more occupations or display at least moderate need in a large number of occupations.

APPENDIX B: CLUSTER BUSINESSES

The tables below provide a reference for stakeholder outreach and engagement, and additional metrics on firm sizes, revenue and county splits for employment. (Note: The source of the data is different than the cluster metrics shown in the previous appendix, so the counts are distinct.)

The following tables show the breakdown of employment by county, and the average size of employment per establishment. The traded cluster is less than a fifth of the size of the non-traded cluster. Traded cluster establishments are generally more than four times the size, on average, of non-traded establishments, based on the average number of employees. The non-traded cluster's companies are mostly small businesses with fewer than 10 employees.

Exhibit 1B: Average number of employees, business size by county, firm-level data, traded and non-traded clusters (2016)[71]

Non-traded cluster businesses		
County	# of Employees	Av Employees per Establishment
Sacramento	63,006	7.8
Yolo	7,499	7.1
Placer	20,879	7.0
Sutter	3,143	7.0
Yuba	1,268	4.7
El Dorado	6,833	4.4
Total	**102,628**	**4.1**

Traded cluster businesses		
County	# of Employees	Av Employees per Establishment
Sacramento	9,526	24.1
El Dorado	1,299	14.9
Placer	2,269	14.6
Yuba	345	12.3
Yolo	834	11.3
Sutter	128	4.4
Total	**14,401**	**18.8**

[71] InfoGroup.

APPENDIX B: CLUSTER BUSINESSES

The tables below provide a reference for the top employers in each cluster and subcluster. The tables show the number of employees, sales volume and location.

Exhibit 2B: Top 20 employers by number of employees, by subcluster (2016)[72]

Non-Traded Cluster

Building Equipment Distribution			
Company Name	Number of Employees	Sales Volume	City
American Refrigeration Suppls	250	$642,770,000	Sacramento
Park Mechanical	79	$203,115,000	Sacramento
Mainstream Energy Corp	67	$89,962,000	Sacramento
Slakey Brothers	65	$ -	Elk Grove
Pace Supply Corp	60	$80,563,000	Sacramento
Blue Oak Energy	59	$79,220,000	Davis
Ferguson Enterprises Inc	50	$67,136,000	Sacramento
Ldi Mechanical Inc	50	$128,554,000	Sacramento
D & D Supply	50	$67,136,000	Rancho Cordova
Slakey Brothers	25	$33,568,000	North Highlands
Sign of The Crab	22	$29,539,000	Rancho Cordova
Tahoe Solar Designs	21	$28,197,000	South Lake Tahoe
Pacific Power Renewables	18	$24,168,000	Auburn
Cal-Steam	16	$21,483,000	North Highlands
Geary Pacific Supply	15	$38,566,000	North Highlands
Air Cold Supply	15	$38,566,000	Sacramento
Johnstone Supply	15	$38,566,000	North Highlands
Opde Us Corp	13	$17,455,000	West Sacramento
Hajoca	12	$16,112,000	Sacramento
Heating & Cooling Supply	12	$30,852,000	Sacramento

[72] InfoGroup.

APPENDIX B: CLUSTER BUSINESSES

Concrete Products			
Company Name	Number of Employees	Sales Volume	City
Clark Pacific	300	$ -	West Sacramento
Teichert Readymix	130	$ -	Sacramento
Livingston's Concrete Svc	80	$25,491,000	North Highlands
Gc Products Inc	20	$4,134,000	Lincoln
Clark Pacific	5	$1,033,000	Woodland
Sierra Concrete Resurfacing	5	$1,033,000	Loomis
Cain's Concrete	5	$1,033,000	Orangevale
A & A Stepping Stone Mfg Inc	5	$1,033,000	Citrus Heights
Charis Landscape & Design	5	$1,033,000	Meadow Vista
Pacific Decorative Concrete	5	$1,033,000	Sacramento
Echo Rock Ventures	4	$826,000	Auburn
G & C Septic Tank Svc	3	$620,000	Galt
Ak4 Concrete Solutions	2	$413,000	Auburn
Zellars Concrete	1	$206,000	Sacramento

Construction Materials Retailing			
Company Name	Number of Employees	Sales Volume	City
Home Depot	3642	$1,232,288,000	Multiple Locations
Lowe's Home Improvement	1365	$461,852,000	Multiple Locations
Erickson Framing	280	$94,739,000	Roseville
Edges Electrical Group	200	$67,671,000	Sacramento
Silverado Building Materials	175	$59,211,000	Multiple Locations
A & A Concrete Supply Inc	173	$7,781,000	Multiple Locations
Pacific Coast Building Prods	150	$ -	Rancho Cordova
Ply Gem Window	140	$47,369,000	West Sacramento
Knife River Corp	117	$39,587,000	Elk Grove
Safelite Auto Glass	111	$39,929,000	Multiple Locations
Pacific Supply	104	$29,774,000	Multiple Locations
Southgate Glass	100	$33,834,000	Multiple Locations
Heritage Interests LLC	99	$ -	North Highlands
Sherwin-Williams	96	$34,528,000	Multiple Locations
Kelly-Moore Paint Co	89	$32,011,000	Multiple Locations
Meek's Lumber & Hardware	88	$18,608,000	Multiple Locations
Clarion Shutters	75	$25,376,000	Sacramento
Folsom Ready Mix Inc	68	$23,007,000	Multiple Locations
Huttig Building Products	65	$21,993,000	Sacramento
Homewood Lumber	65	$21,993,000	Loomis

APPENDIX B: CLUSTER BUSINESSES

Construction Materials Wholesaling			
Company Name	Number of Employees	Sales Volume	City
Teichert Aggregates	392	$530,117,000	Multiple Locations
Building Material Distributors	200	$ -	Galt
Jeld-Wen Interior Door Div	175	$267,955,000	Rocklin
Bmc	150	$229,675,000	Multiple Locations
Setzer Forest Products Inc	125	$191,396,000	Sacramento
California Cascade Industries	120	$183,740,000	Sacramento
Jensen Precast	106	$143,349,000	Multiple Locations
General Truss Co Inc	70	$107,182,000	Sacramento
Hastie's Capitol Sand & Gravel	69	$93,312,000	Multiple Locations
Oldcastel Precast	42	$56,799,000	Olivehurst
Soper-Wheeler Co	40	$61,246,000	Strawberry Vly
Crusader Fence Co Inc	40	$53,494,000	Rancho Cordova
Pavestone Co	40	$54,094,000	Winters
ABC Supply Co	39	$52,448,000	Multiple Locations
Medimer Marble & Granite	35	$47,332,000	Multiple Locations
West Coast Sand & Gravel	32	$43,275,000	Sacramento
Western Aggregates LLC	30	$ -	Marysville
Quikrete	30	$40,570,000	Sacramento
Aura Hardwoods	26	$39,810,000	Rancho Cordova

APPENDIX B: CLUSTER BUSINESSES

Developers			
Company Name	Number of Employees	Sales Volume	City
Village At Squaw Valley	80	$39,870,000	Olympic Valley
Interland Corp	64	$31,896,000	Davis
Tim Lewis Communities	55	$27,410,000	Roseville
Serrano Associates LLC	45	$22,426,000	El Dorado Hills
M & E Enterprises	43	$21,430,000	Galt
Mc Clellan Park	40	$19,935,000	Mcclellan
Parker Development Co	40	$19,935,000	El Dorado Hills
Akt Development Corp	36	$17,941,000	Sacramento
Palladio Leasing	30	$14,951,000	Folsom
Dream Homes Construction Mgt	30	$14,951,000	Elk Grove
M A Steiner Development Inc	25	$12,459,000	Orangevale
Fite Properties Inc	20	$9,967,000	Sacramento
Mandarich Development	20	$9,967,000	Rocklin
Jenamar	18	$8,970,000	Granite Bay
River West Investments	16	$7,974,000	Sacramento
Marron Road Ventures	15	$7,475,000	Fair Oaks
Richland Communities	15	$ -	Roseville
Chippendale Office Park	14	$6,977,000	Sacramento
Heller Co	13	$6,478,000	Gold River
Sunchase Holding	13	$6,478,000	Roseville

APPENDIX B: CLUSTER BUSINESSES

General Contractors			
Company Name	Number of Employees	Sales Volume	City
K Designers	1000	$513,127,000	Rancho Cordova
Holt Of California	501	$257,076,000	Sacramento
Granite Construction Co	500	$256,563,000	Sacramento
S D Deacon Corp Of California	500	$350,865,000	Citrus Heights
Premier Pools & Spas	500	$188,444,000	Gold River
Dennis Blazona Construction	400	$205,251,000	West Sacramento
Barnum & Celillo	400	$205,251,000	Sacramento
Granite Construction Supply	350	$179,594,000	Sacramento
Swinerton Builders	300	$153,938,000	Sacramento
L B Construction Inc	250	$175,432,000	Roseville
Sunworld LLC	240	$168,415,000	Rancho Cordova
American Building Supply	225	$157,889,000	Sacramento
Mckee Construction Inc	200	$140,346,000	Rocklin
K Hovnanian Co	175	$89,797,000	Sacramento
Dpr Construction	150	$76,969,000	Sacramento
Reeve-Knight Construction Co	150	$105,259,000	Roseville
Geremia Pools Inc	150	$56,533,000	Sacramento
Otto Construction	150	$76,969,000	Sacramento
Kerry Mc Caffrey Construction	140	$71,837,000	Lincoln
Tudor Construction & Rstrtn	130	$66,706,000	Elk Grove

APPENDIX B: CLUSTER BUSINESSES

Highway and Street Construction			
Company Name	Number of Employees	Sales Volume	City
Folsom City Public Works Engr	200	$71,437,000	Folsom
Telfer Highway Technologies	100	$35,718,000	Mcclellan
Central Valley Engineering	100	$35,718,000	Roseville
C C Myers Inc	100	$35,191,000	Rancho Cordova
Valley Slurry Seal Co	88	$31,432,000	West Sacramento
Valley Slurry Seal Co	88	$31,432,000	Sacramento
Placer County Road Maintenance	80	$28,574,000	Auburn
Sacramento County Public Works	67	$23,931,000	Sacramento
Sacramento County Public Works	61	$21,788,000	Sacramento
Valley Precision Grading	61	$21,788,000	Rancho Cordova
Harper B	61	$21,788,000	Wilton
Interstate Logistics	61	$21,788,000	Carmichael
Valley Slurry Seal Inc	50	$ -	West Sacramento
Us Federal Highway Adm	50	$17,859,000	Sacramento
Highways Div	50	$ -	Sacramento
Syar Industries	40	$14,287,000	Madison
J B Bostick Co	40	$14,287,000	Roseville
Sierra Traffic Markings	40	$14,287,000	Roseville
Public Works	40	$14,287,000	Auburn
Collins Lake	33	$11,787,000	Oregon House

