

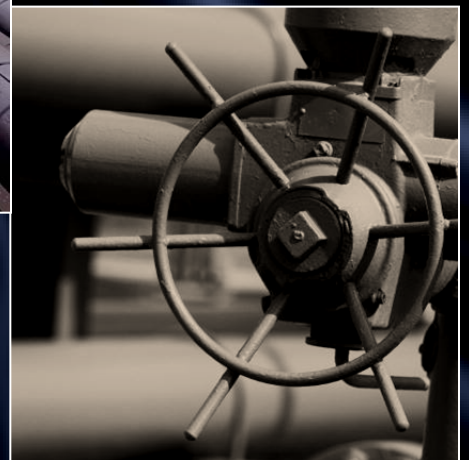
OIL AND GAS IN CALIFORNIA:

THE INDUSTRY, ITS ECONOMIC CONTRIBUTION AND USER INDUSTRIES AT RISK

in 2015



MAY 2017



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This research was commissioned by the Western States Petroleum Association.

The LAEDC Institute for Applied Economics provides objective economic and policy research for public agencies and private firms. The group focuses on economic impact studies, regional industry analyses, economic forecasts and issue studies, particularly in workforce development, transportation, infrastructure and environmental policy.

Every reasonable effort has been made to ensure that the data contained herein reflect the most accurate and timely information possible and they are believed to be reliable.

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Executive Summary

The oil and gas industry makes a significant contribution to the California economy. Extraction, production, refining and petroleum products manufacturing result in highly tradable products both consumed domestically and exported, producing high revenues, high wage jobs and significant fiscal revenues for all levels of government.

The industry is facing changing market conditions as a result of regulatory mandates issued and under consideration in California to meet emissions goals by 2020, 2030 and 2050. These market changes are expected to impact the ability of both upstream and downstream operations to continue in the state and the available supply of petroleum and petroleum products

In this report, the Institute for Applied Economics of the Los Angeles County Economic Development Corporation (LAEDC) conducts an industry contribution analysis of the oil and gas industry as a whole in California in 2015 and concludes with forward industry linkages for petroleum refineries in California in 2015. The findings are as follows.

Oil and Gas Industry

Total Economic Contribution

The total economic contribution of the oil and gas industry in California, which includes indirect and induced activity, is presented in Exhibit ES-1.

- ▶ 368,100 direct, indirect and induced jobs
- ▶ \$33 billion in total labor income
- ▶ \$66 billion in value added, accounting for 2.7 percent of state GDP.
- ▶ \$111 billion in total output



Exhibit ES-1

Total Economic Contribution of Oil and Gas Industry California 2015

Employment (jobs):			
Direct	142,780		
TOTAL		368,100	
<i>Percent of California Total Employment</i>			<i>1.6%</i>
Labor income (\$ millions):			
Direct	\$ 19,910		
TOTAL		\$ 33,120	
<i>Percent of California Total Labor Income</i>			<i>2.2%</i>
Value added (\$ millions):			
Direct	\$ 43,760		
TOTAL		\$ 65,780	
<i>Percent of California Total GDP</i>			<i>2.7%</i>
Output (\$ millions):			
Direct	\$111,163		
TOTAL		\$148,010	
<i>Percent of California Total Output</i>			<i>3.6%</i>

Source: Estimates by LAEDC

Fiscal Contribution

The industry brings significant fiscal revenues to local, state and federal governments, as summarized in Exhibit ES-2.

- ▶ \$26.4 billion in state and local tax revenues
- ▶ \$15.6 billion in federal taxes
- ▶ \$28.5 billion in sales and excise taxes
- ▶ \$2.3 billion in corporate profits taxes.

Exhibit ES-2

Fiscal Contribution of Oil and Gas Industry California 2015

Type of Tax	State and Local (\$ millions)	Federal (\$ millions)	Total Tax Revenues (\$ millions)
Sales and excise taxes	\$ 21,310	\$ 7,180	\$ 28,490
Property taxes	2,650	-	2,650
Personal income taxes	1,080	3,050	4,120
Corporate profits taxes	310	1,960	2,270
All other taxes	1,040	280	1,320
TOTAL TAX REVENUES	\$ 26,390	\$ 15,640	\$ 42,030

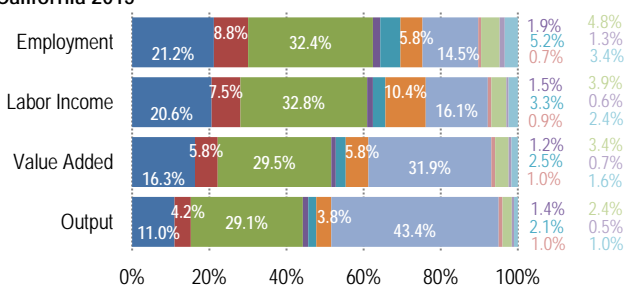
Source: Estimates by LAEDC

Total Economic Contribution by Industry

Each oil and gas industry is associated with its own distinct set of activities, which ripple through the California economy with different magnitudes. Exhibit ES-3 shows the distribution of the total economic contribution of the oil and gas industry by component industry.

Exhibit ES-3

Total Economic Contribution by Industry California 2015



- Oil and gas extraction
- Oil and gas: drilling wells and mining support
- Natural gas distribution
- Oil and gas field machinery/equip mfg
- Oil and gas: pipeline/related structures construction
- Pipeline transportation
- Petroleum refineries
- Petroleum lubricating oil/grease/petrochemicals mfg
- Petroleum and petroleum prods wholesale
- Fuel dealers
- Gasoline stations

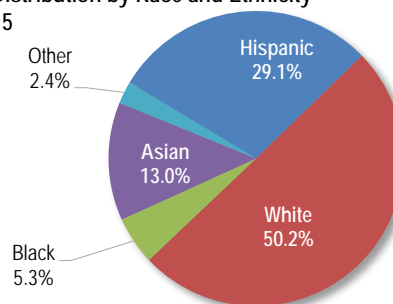
Characteristics of the Workforce

The industry employs individuals with a broad range of characteristics exhibiting some notable trends:

- ▶ The workforce is ethnically and racially diverse, with 50.2 percent white, 29.1 percent of Hispanic origin and 13.0 percent Asian.
- ▶ Men in the workforce outnumber women by more than two to one.
- ▶ Almost three-quarters of the industry's workforce is in its prime working age—between 22 years and 54 years of age, although workers aged 55 years and older still accounted for 24.5 percent, a significant share of the industry workforce.
- ▶ A diversity of employment opportunities is available across the educational attainment spectrum:
 - Approximately 23 percent of workers have a bachelor's degree or higher;
 - Almost 30 percent have some college, post-secondary certification or an associate's degree; and
 - Just under 40 percent of all workers have high school credentials or less.
 - Across all levels of attainment, earnings are higher in oil and gas industries compared to the all industry average.

Exhibit ES-3

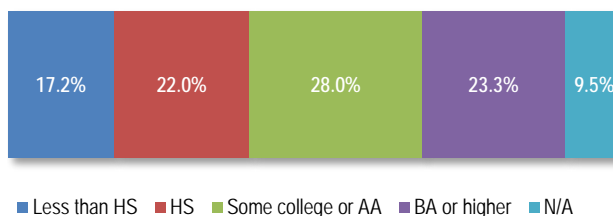
Employment Distribution by Race and Ethnicity California 2015



Source: QWI; Analysis by LAEDC

Exhibit ES-4

Industry Employment Distribution by Education California 2015



- Less than HS
- HS
- Some college or AA
- BA or higher
- N/A

Source: QWI; Analysis by LAEDC

California Refineries

Backward Linkages

Backward linkages of the refinery industry trace its purchases of goods and services in its supply chain and its payment of labor income. These are quantified using contribution analysis. The total economic contribution of the refinery and petrochemical industry in California, which includes all indirect and induced activity, is: presented in Exhibit ES-5.

- ▶ 107,270 direct, indirect and induced jobs
- ▶ \$10.4 billion in total labor income
- ▶ \$29.0 billion in value added, accounting for 1.9 percent of state GDP.

Forward Linkages

Many industries are directly dependent on refinery and petrochemical products in their production processes and will be exposed to the risk of cost increases, relocation or closure should there be a reduction in the availability or increase in the prices of these products. *Forward linkages* are the industries that purchase petroleum products as inputs. These primary user industries of the refinery and petrochemical industry represent significant economic activity which is at risk, as shown in Exhibit ES-6.

- ▶ 1.7 million jobs (7.6 percent of state total)
- ▶ \$111 billion in labor income
- ▶ \$207 billion in value added, accounting for 8.4 percent of state GDP.

In addition to the refinery industry itself, all twenty-one California manufacturing industries (at the 3-digit NAICS level) are vulnerable and will be most at risk. ❖

Exhibit ES-6

Economic Activity At Risk from Refinery Supply Reductions

Employment (jobs):	
Primary Industries	1,712,715
Percent of California Total Employment	7.6%
Labor income (\$ millions):	
Primary Industries	\$ 110,730
Percent of California Total Labor Income	7.4%
Value added (\$ millions):	
Primary Industries	\$ 207,010
Percent of California Total GDP	8.4%

Source: Estimates by LAEDC

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1 Introduction

The U.S. economy is incredibly dependent on the oil and gas industry. Operating in a global market, demand, supply and prices are influenced by what takes place worldwide, not just nationally. Extraction, production, refining and related manufacturing result in highly tradable products consumed domestically and exported to satiate global demand. As a result, the oil and gas industry is associated with high revenues and high wage jobs.

As finite natural resources, fossil fuels are heavily regulated as their extraction, production and refining have consequences for the environment and depletion of these resources could be calamitous for the energy needs of future generations. Taxes are levied on the industry in a variety of ways to mitigate these risks, resulting in public revenues that are larger than those collected from other industries.

The regulatory mandates that have been issued and are under consideration by the state of California to meet emissions goals in 2020, 2030, and 2050 are changing the market faced by the industry. The ability of in-state oil production and refinery operations to continue and the available supply of petroleum products will be affected.

The potential reduction of the in-state supply of crude oil and refined petroleum products and byproducts will impact thousands of businesses that depend on these products in their production processes, impacting production costs and leading to higher prices of end products—which themselves may be used in other industries as inputs into production.

In this report, the Institute for Applied Economics of the Los Angeles County Economic Development Corporation (LAEDC) estimates the economic and fiscal contribution of the oil and gas industry in California, and conducts a regional dependency study of the refinery industry, which evaluates the ripple effect of a potential reduction of supply of refined petroleum products and byproducts in California. The report is presented in nine parts.

This introductory section provides a short description of the industry definition and sub-regions used in the contribution analysis. Additional details and methodology can be found in the appendix.



Section 2 provides a brief overview of the oil and gas industry in California, including upstream and downstream activity. Section 3 examines the state's oil and gas industry's workforce.

Section 4 provides an analysis of the oil and gas industry's total economic and fiscal contribution to the state of California and a discussion of the public revenues attributed to the industry and the consumption of its products.

Section 5 provides analysis at the sub-regional and county levels, and provides contributions for most counties in California.

Section 6 quantifies the direct economic activity associated with the refinery industry in California, such as its direct employment and output, and then estimates the total contribution of the industry through its supply chain. This contribution represents the industry and its *backward linkages*. Then refinery industry products are traced through the industry user chain. A *vulnerability index* is constructed to evaluate each industry's exposure to refinery products. The top twenty primary user industries most vulnerable to potential supply disruptions are quantified, providing an order of magnitude estimate of the economic activity that is at risk from reduction of supply of refined petroleum

products based on the *forward linkages* of the refinery industry in California.

Section 7 provides an analysis for each of the top twenty most vulnerable primary user industries. Employment, labor income, output and direct contribution to GDP are estimated to provide orders of magnitude of the economic activity that is at risk from reduction of supply of refined petroleum products and byproducts.

Section 8 identifies employment in industries at risk, user industries that rely upon refinery products in their supply chain, or who are users of the dependent industry's output. Jobs at risk are identified at the county level and congressional district level.

Section 9 includes detailed sheets for each county in California for the economic contribution of the oil and gas industry, and the number of jobs in industries identified as most at risk from potential refinery supply disruptions.

Detailed tables as referenced in the text can be found in the Appendix. ❖

Oil and Gas Industry Definition

The North American Industry Classification System (NAICS) was created to track economic activity for businesses at the establishment level. Each establishment is grouped according to its primary activity. The thirteen NAICS codes included in the definition of the oil and gas industry used in this report are listed in Exhibit 1-1. These are described in detail in the Appendix. ❖

Exhibit 1-1

Oil and Gas Industry Definition

NAICS	Industry
211	Oil and gas extraction
213111	Drilling oil and gas wells
213112	Support activities for oil and gas operations
2212	Natural gas distribution
23712	Oil and gas pipeline and related structures construction
32411	Petroleum refineries
324191	Petroleum lubricating oil and grease manufacturing
32511	Petrochemical manufacturing
333132	Oil and gas field machinery and equipment manufacturing
4247	Petroleum and petroleum products merchant wholesalers
447	Gasoline stations
45431	Fuel dealers
486	Pipeline transportation

Source: LAEDC

The Sub-Regions of California

For purposes of exposition, California is divided into four sub-regions, which are shown in Exhibit 1-2 and defined below.

Southern California

This sub-region includes the following six counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino and San Diego.

San Francisco Bay Area

This sub-region includes the following nine counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma.

Central Coast

This sub-region includes the following four counties: Monterey, San Luis Obispo, Santa Barbara and Ventura.

Central Valley/Northern California

This sub-region includes the following sixteen counties: Butte, Colusa, Fresno, Glenn, Kern, Kings, Merced, Sacramento, San Joaquin, Shasta, Stanislaus, Sutter, Tehama, Tulare, Yolo and Yuba.

The remaining 23 counties are contained in Rest of State. ❖

Exhibit 1-2

California Sub-Regions



Source: ESRI

2 The Oil and Gas Industry in California

California's oil and gas industry continues to produce energy for its residents and businesses, as well as for those in the rest of the nation. The oil and gas industry remains a high-wage industry in the state. However, strict regulations and pressure on prices prevented job growth from further advancing in 2015.

Upstream Activity

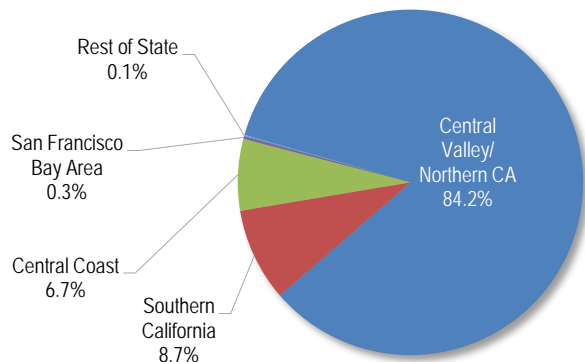
Production, which includes the drilling and pumping of crude oil and natural gas, are upstream operations in the oil and gas industry. According to the Energy Information Administration (EIA), global crude oil consumption in 2015 was 93.88 million barrels per day.

The oil and gas extraction industry is sizeable in California. Active wells are distributed across the state, but the majority of them are located in the Central Valley/Northern California sub-region, as shown in Exhibit 2-1.



Exhibit 2-1

Active Wells in CA by Sub-Region 2015



Source: CA Dept of Conservation, DOGGR

Crude Oil

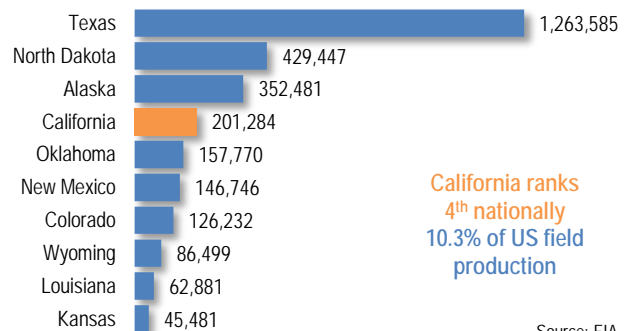
U.S. oil field production totaled just over 3.4 billion barrels in 2015. Exhibit 2-4 shows the highest oil producing states in the nation ranked according to their crude oil production in 2015. California produced 201.3 million barrels, representing 10.3 percent of total national production. Out of the 31 oil producing states nationwide, California ranks fourth.

Previously, California had ranked third in crude oil production and Alaska followed, but changes to the tax law in Alaska (passed in 2013) provided incentives to pursue more drilling and well work, and has resulted in increased production which elevated its ranking over that of the golden state.

Exhibit 2-4

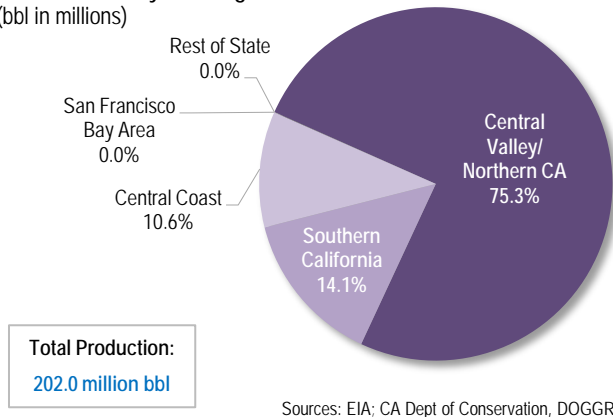
Crude Oil Production 2015

(Thousands of barrels)



Source: EIA

The distribution of California crude oil production in 2015 according to sub-region is shown in Exhibit 2-5.