APPENDIX B: CLUSTER BUSINESSES

Real Estate Services			
Company Name	Number of Employees	Sales Volume	City
Kw Commercial	525	$125,781,000	Roseville
Realty Services	400	$95,833,000	Sacramento
Tami Saner & Assoc	400	$95,833,000	Roseville
Keller Williams Realty	300	$71,875,000	Roseville
Cold Well Banker	238	$57,021,000	Elk Grove
Sacramento Housing & Redevel	201	$ -	Sacramento
Colliers International	200	$47,916,000	Sacramento
Excel Realty & Mortgage	200	$47,916,000	Roseville
Service Link LP	200	$26,549,000	McClellan
Bea Davis Real Estate Team	187	$44,802,000	Roseville
Coldwell Banker	170	$40,729,000	Elk Grove
Cb Richard Ellis	160	$38,333,000	Sacramento
Realty One Group Complete	150	$35,937,000	Rocklin
Fpi Management	150	$35,937,000	Folsom
Commercial Protective Svc	150	$35,937,000	Sacramento
Keller Williams Realty	140	$33,541,000	Elk Grove
Lyon Real Estate	130	$31,145,000	Sacramento
Lyon Real Estate	130	$31,145,000	Fair Oaks
Rosewood Care Ctr	125	$37,703,000	Yuba City
Lyon Village Shopping Ctr	125	$104,071,000	Sacramento

APPENDIX B: CLUSTER BUSINESSES

Specialty Contractors			
Company Name	Number of Employees	Sales Volume	City
Villara	1199	$242,558,000	McClellan
Barnum & Celillo Electric Inc	1000	$188,603,000	Sacramento
California Energy Commission	501	$101,352,000	Sacramento
Airco Mechanical Inc	400	$80,920,000	Sacramento
Uc Davis Medical Ctr-Housekpg	300	$19,008,000	Sacramento
Syntrol Plumbing Electrical	300	$60,690,000	Roseville
Royal Electric Co	250	$47,150,000	Sacramento
Sonoran Roofing Co Inc	200	$36,034,000	Rocklin
Nmi Industrial	200	$40,460,000	Sacramento
Lakeview Professional Ssrvcs	200	$31,398,000	Sacramento
Salvador Gonzalez Labor Contr	200	$75,377,000	Galt
Cemex	200	$35,191,000	El Dorado Hills
Siemens Its	160	$ -	Sacramento
Alcal Specialty Contracting	150	$ -	Sacramento
Beutler Corp	150	$ -	McClellan
Indoor Environmental Svc	150	$30,345,000	Sacramento
Air Systems	150	$30,345,000	Folsom
Republic Electric	150	$28,290,000	Sacramento
Western Engineering Contrs Inc	120	$27,942,000	Loomis
Bell Brothers Plbg Htg & A C	101	$20,432,000	Mather

APPENDIX B: CLUSTER BUSINESSES

Water and Sewer Line Construction			
Company Name	Number of Employees	Sales Volume	City
Eaton Drilling Co Inc	50	$14,909,000	Woodland
Cascade Drilling Inc	40	$11,927,000	Rancho Cordova
Diamond Well Drilling Co	25	$7,454,000	Auburn
Beymer Well Svc	22	$6,560,000	Yuba City
Western Exploration Inc	20	$5,963,000	Clarksburg
Nor-Cal Pump & Well Drilling	15	$4,472,000	Yuba City
Vannucci Technologies	13	$3,876,000	Davis
Cascade Drilling	13	$3,876,000	West Sacramento
Tsa Drilling Inc	13	$3,876,000	Woodland
Cache Creek Drilling	13	$3,876,000	Woodland
Norcal Environmental	12	$2,996,000	Rancho Cordova
Bmp Solutions	12	$2,996,000	Rocklin
PC Exploration Inc	12	$3,578,000	Lincoln
Fox Loomis Inc	11	$3,280,000	Sacramento
Hdd Co Inc	10	$2,981,000	Cameron Park
Earth Saver Erosion Control	10	$2,497,000	Woodland
Reclamation District 1000	8	$1,997,000	Sacramento
Ken Gross Pumps	8	$2,385,000	Galt
Westslope Waterworks	7	$2,087,000	Auburn
Peters' Drilling & Pump Svc	7	$2,087,000	Colfax

APPENDIX B: CLUSTER BUSINESSES

Exhibit 2B: Top 20 employers by number of employees, by subcluster (2016)

Traded Cluster

Construction			
Company Name	Number of Employees	Sales Volume	City
Sacramento Municipal Utility	4000	$ -	Sacramento
Lund Construction Co	270	$34,138,000	North Highlands
Vanir Construction Mgmt Inc	240	$37,666,000	Sacramento
Irish Construction	200	$25,287,000	Sacramento
USA Properties Fund Inc	180	$28,250,000	Roseville
Buzz Oates Enterprises II	150	$35,312,000	Sacramento
4leaf Inc	132	$31,075,000	Fair Oaks
West Concrete Inc	108	$16,950,000	Sacramento
Gm Construction & Devel	90	$21,187,000	North Highlands
Sierra National Construction	90	$14,125,000	Carmichael
Jls Environmental Construction	80	$18,833,000	Loomis
Staples Construction Inc	75	$11,770,000	Sacramento
Utili Quest	75	$6,321,000	West Sacramento
Sunseri Associates Inc	66	$10,358,000	Sacramento
Barry-Wehmiller Design Group	60	$20,546,000	Roseville
Wilson Construction	60	$9,416,000	Sacramento
Abs-American Building Supply	60	$14,125,000	Sacramento
Sierra Northern Railway	60	$4,994,000	Woodland
Valley Utility Svc Inc	60	$5,057,000	Sacramento
Parsons Bros Rock Retaining	52	$9,799,000	Roseville

APPENDIX B: CLUSTER BUSINESSES

Construction Components			
Company Name	Number of Employees	Sales Volume	City
Calstone Co	198	$25,963,000	Galt
Pabco Gypsum	150	$ -	Rancho Cordova
Sacramento Stucco Co	60	$6,680,000	West Sacramento
D & T Fiberglass Inc	52	$8,484,000	Sacramento
Sierra Rock	45	$6,471,000	Placerville
North Tahoe Marina	24	$3,915,000	Tahoe Vista
Picasso Granite & Marble	24	$1,476,000	Rancho Cordova
Natural Stone Design Gallery	20	$1,230,000	Sacramento
Original Flea Quayle Metal	18	$3,006,000	Rocklin
Sierra Glass Block	15	$1,670,000	Sacramento
Silverado Stone Design	12	$492,000	Cameron Park
Jon Herr Pro Fiberglass Repair	12	$1,957,000	Knights Landing
Professional Fiberglass Repair	10	$1,631,000	Woodland
A & A Stepping Stone Mfg Inc	10	$1,311,000	Citrus Heights
Nevada Cement Co	8	$2,357,000	Sacramento
Granitis Marble Stone	8	$492,000	Galt
Sick Fab	8	$1,305,000	Sacramento
Pearson's Us Lapidary-Jwlr's	4	$246,000	Sacramento
Renaissance Granite	4	$246,000	Cameron Park

Construction Materials			
Company Name	Number of Employees	Sales Volume	City
Vulcan Materials Co	40	$15,496,000	Roseville
Paramount Petroleum Corp	28	$10,847,000	Elk Grove

APPENDIX B: CLUSTER BUSINESSES

Construction Products			
Company Name	Number of Employees	Sales Volume	City
Ames Fire & Waterworks	220	$26,029,000	Woodland
Us Pipe Fabrication	144	$11,358,000	Olivehurst
Thrifty Supply Co Inc	105	$7,953,000	Sacramento
Gladding Mcbean LLC	101	$ -	Lincoln
Lawson Mechanical Contractors	100	$11,831,000	Sacramento
Chart Inc	82	$10,577,000	Sacramento
Anderson's Sierra Pipe Co	40	$4,732,000	Auburn
Specialty Products Design	39	$3,076,000	Rancho Cordova
R & J Wholesale Co Inc	24	$2,726,000	Rancho Cordova
Galt Pipe Co	22	$2,602,000	Galt
Pacific Corrugated Pipe Co	20	$2,366,000	Sacramento
Upstream Engineering	15	$1,183,000	Sacramento
Milwaukee Valve Co	14	$1,656,000	Placerville
T W Smith Co	12	$908,000	Sacramento
Ferguson Plumbing Supply	2	$454,000	Sacramento

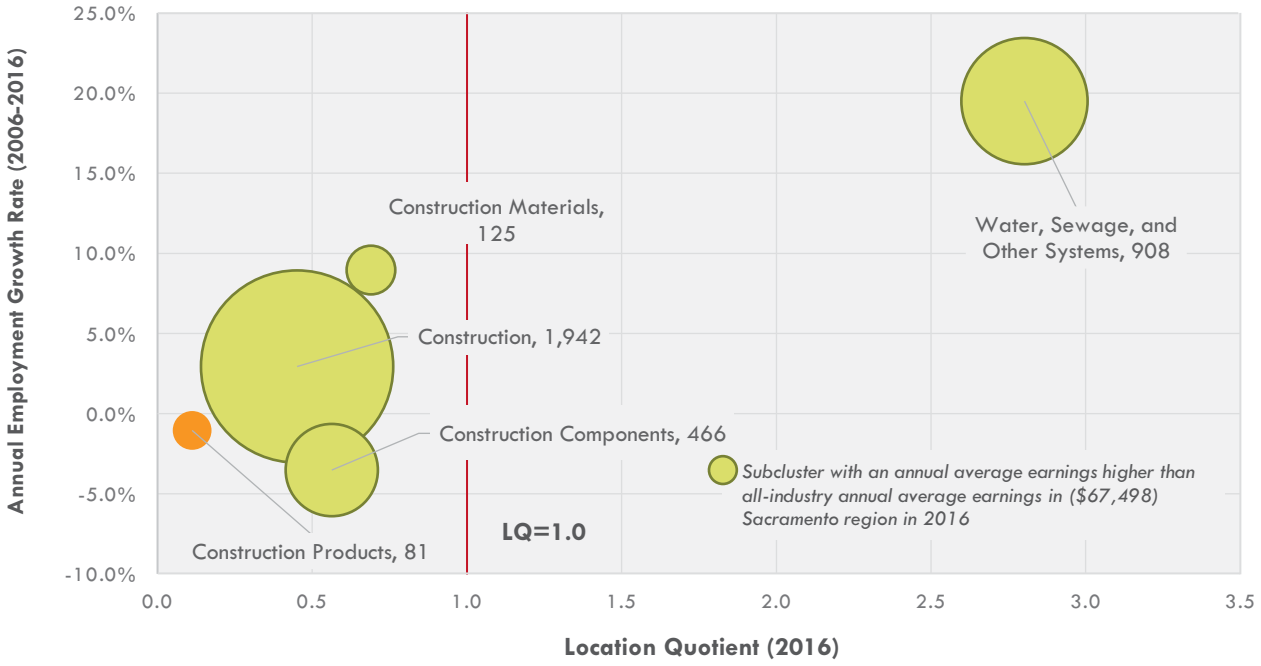
Water, Sewage and Other Systems			
Company Name	Number of Employees	Sales Volume	City
El Dorado Irrigation District	420	$55,230,000	Placerville
South Tahoe Pubc Utility Dist	336	$29,456,000	South Lake Tahoe
Placer County Water Agency	300	$39,450,000	Auburn
Sacramento Suburban Water Dist	195	$17,095,000	Sacramento
Tahoe City Public Utility Dist	150	$13,150,000	Tahoe City
County of Sacramento	140	$18,410,000	Sacramento
San Juan Water District	138	$12,098,000	Granite Bay
El Dorado Water & Shower Svc	120	$15,780,000	Placerville
Roseville Water Dept	120	$15,780,000	Roseville
Rancho Murieta Community Svc	90	$11,835,000	Rancho Murieta
Watereuse California	90	$ -	Sacramento
Taylor Made Water Systems Inc	90	$ -	Sacramento
North Tahoe Pubc Utility Dist	84	$11,046,000	Tahoe Vista
Rancho Murieta Community Svc	78	$10,257,000	Rancho Murieta
Fair Oaks Water District	70	$9,205,000	Fair Oaks
South Placer Mun Utility Dist	66	$5,786,000	Rocklin
Elk Grove Water Svc	60	$7,890,000	Elk Grove
Woodland Water Dept	57	$4,997,000	Woodland
Olivehurst Public Utility	56	$7,364,000	Olivehurst
Waste Water Plant	54	$4,734,000	El Dorado Hills

APPENDIX C: CLUSTER DETAIL

The charts and tables in this appendix provide additional detail on the subclusters for the traded and non-traded clusters.

Exhibits 1C and 2C show several metrics. The size of the bubble indicates the number of jobs for each subcluster in 2016. (The employment count is shown next to each subcluster title.) The x-axis shows the 2016 location quotient. A location quotient of 1.0 represents employment that is on par with the national concentration of employment. Location quotients above or below 1.0 represent how concentrated a region's employment is compared to the national concentration. The y-axis demonstrates the average annual job growth rate between 2006 and 2016. Yellow bubbles represent the subclusters with an annual average earning higher than an all-industry annual average earning in the Sacramento region in 2016.

Exhibit 1C: Traded subclusters in the Sacramento region[73]



[73] EMSI, 2017.3 – QCEW Employees, Non-QCEW Employees, and Self-Employed.

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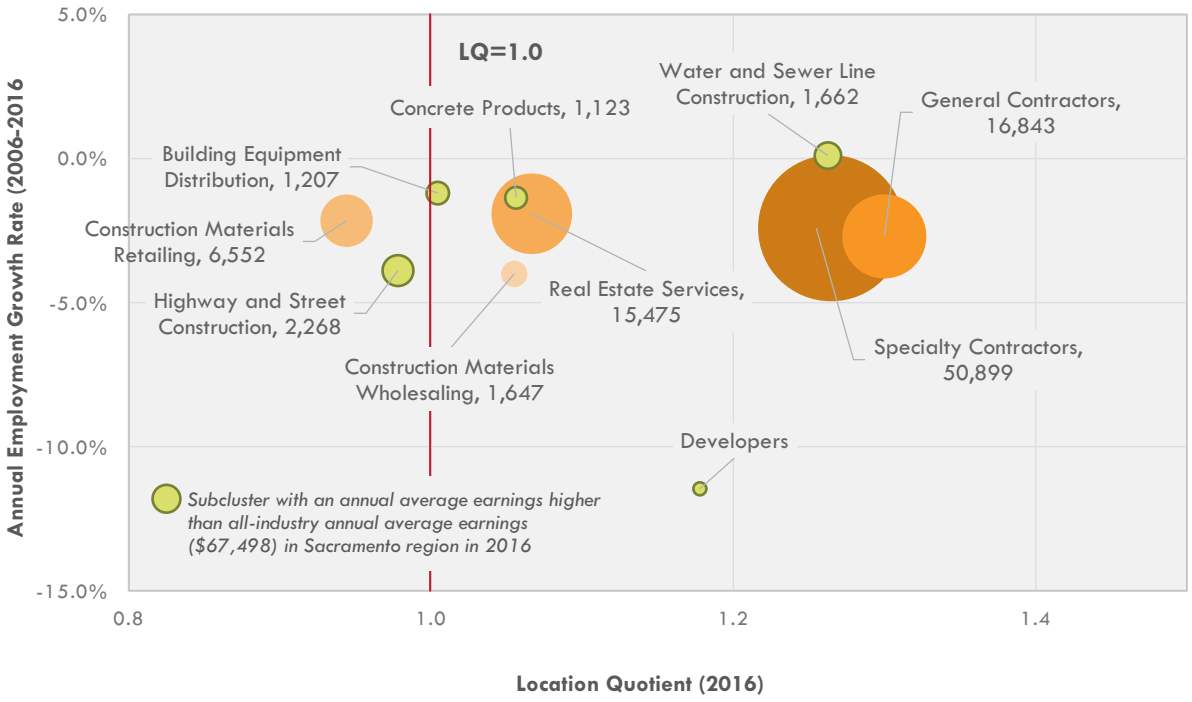
Exhibit 2C: Non-traded subclusters in the Sacramento region[74]



[74] EMSI, 2017.3 – QCEW Employees, Non-QCEW Employees, and Self-Employed.

APPENDIX C: CLUSTER DETAIL

The following tables detail the top industries in each subcluster for each of the study regions.

Exhibit 3C: Traded cluster, industry detail, Sacramento region[75]

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
237130	Power and Communication Line and Related Structures Construction	Construction	539	624	1,293	1,917	9.1%	8.2%	1.01	94.6%	$92,096	-4.4%
237120	Oil and Gas Pipeline and Related Structures Construction	Construction	55	47	144	202	10.2%	7.1%	0.15	75.7%	$100,716	102.2%
237990	Other Heavy and Civil Engineering Construction	Construction	512	593	362	304	-3.4%	-3.4%	0.42	-19.4%	$71,951	1.7%
236210	Industrial Building Construction	Construction	348	261	144	99	-8.4%	-7.2%	0.12	-54.0%	$76,563	-5.1%
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	Construction Components	67	51	135	173	7.2%	5.1%	1.54	118.9%	$79,345	62.7%
327331	Concrete Block and Brick Manufacturing	Construction Components	208	30	161	194	-2.5%	3.8%	1.16	-0.6%	$76,232	22.7%
327420	Gypsum Product Manufacturing	Construction Components	49	14	44	56	-1.0%	4.7%	0.58	26.2%	$73,187	35.6%
327310	Cement Manufacturing	Construction Components	57	36	70	95	2.0%	6.2%	0.73	57.6%	$63,416	-31.0%
327332	Concrete Pipe Manufacturing	Construction Components	100	53	<10	<10			0.18	-83.7%		
327991	Cut Stone and Stone Product Manufacturing	Construction Components	107	21	53	54	-6.7%	0.3%	0.23	-49.5%	$46,771	-1.2%
327993	Mineral Wool Manufacturing	Construction Components	77	11	<10	<10			0.02	-96.7%		
324121	Asphalt Paving Mixture and Block Manufacturing	Construction Materials	39	11	125	181	12.4%	7.7%	1.20	232.5%	$130,987	-37.5%
332996	Fabricated Pipe and Pipe Fitting Manufacturing	Construction Products	89	23	80	88	-1.2%	2.0%	0.32	-18.3%	$63,593	-3.7%
221310	Water Supply and Irrigation Systems	Water, Sewage, and Other Systems	153	276	792	1,089	17.9%	6.6%	2.53	332.2%	$79,742	55.1%
221330	Steam and Air-Conditioning Supply	Water, Sewage, and Other Systems	0	0	116	164		7.1%	10.02		$108,310	

[75] Ibid.

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Exhibit 4C: Traded cluster, industry detail, Bay Area[76]

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
237990	Other Heavy and Civil Engineering Construction	Construction	2,704	2,370	2,828	3,032	0.5%	1.4%	0.87	6.3%	$105,496	16.8%
237130	Power and Communication Line and Related Structures Construction	Construction	1,879	1,480	2,682	3,648	3.6%	6.3%	0.55	3.4%	$86,262	-7.4%
236210	Industrial Building Construction	Construction	2,617	1,413	2,093	2,225	-2.2%	1.2%	0.46	-20.7%	$113,090	12.5%
237120	Oil and Gas Pipeline and Related Structures Construction	Construction	1,033	733	1,179	1,325	1.3%	2.4%	0.33	-32.0%	$110,373	31.1%
327991	Cut Stone and Stone Product Manufacturing	Construction Components	643	497	538	574	-1.8%	1.3%	0.62	-24.6%	$59,221	13.1%
327420	Gypsum Product Manufacturing	Construction Components	452	321	398	401	-1.3%	0.1%	1.38	9.6%	$80,571	-2.7%
327331	Concrete Block and Brick Manufacturing	Construction Components	493	279	336	331	-3.8%	-0.3%	0.64	-21.9%	$76,063	7.9%
327993	Mineral Wool Manufacturing	Construction Components	563	241	274	279	-7.0%	0.4%	0.61	-45.6%	$96,921	12.6%
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	Construction Components	289	196	247	240	-1.6%	-0.6%	0.75	-16.8%	$84,210	35.7%
327310	Cement Manufacturing	Construction Components	174	215	118	77	-3.8%	-8.3%	0.33	-21.9%	$143,460	29.7%
327332	Concrete Pipe Manufacturing	Construction Components	220	22	28	26	-18.7%	-1.4%	0.14	-80.7%	$67,749	-16.7%
324121	Asphalt Paving Mixture and Block Manufacturing	Construction Materials	257	83	111	86	-8.1%	-4.9%	0.28	-60.2%	$107,418	-8.3%
324122	Asphalt Shingle and Coating Materials Manufacturing	Construction Materials	166	122	106	98	-4.4%	-1.6%	0.37	-24.7%	$144,680	7.2%
332420	Metal Tank (Heavy Gauge) Manufacturing	Construction Products	166	205	259	297	4.5%	2.8%	0.28	14.6%	$77,003	10.3%
332996	Fabricated Pipe and Pipe Fitting Manufacturing	Construction Products	115	144	119	151	0.3%	4.9%	0.13	-15.5%	$57,198	-13.0%
332913	Plumbing Fixture Fitting and Trim Manufacturing	Construction Products	35	18	14	20	-8.6%	6.9%	0.05	-53.1%	$82,179	9.3%
221310	Water Supply and Irrigation Systems	Water, Sewage, and Other Systems	459	779	729	751	4.7%	0.6%	0.62	18.2%	$90,202	-6.2%
221330	Steam and Air-Conditioning Supply	Water, Sewage, and Other Systems	430	303	0	0			0.00			

Continued

[76] Ibid.