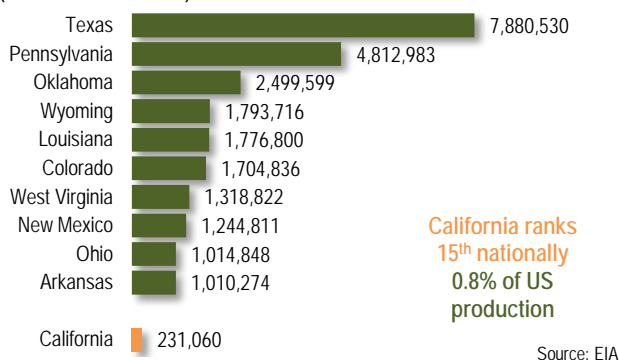
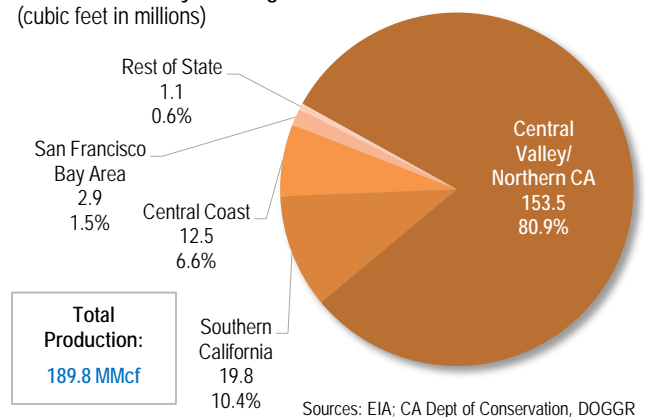
Exhibit 2-5**Oil Production by Sub-Region 2015**
(bbl in millions)

While crude oil production activity occurs throughout the state, the Central Valley/Northern California sub-region accounted for close to 80 percent of total California production. The second and third largest producing sub-regions were Southern California and the Central Coast, with 14 percent and 11 percent respectively.

Natural Gas

Natural gas production in the U.S. totaled 28.8 trillion cubic feet in 2015. California produced 231.1 billion cubic feet, accounting for 0.8 percent of total U.S. production. Out of the 33 natural gas producing states nationwide, California ranks fifteenth. Exhibit 2-2 displays the highest ten ranking states and California according to their total natural gas production in 2015.

The distribution of California natural gas production in 2015 by sub-region is shown in Exhibit 2-3.

Exhibit 2-2**Natural Gas Production 2015**
(Cubic feet in millions)**Exhibit 2-3****Gas Production by Sub-Region 2015**
(cubic feet in millions)

Similar to crude oil production, the Central Valley/Northern California sub-region also accounted for approximately 80 percent of total California natural gas production in 2015, followed by The Central Coast and Southern California, each producing an additional eight percent. ❖

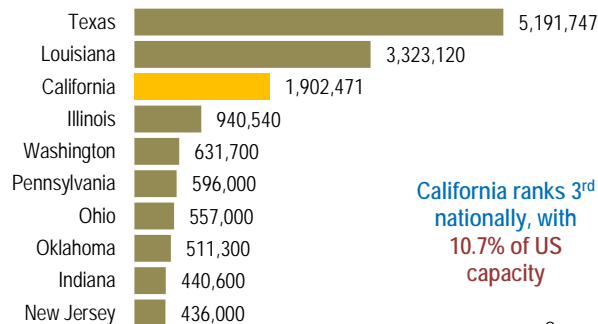
Downstream Activity

Petroleum refineries are downstream operations in the oil and gas industry. The refining of crude oil produces highly tradable products consumed domestically and exported to global markets. According to the Energy Information Administration (EIA), global crude oil consumption in 2015 was 93.88 million barrels per day. Byproducts of the refining process include petrochemicals, which are used to manufacture a wide variety of different goods, including medical and personal products, fuel and lubricants, chemical products, synthetic fabrics and materials, and more (see Exhibit 6-1 for a more comprehensive listing).

The petroleum refining industry also has a large presence in California. As of January 1, 2015, annual operable atmospheric crude oil distillation capacity in California was just over 1.9 million barrels per calendar day (bpcd), ranking third among states and representing 11 percent of total U.S. capacity of 17.8 million bpcd (Exhibit 2-6). From 2014 to 2015, crude oil distillation capacity in California increased by 1.4 percent, adding 26,300 bpcd, a faster rate of increase than the U.S. as a whole with a distillation capacity increase of only 0.2 percent over the year.

Exhibit 2-6**Crude Oil Distillation Capacity 2015**

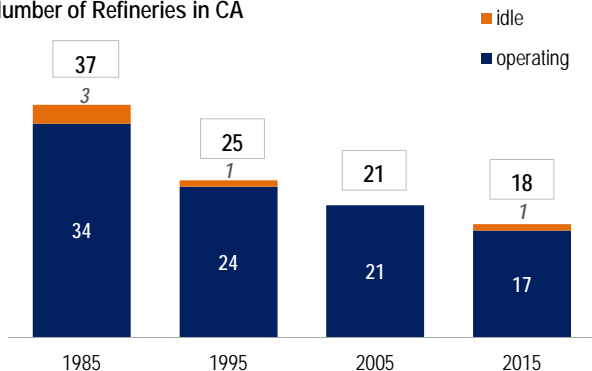
Annual Operating Atmospheric (bpcd)



Source: EIA

Despite the prominence of the state in terms of the national industry, the number of refineries in California has been decreasing over the years due to emissions related regulations, which would otherwise require refineries to make large expenditures on equipment, modifications and upgrades. Operations that are unable to merge or consolidate to fund these investments have ceased operations. This has resulted in the closure of older and smaller refining operations that found compliance with the state's strict environmental regulations to be cost prohibitive. This is also limiting the permitting of new facilities, and therefore, any potential increase in oil refining capacity in the future to meet upcoming needs in California appears highly unlikely.

There were 18 operable refineries in 2015, less than half of the number of operable refineries in 1985 (Exhibit 2-7). The number of operable refineries in California has remained constant at 18 since 2012.

Exhibit 2-7**Number of Refineries in CA**

Source: EIA

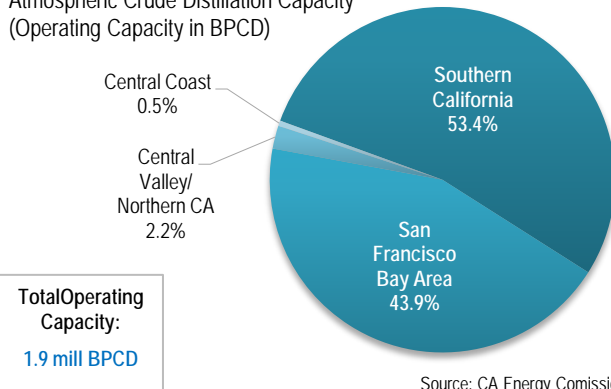
Refineries in California are located largely within two sub-regions: Southern California (primarily Los Angeles County) and the San Francisco Bay Area.

Exhibit 2-8 displays the crude oil refining capacity in California by sub-region as of December 2015. Total statewide refining capacity was approximately 1.9 million barrels per calendar day. Southern California accounts for more than half, and the San Francisco Bay Area accounts for another 44 percent of total refining capacity.

Exhibit 2-8**Refining Capacity in CA by Sub-Region 2015**

Atmospheric Crude Distillation Capacity

(Operating Capacity in BPCD)

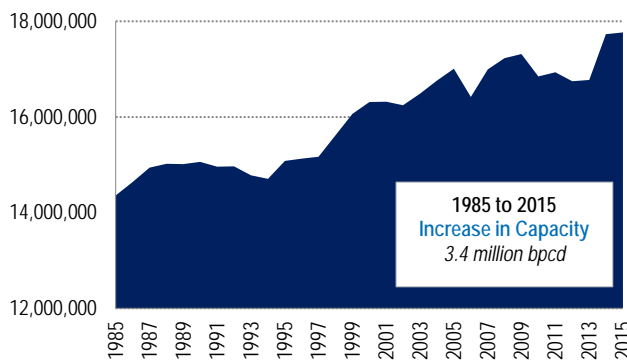


Source: CA Energy Commission

Although the number of refineries have been declining in both California and the nation as a whole, expansions of existing operations and increases in efficiencies have resulted in increased capacity nationwide (Exhibit 2-9).

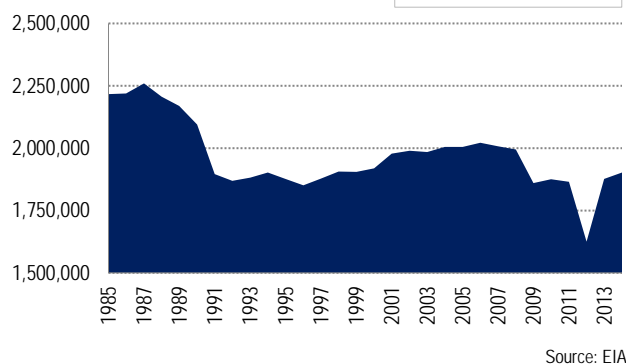
Exhibit 2-9**Annual Operating Refinery Capacity in U.S.**

(barrels per calendar day)



Source: EIA

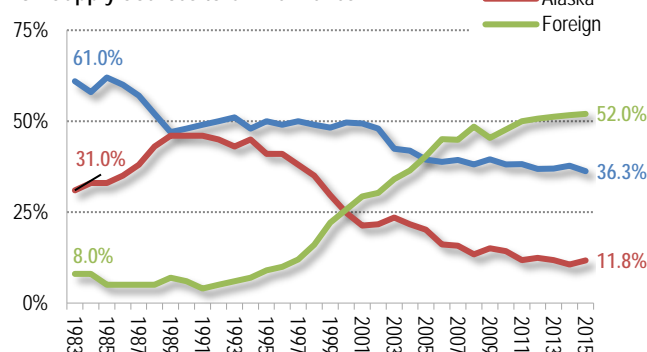
However, unlike the national experience, overall operating capacity in California has not seen a consistent upward trend. Despite an increase in refinery capacity of 17.1 percent in 2015 over that in 2013, there remains an overall loss of 178,130 bpcd capacity (a decline of 8.6 percent) since 1985 (Exhibit 2-10).

Exhibit 2-10**Annual Operating Capacity in CA**
(barrels per calendar day)

Oil Supply Sources

The requirements for fuel consumed in California are highly specific. In order to meet demand, California refineries operate at or near maximum capacity. Due to limits placed on in-state production, refineries import crude oil sourced from Alaska and outside the U.S. Production volumes from domestic sources have been declining over the years, leading to increasing amounts of foreign crude being delivered to marine terminals in the San Pedro and San Francisco ports to augment the supply of crude which is constrained locally.

Exhibit 2-11 shows the total supply of crude oil to petroleum refineries in California by source from 1985 through 2015. In 2015, crude oil from foreign sources represented just over half the oil supplied to refineries in the state.

Exhibit 2-11**Oil Supply Sources to CA Refineries**

The specificity of the requirements for fuel and the growing reliance upon foreign crude oil sources leave consumers at the pump in California vulnerable to short-

term fluctuations in oil prices and supply shocks resulting from unplanned disruptions during refinery outages.

The Supply Shock

Each year, California transitions from winter-grade to spring-grade gasoline and from spring-grade to summer-grade gasoline. The cost to manufacture the warmer weather blends is higher than that to manufacture the winter-blend. Regardless of the blend, the cost of manufacturing gasoline to state specifications exceeds that of conventional gasoline used outside of California.

Blendstock transitions also reveal price volatility. Immediately preceding a transition from one seasonal gasoline blend to another, prices will either increase or decrease according to inventory levels; they will rise when inventory is low to delay a badly timed purchase, or will drop to accelerate sales of the current blend if inventory is deemed high.

In the event that capacity is reduced further, and local production cannot meet local demand due to more aggressive restrictions, additional product must be imported into the area. Costs for petroleum and petrochemical products produced out of state will be higher due to increased shipping costs and costs associated with out-of-state producers reconfiguring and refitting facilities, a costly and labor-intensive undertaking that will be required to accommodate California's specific blends of low sulfur gasoline and diesel.

Both industries and individual consumers will feel these additional costs. Dependent industries that use petroleum and petrochemical products as an input in production or are heavily reliant upon these products in the provision of a service, such as transportation industries, may not be able to absorb the increases. Consumers will feel cost increases that cannot be absorbed by the industry at the pump or when they purchase transportation services or petroleum based end products.

California is Leading the Way

High costs are in part due to California's stringent environmental standards. California has long been heralded for its leading role in renewable energy and environmental issues. According to Governor Jerry Brown, "California has the most far-reaching environmental laws of any state and the most integrated

policy to deal with climate change of any political jurisdiction in the Western Hemisphere.”

Market conditions for refined petroleum products and byproducts produced in-state continue to change as a result of regulatory mandates issued to meet increasingly more ambitious emissions goals. Existing environmental regulations, undertaken as a means for California to achieve its larger 2020, 2030 and 2050 climate change goals, may already be limiting the permitting of new petroleum refining facilities, making any potential increase in oil refining capacity in the future in California highly unlikely. These new changes in the refined petroleum products and byproducts market are expected to further impact the ability of refinery operations to continue in the state.

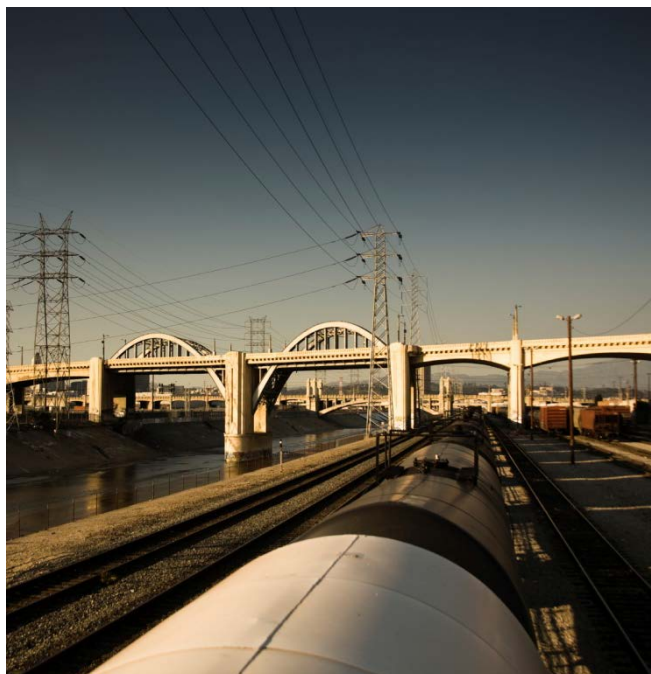
In his January 2015 inaugural address for his fourth term as governor of the state of California, Jerry Brown identified three main goals to be achieved by 2030, the second of which included cutting current petroleum use in cars and trucks (an estimated 16 billion plus gasoline gallons equivalent in 2014) by half. While this measure stalled in the Assembly (SB 350), new climate legislation (SB 32) was passed that extended AB32 goals out to 2030, with a new target of 40 percent below 1990 levels by 2030, building upon the momentum of the previous target of meeting 1990 levels by 2020.

Despite the stripping of the 2050 goals from SB 350, the fifty percent reduction remains an objective of the governor. Under CARB's authority and a renewal of the Low Carbon Fuel Standard (frozen since 2013), regulations to cut methane and hydrofluorocarbon emissions by 40 percent and black carbon by 50 percent by 2030 have been approved to move forward. Additional options to extend and toughen GHG reductions in California exist for Brown besides legislative bills and CARB's authority, mainly the option to place initiative measures on the state ballot in the 2018 election, allowing voters to weigh in.

Oil and Gas Industry Employment Trends

The oil and gas industry has proven itself to be valuable to the state's economy in that its employment has been more resilient than other private industries as a whole. While it does react to contractions in the economy, the magnitude of these reactions are milder than those experienced by other private industries.

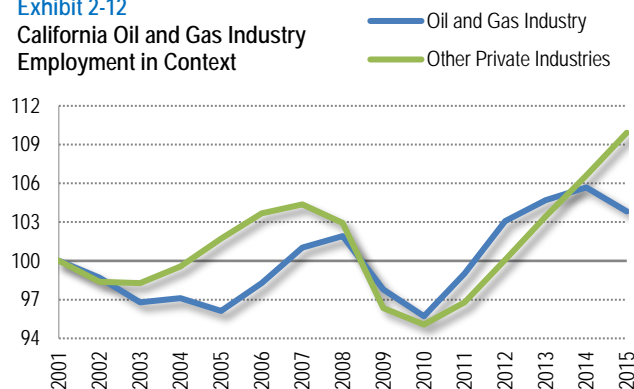
Exhibit 2-12 displays the private payroll employment in the oil and gas industry as a whole and for all other private industries in California, indexed to 2001



employment levels. Values of 100 mean that the employment level is equal to that seen in the base year (2001).

Exhibit 2-12

California Oil and Gas Industry
Employment in Context



Source: CA EDD; Estimates by LAEDC

The Great Recession caused private employment levels to dip below that of the base year and has rebounded, posting a consistent gain from the lowest level in 2010, and exceeding the pre-recession peak by five percent in 2015.

In contrast, the oil and gas industry exhibited more post-recession buoyancy; the industry rebounded from the lowest level, also in 2010, to base year levels a year earlier than other private industry and beating the prerecession peak starting in 2012. Oil and gas industry employment declined by nearly two percent in 2015

after four consecutive years of growth, most likely a result of low crude prices; however, the current level still exceeds the pre-recession peak by two percent.

Another feature of the oil and gas industry is the higher annual wages paid in most component industries, as shown in Exhibit 2-13. With the exception of petrochemical manufacturing, fuel dealers and gasoline stations, wages in each of the component industries listed exceed the average annual wage in the state.