APPENDIX C: CLUSTER DETAIL

Exhibit 5C: Traded cluster, industry detail, California[77]

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
237130	Power and Communication Line and Related Structures Construction	Construction	10,781	9,653	14,248	18,854	2.8%	5.8%	0.66	2.5%	$102,761	12.3%
237120	Oil and Gas Pipeline and Related Structures Construction	Construction	6,830	9,939	10,511	11,511	4.4%	1.8%	0.65	-1.8%	$88,213	2.5%
237990	Other Heavy and Civil Engineering Construction	Construction	13,722	9,685	9,507	8,785	-3.6%	-1.6%	0.65	-24.6%	$88,998	10.6%
236210	Industrial Building Construction	Construction	9,388	6,412	6,368	5,801	-3.8%	-1.9%	0.31	-27.9%	$95,649	10.6%
327991	Cut Stone and Stone Product Manufacturing	Construction Components	3,010	1,339	1,905	1,948	-4.5%	0.4%	0.49	-38.9%	$54,751	4.1%
327993	Mineral Wool Manufacturing	Construction Components	2,193	1,656	1,779	1,824	-2.1%	0.5%	0.88	-2.7%	$74,550	2.1%
327331	Concrete Block and Brick Manufacturing	Construction Components	2,178	996	1,744	1,970	-2.2%	2.5%	0.74	-1.7%	$69,788	5.4%
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	Construction Components	1,789	1,244	1,533	1,564	-1.5%	0.4%	1.04	-10.6%	$83,846	47.4%
327310	Cement Manufacturing	Construction Components	1,682	1,144	1,232	1,186	-3.1%	-0.7%	0.76	-9.8%	$101,328	0.0%
327420	Gypsum Product Manufacturing	Construction Components	2,007	924	1,166	1,038	-5.3%	-2.3%	0.90	-22.4%	$78,830	2.3%
327332	Concrete Pipe Manufacturing	Construction Components	1,676	536	490	469	-11.6%	-0.9%	0.54	-52.4%	$82,203	13.6%
327410	Lime Manufacturing	Construction Components	60	59	90	95	4.1%	1.2%	0.20	68.7%	$98,520	13.5%
324122	Asphalt Shingle and Coating Materials Manufacturing	Construction Materials	1,241	876	698	645	-5.6%	-1.6%	0.54	-29.2%	$119,936	12.8%
324121	Asphalt Paving Mixture and Block Manufacturing	Construction Materials	672	458	650	735	-0.3%	2.5%	0.37	-4.4%	$125,984	-5.8%
332420	Metal Tank (Heavy Gauge) Manufacturing	Construction Products	1,772	1,649	2,072	2,365	1.6%	2.7%	0.50	-7.7%	$73,001	5.4%
332996	Fabricated Pipe and Pipe Fitting Manufacturing	Construction Products	1,611	1,408	1,508	1,496	-0.7%	-0.2%	0.36	-17.8%	$62,761	1.8%
332913	Plumbing Fixture Fitting and Trim Manufacturing	Construction Products	1,424	884	1,322	1,437	-0.7%	1.7%	1.03	15.0%	$80,648	27.7%
332410	Power Boiler and Heat Exchanger Manufacturing	Construction Products	408	423	460	494	1.2%	1.4%	0.18	9.9%	$83,551	12.5%
221310	Water Supply and Irrigation Systems	Water, Sewage, and Other Systems	3,933	4,300	4,923	5,462	2.3%	2.1%	0.93	-0.2%	$89,024	10.4%
221330	Steam and Air-Conditioning Supply	Water, Sewage, and Other Systems	603	765	443	625	-3.0%	7.1%	2.26	-21.7%	$110,556	-0.3%

[77] Ibid.

APPENDIX C: CLUSTER DETAIL

Exhibit 6C: Non-traded cluster, industry detail, Sacramento[78]

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	Building Equipment Distribution	928	520	798	908	-1.5%	2.6%	1.19	-6.6%	$70,214	-0.3%
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	Building Equipment Distribution	393	372	323	275	-2.0%	-3.1%	0.73	-16.5%	$75,967	-25.1%
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	Building Equipment Distribution	41	52	86	117	7.8%	6.4%	0.97	135.6%	$75,399	-1.3%
327390	Other Concrete Product Manufacturing	Concrete Products	279	281	721	1,037	9.9%	7.6%	1.86	229.1%	$88,579	12.1%
327320	Ready-Mix Concrete Manufacturing	Concrete Products	1,009	413	402	312	-8.8%	-5.0%	0.60	-44.9%	$74,247	-7.3%
444110	Home Centers	Construction Materials Retailing	5,294	4,367	4,847	4,972	-0.9%	0.5%	0.98	-9.5%	$33,470	-13.2%
444190	Other Building Material Dealers	Construction Materials Retailing	2,405	1,197	1,327	1,173	-5.8%	-2.4%	0.77	-25.6%	$60,315	1.7%
444120	Paint and Wallpaper Stores	Construction Materials Retailing	449	310	378	405	-1.7%	1.4%	1.31	-7.4%	$50,995	-12.1%
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	Construction Materials Wholesaling	1,384	703	878	872	-4.4%	-0.1%	1.20	-10.2%	$58,139	-10.6%
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers	Construction Materials Wholesaling	697	387	530	575	-2.7%	1.7%	1.32	-13.8%	$56,566	-23.3%
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	Construction Materials Wholesaling	150	158	197	263	2.7%	5.9%	0.81	38.2%	$74,119	1.7%
423390	Other Construction Material Merchant Wholesalers	Construction Materials Wholesaling	248	49	42	22	-16.2%	-12.2%	0.23	-80.2%	$59,932	8.6%
237210	Land Subdivision	Developers	1,370	494	405	245	-11.5%	-9.6%	1.18	-26.8%	$126,718	3.5%
236118	Residential Remodelers	General Contractors	6,052	5,013	6,059	6,719	0.0%	2.1%	1.49	-1.0%	$39,202	-14.4%
236220	Commercial and Institutional Building Construction	General Contractors	6,586	4,835	5,246	5,161	-2.2%	-0.3%	1.10	-13.8%	$87,932	-1.2%
236115	New Single-Family Housing Construction (except For-Sale Builders)	General Contractors	8,102	3,445	4,550	4,092	-5.6%	-2.1%	1.34	-3.6%	$49,898	-17.3%
236117	New Housing For-Sale Builders	General Contractors	1,055	449	532	510	-6.6%	-0.8%	1.19	2.8%	$86,871	21.0%
236116	New Multifamily Housing Construction (except For-Sale Builders)	General Contractors	355	527	457	441	2.6%	-0.7%	1.69	45.2%	$84,142	-3.7%
237310	Highway, Street, and Bridge Construction	Highway and Street Construction	3,372	2,291	2,268	2,204	-3.9%	-0.6%	0.98	-23.0%	$98,147	0.7%
531311	Residential Property Managers	Real Estate Services	3,758	3,933	4,630	5,219	2.1%	2.4%	1.45	-5.4%	$43,699	-2.0%
531210	Offices of Real Estate Agents and Brokers	Real Estate Services	5,951	3,795	4,093	3,917	-3.7%	-0.9%	1.32	-4.4%	$54,995	-14.8%
531110	Lessors of Residential Buildings and Dwellings	Real Estate Services	2,093	1,922	1,896	1,878	-1.0%	-0.2%	0.60	-3.2%	$40,053	3.9%
531390	Other Activities Related to Real Estate	Real Estate Services	3,215	1,196	1,296	1,104	-8.7%	-3.2%	1.30	-50.8%	$53,221	-31.5%

Continued

[78] Ibid.

APPENDIX C: CLUSTER DETAIL

Exhibit 6C: Non-traded cluster, industry detail, Sacramento (continued)