Exhibit 2-13

**Oil and Gas Industry Wages
California 2015**

NAICS	Industry	Ave Annual Wage
211111	Crude petroleum/natural gas extraction	\$ 109,536
211112	Natural gas liquid extraction	102,476
213111	Drilling oil and gas wells	80,143
213112	Support activities for oil and gas operations	75,422
2212	Natural gas distribution	124,086
23712	Oil and gas pipeline construction	72,972
32411	Petroleum refineries	179,024
324191	Petroleum lubricating oil and grease mfg	77,679
32511	Petrochemical manufacturing	33,343
333132	Oil and gas field machinery and eqmt mfg	66,760
4247	Petroleum and petroleum prods wholesalers	77,259
447	Gasoline stations	22,940
45431	Fuel dealers	52,827
486	Pipeline transportation	108,401
Oil and Gas Industry		\$ 84,451
All other private industries		61,030
All private industries in CA		\$ 61,276

Note: Excludes non-employers and independent contractors

Source: CA EDD; Estimates by LAEDC

The industry operates in close geographic proximity to wherever reserves are found—often in rural areas with limited industry. Without a diverse economic base, these rural areas typically have challenges in attracting and sustaining other industries. Oil and gas industries provide much needed employment opportunities with higher than average wages, translating into larger indirect and induced effects that ripple throughout the economy. ❖

The Employment and Price Relationship

Increased domestic oil production resulting from horizontal drilling techniques and fracking combined with high levels of output by the Organization of Petroleum Exporting Countries (OPEC) has led to a global supply glut that has put downward pressure on

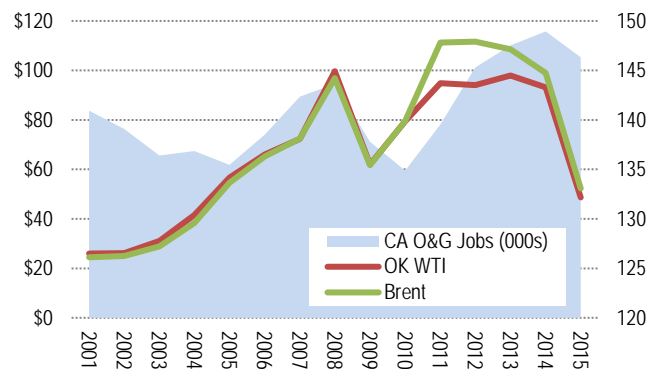
crude oil prices. Low oil prices translate into increased expendable income for consumers, but for the oil and gas industry, extended periods of low prices result in decreased activity in extraction and refinery operations and, consequently, job cuts.

Jobs cut are not limited to those working in actual oil fields and refineries, companies in oil and gas industries looking to decrease their payrolls also shed workers in office admin roles, IT staff, workers in finance and legal, and in marketing. As oil production declines, new drilling and other projects are put on hold, whose negative effects then ripple out to companies in their energy supply chain such as equipment manufacturers, shippers and construction crews.

Exhibit 2-14 shows annual average payroll employment in the oil and gas industry in California from 2001 through 2015, overlaid with annual average spot prices for the West Texas Intermediate (WTI) and Brent Price.

Exhibit 2-14

Payroll Jobs and Spot Prices FOB (\$US per barrel)



Source: EIA, estimates by LAEDC

Mid-2014 marked the beginning of a precipitous fall in the price of oil that continued through 2015, where annual averages of spot prices for both WTI and the Brent Price experienced their lowest annual averages since 2005. From 2014 to 2015, payroll employment in the oil and gas industry in California lost just over 2,600 jobs, the industry's first employment decline after four consecutive years of growth.

Low oil prices have gone hand in hand with a buildup of inventories in both crude and other liquids. When oil prices start to rise, inventories will be worked through prior to bringing increased levels of production back on line. This means that any gains in employment associated with a price increase will lag slightly behind as well.

3 California's Oil and Gas Industry Workforce

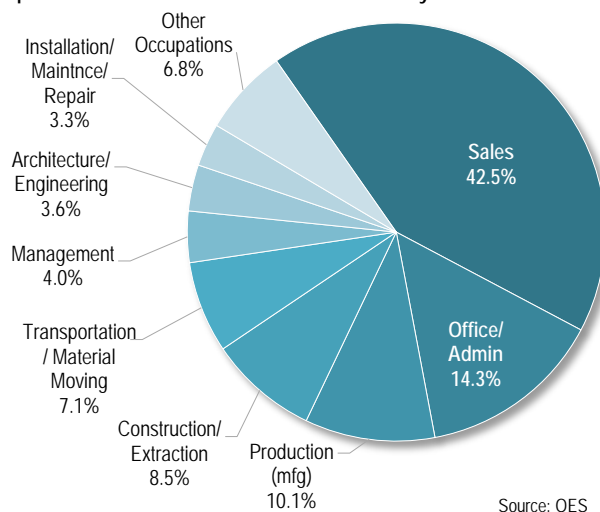
The oil and gas industry employs a large number of people in California, providing a myriad of employment opportunities for a diverse group of individuals. As job duties vary, so do the required skills and education levels for job entry. Wages vary with occupations in the industry, with many associated with high wages.

Industry Occupations

An occupation is classified according to the set of activities or tasks that an employee is paid to perform. Some occupations are specific to an industry, but others exist in a number of different industries, for example, customer service representatives, salespersons, accounting staff and receptionists.

Occupations are classified by the Standard Occupational Classification (SOC) System. Workers fall into one of 840 detailed occupations, which are combined into 23 major groups. Each occupation requires its own skill set and education levels. The distribution of employment by major occupational group specific to the oil and gas industry in California is displayed in Exhibit 3-1.

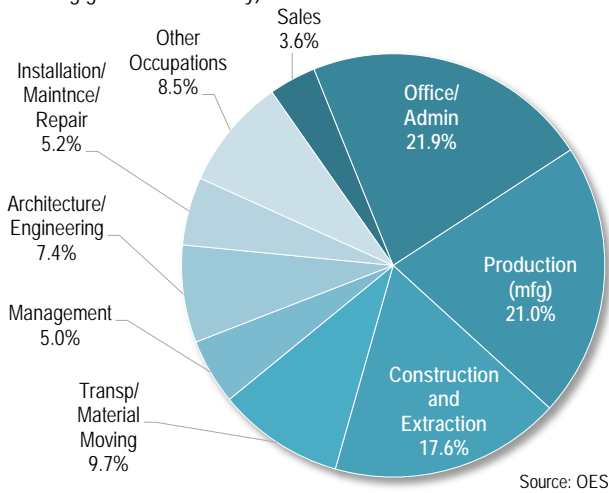
Exhibit 3-1
Occupational Distribution of Oil and Gas Industry



Over forty percent of workers in the industry are employed in sales occupations, another 20 percent in office and administrative, business and financial, and management occupations combined, and just over a quarter work in occupations in construction and extraction, production, installation and maintenance, and transportation and material moving.

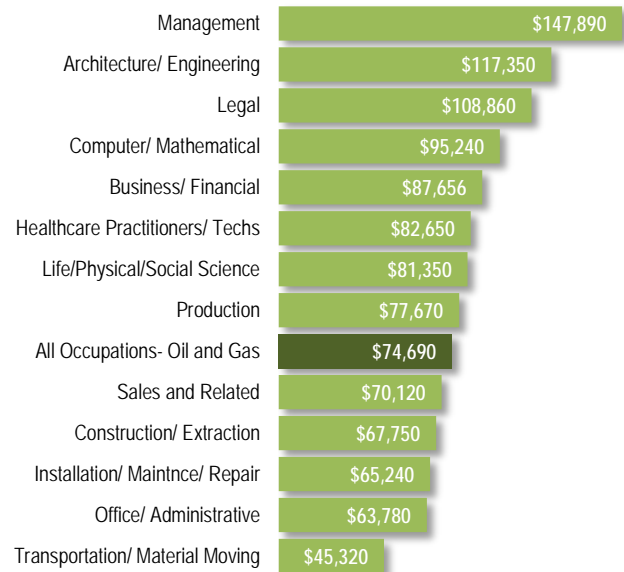
It should be noted that this occupational distribution includes individuals employed at gas stations. Gas stations represent the retail side of the oil and gas industry and account for a large share of industry employment. Activities taking place at retail gas stations are dissimilar to activities taking place in other oil and gas industries, many of which involve production and distribution.

Including gasoline stations in an occupational analysis skews average annual wages of occupations in the oil and gas industry and the occupational composition of the oil and gas industry. Many gas station jobs require lower skills levels and are associated with average annual wages significantly lower than found in other oil and gas industries. This skewing is evident in the next exhibit as the oil and gas industry outside of gasoline stations is reviewed. (The gas station industry is shown separately in the following section.) Exhibit 3-2 shows the distribution of employment in the California oil and gas industry by major occupational group excluding the gasoline stations.

Exhibit 3-2**Occupational Distribution of Oil and Gas Industry**
(Excluding gas station industry)

Excluding the gasoline stations, the largest share of the oil and gas workforce is employed in office and administrative occupations, which includes bookkeepers and accounting clerks, utility meter readers, office clerks, stock clerks and order fillers, dispatchers and customer service representatives. Individuals employed in production (manufacturing) occupations and construction and extraction occupations follow, with employment shares of 21.0 percent and 17.6 percent respectively. Transportation and material moving occupations account for nearly ten percent of industry employment and architecture and engineering occupations at 7.4 percent, round out the top five.

The wages of occupations in the oil and gas industry vary widely. Exhibit 3-3 shows average annual wages in the oil and gas industry in California for the different major occupational groups shown in Exhibit 3-2.

Exhibit 3-3**Average Wages by Major Occupational Group**
California Industry in 2015
(Excluding gas station industry)

Source: OES

A wide variety of detailed occupations exist in each major occupational group. The top 20 detailed occupations by employment share in the oil and gas industry in California and their associated wages in 2015 are shown in Exhibit 3-4, followed by the top 20 by average annual wages in Exhibit 3-5.

The top twenty detailed occupations account for just over half of the industry's workforce. In contrast, the top twenty highest paid occupations account for approximately twelve percent of the workforce. ❖

Exhibit 3-4**Detailed Industry Occupations by Employment Share (Excluding Gas Station Industry)
California 2015**

SOC	Detailed Occupation	Emp Share (%)	Average Annual Wage
51-8093	Petroleum Pump System Operators, Refinery Operators, Gaugers	8.5	\$ 74,990
53-3032	Heavy and Tractor-Trailer Truck Drivers	5.0	43,845
43-9061	Office Clerks, General	4.2	62,318
17-2171	Petroleum Engineers	3.8	132,134
47-5013	Service Unit Operators, Oil, Gas, and Mining	3.0	57,280
51-1011	First-Line Supervisors of Production / Operating Workers	2.9	83,600
49-9041	Industrial Machinery Mechanics	2.7	73,598
43-5041	Meter Readers, Utilities	2.7	49,800
51-8092	Gas Plant Operators	2.3	92,695
49-9012	Control and Valve Installers / Repairers, Except Mechanical Door	2.2	69,988
11-1021	General and Operations Managers	2.2	148,495
47-1011	First-Line Supervisors of Construction / Extraction Workers	2.0	85,930
47-5012	Rotary Drill Operators, Oil and Gas	1.8	66,480
17-2112	Industrial Engineers	1.8	123,623
43-1011	First-Line Supervisors of Office and Administrative Workers	1.7	74,283
47-5071	Roustabouts, Oil and Gas	1.7	45,533
47-2152	Plumbers, Pipefitters, and Steamfitters	1.5	78,290
13-1199	Business Operations Specialists, All Other	1.1	92,792
53-7062	Laborers and Freight/Stock/Material Movers, Hand	1.1	34,621
41-4012	Sales Reps, Wholesale/Mfg, Except Technical/Scientific Prod	1.1	66,610
	<i>Other Occupations</i>	46.6	
All Occupations in the Oil and Gas Industry		100.0	\$ 74,690

Source: OES

Exhibit 3-5**Detailed Industry Occupations by Average Annual Wages (Excluding Gas Station Industry)
California 2015**

SOC	Detailed Occupation	Emp Share (%)	Average Annual Wage
23-1011	Lawyers	0.1	\$ 196,890
11-3021	Computer and Information Systems Managers	0.3	184,850
11-9199	Managers, All Other	0.2	172,584
11-9041	Architectural and Engineering Managers	0.8	159,573
11-9021	Construction Managers	0.1	154,490
11-3031	Financial Managers	0.4	150,155
11-1021	General and Operations Managers	2.2	148,495
11-2022	Sales Managers	0.1	139,160
11-3051	Industrial Production Managers	0.2	133,110
17-2171	Petroleum Engineers	3.8	132,134
15-1152	Computer Network Support Specialists	0.1	128,040
17-2112	Industrial Engineers	1.8	123,623
15-1143	Computer Network Architects	0.4	121,060
11-3011	Administrative Services Managers	0.2	116,757
17-2081	Environmental Engineers	0.1	116,200
17-2151	Mining / Geological Engineers, Including Mining Safety Engineers	0.3	113,230
13-1111	Management Analysts	0.2	112,980
19-2042	Geoscientists, Except Hydrologists and Geographers	0.7	112,710
13-2051	Financial Analysts	0.3	106,551
15-1142	Network and Computer Systems Administrators	0.2	104,376
	<i>Other Occupations</i>	87.6	
All Occupations in the Oil and Gas Industry		100.0	\$ 74,690

Source: OES

Gas Station Industry

Gasoline stations represent the retail side of the oil and gas industry, with products being sold to the end user.

The distribution of employment by major occupational group specific to gas stations in California is shown in Exhibit 3-6. The majority of individuals in this industry segment work in sales occupations, close to 80 percent. Most of these workers are cashiers. Workers in office and administrative occupations and transportation and material moving occupations rank second and third, each with employment shares of 7.2 percent and 4.7 percent respectively. The fourth largest group in terms of employment is food preparation and serving occupations, with just over four percent of workers.

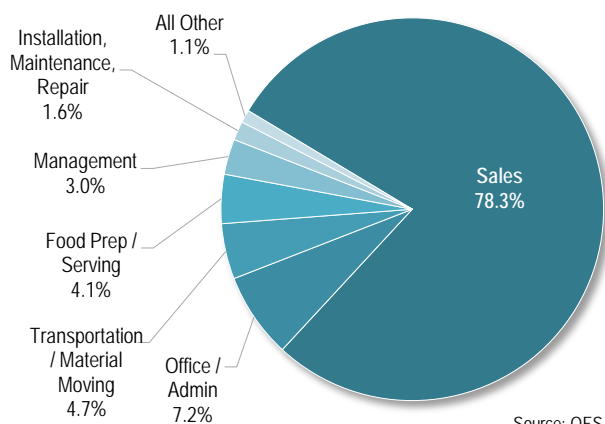
The wages of these occupations also vary substantially. Exhibit 3-7 shows the average wages in the gas station industry in California for the different major occupational groups.

As expected, the highest average annual wages are paid to those in management occupations. Sales occupations, which account for more than 80 percent of gas station industry employment, earn on average \$22,490 per year. Overall, the industry average is \$25,070 annually. ❖



Exhibit 3-6

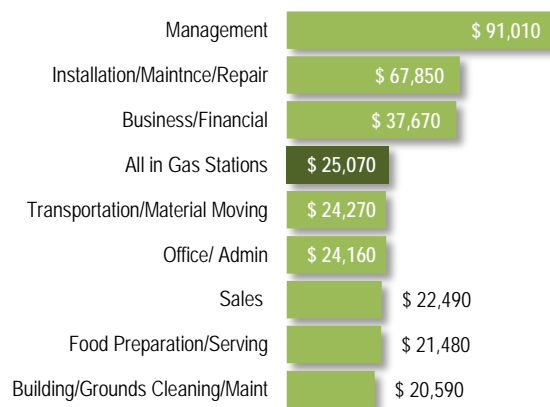
Occupational Distribution of Gas Station Industry



Source: OES

Exhibit 3-7

Average Annual Wages of Gas Station Industry California 2015



Source: OES

Characteristics of the Industry Workforce

The composition of the workforce in the oil and gas industry varies according to sex, age, race and ethnicity and educational attainment.

Sex of Workforce

Workers in the oil and gas industry are predominantly male. In 2015, males represented 68 percent of the workforce (Exhibit 3-8).

Age of Workforce

The majority of the workforce is in its prime working age—between 22 years and 54 years of age, with almost half being in the 35 to 54 years of age group (Exhibit 3-9). Still, workers aged 55 years and older accounted for 24.5 percent, a significant share of the industry workforce.

Race and Ethnicity in the Workforce

The workforce in the oil and gas industry is diverse in both race and ethnicity (Exhibit 3-10). Workers reporting their race as white accounted for just over half of the workforce, with those reporting their ethnicity as Hispanic or Latino (all races) accounting for about 30 percent. Thirteen percent of industry workers reported as Asian and 5.3 percent identified as Black.