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
531312	Nonresidential Property Managers	Real Estate Services	960	1,036	1,268	1,466	2.8%	2.9%	1.12	16.2%	$76,324	17.9%
531120	Lessors of Nonresidential Buildings (except Miniwarehouses)	Real Estate Services	639	522	816	939	2.5%	2.9%	0.58	30.2%	$60,460	-41.7%
531190	Lessors of Other Real Estate Property	Real Estate Services	746	671	709	701	-0.5%	-0.2%	1.75	2.0%	$33,322	1.1%
531320	Offices of Real Estate Appraisers	Real Estate Services	465	387	403	407	-1.4%	0.2%	1.41	22.2%	$72,587	25.7%
541191	Title Abstract and Settlement Offices	Real Estate Services	654	238	251	195	-9.1%	-4.9%	0.51	-49.0%	$135,029	40.0%
541370	Surveying and Mapping (except Geophysical) Services	Real Estate Services	298	147	114	78	-9.2%	-7.3%	0.32	-44.1%	$66,606	-20.8%
238220	Plumbing, Heating, and Air-Conditioning Contractors	Specialty Contractors	10,011	6,457	10,086	11,315	0.1%	2.3%	1.25	2.3%	$67,278	8.3%
238210	Electrical Contractors and Other Wiring Installation Contractors	Specialty Contractors	8,004	5,416	7,898	9,122	-0.1%	2.9%	1.15	8.0%	$72,336	11.7%
238990	All Other Specialty Trade Contractors	Specialty Contractors	7,017	4,510	4,627	4,414	-4.1%	-0.9%	1.30	-23.5%	$51,319	-0.8%
238130	Framing Contractors	Specialty Contractors	3,626	1,440	3,683	4,479	0.2%	4.0%	5.14	113.5%	$51,774	2.2%
238310	Drywall and Insulation Contractors	Specialty Contractors	7,448	2,556	3,551	3,200	-7.1%	-2.1%	1.61	-26.7%	$53,910	13.9%
238320	Painting and Wall Covering Contractors	Specialty Contractors	3,954	2,373	3,219	3,428	-2.0%	1.3%	1.36	9.8%	$43,601	6.8%
238910	Site Preparation Contractors	Specialty Contractors	4,128	2,726	2,700	2,515	-4.2%	-1.4%	0.78	-14.3%	$51,107	-7.1%
238110	Poured Concrete Foundation and Structure Contractors	Specialty Contractors	3,808	1,449	2,467	2,577	-4.2%	0.9%	1.42	-15.9%	$64,495	25.7%
238160	Roofing Contractors	Specialty Contractors	2,864	1,830	2,264	2,367	-2.3%	0.9%	1.38	-13.1%	$55,312	14.6%
238350	Finish Carpentry Contractors	Specialty Contractors	2,963	1,571	2,089	2,140	-3.4%	0.5%	1.17	-2.7%	$49,017	-5.9%
238340	Tile and Terrazzo Contractors	Specialty Contractors	2,610	927	1,394	1,356	-6.1%	-0.5%	2.15	-24.7%	$44,457	-10.5%
238140	Masonry Contractors	Specialty Contractors	1,460	682	1,197	1,569	-2.0%	5.6%	0.90	42.2%	$53,240	-1.0%
238330	Flooring Contractors	Specialty Contractors	1,885	1,014	1,136	1,050	-4.9%	-1.6%	1.18	-24.9%	$46,736	-13.1%
238120	Structural Steel and Precast Concrete Contractors	Specialty Contractors	809	484	949	1,178	1.6%	4.4%	1.48	40.7%	$73,747	3.8%
238150	Glass and Glazing Contractors	Specialty Contractors	856	466	682	686	-2.2%	0.1%	1.30	-20.1%	$68,353	16.6%
238290	Other Building Equipment Contractors	Specialty Contractors	640	618	680	731	0.6%	1.5%	0.63	-1.7%	$86,126	0.2%
238390	Other Building Finishing Contractors	Specialty Contractors	561	439	630	692	1.2%	1.9%	0.88	12.9%	$46,687	-3.7%
332322	Sheet Metal Work Manufacturing	Specialty Contractors	818	396	567	580	-3.6%	0.4%	0.75	-27.4%	$55,277	-0.2%

Continued

APPENDIX C: CLUSTER DETAIL

Exhibit 6C: Non-traded cluster, industry detail, Sacramento (Continued)

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
238170	Siding Contractors	Specialty Contractors	851	370	468	409	-5.8%	-2.7%	1.27	-19.9%	$41,539	-22.1%
238190	Other Foundation, Structure, and Building Exterior Contractors	Specialty Contractors	432	238	346	385	-2.2%	2.2%	0.84	-8.9%	$68,405	23.6%
562991	Septic Tank and Related Services	Specialty Contractors	151	58	182	235	1.9%	5.2%	0.91	14.1%	$44,698	-12.8%
337212	Custom Architectural Woodwork and Millwork Manufacturing	Specialty Contractors	111	46	84	83	-2.8%	-0.3%	0.52	-29.0%	$53,714	-20.2%
237110	Water and Sewer Line and Related Structures Construction	Water and Sewer Line Construction	1,645	1,137	1,662	1,963	0.1%	3.4%	1.26	22.8%	$85,108	9.9%

Exhibit 7C: Non-traded cluster, industry detail, Bay Area[79]

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	Building Equipment Distribution	1,686	1,779	2,035	2,193	1.9%	1.5%	0.81	16.9%	$88,871	2.4%
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	Building Equipment Distribution	717	650	843	897	1.6%	1.3%	0.50	6.5%	$154,438	27.3%
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	Building Equipment Distribution	168	304	165	125	-0.2%	-5.4%	0.49	-2.7%	$94,753	10.3%
327320	Ready-Mix Concrete Manufacturing	Concrete Products	1,758	1,157	1,449	1,442	-1.9%	-0.1%	0.57	1.4%	$106,880	6.8%
327390	Other Concrete Product Manufacturing	Concrete Products	2,040	711	854	716	-8.3%	-3.5%	0.58	-52.4%	$68,361	3.8%
444110	Home Centers	Construction Materials Retailing	13,990	12,344	13,592	14,055	-0.3%	0.7%	0.73	-14.3%	$37,382	-7.4%
444190	Other Building Material Dealers	Construction Materials Retailing	6,842	4,703	5,213	5,061	-2.7%	-0.6%	0.80	-8.4%	$66,800	-5.7%
444120	Paint and Wallpaper Stores	Construction Materials Retailing	1,228	975	1,147	1,254	-0.7%	1.8%	1.05	-8.3%	$56,021	-1.6%
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	Construction Materials Wholesaling	3,263	1,491	1,643	1,507	-6.6%	-1.7%	0.59	-36.5%	$73,473	5.7%
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers	Construction Materials Wholesaling	1,094	710	1,079	1,216	-0.1%	2.4%	0.71	-0.2%	$73,758	-5.7%
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	Construction Materials Wholesaling	334	451	524	631	4.6%	3.8%	0.57	47.4%	$72,663	18.8%
423390	Other Construction Material Merchant Wholesalers	Construction Materials Wholesaling	323	239	369	448	1.3%	4.0%	0.53	18.6%	$89,253	42.4%
237210	Land Subdivision	Developers	2,859	1,601	1,512	1,314	-6.2%	-2.8%	1.16	16.6%	$139,124	4.0%
236118	Residential Remodelers	General Contractors	23,908	20,261	23,502	25,443	-0.2%	1.6%	1.53	-13.3%	$55,473	2.4%
236220	Commercial and Institutional Building Construction	General Contractors	16,756	13,820	20,251	23,082	1.9%	2.7%	1.12	16.6%	$118,388	16.6%
236115	New Single-Family Housing Construction (except For-Sale Builders)	General Contractors	27,822	13,348	17,361	17,147	-4.6%	-0.2%	1.35	-4.5%	$67,617	-5.2%
236116	New Multifamily Housing Construction (except For-Sale Builders)	General Contractors	629	1,598	1,775	2,079	10.9%	3.2%	1.73	183.6%	$113,098	30.6%

Continued

[79] Ibid.

APPENDIX C: CLUSTER DETAIL

Exhibit 7C: Non-traded cluster, industry detail, Bay Area (continued)

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
236117	New Housing For-Sale Builders	General Contractors	2,049	737	664	562	-10.7%	-3.3%	0.39	-41.0%	$67,325	-11.8%
237310	Highway, Street, and Bridge Construction	Highway and Street Construction	6,691	4,830	5,910	6,194	-1.2%	0.9%	0.67	-9.8%	$108,247	7.8%
531210	Offices of Real Estate Agents and Brokers	Real Estate Services	22,202	14,837	15,439	14,187	-3.6%	-1.7%	1.32	-13.8%	$92,775	25.8%
531311	Residential Property Managers	Real Estate Services	12,624	12,990	14,744	16,558	1.6%	2.3%	1.22	-20.0%	$63,680	8.9%
531110	Lessors of Residential Buildings and Dwellings	Real Estate Services	11,235	11,309	10,948	10,607	-0.3%	-0.6%	0.92	-7.1%	$57,329	4.6%
531120	Lessors of Nonresidential Buildings (except Miniwarehouses)	Real Estate Services	5,670	4,579	5,674	6,049	0.0%	1.3%	1.07	-9.0%	$89,874	21.2%
531390	Other Activities Related to Real Estate	Real Estate Services	6,384	4,618	5,132	5,213	-2.2%	0.3%	1.37	-12.5%	$64,577	24.2%
531312	Nonresidential Property Managers	Real Estate Services	4,568	4,147	4,659	5,052	0.2%	1.6%	1.09	-20.0%	$116,629	31.6%
531190	Lessors of Other Real Estate Property	Real Estate Services	1,954	2,146	1,780	1,610	-0.9%	-2.0%	1.17	-12.9%	$49,119	19.1%
541370	Surveying and Mapping (except Geophysical) Services	Real Estate Services	832	980	1,247	1,352	4.1%	1.6%	0.94	95.2%	$139,636	53.0%
541191	Title Abstract and Settlement Offices	Real Estate Services	1,816	815	1,047	1,152	-5.4%	1.9%	0.56	-31.6%	$90,554	-19.3%
531320	Offices of Real Estate Appraisers	Real Estate Services	1,448	1,019	803	633	-5.7%	-4.6%	0.74	-30.3%	$76,435	11.6%
238220	Plumbing, Heating, and Air-Conditioning Contractors	Specialty Contractors	24,326	20,695	30,568	35,108	2.3%	2.8%	1.00	13.8%	$92,749	15.0%
238210	Electrical Contractors and Other Wiring Installation Contractors	Specialty Contractors	23,533	19,768	26,678	31,968	1.3%	3.7%	1.03	10.7%	$98,613	16.5%
238990	All Other Specialty Trade Contractors	Specialty Contractors	14,494	10,823	12,467	12,653	-1.5%	0.3%	0.93	-11.0%	$60,467	9.1%
238320	Painting and Wall Covering Contractors	Specialty Contractors	14,403	9,728	11,771	12,257	-2.0%	0.8%	1.32	-1.7%	$51,654	11.4%
238310	Drywall and Insulation Contractors	Specialty Contractors	15,576	7,742	11,596	12,255	-2.9%	1.1%	1.39	2.1%	$82,860	27.0%
238910	Site Preparation Contractors	Specialty Contractors	10,460	7,638	8,778	9,027	-1.7%	0.6%	0.67	-2.0%	$65,223	2.5%
238110	Poured Concrete Foundation and Structure Contractors	Specialty Contractors	6,317	4,004	7,117	8,572	1.2%	3.8%	1.08	30.4%	$83,576	20.8%
238160	Roofing Contractors	Specialty Contractors	8,589	6,236	7,109	7,494	-1.9%	1.1%	1.15	-18.9%	$65,594	23.6%
238330	Flooring Contractors	Specialty Contractors	5,616	3,922	4,413	4,350	-2.4%	-0.3%	1.22	-12.7%	$63,125	9.0%
238350	Finish Carpentry Contractors	Specialty Contractors	5,651	3,687	4,412	4,359	-2.4%	-0.2%	0.65	-3.9%	$53,895	0.7%
238390	Other Building Finishing Contractors	Specialty Contractors	2,416	3,190	3,928	4,532	5.0%	2.9%	1.45	46.0%	$74,294	27.6%
238340	Tile and Terrazzo Contractors	Specialty Contractors	4,697	2,672	3,815	4,073	-2.1%	1.3%	1.55	2.1%	$49,067	-7.9%