Educational Attainment of Workers

The industry provides a wide range of jobs to individuals with different levels of education (Exhibit 3-11). Approximately 39 percent of the workforce has a high school education or less; 22 percent have a high school diploma and 17.2 percent have less than a high school education. Oil and gas workers with some college education accounted for 28 percent of the workforce, and 23 percent have earned a bachelor's degree or higher. While more than a third of the workforce has an educational attainment of high school or less, these jobs in oil and gas industries are associated with higher earnings compared to those with the same levels of education across all industries in the state (Exhibit 3-12). ❖

Exhibit 3-8

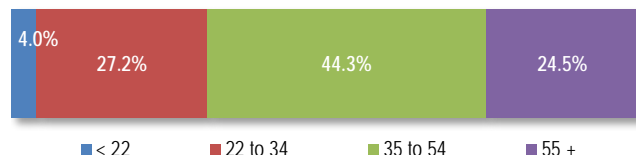
Industry Employment Distribution by Sex
California 2015



Source: QWI; Analysis by LAEDC

Exhibit 3-9

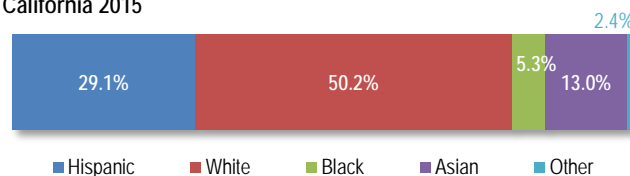
Industry Employment Distribution by Age Group
California 2015



Source: QWI; Analysis by LAEDC

Exhibit 3-10

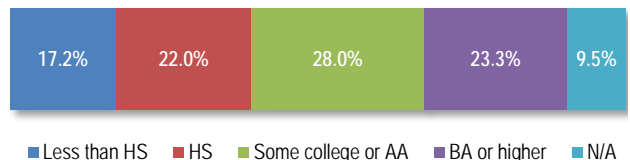
Industry Employment Distribution by Race /Ethnicity
California 2015



Source: QWI; Analysis by LAEDC

Exhibit 3-11

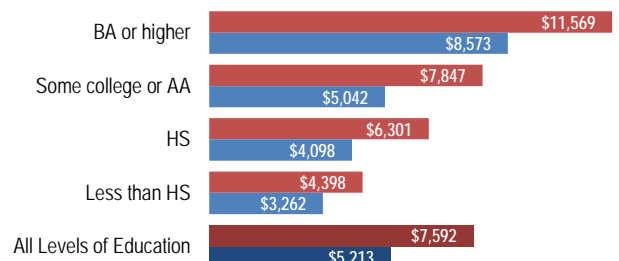
Industry Employment Distribution by Education
California 2015



Source: QWI; Analysis by LAEDC

Exhibit 3-12

Average Monthly Earnings
California 2015



Source: QWI; Analysis by LAEDC

4 Economic Contribution of Oil and Gas in California

Extraction, production, refining and petroleum products manufacturing result in highly tradable products both consumed domestically and exported, producing high revenues, high wage jobs and significant fiscal revenues for all levels of government.

Direct Economic Activity

Direct activity associated with the oil and gas industry is the direct contribution to the economy of the industry in terms of employment, labor income and value added.

Direct employment of the oil and gas industry includes all individuals whose employment is directly related to business establishments with activities that fall within the NAICS codes included in the industry definition. Measured on a job-count basis regardless of the number of hours worked, it includes full-time, part-time, permanent and seasonal employees and the self-employed.

Exhibit 4-1 displays the estimated direct employment associated with each component industry in the oil and gas industry in California in 2015.

The oil and gas industry in California provided 142,780 jobs in 2015, including independent contractors and payroll employees. Just over 30 percent was in oil and gas extraction, about a quarter in gas distribution and about seven percent each in oil and gas pipeline construction and petroleum refineries.

Exhibit 4-2 shows the distribution of estimated direct oil and gas industry employment by sub-region in 2015.

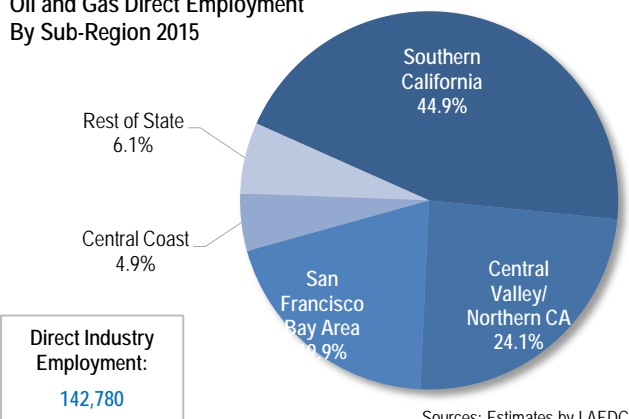
While the number of wells, and both gas and oil production levels are highest in the Central Valley/Northern California region, almost half of all industry employment is in Southern California.

Exhibit 4-1
Oil and Gas Industry Employment
California 2015

NAICS	Industry	Direct Employment
211	Oil and gas extraction	43,490
213111	Drilling oil and gas wells	7,680
213112	Support activities for oil and gas operations	9,730
2212	Natural gas distribution	36,760
23712	Oil and gas pipeline construction	10,760
32411	Petroleum refineries	10,210
324191	Petroleum lubricating oil and grease mfg	760
32511	Petrochemical manufacturing	30
333132	Oil and gas field machinery and eqmt mfg	1,870
4247	Petroleum and petroleum prods wholesalers	7,250
447	Gasoline stations	7,960
45431	Fuel dealers	3,020
486	Pipeline transportation	3,260
Oil and Gas Industry Employment		142,780
<i>Percent of California Total Employment</i>		<i>0.6%</i>

Note: Includes non-employers and independent contractors
Source: Estimates by LAEDC

Exhibit 4-2
Oil and Gas Direct Employment
By Sub-Region 2015



Sources: Estimates by LAEDC

Labor income in the oil and gas industry is the value of all earnings received by both payroll employees and the self-employed, including benefits such as health insurance and pension plan contributions. Total labor payments by industry are presented in Exhibit 4-3.

Exhibit 4-3**Oil and Gas Industry Labor Income
California 2015**

NAICS	Industry	Labor Income (\$ millions)
211	Oil and gas extraction	\$ 4,758
213111	Drilling oil and gas wells	779
213112	Support activities for oil and gas operations	797
2212	Natural gas distribution	6,236
23712	Oil and gas pipeline construction	634
32411	Petroleum refineries	2,685
324191	Petroleum lubricating oil and grease mfg	100
32511	Petrochemical manufacturing	2
333132	Oil and gas field machinery and eqmt mfg	147
4247	Petroleum and petroleum prods wholesalers	640
447	Gasoline stations	529
45431	Fuel dealers	96
486	Pipeline transportation	2,509
Oil and Gas Industry Labor Income		\$ 19,910
<i>Percent of California Total Labor Income</i>		<i>1.3%</i>

Note: Includes non-employers and independent contractors

Source: Estimates by LAEDC

More than 30 percent of the labor income in the industry was earned by natural gas distribution workers, nearly a quarter by oil and gas extraction workers and just under fourteen percent by workers at refineries. The total labor income paid by the oil and gas industry accounted for 1.3 percent of all labor income in California. ❖

Total Economic Contribution

The total economic contribution of the oil and gas industry in California includes indirect and induced activity in addition to the direct activity already identified. These direct, indirect and induced effects combined result in a considerable contribution to the California economy, which is presented in Exhibit 4-4.

It is estimated that the activities related to the oil and gas industry in California in 2015 generated value added equaling \$65.8 billion in California, approximately 2.7 percent of the state's GDP of \$2.5 trillion. The industry contributed 368,100 jobs, or 1.6 percent of the state total, with labor income of just over \$33 billion,

exceeding two percent of all labor income earned in the state.

Exhibit 4-4**Total Economic Contribution of Oil and Gas Industry
California 2015**

Employment (jobs):		
Direct	142,780	
Indirect	81,550	
Induced	143,800	
TOTAL		368,100
<i>Percent of California Total Employment</i>		<i>1.6%</i>
Labor income (\$ millions):		
Direct	\$ 19,912	
Indirect	5,565	
Induced	7,645	
TOTAL		\$ 33,120
<i>Percent of California Total Labor Income</i>		<i>2.2%</i>
Value added (\$ millions):		
Direct	\$ 43,756	
Indirect	8,653	
Induced	13,375	
TOTAL		\$ 65,780
<i>Percent of California Total GDP</i>		<i>2.7%</i>
Output (\$ millions):		
Direct	\$ 111,363	
Indirect	14,255	
Induced	22,387	
TOTAL		\$ 148,010
<i>Percent of California Total Output</i>		<i>3.6%</i>

Source: Estimates by LAEDC

Industry Distribution

The total economic contribution is achieved through activity occurring across a wide range of industry sectors via indirect and induced effects. The distribution of the total employment, labor income and value added contribution among industry sectors is presented in Exhibit 4-5.

Of the 368,100 jobs supported, close to 17 percent were in the mining sector (which includes much of the oil and gas industry) and approximately 10 percent were in the utilities sector (which includes natural gas distribution and electric power generation and transmission). However, virtually all industry sectors receive a positive economic impact from the oil and gas industry, including retail trade, health and social services, professional,

scientific and technical services, and accommodation and food services.

Exhibit 4-5

Total Economic Contribution of Oil and Gas Industry By Sector California 2015

	Jobs	Labor Income (\$ millions)	Value Added (\$ millions)
Ag, forestry, fish & hunting	1,010	\$67	\$83
Mining	61,030	6,342	9,791
Utilities	37,090	6,290	12,050
Construction	18,950	1,129	1,565
Manufacturing	19,280	3,414	17,704
Wholesale trade	18,810	1,661	3,218
Retail trade	33,280	1,480	2,368
Transportation and warehousing	16,750	3,334	3,300
Information	3,680	623	1,191
Finance and insurance	16,300	1,345	2,427
Real estate and rental	11,570	455	3,734
Professional, scientific technical	24,090	1,976	2,311
Management of companies	3,570	484	582
Administrative and waste services	22,707	871	1,092
Educational services	5,460	254	270
Health and social services	27,200	1,656	1,818
Arts, entertainment and recreation	5,410	196	298
Accommodation and food services	22,210	600	864
Other services	18,490	814	943
Government	1,260	131	173
Total	368,100	\$33,123	\$65,784

Source: Estimates by LAEDC

A description of the industry sectors is provided in the Appendix. ❖

Public Revenues

The oil and gas industry faces a high tax burden, incurred by both businesses operating within the industry and by consumers. The production, refining, distribution, retail and consumption of oil and gas all face taxes levied by local, state and federal governments.

Ad Valorem:

In California, ad valorem taxes are locally assessed and administered by each county. The state of California dictates that ad valorem taxes have a one percent maximum; however, individual counties have the option to add to this rate to satisfy local voter-approved debt. In the case of oil and gas industry, the market value of the mineral property interest is assessed by estimating the market value of proved reserves volumes.

Production:

While other states levy a severance tax on oil production, the state of California does not. Instead, the state imposes an assessment on oil and gas production in order to support the Department of Conservation's Division of Oil, Gas, and Geothermal Resources (DOGGR).

State and Local Excise Taxes:

Excise taxes are levied on the purchase of certain goods and are paid by the end user at the time of sale. California imposes an excise tax on both natural gas and oil sales. The state excise tax levied on natural gas consumption in California varies among the different private utility gas distributors in the state and with the type of customer (residential, commercial, industrial, etc.), while excises taxes levied on the purchase of fuel varies by fuel type.

Federal Excise Tax:

The federal government levies an excise tax on fuel consumption in addition to those levied by the State of California. The federal excise tax applied to the purchase of fuel (from point of sale, terminal, refinery or from outside of the U.S.) also varies by fuel type, including gasoline, aviation gasoline, diesel and jet fuel. Compressed natural gas used as a fuel for motor vehicles is also subject to a federal excise tax.

Sales Tax:

Sales tax is levied on the sale of gasoline by both state and local governments; the purchaser incurs the tax burden at the point of sale. State and local (county and city) sales tax rates are usually bundled together. The total rate varies from county to county (and even different areas within the same county), based upon voter approved measures specific to that geography. Diesel fuel sales in California are subject to an additional sales tax levied by the state.

Lease and Royalty Payments:

Oil and gas operations involved in extraction may enter into a mineral lease with the federal government to obtain the right to explore, drill, extract, remove, and dispose of oil and gas deposits on federally owned lands. Leases are purchased, bonus lease payments are paid, rental rates apply and once production is underway the lessees are subject to royalty fees.

The State Lands Commission's Mineral Resources Management Division is charged with the management and administration of oil and gas, geothermal and other mineral resources on state-owned public lands in California. In addition to initial bonus lease payments,

lease rent and royalties apply. They have 26 state tidelands oil and gas leases, only eight of which are not producing. Royalty payments on their leases are determined by several methods: price based sliding scale on oil royalty, sliding rate scale, net profits share and fixed royalty rates.

Private individuals also receive royalty payments for production activity taking place on their lands; as of 2015, there are an estimated 600,000 oil and gas royalty earning landowners in the state of California.

Other State and Local Taxes and Fees:

Additional taxes and fees relevant to the oil and gas industry in California include the following:

International Fuel Tax Agreement (IFTA) tax rates in California on diesel fuel at the close of 2015 were \$0.4500 per gallon purchased, to be redistributed among jurisdictions according to miles travelled in each. Miles travelled are reported by the commercial carrier in quarterly reports.

The *Underground Storage Tank Fee* funds programs to replace underground petroleum storage tanks in California that have reached or exceeded their regulated age limit.

The *Oil Spill Response Fee* applies to crude oil and petroleum products received at marine terminals, moving through marine pipelines, or received at California refineries. The fee has not been applicable since the fund reached its \$50 million maximum in 1991. However, in the event that this fund is accessed, it would once again apply. ❖

Total Fiscal Contribution

Given this background, the economic activity associated with the oil and gas industry in California in 2015 is estimated to have generated \$26.4 billion in state and local taxes and just under \$16 billion in federal tax revenues. The disaggregation of taxes by type is shown in Exhibit 4-6.

Of state and local government revenues, over \$21 billion was earned from sales and excise taxes (including those paid on the consumption of oil and gas products), \$2.6 billion was earned from property taxes paid by households and businesses and about \$1.4 billion was earned from personal and corporate income taxes.

Of federal taxes, \$7.2 billion in taxes was earned in excise taxes, \$3.0 billion from personal income taxes, \$2.0 billion in taxes on corporate profits and \$3.2 billion in social insurance payments. ❖

Exhibit 4-6

Fiscal Contribution of Oil and Gas Industry California 2015

State and Local Taxes (\$ millions):

Sales and excise taxes	\$ 21,313
Property taxes	2,646
Personal income taxes	1,076
Corporate profits taxes	311
Social insurance	77
Other taxes	704
Fees, fines and permits	262
Total State and Local Taxes	\$ 26,390

Federal Taxes (\$ millions):

Excise taxes	\$ 7,179
Personal income taxes	3,046
Corporate profits taxes	1,964
Social insurance	3,172
Other taxes	237
Fees, fines and permits	39
Total Federal Taxes	\$ 15,638

Source: Estimates by LAEDC

Economic Contribution by Industry

The total economic impact of the oil and gas industry in California in 2015 was just presented; however, each component industry is associated with its own distinct set of activities. These direct activities ripple through the California economy with different magnitudes.

Exhibit 4-7 identifies the total economic contribution (direct, indirect and induced) of each industry included in the definition of the larger oil and gas industry. The three component industries with the largest impacts are consistent across all four measures (employment, labor income, value added and output), these industries are natural gas distribution, oil and gas extraction and petroleum refineries.

Exhibit 4-8 shows the distribution of the total economic impact of each component industry, allowing for the comparison of each industry's share of the larger oil and gas industry's total economic contribution.

Exhibit 4-7**Total Economic Contribution by Industry in California 2015****Total Employment Impact (jobs):**

Oil and gas extraction	77,700
Oil and gas: drilling wells and mining support	32,400
Natural gas distribution	118,600
Oil and gas field machinery/equip mfg	7,100
Oil and gas: pipeline/related structures construction	19,000
Pipeline transportation	21,100
Petroleum refineries	53,000
Petroleum lubricating oil/grease/petrochemicals mfg	2,700
Petroleum and petroleum prods wholesale	17,500
Fuel dealers	4,900
Gasoline stations	12,500
TOTAL	368,100

Total Labor Income (\$ billions):

Extraction	\$ 6.9
Drilling wells and mining support	2.5
Natural gas distribution	11.0
Oil and gas field machinery/equip mfg	0.5
Pipeline and related structures const	1.1
Pipeline transportation	3.5
Petroleum refineries	5.4
Petroleum lubricating oil/grease/petrochemicals mfg	0.3
Petroleum and petroleum prods wholesale	1.3
Fuel dealers	0.2
Gasoline stations	0.8
TOTAL	\$ 33.1

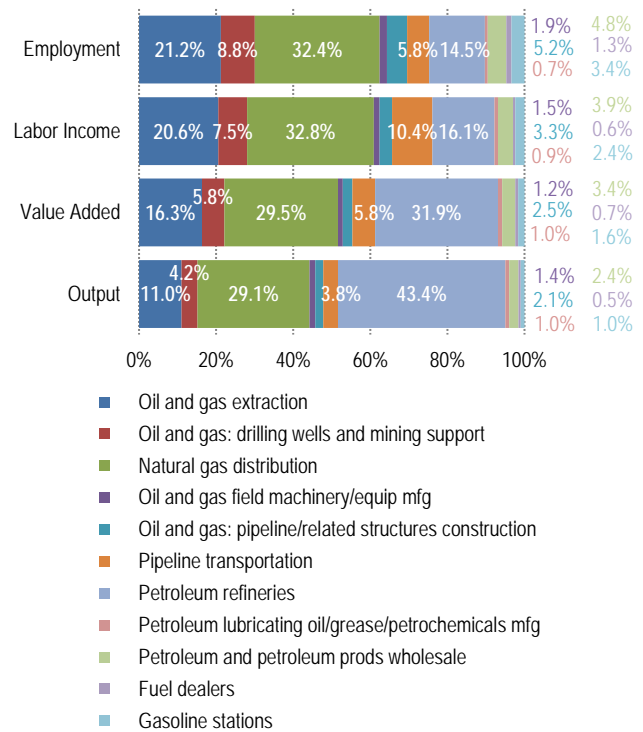
Total Value Added (\$ billions):

Extraction	\$ 10.9
Drilling wells and mining support	3.9
Natural gas distribution	19.7
Oil and gas field machinery/equip mfg	0.8
Pipeline and related structures const	1.7
Pipeline transportation	3.9
Petroleum refineries	21.3
Petroleum lubricating oil/grease/petrochemicals mfg	0.7
Petroleum and petroleum prods wholesale	2.3
Fuel dealers	0.5
Gasoline stations	1.1
TOTAL	\$ 65.8

Total Output (\$ billions):

Extraction	\$ 16.3
Drilling wells and mining support	6.2
Natural gas distribution	43.1
Oil and gas field machinery/equip mfg	2.1
Pipeline and related structures const	3.1
Pipeline transportation	5.7
Petroleum refineries	64.3
Petroleum lubricating oil/grease/petrochemicals mfg	1.5
Petroleum and petroleum prods wholesale	3.6
Fuel dealers	0.8
Gasoline stations	1.5
TOTAL	\$ 148.0

Source: Estimates by LAEDC

Exhibit 4-8**Total Economic Contribution by Industry
California 2015**

In terms of employment and associated labor income, upstream activity (extraction) contributes a larger share compared to downstream activity (refineries), ranking second with twenty percent of each. When it comes to total value added and total output, refineries contribute a larger share, accounting for 32 percent and 43 percent respectively. ❖

5 Economic Contribution by Sub-Region and County

The oil and gas industry is widespread across the state. However, concentrations of activity are evident.

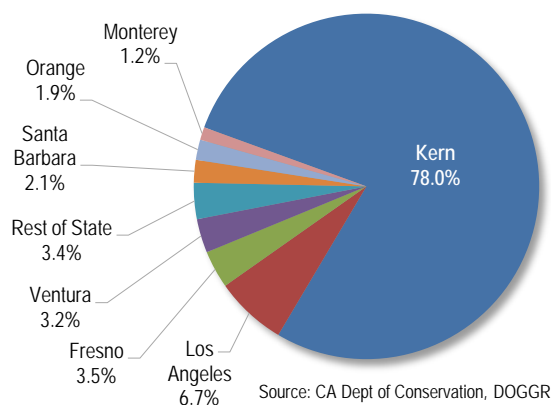
In this section, the industry is analyzed in four sub-regional geographies depicted in Exhibit 5-2: Southern California, the Central Coast, the San Francisco Bay Area, and Central Valley/ Northern California.

These four sub-regions account for 35 counties and more than ninety percent of the direct employment in the industry. The remaining counties are summarized in a Rest of State sub-region.

According to the Division of Oil, Gas and Geothermal Resources of the California Department of Conservation (DOGGR), well activity is similarly distributed among the sub-regions.

Active wells are distributed across the state, but the majority of them are located in Kern County in the Central Valley/ Northern California sub-region, as shown in Exhibit 5-1.

Exhibit 5-1
Active Wells in CA by County 2015



Direct activity and economic and fiscal contributions of each sub-region are presented in the following pages. ❖

Exhibit 5-2
California Sub-Regions



Source: ESRI

Southern California Sub-Region

The Southern California sub-region consists of the six counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino and San Diego.

Exhibit 5-3
Southern California Sub-Region



Source: ESRI

Exhibit 5-4
Direct Employment of Oil and Gas Industry
Southern California Sub-Region 2015

	Employment
211 Oil and gas extraction	19,690
213111 Drilling oil and gas wells	2,720
213112 Support activities for oil and gas operations	2,260
2212 Natural gas distribution	17,610
23712 Oil and gas pipeline construction	5,420
32411 Petroleum refineries	4,020
324191 Petroleum lubricating oil and grease mfg	570
32511 Petrochemical manufacturing	2
333132 Oil and gas field machinery and eqmt mfg	970
4247 Petroleum and petroleum prods wholesalers	3,280
447 Gasoline stations	4,060
45431 Fuel dealers	930
486 Pipeline transportation	1,130
TOTAL DIRECT EMPLOYMENT	62,640
<i>Percent of California Industry Employment</i>	<i>44.9%</i>

Exhibit 5-5
Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Southern California Sub-Region 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	62,640	\$ 8,759	\$ 18,564	\$ 46,853
Indirect	37,272	2,420	3,846	6,324
Induced	63,805	3,219	5,674	9,498
TOTAL CONTRIBUTION	163,716	\$ 14,398	\$ 28,084	\$ 62,675
<i>Percent of Total CA Contribution</i>	<i>46.9%</i>	<i>44.4%</i>	<i>43.1%</i>	<i>43.1%</i>
<i>Percent of Sub-Region Total</i>	<i>1.3%</i>	<i>1.9%</i>	<i>2.2%</i>	<i>3.0%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 6,302.2	\$ 1,943.9	\$ 8,246.1
Property taxes	1,197.2	-	1,197.2
Personal income taxes	470.2	1,328.8	1,799.0
Corporate profits taxes	126.6	800.3	926.8
Social insurance taxes	32.0	1,380.0	1,412.0
Other taxes	286.4	113.1	286.4
Fees, fines and permits	121.0	18.4	252.5
TOTAL TAX REVENUES	\$ 8,535.5	\$ 5,584.5	\$ 14,120.0

Central Coast Sub-Region

The Central Coast sub-region consists of the four counties of Monterey, San Luis Obispo, Santa Barbara and Ventura.

Exhibit 5-6

Central Coast Sub-Region



Source: ESRI

Exhibit 5-7

**Direct Employment of Oil and Gas Industry
Central Coast Sub-Region 2015**

	Employment
211 Oil and gas extraction	3,090
213111 Drilling oil and gas wells	600
213112 Support activities for oil and gas operations	780
2212 Natural gas distribution	750
23712 Oil and gas pipeline construction	100
32411 Petroleum refineries	140
324191 Petroleum lubricating oil and grease mfg	-
32511 Petrochemical manufacturing	-
333132 Oil and gas field machinery and eqmt mfg	390
4247 Petroleum and petroleum prods wholesalers	360
447 Gasoline stations	400
45431 Fuel dealers	170
486 Pipeline transportation	40

TOTAL DIRECT EMPLOYMENT	6,820
<i>Percent of California Industry Employment</i>	<i>4.9%</i>

Exhibit 5-8

**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Central Coast Sub-Region 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	6,818	\$ 982	\$ 1,647	\$ 3,133
Indirect	2,244	120	192	328
Induced	5,348	235	425	709
TOTAL CONTRIBUTION	14,410	\$ 1,337	\$ 2,264	\$ 4,170
<i>Percent of Total CA Contribution</i>	<i>4.1%</i>	<i>4.1%</i>	<i>3.5%</i>	<i>2.9%</i>
<i>Percent of Sub-Region Total</i>	<i>1.3%</i>	<i>2.1%</i>	<i>2.2%</i>	<i>2.5%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 548.9	\$ 179.5	\$ 728.4
Property taxes	97.2	-	97.2
Personal income taxes	43.6	123.2	166.8
Corporate profits taxes	7.6	48.4	56.0
Social insurance taxes	3.3	125.0	128.3
Other taxes	21.1	7.7	21.1
Fees, fines and permits	8.1	1.2	17.1
TOTAL TAX REVENUES	\$ 729.8	\$ 485.0	\$ 1,214.9

San Francisco Bay Area Sub-Region

The San Francisco Bay Area sub-region consists of the nine counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma.

Exhibit 5-9
San Francisco Bay Area Sub-Region



Source: ESRI

Exhibit 5-10
Direct Employment of Oil and Gas Industry
San Francisco Bay Area Sub-Region 2015

	Employment
211 Oil and gas extraction	6,230
213111 Drilling oil and gas wells	1,150
213112 Support activities for oil and gas operations	610
2212 Natural gas distribution	10,710
23712 Oil and gas pipeline construction	690
32411 Petroleum refineries	5,110
324191 Petroleum lubricating oil and grease mfg	-
32511 Petrochemical manufacturing	5
333132 Oil and gas field machinery and eqmt mfg	40
4247 Petroleum and petroleum prods wholesalers	1,010
447 Gasoline stations	1,380
45431 Fuel dealers	240
486 Pipeline transportation	610
TOTAL DIRECT EMPLOYMENT	27,790
<i>Percent of California Industry Employment</i>	<i>19.9%</i>

Exhibit 5-11
Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
San Francisco Bay Area Sub-Region 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	27,785	\$ 5,281	\$ 14,878	\$ 40,628
Indirect	26,736	2,705	3,962	6,210
Induced	30,623	1,901	3,306	5,169
TOTAL CONTRIBUTION	85,143	\$ 9,823	\$ 22,145	\$ 52,008
Percent of Total CA Contribution	24.4%	30.3%	34.0%	35.8%
Percent of Sub-Region Total	1.6%	2.1%	3.0%	4.4%

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 2,580.5	\$ 712.7	\$ 3,293.2
Property taxes	806.9	-	806.9
Personal income taxes	308.4	881.8	1,190.2
Corporate profits taxes	124.1	789.9	914.0
Social insurance taxes	15.0	875.8	890.7
Other taxes	273.6	62.7	273.6
Fees, fines and permits	61.2	10.2	134.1
TOTAL TAX REVENUES	\$ 4,168.7	\$ 3,333.2	\$ 7,502.8

Central Valley / Northern California Sub-Region

The Central Valley / Northern California sub-region consists of the sixteen counties of Butte, Colusa, Fresno, Glenn, Kern, Kings, Merced, Sacramento, San Joaquin, Shasta, Stanislaus, Sutter, Tehama, Tulare, Yolo and Yuba.

Exhibit 5-12

Central Valley / Northern California Sub-Region



Source: ESRI

Exhibit 5-13

Direct Employment of Oil and Gas Industry
Central Valley / Northern California Sub-Region 2015

	Employment
211 Oil and gas extraction	11,130
213111 Drilling oil and gas wells	2,610
213112 Support activities for oil and gas operations	5,680
2212 Natural gas distribution	3,280
23712 Oil and gas pipeline construction	3,730
32411 Petroleum refineries	1,160
324191 Petroleum lubricating oil and grease mfg	60
32511 Petrochemical manufacturing	30
333132 Oil and gas field machinery and eqmt mfg	440
4247 Petroleum and petroleum prods wholesalers	1,980
447 Gasoline stations	1,490
45431 Fuel dealers	750
486 Pipeline transportation	1,330
TOTAL DIRECT EMPLOYMENT	33,660
<i>Percent of California Industry Employment</i>	<i>24.1%</i>

Exhibit 5-14

Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Central Valley / Northern California Sub-Region 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	33,656	\$ 4,375	\$ 7,941	\$ 16,699
Indirect	11,812	597	933	1,692
Induced	25,393	1,089	1,962	3,425
TOTAL CONTRIBUTION	70,861	\$ 6,061	\$ 10,837	\$ 21,861
<i>Percent of Total CA Contribution</i>	<i>20.3%</i>	<i>18.7%</i>	<i>16.6%</i>	<i>15.0%</i>
<i>Percent of Sub-Region Total</i>	<i>2.3%</i>	<i>3.4%</i>	<i>4.0%</i>	<i>4.5%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 2,095.6	\$ 688.1	\$ 2,783.7
Property taxes	406.3	0.0	406.3
Personal income taxes	196.1	547.7	743.8
Corporate profits taxes	44.0	273.9	317.9
Social insurance taxes	24.6	569.7	594.3
Other taxes	108.4	0.0	108.4
Fees, fines and permits	59.7	50.6	110.3
TOTAL TAX REVENUES	\$ 2,934.8	\$ 2,130.0	\$ 5,064.8

Rest of State

The Rest of State consists of the remaining twenty-three states that have not been included in the four sub-regions above.

Exhibit 5-15
Rest of State



Source: ESR

Exhibit 5-16
Direct Employment of Oil and Gas Industry
Rest of State 2015

	Employment
211 Oil and gas extraction	4,350
213111 Drilling oil and gas wells	-
213112 Support activities for oil and gas operations	140
2212 Natural gas distribution	1,790
23712 Oil and gas pipeline construction	100
32411 Petroleum refineries	280
324191 Petroleum lubricating oil and grease mfg	-
32511 Petrochemical manufacturing	-
333132 Oil and gas field machinery and eqmt mfg	-
4247 Petroleum and petroleum prods wholesalers	530
447 Gasoline stations	490
45431 Fuel dealers	780
486 Pipeline transportation	50
TOTAL DIRECT EMPLOYMENT	8,500
<i>Percent of California Industry Employment</i>	<i>6.1%</i>

Exhibit 5-17
Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Rest of State 2015

	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	8,499	\$ 540	\$ 1,342	\$ 3,769
Indirect	2,994	129	203	387
Induced	3,331	131	240	430
TOTAL CONTRIBUTION	14,823	\$ 801	\$ 1,786	\$ 4,586
<i>Percent of Total CA Contribution</i>	<i>4.2%</i>	<i>2.5%</i>	<i>2.7%</i>	<i>3.2%</i>
<i>Percent of Sub-Region Total</i>	<i>1.6%</i>	<i>1.8%</i>	<i>2.6%</i>	<i>3.6%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 586.7	\$ 186.8	\$ 773.6
Property taxes	141.6	-	141.6
Personal income taxes	25.2	70.8	96.0
Corporate profits taxes	6.6	41.1	47.7
Social insurance taxes	2.7	87.2	90.0
Other taxes	27.7	10.7	27.7
Fees, fines and permits	10.5	1.7	22.9
TOTAL TAX REVENUES	\$ 801.0	\$ 398.3	\$ 1,199.3

California's Oil and Gas Industry by County

California is comprised of 58 individual counties. Oil and gas industry activity varies from county to county. This section identifies the direct activity of the oil and gas industry in each county and then estimates their economic and fiscal contribution.

Exhibit 5-18 identifies the direct industry employment, the total economic contribution and the total fiscal contribution of each county. Counties asterisked (*) are detailed in Section 8, in alphabetical order. ❖

Exhibit 5-18

Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution by County
California 2015

County	Direct Employment	Total Employment	----- Total Economic Contribution -----		<u>Total Fiscal Contribution</u> (\$ millions)
			Total Labor Income (\$ millions)	Total Value Added (\$ millions)	
Alameda County *	2,896	6,956	\$ 597.7	\$ 1,165.9	\$ 866.6
Alpine County	0	0	0.0	0.0	0.0
Amador County	145	214	9.7	19.9	20.2
Butte County *	625	1,347	91.6	176.6	127.7
Calaveras County	220	406	25.1	46.8	28.1
Colusa County *	146	205	15.9	29.9	21.5
Contra Costa County *	12,945	39,494	4856.7	13297.8	3237.0
Del Norte County	153	168	2.5	6.9	9.9
El Dorado County *	796	1,568	105.7	440.1	143.5
Fresno County *	2,468	6,463	552.5	960.9	605.9
Glenn County *	263	372	24.7	44.7	28.0
Humboldt County *	620	874	26.7	68.5	72.8
Imperial County *	696	934	48.7	90.0	78.1
Inyo County	185	211	4.2	11.8	19.1
Kern County *	21,348	40,190	3805.5	7046.3	2029.3
Kings County *	331	437	22.3	44.4	57.9
Lake County	154	245	14.3	25.6	26.7
Lassen County	253	317	17.0	32.2	15.9
Los Angeles County *	31,235	77,846	7893.2	16819.9	6947.6
Madera County *	635	838	31.1	67.2	84.7
Marin County *	577	863	74.0	110.5	118.4
Mariposa County	64	78	2.1	4.8	7.6
Mendocino County *	477	971	65.4	122.0	82.4
Merced County	741	852	12.8	34.6	114.7
Modoc County	156	174	2.3	7.1	4.7
Mono County	36	53	4.2	6.4	3.8
Monterey County *	746	1,182	75.1	148.2	166.2
Napa County *	975	1,666	129.6	219.5	118.8
Nevada County	725	864	10.3	34.0	49.3
Orange County *	10,089	19,535	1668.5	2714.5	1807.5
Placer County *	1,698	4,602	390.8	703.8	392.6
Plumas County	282	412	18.4	39.8	24.0
Riverside County *	3,472	7,210	554.4	936.3	1022.1
Sacramento County *	2,467	5,984	538.2	747.2	683.4
San Benito County	170	233	7.7	19.1	23.6
San Bernardino County *	4,570	9,364	678.7	1145.4	1159.0
San Diego County *	12,577	30,335	2399.4	4429.8	2588.7
San Francisco County *	3,519	6,900	998.4	1606.5	595.4

Exhibit 5-18 (cont'd)

County	Direct Employment	Total Employment	----- Total Economic Contribution -----		<u>Total Fiscal Contribution</u> (\$ millions)
			Total Labor Income (\$ millions)	Total Value Added (\$ millions)	
San Joaquin County *	1,199	2,830	\$ 278.3	\$ 451.5	\$ 438.9
San Luis Obispo County *	1,286	2,576	152.4	375.4	196.6
San Mateo County *	1,281	1,909	147.4	518.5	348.3
Santa Barbara County *	2,135	4,224	423.8	688.0	313.0
Santa Clara County *	2,652	3,782	261.6	481.2	744.1
Santa Cruz County	1,037	1,238	20.6	54.3	113.9
Shasta County *	1,243	1,870	65.7	135.9	138.3
Sierra County	2	2	0.0	0.1	0.0
Siskiyou County	325	417	12.2	27.7	40.4
Solano County *	1,862	4,035	412.9	1295.0	443.1
Sonoma County *	1,079	1,613	68.7	128.5	201.1
Stanislaus County *	920	1,520	68.9	171.1	223.6
Sutter County *	225	387	26.8	47.5	47.2
Tehama County *	181	260	14.7	26.2	50.1
Trinity County	66	76	1.5	3.4	3.4
Tulare County *	805	1,714	188.8	275.2	208.2
Tuolumne County	304	461	18.9	37.2	28.3
Ventura County *	2,651	5,985	657.1	1004.1	523.3
Yolo County *	564	783	47.8	102.1	106.5
Yuba County *	153	226	12.3	24.6	31.9

Source: Estimates by LAEDC

Fiscal contributions may not sum to the aggregate state level fiscal contribution since some tax revenues cannot be estimated at the county level with any accuracy. The estimates provided at the county level are therefore likely to be conservative.