Continued

APPENDIX C: CLUSTER DETAIL

Exhibit 7C: Non-traded cluster, industry detail, Bay Area (Continued)

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
332322	Sheet Metal Work Manufacturing	Specialty Contractors	3,164	2,939	3,684	4,163	1.5%	2.5%	1.29	8.8%	$65,560	-11.0%
238130	Framing Contractors	Specialty Contractors	5,121	1,156	3,044	3,244	-5.1%	1.3%	1.12	11.4%	$59,735	12.3%
238290	Other Building Equipment Contractors	Specialty Contractors	2,131	2,540	2,614	2,697	2.1%	0.6%	0.64	1.1%	$108,869	3.2%
238120	Structural Steel and Precast Concrete Contractors	Specialty Contractors	2,538	2,080	2,600	2,869	0.2%	2.0%	1.07	9.6%	$95,058	26.0%
238140	Masonry Contractors	Specialty Contractors	3,538	1,720	2,235	2,290	-4.5%	0.5%	0.44	-2.4%	$65,572	5.3%
238150	Glass and Glazing Contractors	Specialty Contractors	1,755	1,401	2,199	2,402	2.3%	1.8%	1.11	12.1%	$91,329	14.9%
238190	Other Foundation, Structure, and Building Exterior Contractors	Specialty Contractors	834	973	1,203	1,346	3.7%	2.3%	0.77	46.4%	$80,694	32.0%
238170	Siding Contractors	Specialty Contractors	484	340	689	868	3.6%	4.7%	0.50	84.9%	$50,770	6.7%
337212	Custom Architectural Woodwork and Millwork Manufacturing	Specialty Contractors	779	387	596	641	-2.6%	1.5%	0.98	-35.6%	$100,576	27.4%
562991	Septic Tank and Related Services	Specialty Contractors	257	202	310	352	1.9%	2.6%	0.41	2.1%	$62,402	18.8%
237110	Water and Sewer Line and Related Structures Construction	Water and Sewer Line Construction	4,589	3,441	3,942	3,946	-1.5%	0.0%	0.79	-6.9%	$108,147	8.8%

Exhibit 8C: Non-traded cluster, industry detail, California[80]

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	Building Equipment Distribution	11,281	9,595	10,571	10,906	-0.6%	0.6%	0.93	-2.8%	$74,544	0.6%
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	Building Equipment Distribution	3,813	3,384	4,061	4,245	0.6%	0.9%	0.54	3.4%	$100,120	10.1%
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	Building Equipment Distribution	1,157	1,132	1,095	1,074	-0.6%	-0.4%	0.73	0.5%	$76,987	-4.9%
327320	Ready-Mix Concrete Manufacturing	Concrete Products	11,805	6,691	7,884	7,402	-4.0%	-1.3%	0.69	-11.9%	$77,077	-3.8%
327390	Other Concrete Product Manufacturing	Concrete Products	6,760	3,672	4,699	4,799	-3.6%	0.4%	0.71	-15.3%	$66,693	8.1%
444110	Home Centers	Construction Materials Retailing	73,081	62,648	68,867	71,197	-0.6%	0.7%	0.82	-11.0%	$33,310	-15.0%
444190	Other Building Material Dealers	Construction Materials Retailing	33,690	21,925	25,413	25,492	-2.8%	0.1%	0.87	-2.9%	$61,143	-2.9%
444120	Paint and Wallpaper Stores	Construction Materials Retailing	4,660	3,916	4,583	4,942	-0.2%	1.5%	0.94	3.4%	$53,543	-1.4%
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers	Construction Materials Wholesaling	13,249	7,509	9,647	10,035	-3.1%	0.8%	0.78	-1.7%	$66,042	-4.7%
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers	Construction Materials Wholesaling	8,728	5,505	7,041	7,595	-2.1%	1.5%	1.03	-12.6%	$67,589	-3.5%

Continued

[80] Ibid.

APPENDIX C: CLUSTER DETAIL

Exhibit 8C: Non-traded cluster, industry detail, California (Continued)

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
423390	Other Construction Material Merchant Wholesalers	Construction Materials Wholesaling	3,359	1,798	2,566	2,756	-2.7%	1.4%	0.82	-14.9%	$74,508	-4.8%
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	Construction Materials Wholesaling	2,295	2,046	2,169	2,273	-0.6%	0.9%	0.53	-4.8%	$81,254	4.1%
237210	Land Subdivision	Developers	19,819	9,098	8,630	7,623	-8.0%	-2.5%	1.48	2.8%	$120,680	5.9%
236118	Residential Remodelers	General Contractors	87,338	78,336	88,694	96,398	0.2%	1.7%	1.29	-4.0%	$43,848	-5.4%
236220	Commercial and Institutional Building Construction	General Contractors	73,627	57,988	75,873	82,727	0.3%	1.7%	0.94	6.5%	$93,506	10.7%
236115	New Single-Family Housing Construction (except For-Sale Builders)	General Contractors	121,915	58,480	75,699	74,767	-4.7%	-0.2%	1.32	1.8%	$58,502	-12.5%
236116	New Multifamily Housing Construction (except For-Sale Builders)	General Contractors	3,725	5,578	5,519	6,195	4.0%	2.3%	1.20	59.5%	$88,373	27.3%
236117	New Housing For-Sale Builders	General Contractors	11,435	4,294	3,727	2,951	-10.6%	-4.6%	0.49	-36.4%	$68,219	-7.5%
237310	Highway, Street, and Bridge Construction	Highway and Street Construction	29,795	21,317	24,495	24,948	-1.9%	0.4%	0.62	-10.1%	$98,254	5.5%
531210	Offices of Real Estate Agents and Brokers	Real Estate Services	102,035	70,421	73,913	69,769	-3.2%	-1.1%	1.41	-3.9%	$76,897	9.0%
531311	Residential Property Managers	Real Estate Services	58,777	63,183	72,578	82,361	2.1%	2.6%	1.34	-9.4%	$54,610	4.9%
531110	Lessors of Residential Buildings and Dwellings	Real Estate Services	47,090	44,920	45,693	45,602	-0.3%	0.0%	0.85	-1.0%	$47,096	3.9%
531390	Other Activities Related to Real Estate	Real Estate Services	38,012	27,240	28,984	29,428	-2.7%	0.3%	1.72	-11.1%	$67,182	16.7%
531120	Lessors of Nonresidential Buildings (except Miniwarehouses)	Real Estate Services	19,488	18,297	23,047	25,159	1.7%	1.8%	0.97	15.1%	$82,503	11.0%
531312	Nonresidential Property Managers	Real Estate Services	20,430	18,851	19,864	20,940	-0.3%	1.1%	1.03	-18.3%	$84,932	13.7%
531190	Lessors of Other Real Estate Property	Real Estate Services	11,137	10,830	10,530	10,269	-0.6%	-0.5%	1.54	-3.2%	$47,366	24.5%
531320	Offices of Real Estate Appraisers	Real Estate Services	7,320	6,190	4,886	4,362	-4.0%	-2.2%	1.01	-10.0%	$71,221	15.5%
541370	Surveying and Mapping (except Geophysical) Services	Real Estate Services	3,772	2,857	3,608	3,781	-0.4%	0.9%	0.61	33.5%	$95,934	20.5%
541191	Title Abstract and Settlement Offices	Real Estate Services	7,522	3,038	2,989	2,657	-8.8%	-2.3%	0.36	-49.5%	$86,771	-18.1%

APPENDIX C: CLUSTER DETAIL

Exhibit 8C: Non-traded cluster, industry detail, California (Continued)

NAICS Code	NAICS Description	Subcluster Name	2006 Jobs	2011 Jobs	2016 Jobs	2021 Jobs	AAGR 06-16	AAGR 16-21	2016 Location Quotient	LQ % Change 06-16	2016 Total Earnings	Earnings % Change 06-16
238220	Plumbing, Heating, and Air-Conditioning Contractors	Specialty Contractors	116,417	87,270	129,053	147,975	1.0%	2.8%	0.94	7.6%	$71,315	10.8%
238210	Electrical Contractors and Other Wiring Installation Contractors	Specialty Contractors	109,877	88,481	113,623	129,994	0.3%	2.7%	0.97	8.1%	$75,407	10.6%
238990	All Other Specialty Trade Contractors	Specialty Contractors	79,360	58,858	65,803	66,909	-1.9%	0.3%	1.09	-8.1%	$50,598	3.9%
238310	Drywall and Insulation Contractors	Specialty Contractors	90,273	38,761	53,334	54,098	-5.1%	0.3%	1.43	-13.2%	$60,436	17.2%
238320	Painting and Wall Covering Contractors	Specialty Contractors	62,296	42,097	48,467	49,690	-2.5%	0.5%	1.21	0.2%	$41,990	3.0%
238910	Site Preparation Contractors	Specialty Contractors	57,544	40,874	44,949	45,360	-2.4%	0.2%	0.76	-2.3%	$53,720	-3.1%
238110	Poured Concrete Foundation and Structure Contractors	Specialty Contractors	40,773	20,024	28,741	30,493	-3.4%	1.2%	0.97	-12.6%	$64,661	15.2%
238160	Roofing Contractors	Specialty Contractors	33,340	25,141	28,001	29,769	-1.7%	1.2%	1.01	-11.9%	$54,222	11.3%
238350	Finish Carpentry Contractors	Specialty Contractors	37,028	21,649	26,807	27,196	-3.2%	0.3%	0.88	-4.5%	$46,752	-2.0%
238130	Framing Contractors	Specialty Contractors	46,669	11,403	24,009	24,856	-6.4%	0.7%	1.98	3.3%	$47,906	5.9%
238330	Flooring Contractors	Specialty Contractors	24,226	17,184	19,168	18,980	-2.3%	-0.2%	1.18	-5.9%	$47,939	-2.7%
238340	Tile and Terrazzo Contractors	Specialty Contractors	29,152	14,676	18,302	17,800	-4.5%	-0.6%	1.66	-15.4%	$43,085	-7.4%
238140	Masonry Contractors	Specialty Contractors	28,938	12,598	16,040	16,971	-5.7%	1.1%	0.71	-8.2%	$51,488	0.0%
332322	Sheet Metal Work Manufacturing	Specialty Contractors	13,578	12,062	13,703	14,427	0.1%	1.0%	1.07	1.0%	$62,793	-1.3%
238390	Other Building Finishing Contractors	Specialty Contractors	13,401	10,665	13,644	15,252	0.2%	2.3%	1.12	-2.1%	$58,110	11.2%
238120	Structural Steel and Precast Concrete Contractors	Specialty Contractors	15,239	9,910	13,402	14,361	-1.3%	1.4%	1.23	0.8%	$76,918	10.4%
238290	Other Building Equipment Contractors	Specialty Contractors	10,684	9,724	11,465	12,478	0.7%	1.7%	0.62	-5.2%	$90,463	13.3%
238150	Glass and Glazing Contractors	Specialty Contractors	9,505	6,822	9,320	9,863	-0.2%	1.1%	1.05	-6.1%	$71,622	11.6%
238190	Other Foundation, Structure, and Building Exterior Contractors	Specialty Contractors	6,699	4,743	5,785	6,031	-1.5%	0.8%	0.83	-6.1%	$57,806	11.1%
562991	Septic Tank and Related Services	Specialty Contractors	3,208	2,879	3,764	4,529	1.6%	3.8%	1.12	6.4%	$54,036	-4.5%
238170	Siding Contractors	Specialty Contractors	2,907	1,834	2,612	2,859	-1.1%	1.8%	0.42	24.9%	$45,664	-1.8%
337212	Custom Architectural Woodwork and Millwork Manufacturing	Specialty Contractors	3,160	1,657	2,604	2,895	-1.9%	2.1%	0.95	-25.6%	$69,938	6.1%
237110	Water and Sewer Line and Related Structures Construction	Water and Sewer Line Construction	21,833	15,476	20,210	22,181	-0.8%	1.9%	0.90	7.5%	$90,377	9.9%