Additionally, county-level economic contributions may not add to sub-regional contributions because estimates are produced at defined geographic levels, which do not account for spill-over impacts between counties. Such spill-over effects are captured in state level impacts and in the sub-regional impacts. ❖

6 Refineries in California

This section focuses on refined petroleum products and byproducts, specifically describing what is produced through refining. Refined petroleum products include gasoline and diesel, liquefied petroleum gas (LPG), kerosene, jet fuel and fuel oils. Petrochemicals, byproducts of the refining process and generally also produced at refineries, are used as a feedstock for a wide range of materials including adhesives, detergents, solvents, and fibers, gels, lubricants, plastics and resins.

Additionally, both refined petroleum and petrochemicals are used as an input for a wide variety of consumer products including plastics, cosmetics, pharmaceuticals, wax-based products like packaging or crayons, paints, solvents, asphalt, pesticides and fertilizers (see Exhibit 6-1 for a partial list of products).

Exhibit 6-1

Petroleum-Based Consumer Products

Medical and Personal

antihistamines	inhalers	makeup
anesthetics	band aids	perfume
aspirin	latex gloves	contact lenses
cough syrup	syringes	lotion
vitamins	artificial limbs	diapers

Fuel and Lubricant

gasoline	heating fuel	motor oil
diesel fuel	propane	electricity generation

Chemical Products

pesticides	fabric softeners	brake fluid
fertilizers	cleaning chemicals	coolant
preservatives	solvents	antifreeze
Teflon	paint	

Synthetic Fabrics and Materials

polyester	elastic	carpeting
nylon, rayon	shoes	vinyl
	upholstery	styrofoam

Other Products

PVC pipe	electronics	toys
shingles	plastic containers	helmets
tires	plastic bags	guitar strings
asphalt/ tar	sponges	sports equipment

Compiled by LAEDC

The extent of purchases of refinery products made by other industries illustrates the broad reach that these products have throughout its user industries (see Exhibit 6-2). The top twenty industries purchased more than \$22.6 billion worth of products from California's refineries in 2015.

Both end-user consumers and user chain industries will be vulnerable to reductions of the supply of petroleum-based products. Response strategies may include: relocation; input substitution; operational shut-down; price increases; and more. Each of these options will have its own impact on the state's economic activity. The overall potential impact is demonstrated in the sections that follow. ❖

Exhibit 6-2

Top 20 User Industries of California Refinery Products

NAICS	Industry Description	Purchases From CA Refineries (\$ millions)
23	Construction	\$3,287.7
484	Truck transportation	3,203.6
481	Air transportation	2,734.7
325	Chemical manufacturing	882.1
111,112,115	Agriculture	730.5
492	Couriers and messengers	556.4
483	Water transportation	547.0
221	Utilities	533.4
42	Wholesale Trade	511.9
482	Rail transportation	389.0
561	Administrative and support services	310.1
722	Food services and drinking places	253.4
324	Petroleum and coal products manufacturing	249.5
485	Transit and ground passenger transportation	211.9
813	Membership associations and organizations	197.1
622	Hospitals	174.7
487,488	Support activities for transportation	159.0
541	Professional and technical services	152.2
212,213	Mining and Mining Support	143.1
55	Management of companies and enterprises	132.6
	Top 20	\$15,359.69
	<i>All Other Industries</i>	<i>\$2,014.83</i>
	Purchases from California Refineries	\$17,374.5

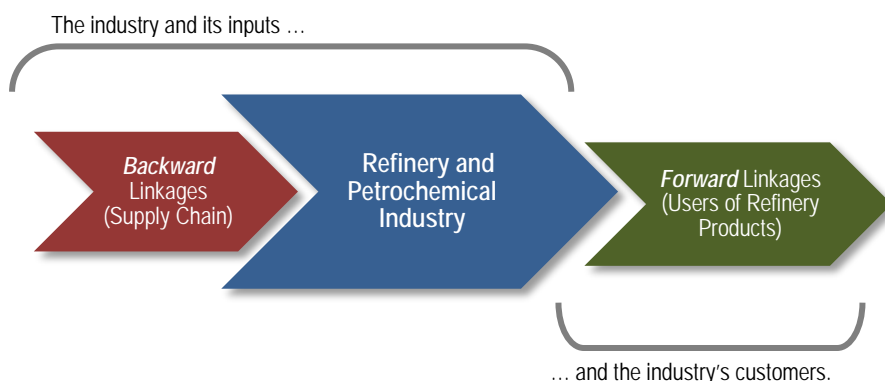
* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Backward Linkages

In his seminal work, *The Strategy of Economic Development* (1958), Albert O. Hirschman introduces the concept of backward and forward linkages to industries.

Backward linkages are the industries in the supply chain of a given industry, providing the inputs needed for its output. These are estimated for the refinery industry here using economic contribution analysis. Economic contribution quantifies the portion of a region's economy that can be attributed to an existing industry by tracing its purchases of goods and services in its supply chain, its payment of labor income to regional workers, and the tax revenues generated on its operations and their multiplier impacts. This analysis models what would happen if the industry did not exist in terms of those whose economic activity depends on supplying the industry. A detailed description of our methodology can be found in the Appendix. ❖

Backward linkages and forward linkages



Direct Activity and its Contribution

Direct activity associated with the refinery industry is its direct contribution to the economy in terms of employment, labor income and value added. Direct employment includes all individuals whose employment is directly related to refineries. Measured on a job-count basis regardless of the number of hours worked, it includes full-time, part-time, permanent and seasonal employees, contingent workers and the self-employed. Labor income includes all payments these employees receive, such as wages and benefits, and payroll taxes paid on their behalf.

Exhibit 6-3 displays the estimated direct activity associated with the refinery and petrochemical industry in California in 2015, the latest year for which complete data is available.

Total direct labor payments, the value of all earnings received by both payroll employees and the self-employed, including benefits such as health insurance and pension plan contributions, was an estimated \$2.9 billion in 2015, representing 0.2 percent of total labor income in the state.

In 2015, the industry in California provided 10,610 jobs. Direct employment in the industry accounted for just under one percent of employment in California.

Exhibit 6-3

Petroleum Refineries and Petrochemical Products Manufacturing California 2015

		% of CA Total
Employment (jobs):	10,610	0.1%
Labor income (\$ billions):	\$ 2.9	0.2%
Value added (\$ billions):	\$ 17.1	0.7%
Output (\$ billions):	\$ 57.4	1.4%

Source: Estimates by LAEDC

In addition to its own direct activity, petroleum refineries and petrochemical products manufacturing establishments generate significant spillover employment and labor income effects that are proportionately among the highest of all industries, consistent with the larger encompassing oil and gas industry. This is a consequence of the productivity of the industry and the high wages paid to industry workers.

The total economic contribution of the industry in California is presented in Exhibit 6-4.

Exhibit 6-4

Total Economic Contribution in California 2015 Petroleum Refineries and Petrochemical Products Manufacturing

Employment (jobs):			
Direct	10,610		
Indirect and Induced	96,660		
TOTAL		107,270	
Percent of California Total Employment		0.5%	
Labor income (\$ millions):			
Direct	\$2,870		
Indirect	7,570		
TOTAL		\$10,430	
Percent of California Total Labor Income		0.7%	
Value added (\$ millions):			
Direct	\$17,130		
Indirect and Induced	11,880		
TOTAL		\$29,010	
Percent of California Total GDP		1.2%	
Output (\$ millions):			
Direct	\$57,370		
Indirect and Induced	18,740		
TOTAL		\$76,110	
Percent of California Total Output		1.9%	

Source: Estimates by LAEDC

It is estimated that the activities related to the refining and petrochemicals industry in California in 2015 supported 107,270 jobs with labor income of just over \$10.4 billion in 2015, and generated close to \$29.0 billion in value added (approximately 1.2 percent of the state's GDP of \$2.5 trillion) on output of \$76.1 billion.

Industry Distribution

The total economic contribution is achieved through activity occurring across a wide range of industry sectors via indirect and induced effects. The distribution of the total employment, labor income and output among industry sectors is presented in Exhibit 6-5.

Of the 107,270 jobs supported, just under 26 percent were in the mining sector (which includes much of the oil and gas industry) and approximately twelve percent in the manufacturing sector. However, virtually all industry sectors receive a positive economic impact from activity occurring in petroleum refineries and petrochemical products manufacturing industries,

including, health and social services, retail and wholesale trade, transportation and warehousing and accommodation and food services.

Exhibit 6-5

Total Contribution of Industry By Sector in California 2015 Petroleum Refineries and Petrochemical Products Manufacturing

	Jobs	Labor Income (\$ millions)	Output (\$ millions)
Ag, forestry, fish & hunting	314	\$21	\$26
Mining	27,595	3,055	4,696
Utilities	308	53	118
Construction	4,426	268	374
Manufacturing	12,348	2,998	17,403
Wholesale trade	5,608	495	959
Retail trade	7,402	292	487
Transportation and warehousing	5,972	776	803
Information	966	157	316
Finance and insurance	3,899	311	499
Real estate and rental	3,043	123	1,071
Professional, scientific technical	4,501	367	427
Management of companies	1,505	204	245
Administrative and waste services	5,248	203	254
Educational services	1,690	78	83
Health and social services	8,560	521	572
Arts, entertainment and recreation	1,611	59	90
Accommodation and food services	6,381	172	249
Other services	5,460	236	271
Government	435	46	61
Total	107,270	\$10,430	\$29,010

Source: Estimates by LAEDC

Output of an industry is its gross revenues. Looking at the disaggregation of the total effects of these two industries in terms of output across the different industries, illustrates the varying magnitudes of impact experienced by each industry sector stemming from activity taking place in petroleum refineries and petrochemical products manufacturing. By far, a disproportionately large impact occurs in the manufacturing sector (exactly 60 percent of the total impact in terms of output), followed by mining (just over sixteen percent), real estate and rental industries (just under four percent), wholesale trade (approximately three percent) and transportation and warehousing (close to three percent). Together, total output effects in these five industry sectors are valued at \$24.9 billion, exactly 86 percent of total generated output.

A description of the industry sectors is provided in the Appendix. ❖

Identifying Forward Linkages

Hirschman also introduces the concept of forward linkages to industries. *Forward linkages* are those industries that use the output of a given industry in their own production. For example, air transportation uses petroleum products in order to provide its services. The air transportation industry is a user of refinery products and is thus a forward linkage of the refinery industry. In this report, we refer to these first tier user industries as *primary users*.

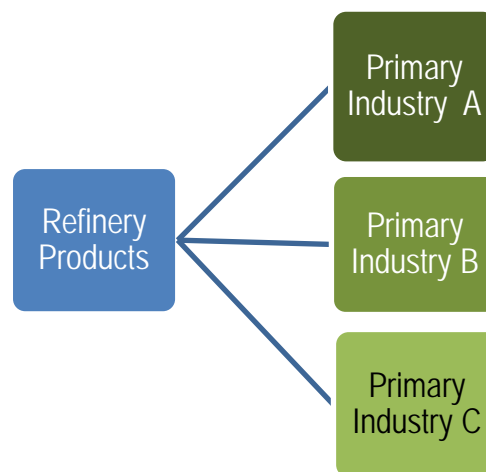
For those industries that are not particularly vulnerable to refinery products in their supply chain, they may instead be dependent on the output of the primary industries. We refer to these industries as *secondary users*. Although they may not be directly impacted by disruption in availability and price of refinery products, they may well be already affected by the availability and price of the output of primary user industries.

This network of linkages is depicted in the diagram. Refinery products are used as inputs into production of primary industries A, B and C. The dependence of these primary industries is estimated using information about their business model and the market for their goods and services. These are direct forward linkages of the refinery and petrochemical industry. The output of these primary industries is used as inputs in the production of secondary industries D, E, F and G. While these are also forward linkages of the refinery and petrochemical industry, their vulnerability to supply disruptions is felt through their supplying primary industry.

We look at a variety of measures that identify these two tiers of forward linkages of the refinery and petrochemical industry in California. ❖

Constructing a Vulnerability Index

Primary users would be immediately impacted by reductions in the availability or increase in the price of refinery products if they were particularly dependent on them. To measure this dependence, we construct an index of vulnerability.



Hirschman's metric for quantifying a forward link was the share of an industry's output that is allocated to an intermediate input. Supplementing the original indicator suggested by Hirschman, we use three metrics to construct a composite index of vulnerability to input disruptions: (1) intensity of use; (2) trade exposure; and (3) gross operating surplus.

Intensity of Use

Refined petroleum products and petrochemical byproducts as an input of production are traced through the industry user chain to measure each user industry's *intensity of use* compared to its revenues (gross output). This is a measure of how dependent the user industry is on refinery products. Understanding interactions between producers of refined petroleum and petrochemical products across the different industries that use these products as an intermediate good in their own production, is valuable for understanding how these user industries stand to be affected by changes in the price and supply of these goods.

User industries with larger shares of these products as inputs to total industry revenues (gross output) have a larger dependency on them as an input in their production. As such, changes in the supply of these inputs will affect them disproportionately more compared to industries whose usage is a smaller share of their gross output.

Exhibit 6-6 lists the top industries that use refined petroleum and petrochemical products in their production in California, with dependency ranked by the share of input value to gross output in 2015.

Exhibit 6-6**Top 20 Industries by Refinery Products Inputs
As a Share of Gross Output**

NAICS	Industry	Share of Output (%)
324	Petroleum and Coal Products Manufacturing	19.2%
481	Air Transportation	15.1
482	Rail Transportation	12.4
483	Water Transportation	12.0
484	Truck Transportation	11.6
492	Couriers and Messengers	5.7
325	Chemical Manufacturing	4.4
485	Transit and Ground Passenger Transportation	4.3
212,213	Mining and Mining Support	2.6
23	Construction	2.4
211	Oil and Gas Extraction	1.5
111,112,115	Agriculture	1.4
323	Printing and Related Support Activities	1.3
486	Pipeline Transportation	1.3
113,114	Forestry, Hunting and Fishing	1.3
221	Utilities	1.1
487,488	Support Activities for Transportation	1.1
562	Waste Management and Remediation Svcs	1.0
326	Plastics and Rubber Products Manufacturing	0.8
327	Nonmetallic Mineral Product Manufacturing	0.8
Average of all industries		0.7%

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Several industries are combined because they are individually very small but are also quite vulnerable. These include agricultural industries, forestry and hunting, and mining and mining support.

Many of the industries (six of the top ten) with the largest intensity of use measure are in the transportation and warehousing sector: air, rail, water, truck and passenger ground transportation industries and the industry subsector of couriers and messengers. Industries within these subsectors rely heavily on transportation fuels (jet fuel, diesel, gasoline, etc.), which are requisite to the provision of their services.

Both petroleum and coal products manufacturing and chemical manufacturing often use refined petroleum and petrochemicals to produce other end products (petroleum refineries and petrochemical product manufacturing industries have first been backed out from their larger corresponding subsectors so as not to double count, and thereby overstate subsector usage).

Equipment used in forestry, hunting and fishing industries, such as timber harvesters, bunchers and

skidders, power generators and ocean vessels require fuel for operation as well.

Materials used in the construction industry, such as asphalt, roofing materials and PVC piping, are produced using refined petroleum and petrochemical products. Additionally, fossil fuels are used to operate heavy machinery including water trucks, bulldozers, excavators, loaders and graders.

Linkages of user industries of refined petroleum and petrochemical products are next evaluated in regards to trade sensitivity.

The full list of refinery product inputs as a share of output for all industries is provided in the Appendix.

Trade Sensitivity

Trade sensitivity or trade exposure provides an indication of an industry's ability to pass potentially higher costs of inputs through to its customers. Commodities traded in the global market must operate within the limitations presented by trade exposure. For example, if production costs increase for firms in California and necessitate price increases, in-state producers will face competition from producers in other states or nations and be unable to protect their market share.

For the composite vulnerability index, *trade sensitivity* is measured by the sum of an industry's domestic and foreign exports as a percentage of its total output. Exhibit 6-7 identifies the top twenty industries in California by their trade sensitivity in 2015.

Industries that export the majority of their output outside the state of California and therefore depend on larger markets for their sales revenue will be particularly vulnerable to changes in input prices. Their ability to increase prices to recover cost increases will be limited given the international competition they face.

California's manufacturing industries are particularly vulnerable to trade exposure. Six of the top ten industries with the highest trade intensities are manufacturing industries, including machinery, apparel and transportation equipment.

Exhibit 6-7**Top 20 Industries by Trade Exposure**

NAICS	Industry	Exposure (%)
316	Leather and Allied Product Manufacturing	96.1%
315	Apparel Manufacturing	77.0
721	Accommodation	76.5
333	Machinery Manufacturing	76.1
313	Textile Mills	73.7
512	Motion Picture / Sound Recording Industries	73.5
334	Computer and Electronic Product Manufacturing	72.9
221	Utilities	72.8
339	Miscellaneous Manufacturing	66.2
113,114	Forestry, Hunting and Fishing	64.0
336	Transportation Equipment Manufacturing	58.5
111,112,115	Agriculture	57.7
335	Electrical Equipment and Component Mfg	55.3
331	Primary Metal Manufacturing	53.1
312	Beverage and Tobacco Product Manufacturing	53.0
325	Chemical Manufacturing	52.4
314	Textile Product Mills	52.2
533	Lessors of Nonfinancial Intangible Assets	48.1
337	Furniture and Related Product Manufacturing	46.9
483	Water Transportation	45.6
<i>Average of all industries</i>		28.2%

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

The list of trade sensitivities for all industries is provided in the Appendix.

Gross Operating Surplus

As an alternative to raising prices of their goods and services, firms in industries that experience increased input costs may instead absorb cost increases through reduction in profits. This capability is necessarily dependent on an industry's typical profit experience. Many industries have extremely thin profit margins and will not be able to absorb costs increases without price increases—which, if they are exposed to trade, may also not be a viable option. Other industries have a significant margin cushion and are less vulnerable to increases in input prices.

Exhibit 5-8 ranks industries by their gross operating surplus as a percentage of total output (essentially, profit margins). The higher this margin, the more likely the user industry will be able to absorb higher input costs. Industries with smaller or even negative gross surplus as a share of total output have no capability to absorb cost increases. If they are also unable to increase

the prices of their goods and services, they will face an existential risk.