APPENDIX D: EXECUTIVE INTERVIEWS

Exhibit 1D lists the industry, union and workforce stakeholders who provided executive interviews between March and April 2017. The interviews were conducted by phone, recorded, transcribed and summarized for the report.

Exhibit 1D: Executive interviews conducted for this study

Name	Title	Company/Organization
Rick Larkey	Executive Director	North State Building Industry Association Foundation
Tim Murphy	CEO	Sacramento Regional Builders Exchange
Chuck Hack	Principal	Leonakis
Doyle Radford	Business Manager	Laborers Local 185
Todd Kraenzel	VP Construction	Jackson Construction
Ed Herrnberger	Area Manager, North Region	Teichert Construction
Rick Wylie	President	Villara Building Systems
Dennis Canevari	President	Sacramento Sierra Building Trades Council
William Walker	Employer and Business Services	Sacramento Employment and Training Center
Leslie Westmoreland	Talent Development Director	Mark III Construction
Jenn Layton	Talent Development Coordinator	Mark III Construction
Michele Daugherty	President and CEO	Associated Builders and Contractors Northern California Chapter
Carl Barrett	President	Otto Construction
Allison Otto	Vice President	Otto Construction

The questionnaire below was provided in advance of the recorded interview.

1. Please briefly tell us about your organization, its history and mission, and one or two major projects and initiatives you are working on now, especially how they will impact skills, training and the workforce.
2. Who are the main sub-contractors or partner contractors you work with in the region that are either located here, or perform a majority of their work here. How many employees do they have—exact or rough number, OR if they are large, medium or small companies. Again, we are talking about the six counties surrounding Sacramento.
3. What major projects has the firm recently finished, are in process, or are planned that you think will impact hiring from the industry in the near and medium terms in the Sacramento region? Please comment on LOCAL trends in terms of project development you are seeing and that you expect to increase.
4. Who are the main LOCAL suppliers that provide services, materials or other goods and support for your projects? These can be architectural or engineering services, building tools, equipment and materials firms, manufacturing suppliers, etc. Emerging areas that are gaining popularity or trending are also of interest.
5. What are the major LOCAL and STATE regulatory or policy items that you think are well-supporting the industry or that you think need to be addressed? As a follow up, please tell us what key stakeholders from government, nonprofits or businesses are spearheading efforts for change.

APPENDIX D: EXECUTIVE INTERVIEWS

6. What union trades serve your industry (the services you offer) and your company? As a follow up, overall, what percentage would you say of your industry and your company is union versus non-union? Please comment on why those levels are the way they are in the Sacramento region.

7. Please tell us the amount—general or in terms of percent—you think out-of-area, or out-of-state contractors are supporting local projects in the Sacramento region. (Out of area would mean the HQ is more than 100 miles away.)

8. As a follow up, what amount or percent—regardless of contractor location—do you think contractors are using out-of-area workers, i.e., bringing in people from more than 100 miles away?

9. As a follow up to that, what percent—regardless of residence or origin of workers—do you think are temporary workers?

10. What positions do you think are key positions that are hard to fill now and in the medium term (six to 24 months)? We're specifically referring to technicians and installers, or middle-skill office workers with less than a bachelor's degree—clerical, entry-level project support.

11. What do you think are the primary LOCAL high school, community college and university relationships for hiring pipelines for your industry (members)? As a follow up, including the building trades and sector-based nonprofits, what are other institutional sources for hiring that are key for the industry?

12. What are the other main ways that contractors in your industry find their employees?

13. Can you tell us about the workforce and skill impacts from environmental policies like CalGreen, AB 350, and energy efficiency for HVAC, lighting, etc.? What do you think are the main occupations and skills that are being impacted now, and that your industry is talking about for the near and medium terms?

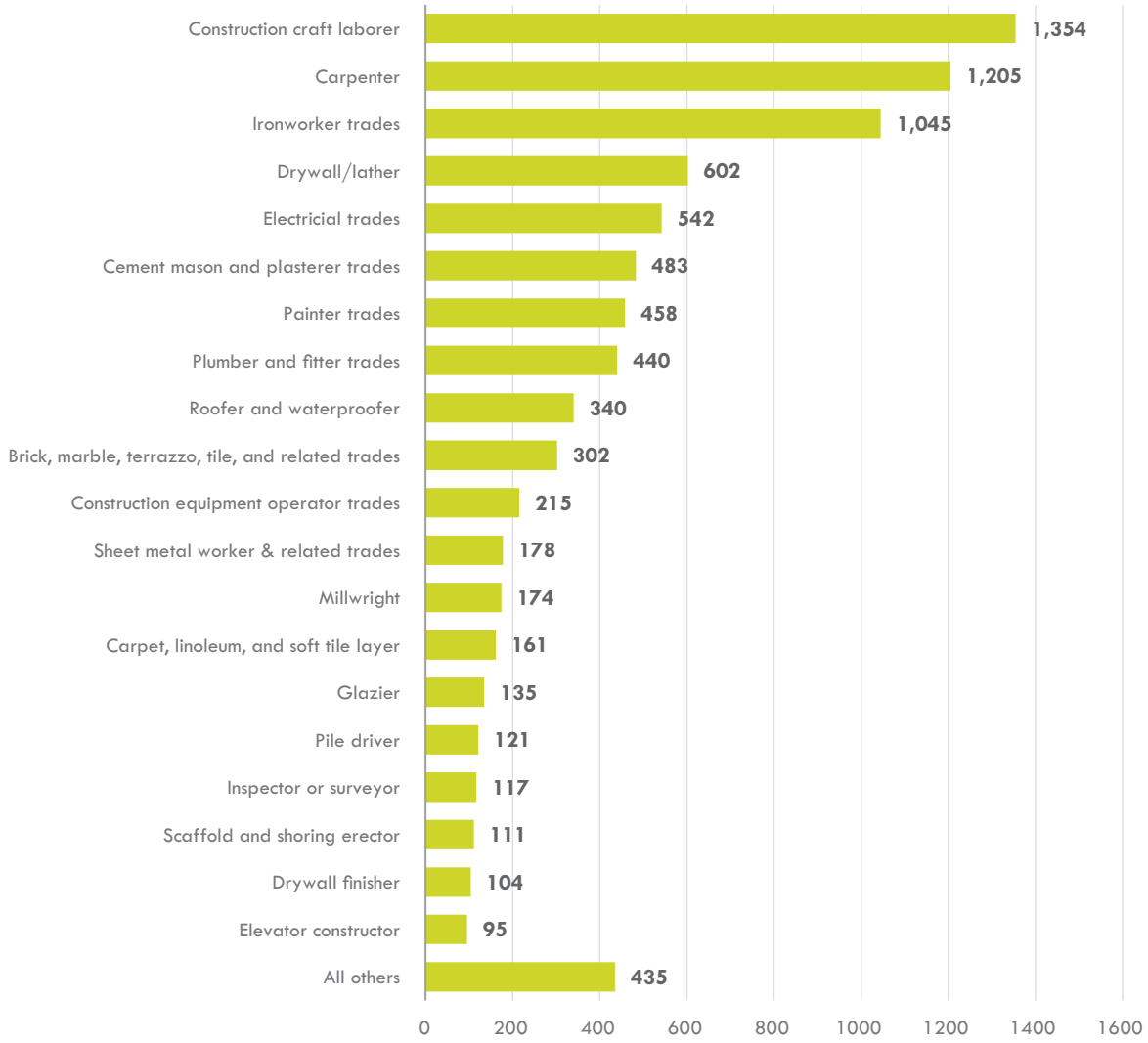
14. Is there anything else you would like to add? Did we miss important or key issues that should be included in our study?

APPENDIX E: UNIONIZED CONSTRUCTION EMPLOYMENT, DEMOGRAPHICS AND WAGES

The following data analysis provides some basic information about the unionized construction workforce in the Sacramento region including apprenticeship starts, educational attainment, number of weeks worked, gender and wages.

Exhibit 1E shows the number of joint apprenticeship starts during a period of a little less than six years, between 2012 and late 2017. The data includes residents in the six-county region by trade of indenture. More than 8,500 workers started apprenticeships during the period analyzed.

Exhibit 1E: Total joint apprentice starts, residents in the six-county Sacramento region (January 2012-October 2017) (n = 8,617)[81]

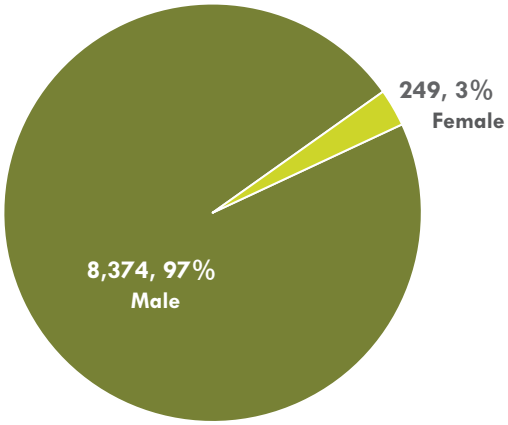


[81] California Apprenticeship Demographic Data as of November 2, 2017, California Division of Apprenticeship Standards.