Industries in California, on average, operate close to the margin, with a gross operating surplus of 18.0 percent of total output. Industries that are especially significant and operating at a break-even point include construction, hospitals, repair and maintenance, and pipeline transportation. Still, the exhibit lists many industries that experience very small profit margins. These leave very little room for firms to absorb cost increases.

Exhibit 6-8**Top 20 Industries by Smallest Gross Operating Surplus**

NAICS	Industry	Gross Operating Surplus (As % Total Output)
443	Electronics and Appliance Stores	-33.9%
812	Personal and Laundry Services	-24.0
486	Pipeline Transportation	-13.6
113,114	Forestry, Hunting and Fishing	-8.1
453	Miscellaneous Store Retailers	-3.3
316	Leather and Allied Product Manufacturing	-3.0
712	Museums, Historical Sites, Zoos and Parks	-2.4
447	Gasoline Stations	-2.4
491	Postal Service	0.4
623	Nursing and Residential Care Facilities	0.6
811	Repair and Maintenance	0.8
611	Educational Services	1.7
523	Securities, Contracts, Investments	2.6
331	Primary Metal Manufacturing	3.0
525	Funds, Trusts, and Other Financial Vehicles	3.7
484	Truck Transportation	3.8
518	Data Processing, Hosting and Related Svcs	3.9
446	Health and Personal Care Stores	4.3
313	Textile Mills	4.5
314	Textile Product Mills	4.8
<i>Average of all industries</i>		18.0%

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

The list of gross operating surplus as a share of total output for all industries is provided in the Appendix.

Composite Index of Vulnerability

The three indicators (intensity of use, trade sensitivity and gross operating surplus) are used to construct an overall composite *vulnerability index*.

As the individual indicators that contribute to this index may be more or less important in determining

vulnerability to supply disruptions in the refinery industry, their values are weighted accordingly.

The share of output that must be allocated to the given input product is clearly the most important factor in judging vulnerability. An industry that does not use much petroleum products, for example, is not vulnerable to disruptions in its availability or price. This component is given a 55 percent weight in the composite vulnerability index.

Trade sensitivity is also relatively important as the ability for firms to compete in the global marketplace will determine their viability. This factor is allocated a 30 percent weight in the vulnerability index.

Finally, the share of output captured by gross operating surplus (or profits) is important, but is given a smaller weight of 15 percent in the vulnerability index, reflective of the variability in the indicator across firms within

industries and the elasticity of this indicator with respect to revenues. ❖

Primary User Industries

Exhibit 6-9 lists the top 20 vulnerable industries ranked by their corresponding composite index scores, along with their direct economic activity in California. These industries are at immediate risk to disruptions in the availability and price of refinery products.

Together, the primary tier of vulnerable industries provide 1.7 million jobs (7.6 percent of all jobs in California) with labor income of \$100.7 billion, and account for \$207.0 billion (or 8.5 percent) of state GDP.

A listing of the vulnerability index for all industries is provided in the Appendix. ❖

Exhibit 6-9

Most Vulnerable Primary User Industries of Refinery Products California 2015

Rank	NAICS	Industry Description	Vulnerability Index	Employment	Labor Income (\$ millions)	Output (\$ millions)	Value-Added (\$ millions)
1	325	Chemical Manufacturing	9.7	75,052	\$11,566.1	\$103,712.3	\$45,194.9
2	221	Utilities	9.1	60,410	10,465.1	61,071.9	28,752.8
3	483	Water Transportation	9.1	6,724	706.0	5,638.0	1,781.4
4	721	Accommodation	8.7	168,383	6,825.5	18,171.2	11,827.3
5	111,112,115	Agriculture	8.7	500,164	29,864.0	64,370.0	38,351.0
6	492	Couriers and Messengers	8.7	109,999	4,240.7	12,009.8	6,732.7
7	481	Air Transportation	8.4	51,441	5,001.8	22,398.4	10,533.5
8	482	Rail Transportation	8.3	11,544	1,333.9	3,905.0	1,739.7
9	212,213	Mining and Mining Support	7.9	26,780	2,154.1	6,923.4	3,985.4
10	113,114	Forestry, Hunting and Fishing	7.9	11,057	440.3	655.7	442.4
11	333	Machinery Manufacturing	7.7	78,127	7,665.1	32,702.4	11,704.6
12	323	Printing and Related Support Activities	7.7	58,163	2,744.4	8,853.7	3,764.0
13	326	Plastics and Rubber Products Manufacturing	7.6	46,963	2,852.2	16,280.7	4,646.6
14	324	Petroleum and Coal Products Manufacturing	7.6	2,298	329.7	2,286.4	987.5
15	487,488	Support Activities for Transportation	7.4	100,711	7,721.9	17,996.3	9,867.5
16	313	Textile Mills	7.3	8,872	394.4	2,351.3	528.6
17	485	Transit and Ground Passenger Transportation	7.1	84,472	2,623.8	6,054.4	3,656.1
18	713	Amusements, Gambling and Recreation	7.0	245,395	6,875.1	20,511.8	12,207.4
19	211	Oil and Gas Extraction	7.0	43,923	4,944.1	10,840.2	7,653.3
20	322	Paper Manufacturing	7.0	22,238	1,982.0	11,074.2	2,656.8
<i>Average of all industries</i>			7.7				
TOTAL OF TOP 20				1,712,715	\$100,730.3	\$427,807.3	\$207,013.6
<i>Percent of California Total</i>				<i>7.6%</i>	<i>7.4%</i>	<i>10.6%</i>	<i>8.5%</i>

¹ 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

7 Detailed Industry Sheets

The following pages provide detailed data for each vulnerable primary and secondary user industry.

Primary Industries

For each of the top twenty vulnerable primary industries, we provide an industry description as detailed in the North American Industry Classification System (NAICS) in its sourcebook, *North American Industry Classification System*, published by the U.S. Office of Management and Budget (2013).

We quantify the industry in terms of employment, labor income, industry output and its contribution to state GDP. These metrics are an indication of the activity that is at risk.

We outline the products that each industry produces and sells in California, and list the industries that purchase its products. This provides an indication of the breadth and width the primary industry through its own user chain. Finally, we list the vulnerable secondary industries to the primary industry according to their vulnerability index.

Industries are shown in the following sequence:

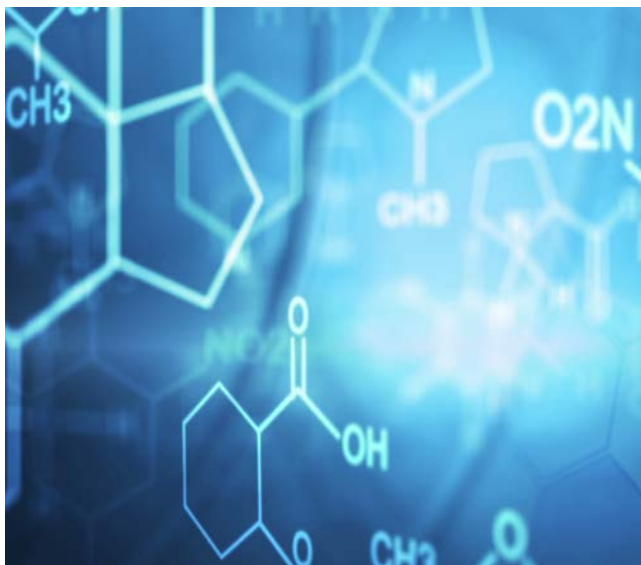
Primary Industries	Page
Chemical Manufacturing	34
Utilities	36
Water Transportation	38
Accommodation	40
Agriculture	42
Couriers and Messengers	44
Air Transportation	46
Rail Transportation	48
Mining and Support Activities	50
Forestry, Hunting and Fishing	52
Machinery Manufacturing	54
Printing and Related Services	56
Plastics and Rubber Products Mfg	58
Petroleum and Coal Products Mfg	60
Support Activities for Transportation	62
Textile Mills	64
Transit and Ground Passenger Transport	66
Amusements, Gambling and Recreation	68
Oil and Gas Extraction	70
Paper Manufacturing	72

Primary Industry:

CHEMICAL MANUFACTURING
(NAICS 325*)

**Vulnerability
Index:**

9.7

**Industry Description**

This subsector is based on the transformation of organic and inorganic raw materials by a chemical process and the formulation of products. This subsector distinguishes the production of basic chemicals that comprise the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry groups.

** For the purposes of this report, this industry has been modified to remove Petrochemical Manufacturing (NAICS 32511) to avoid double-counting.*

What Is At Risk?

This industry provides almost 75,100 jobs in California with average annual wages and benefits of \$154,070.

75,050 jobs

\$ 11.6 billion
Labor Income

\$ 103.7 billion
Industry Output

\$ 45.2 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-1.

Exhibit 7-1

Products of the Chemical Manufacturing Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Industrial gases	\$1,072.6	5.8
Synthetic dyes, basic organics and inorganics	1,265.1	6.9
Plastics, resins, synthetic rubbers, fibers	1,095.8	5.9
Fertilizer and agricultural chemicals	1,880.4	10.2
Pharmaceuticals, medicines, biological prods	7,470.9	40.6
Paints, coatings, adhesives	1,992.0	10.8
Detergents, polish, toilet preparations	1,662.4	9.0
Other chemical products	1,981.6	10.8
Total Industry Sales in California	18,348.1	10.00

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 6-2 lists the user industries in California of this industry's goods and services.

Exhibit 7-2

Top 20 User Industries of Chemical Manufacturing

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
621	Ambulatory health care services	\$ 1,803.9
622	Hospitals	1642.3
111,112,115	Agriculture	1208.9
23	Construction	1045.6
334	Computer and electronic product manufacturing	990.5
326	Plastics and rubber products manufacturing	839.3
55	Management of companies and enterprises	615.1
332	Fabricated metal product manufacturing	477.8
562	Waste management and remediation services	332.0
221	Utilities	303.6
339	Miscellaneous manufacturing	263.2
311	Food manufacturing	258.5
812	Personal and laundry services	250.4
336	Transportation equipment manufacturing	198.6
322	Paper manufacturing	194.0
561	Administrative and support services	168.0
333	Machinery manufacturing	164.1
623	Nursing and residential care facilities	140.2
323	Printing and related support activities	138.8
811	Repair and maintenance	112.0
	Top 20	\$ 11,146.7
	All Other Industries	\$ 7,201.4
	Total Industry Sales in California	\$ 18,348.1

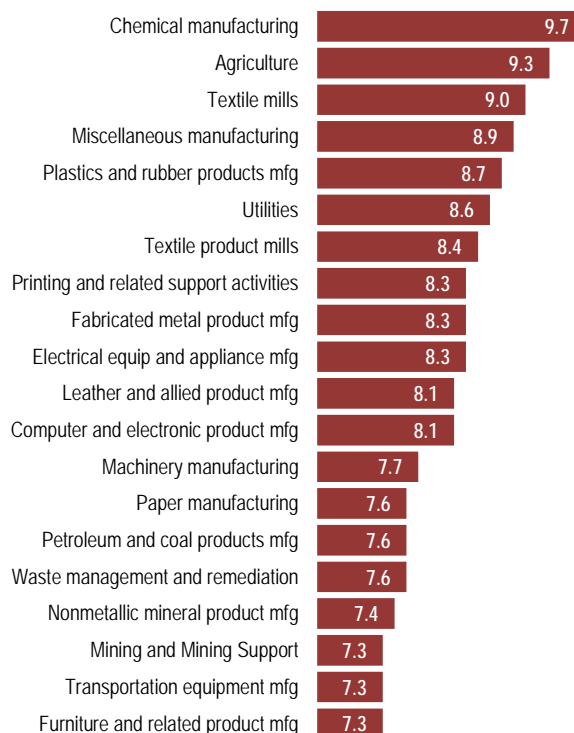
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 6-3.

Exhibit 7-3

Chemical Manufacturing Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

UTILITIES
(NAICS 221)



Vulnerability
Index:

9.1

Industry Description

Industries in the Utilities subsector provide electric power, natural gas, steam supply, water supply, and sewage removal through a permanent infrastructure of lines, mains, and pipes. Establishments are grouped together based on the utility service provided and the particular system or facilities required to perform the service.

What Is At Risk?

This industry provides
60,400 jobs in
California with average
annual wages and
benefits of \$173,240.

60,410 jobs

\$ 10.5
Labor Income

\$ 61.1 billion
Industry Output

\$ 28.8 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-4.

Exhibit 7-4

Products of the Utilities Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Electric power generation	\$7,549.7	34.2
Electricity transmission and distribution	7,211.2	32.6
Natural gas distribution	4,772.1	21.6
Water, sewage and other systems	2,554.8	11.6
Total Industry Sales in California	\$22,087.8	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-5 lists the user industries in California of this industry's goods and services.

Exhibit 7-5

Top 20 User Industries of Utilities

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
531	Real estate	\$ 2497.5
325	Chemical manufacturing	892.6
611	Educational services	774.6
311	Food manufacturing	772.2
722	Food services and drinking places	627.7
42	Wholesale Trade	565.3
334	Computer and electronic product manufacturing	457.5
111,112,115	Agriculture	414.1
521,522	Monetary auth, credit intermediation and related	386.2
23	Construction	361.5
541	Professional and technical services	353.1
327	Nonmetallic mineral product manufacturing	338.3
332	Fabricated metal product manufacturing	301.3
622	Hospitals	279.1
55	Management of companies and enterprises	275.8
813	Membership associations and organizations	257.0
312	Beverage and tobacco product manufacturing	247.8
445	Food and beverage stores	237.7
721	Accommodation	236.0
336	Transportation equipment manufacturing	216.6
	Top 20	\$ 10,491.8
	<i>All Other Industries</i>	<i>11,596.1</i>
	Total Industry Sales in California	\$ 22,087.8

Source: IMPLAN Data for California; Analysis by LAEDC

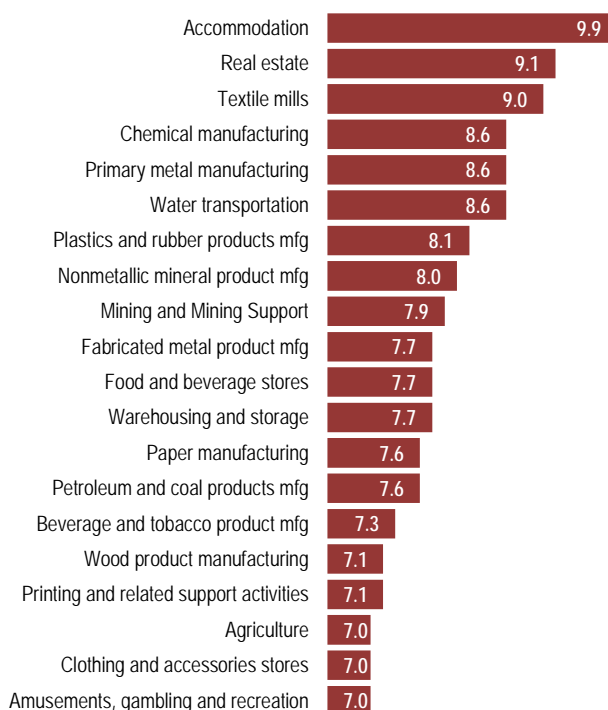
Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-6.

Exhibit 7-6

Utilities

Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

WATER TRANSPORTATION
(NAICS 483)

**Vulnerability
Index:** 9.1

**Industry Description**

Industries in this subsector provide water transportation of passengers and cargo using watercraft, such as ships, barges and boats. The subsector is organized into two groups: (1) one for deep sea, coastal and Great Lakes; and (2) one for inland water transportation. This split typically reflects the difference in equipment used.

What Is At Risk?

This industry provides
6,700 jobs in
California with average
annual wages and
benefits of \$105,000.

6,720 jobs

\$ 706 million
Labor Income

\$ 5.6 billion
Industry Output

\$ 1.8 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-7.

Exhibit 7-7

Products of the Water Transportation Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Water transportation service	\$ 1,207.6	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-8 lists the user industries in California of this industry's goods and services.

Exhibit 7-8

Top 20 User Industries of Water Transportation

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
311	Food manufacturing	\$ 356.7
23	Construction	209.3
541	Professional and technical services	145.6
111,112,115	Agriculture	72.7
312	Beverage and tobacco product manufacturing	47.7
325	Chemical manufacturing	44.0
327	Nonmetallic mineral product manufacturing	36.2
334	Computer and electronic product manufacturing	24.7
331	Primary metal manufacturing	24.2
722	Food services and drinking places	19.6
484	Truck transportation	10.8
336	Transportation equipment manufacturing	10.8
221	Utilities	9.9
324	Petroleum and coal products manufacturing	8.8
335	Electrical equipment and appliance mfg.	8.6
332	Fabricated metal product manufacturing	8.5
621	Ambulatory health care services	7.8
531	Real estate	7.7
481	Air transportation	6.9
339	Miscellaneous manufacturing	6.8
	<i>Top 20</i>	<i>\$ 1,067.2</i>
	<i>All Other Industries</i>	<i>\$ 140.4</i>
	<i>Total Industry Sales in California</i>	<i>\$ 1,207.6</i>

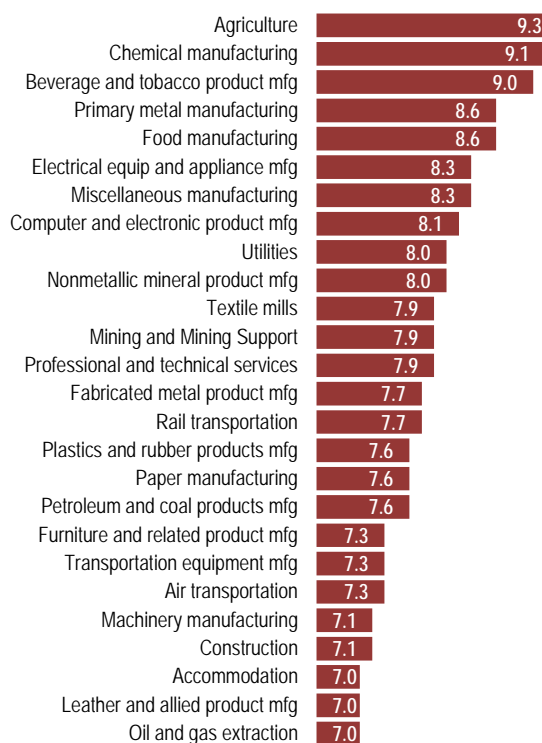
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-9.