APPENDIX E: UNIONIZED CONSTRUCTION EMPLOYMENT, DEMOGRAPHICS AND WAGES

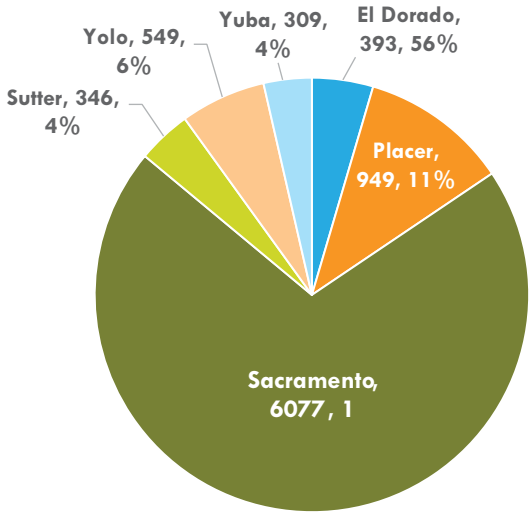
Of the more than 8,500 workers who entered joint apprenticeships in the six-year period, only 3% were women.

Exhibit 2E: Joint apprentices by gender in the Sacramento region (January 2012–October 2017)[82]



Most apprentices in the Sacramento region are residents of Sacramento County, followed by Placer County (Exhibit 3E).

Exhibit 3E: Joint apprentices by county of residence in the Sacramento region (January 2012–October 2017) [83]



[82] Ibid.

[83] Ibid.

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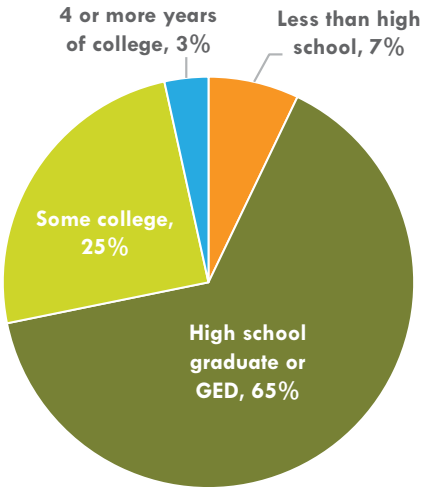
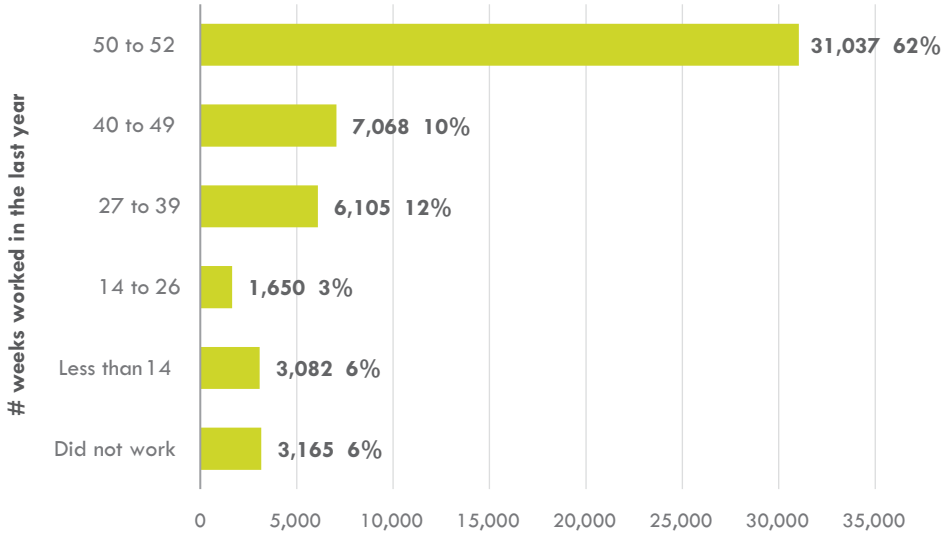
Most workers entering joint apprenticeship programs in the Sacramento region have a high school diploma or GED (Exhibit 4E). About a quarter have completed some college, between one and three years.

Exhibit 4E: Joint apprentices' highest level of education prior to apprenticeship in the Sacramento region (January 2012–October 2017)[84]



Many construction workers do not work a full year, which can impact their earnings. Exhibit 5E refers to all workers counted in the construction industry by the 2015 American Community Survey in the Sacramento region. Even though a majority, more than 60%, worked 50 or more weeks during the last year, nearly 30% worked fewer than 40 weeks or did not work during the year.

Exhibit 5E: Number of weeks worked, all workers in the construction sector in the Sacramento region (2015)[85]



[84] Ibid.

[85] U.S. Census Bureau, American Community Survey Public Use Microdata Sample. Data includes only individuals whose employment is in NAICS code 23 (Construction).

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Exhibit 6E: Unionized construction prevailing wages (second quarter of 2017)[86]

	Period 1 Apprentice		Journey-Level Worker	
	Hourly Basic Rate	Hourly Total Rate (including benefits)	Hourly Basic Rate	Hourly Total Rate (including benefits)
Asbestos Worker, Heat and Frost Insulator	$19.78	$28.59	$65.36	$88.72
Boilermaker- Blacksmith	$30.30	$68.65	$43.28	$81.63
Bricklayer*	$17.83	$26.02	$37.14	$60.73
Pointer, Caulker and Cleaner	$18.47	$24.95	$41.04	$62.75
Bricktender	$19.18	$27.93	$33.27	$52.70
Carpenter	$24.31	$38.86	$40.52	$69.42
Acoustical Installer (Carpenter)	$24.31	$38.86	$40.52	$69.42
Hardwood Floor Layer (Carpenter)	$24.40	$38.95	$40.52	$69.42
Insulation Installer (Carpenter)	$24.31	$38.86	$40.52	$69.42
Scaffold & Shoring Erector (Carpenter)	$24.40	$38.95	$40.67	$69.57
Shingler (Carpenter)	$24.40	$38.95	$40.52	$69.42
Modular Furniture Installer (Carpenter)	$20.49	$32.14	$28.23	$49.37
Carpet, Linoleum and Resilient Floor Layer	$16.92	$32.60	$33.88	$54.38
Cement Mason	$21.77	$30.12	$33.49	$59.01
Drywall Installer/Lather (Carpenter)	$23.80	$38.66	$41.02	$71.01
Electrician, Inside Wireman	$14.02	$27.87	$40.06	$67.74
Electrical Utility Lineman	$33.29	$48.74	$55.49	$72.74
Communications & Systems Installer	$15.59	$30.58	$28.35	$43.80
Elevator Constructor	$31.72	$31.72	$63.44	$99.14
Field Surveyor Instrumentman	$17.09	$32.98	$34.18	$64.11
Field Surveyor Chainman/ Rodman	$17.09	$32.98	$37.06	$66.99
Chief of Party	$17.09	$32.98	$40.15	$70.08
Glazier	$13.78	$31.25	$34.52	$61.45
Iron Worker	$18.00	$28.51	$36.00	$66.46
Laborer**	$18.55	$28.13	$29.79	$53.09
Tunnel Worker (Laborer)**	$23.48	$33.52	$36.60	$60.36
Marble Finisher	$18.73	$29.33	$31.17	$46.29
Marble Setter	$30.52	$45.63	$41.77	$68.66
Millwright	$25.81	$40.56	$43.02	$73.52

Continued

[86] California Division of Industrial Relations, Director's Prevailing Wage Determinations, Index 2017-2. *Apprentice rate shown for those who have completed 3 months. **Journey-level rate varies depending on job classification; rates shown for Group 1. https://www.dir.ca.gov/oprl/DPreWageDetermination.htm.

APPENDIX E: UNIONIZED CONSTRUCTION EMPLOYMENT, DEMOGRAPHICS AND WAGES

Exhibit 6E: Unionized construction prevailing wages (second quarter of 2017 (Continued)

	Period 1 Apprentice		Journey-Level Worker	
	Hourly Basic Rate	Hourly Total Rate (including benefits)	Hourly Basic Rate	Hourly Total Rate (including benefits)
Operating Engineer**	$22.15	$51.83	$43.25	$74.03
Building Construction Inspector	$23.27	$42.42	$43.02	$73.59
Pile Driver (Carpenter)	$27.39	$41.95	$45.65	$77.71
Parking and Highway Improvement (Striper-Laborer)	$19.39	$28.94	$34.26	$45.91
Painter	$16.03	$30.82	$32.11	$50.73
Taper	$17.96	$35.07	$39.98	$64.78
Plasterer	$18.61	$31.89	$32.92	$62.85
Plaster Tender	$18.61	$28.00	$31.02	$54.48
Plumber, Steamfitter	$24.19	$38.04	$48.37	$72.72
Landscape/Irrigation Fitter	$12.65	$25.30	$26.85	$42.50
Sprinkler Fitter (Fire Protection/ Fire Control Systems	$17.58	$26.60	$39.07	$60.31
Underground/Utility Pipefitter	$12.65	$25.30	$26.85	$42.50
Roofer	$15.71	$20.76	$31.41	$52.80
Metal Roofing System Installer	$16.04	$19.02	$34.00	$38.80
Sheet Metal Worker	$16.72	$50.61	$41.80	$78.77
Metal Deck and Siding	$14.61	$35.49	$35.64	$69.13
Terrazzo Finisher	$18.20	$27.47	$35.14	$52.34
Terrazzo Worker	$26.47	$41.11	$44.11	$70.80
Tile Setter	$23.15	$32.10	$37.25	$55.90
Tile Finisher	$13.35	$18.80	$22.90	$31.35
MEDIAN	**$18.73**	**$32.14**	**$37.25**	**$64.78**

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The Centers of Excellence Initiative is funded in part by the Chancellor's Office, California Community Colleges, Economic and Workforce Development Program. The Centers aspire to be the leading source of regional workforce information and insight for California community colleges. More information about the Centers of Excellence is available at **www.coeccc.net**.

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MORE ABOUT VALLEY VISION

Since 1994, Valley Vision's work has driven transformative change and improved lives across Northern California. An independent social impact and civic leadership organization headquartered in Sacramento, Valley Vision strengthens our communities through unbiased research, boundary-crossing collaboration and change leadership. Our work improves overall quality of life and creates the conditions for economic prosperity and community health and vitality.

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