Exhibit 7-9

Water Transportation Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

ACCOMMODATION (NAICS 721)

Industry Description

Industries in the Accommodation subsector provide lodging or short-term accommodations for travelers, vacationers, and others. There is a wide range of establishments in these industries. Some provide lodging only; while others provide meals, laundry services, and recreational facilities, as well as lodging.

The subsector is organized into three groups: (1) traveler accommodation, (2) recreational accommodation, and (3) rooming and boarding houses. Traveler Accommodation includes establishments that primarily provide traditional types of lodging services, hotels, motels, and bed-and-breakfast inns. RV (Recreational Vehicle) Parks and Recreational Camps includes establishments that operate lodging facilities to accommodate outdoor enthusiasts, travel trailer campsites, recreational vehicle parks, and outdoor adventure retreats. Rooming and Boarding Houses includes establishments providing temporary or longer-term accommodations, that for the period of occupancy, may serve as a principal residence.

Vulnerability
Index: 8.7



What Is At Risk?

This industry provides close to 168,400 jobs in California with average annual wages and benefits of \$40,535.

168,380 jobs

\$ 6.8 billion
Labor Income

\$ 18.2 billion
Industry Output

\$ 11.8 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-10.

Exhibit 7-10

Products of the Accommodation Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Hotels and motels, including casino hotels	\$ 777.46	99.2
Other accommodations	6.48	0.8
Total Industry Sales in California	\$ 783.94	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-11 lists the user industries in California of this industry's goods and services.

Exhibit 7-11

Top 20 User Industries of Accommodation

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
541	Professional and technical services	\$ 176.8
561	Administrative and support services	66.4
521,522	Monetary auth, credit intermediation and related	49.5
518	Data processing, hosting and related services	35.6
523	Securities, commodity contracts, investments	33.7
621	Ambulatory health care services	30.8
531	Real estate	29.7
23	Construction	27.5
524	Insurance carriers and related activities	24.2
519	Other information services	23.3
42	Wholesale Trade	22.0
722	Food services and drinking places	18.1
517	Telecommunications	17.1
511	Publishing industries, except internet	15.8
611	Educational services	13.0
813	Membership associations and organizations	12.9
221	Utilities	11.7
562	Waste management and remediation services	10.3
334	Computer and electronic product manufacturing	9.9
55	Management of companies and enterprises	9.2
Top 20		\$ 637.4
All Other Industries		\$ 146.5
Total Industry Sales in California		\$ 783.9

Source: IMPLAN Data for California; Analysis by LAEDC

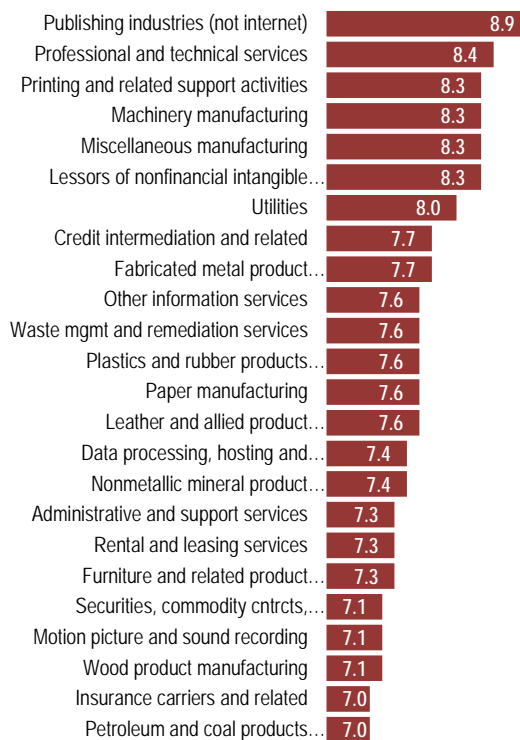
Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-12.

Exhibit 7-12

Accommodation

Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

AGRICULTURE

(NAICS 111, 112, 115)

Vulnerability
Index:

8.7

Industry Description

Agriculture includes three subsectors (1) crop production, (2) animal production and aquaculture and (3) support activities for agriculture and forestry. Industries in the Crop Production subsector grow crops mainly for food and fiber.

Industries in the Animal Production and Aquaculture subsector raise or fatten animals for the sale of animals or animal products and/or raise aquatic plants and animals in controlled or selected aquatic environments for the sale of aquatic plants, animals, or their products.

Industries in the Support Activities for Agriculture and Forestry subsector provide support services that are an essential part of agricultural and forestry production which may be performed by the agriculture or forestry producing establishment or conducted independently as an alternative source of inputs required for the production process for a given crop, animal, or forestry industry.



What Is At Risk?

This industry provides more than 500,000 jobs in California with average annual wages and benefits of \$59,710.

500,160 jobs

\$ 29.9 billion
Labor Income

\$ 64.4 billion
Industry Output

\$ 38.4
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-13.

Exhibit 7-13

Products of the Agriculture Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Oilseeds and grains	\$ 1,029.11	4.4
Vegetables and fruit	2,545.76	10.9
Tree nuts, greenhouse, nurseries	1,279.49	5.5
Cotton, sugarcane, all other crops	2,095.02	9.0
Beef cattle	3,319.76	14.2
Dairy cattle and milk products	6,069.27	25.9
Poultry and egg products	1,301.23	5.6
All other animal products	380.72	1.6
Support activities for ag and forestry	5,382.47	23.0
Total Industry Sales in California	\$ 23,402.82	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-14 lists the user industries in California of this industry's goods and services.

Exhibit 7-14

Top 20 User Industries of Agriculture

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
311	Food manufacturing	\$ 13,466.4
312	Beverage and tobacco product manufacturing	1095.3
23	Construction	405.8
561	Administrative and support services	122.7
325	Chemical manufacturing	62.6
113,114	Forestry, Hunting and Fishing	56.5
541	Professional and technical services	53.7
339	Miscellaneous manufacturing	50.0
722	Food services and drinking places	39.1
445	Food and beverage stores	38.3
313	Textile mills	29.0
441	Motor vehicle and parts dealers	16.3
531	Real estate	11.3
713	Amusements, gambling, and recreation	9.7
611	Educational services	9.3
454	Nonstore retailers	7.5
813	Membership associations and organizations	6.2
448	Clothing and clothing accessories stores	5.2
444	Building material and garden supply stores	3.8
623	Nursing and residential care facilities	3.7
	Top 20	\$ 15,492.3
	<i>All Other Industries</i>	<i>\$ 7,910.5</i>
	Total Industry Sales in California	\$ 23,402.8

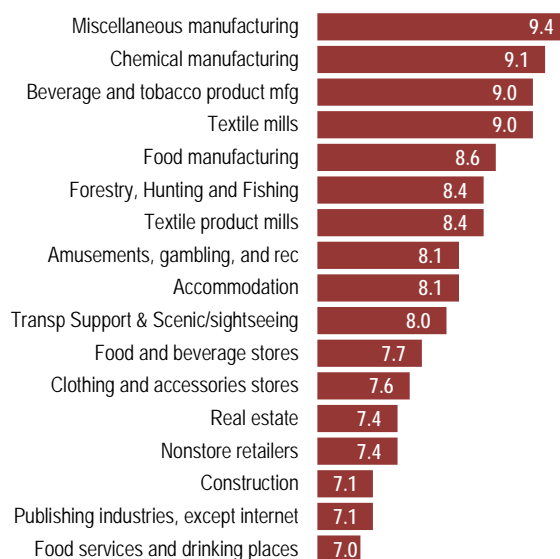
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-15.

Exhibit 7-15

Agriculture Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

COURIERS AND MESSENGERS (NAICS 492)

Industry Description

Industries in this subsector provide intercity, local, and/or international delivery of parcels and documents (including express delivery services) without operating under a universal service obligation. These articles may originate in the U.S. but be delivered to another country and can be described as those that may be handled by one person without using special equipment. This allows the collection, pick-up, and delivery operations to be done with limited labor costs and minimal equipment. Sorting and transportation activities, where necessary, are generally mechanized. The restriction to small parcels partly distinguishes these establishments from those in the transportation industries. The complete network of courier services establishments also distinguishes these transportation services from local messenger and delivery establishments in this subsector. This includes the establishments that perform intercity transportation as well as establishments that, under contract to them, perform local pick-up and delivery. Messengers, which usually deliver within a metropolitan or single urban area, may use bicycle, foot, small truck, or van.

Vulnerability
Index: 8.7



What Is At Risk?

This industry provides
110,000 jobs
in California with
average annual wages
and benefits of
\$38,552.

110,000 jobs

\$ 4.2 billion
Labor Income

\$ 12.0 billion
Industry Output

\$ 6.7 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-16.

Exhibit 7-16

Products of the Couriers and Messengers Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Couriers and messengers	\$ 9,696.3	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-17 lists the user industries in California of this industry's goods and services.

Exhibit 7-17

Top 20 User Industries of Couriers and Messengers

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
42	Wholesale Trade	\$ 2,538.2
484	Truck transportation	1818.7
487,488	Support activities for transportation	1152.3
541	Professional and technical services	540.0
519	Other information services	440.2
523	Securities, commodity contracts, investments	326.9
518	Data processing, hosting and related services	178.2
512	Motion picture and sound recording industries	164.4
561	Administrative and support services	150.3
511	Publishing industries, except internet	145.1
813	Membership associations and organizations	141.0
454	Nonstore retailers	126.0
493	Warehousing and storage	121.4
452	General merchandise stores	115.5
621	Ambulatory health care services	114.1
533	Lessors of nonfinancial intangible assets	112.8
483	Water transportation	93.2
448	Clothing and clothing accessories stores	88.1
524	Insurance carriers and related activities	75.8
622	Hospitals	73.8
	Top 20	\$8,515.9
	<i>All Other Industries</i>	<i>\$ 1,180.4</i>
	Total Industry Sales in California	\$ 9,696.3

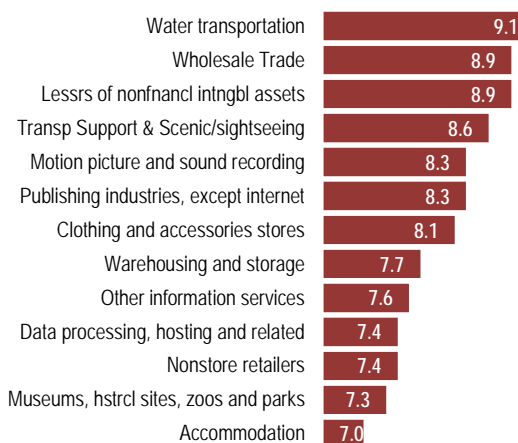
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-18.

Exhibit 7-18

Couriers and Messengers Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

AIR TRANSPORTATION (NAICS 481)

Industry Description

Industries in this subsector provide air transportation of passengers and/or cargo using aircraft, such as airplanes and helicopters. The subsector distinguishes scheduled from nonscheduled air transportation. Scheduled air carriers fly regular routes on regular schedules and operate even if flights are only partially loaded.

Nonscheduled carriers often operate during nonpeak time slots at busy airports. These establishments have more flexibility with respect to choice of airport, hours of operation, load factors, and similar operational characteristics. Nonscheduled carriers provide chartered air transportation of passengers, cargo, or specialty flying services.

Specialty flying services establishments use general-purpose aircraft to provide a variety of specialized flying services.

Vulnerability
Index: 8.4



What Is At Risk?

This industry provides more than 51,400 jobs in California with average annual wages and benefits of \$97,230.

51,440 jobs

\$ 5.0 billion
Labor Income

\$ 22.4 billion
Industry Output

\$ 10.5 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-19.

Exhibit 7-19

Products of the Air Transportation Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Air transportation services	\$ 7,101.6	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-20 lists the user industries in California of this industry's goods and services.

Exhibit 7-20

Top 20 User Industries of Air Transportation

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
541	Professional and technical services	\$1,047.5
42	Wholesale Trade	484.4
561	Administrative and support services	465.2
523	Securities, commodity contracts, investments	278.6
23	Construction	229.9
519	Other information services	222.9
521,522	Monetary auth, credit intermediation and related	222.9
621	Ambulatory health care services	221.1
334	Computer and electronic product manufacturing	202.8
484	Truck transportation	197.2
518	Data processing, hosting and related services	165.5
531	Real estate	165.2
311	Food manufacturing	164.8
524	Insurance carriers and related activities	125.0
325	Chemical manufacturing	114.8
511	Publishing industries, except internet	111.9
517	Telecommunications	109.1
611	Educational services	104.9
722	Food services and drinking places	99.3
487,488	Support activities for transportation	98.2
Top 20		\$4,831.0
All Other Industries		\$1,695.6
Total Industry Sales in California		\$6,526.6

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-21.

Exhibit 7-21

Air Transportation Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)

Transp Support & Scenic/sightseeing...	8.6
Machinery manufacturing	8.3
Printing and related support activities	8.3
Amusements, gambling, and recreation	8.1
Couriers and messengers	8.1
Publishing industries, except internet	7.7
Fabricated metal product manufacturing	7.7
Miscellaneous manufacturing	7.7
Other information services	7.6
Waste mgmt and remediation services	7.6
Plastics and rubber products...	7.6
Accommodation	7.6
Petroleum and coal products...	7.6
Leather and allied product...	7.6
Data processing, hosting and related...	7.4
Nonmetallic mineral product...	7.4
Professional and technical services	7.3
Administrative and support services	7.3
Rental and leasing services	7.3
Beverage and tobacco product mfg	7.3
Furniture and related product...	7.3
Wholesale Trade	7.1
Wood product manufacturing	7.1
Computer and electronic product mfg	7.0
Paper manufacturing	7.0

Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

RAIL TRANSPORTATION
(NAICS 482)



**Vulnerability
Index:** 8.3

Industry Description

Industries in this subsector provide rail transportation of passengers and/or cargo using railroad rolling stock. The railroads in this subsector primarily either operate on networks, with physical facilities, labor force, and equipment spread over an extensive geographic area, or operate over a short distance on a local rail line.

What Is At Risk?

This industry provides almost 12,000 jobs in California with average annual wages and benefits of \$115,560.

11,540 jobs

\$ 1.3 billion
Labor Income

\$ 3.9 billion
Industry Output

\$ 1.7 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-22.

Exhibit 7-22

Products of the Rail Transportation Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Rail transportation	\$ 2,480.2	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-23 lists the user industries in California of this industry's goods and services.

Exhibit 7-23

Top 20 User Industries of Rail Transportation

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
311	Food manufacturing	\$ 441.9
484	Truck transportation	235.0
325	Chemical manufacturing	209.2
23	Construction	178.5
221	Utilities	148.9
331	Primary metal manufacturing	144.8
327	Nonmetallic mineral product manufacturing	129.6
322	Paper manufacturing	87.7
111,112,115	Agriculture	80.7
326	Plastics and rubber products manufacturing	65.0
312	Beverage and tobacco product manufacturing	56.9
541	Professional and technical services	56.4
332	Fabricated metal product manufacturing	56.3
334	Computer and electronic product manufacturing	49.5
531	Real estate	46.0
336	Transportation equipment manufacturing	45.1
722	Food services and drinking places	40.0
324	Petroleum and coal products manufacturing	33.4
321	Wood product manufacturing	32.9
561	Administrative and support services	24.0
	Top 20	\$ 2,161.9
	<i>All Other Industries</i>	<i>\$318.3</i>
	Total Industry Sales in California	\$ 2,480.2

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-24.

Exhibit 7-24

Rail Transportation Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)

Chemical manufacturing	9.1
Utilities	9.1
Plastics and rubber products mfg	8.7
Food manufacturing	8.6
Primary metal manufacturing	8.6
Beverage and tobacco product mfg	8.4
Machinery manufacturing	8.3
Electrical equip and appliance mfg.	8.3
Miscellaneous manufacturing	8.3
Paper manufacturing	8.1
Agriculture	8.1
Computer and electronic product mfg	8.1
Nonmetallic mineral product mfg	8.0
Transportation equipment mfg	7.9
Mining and Mining Support	7.9
Furniture and related product mfg	7.9
Textile mills	7.9
Fabricated metal product mfg	7.7
Wood product manufacturing	7.7
Petroleum and coal products mfg	7.6
Accommodation	7.6
Printing and related support activities	7.1
Leather and allied product mfg	7.0

Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

MINING AND MINING SUPPORT (NAICS 212, 213)

Industry Description

Mining and mining support includes two subsectors, (1) Mining (except oil and gas) and (2) support activities for mining. Industries in the mining (except Oil and Gas) subsector primarily engage in mining, mine site development, and beneficiating (i.e., preparing) metallic minerals and nonmetallic minerals, including coal. It includes ore extraction, quarrying, and beneficiating (e.g., crushing, screening, washing, sizing, concentrating, and flotation), customarily done at the mine site. Industries in the Support Activities for Mining subsector group establishments primarily providing support services, on a contract or fee basis, required for the mining and quarrying of minerals and for the extraction of oil and gas. Establishments performing exploration (except geophysical surveying and mapping) for minerals, on a contract or fee basis, are included in this subsector. Exploration includes traditional prospecting methods, such as taking core samples and making geological observations at prospective sites.



Vulnerability
Index:

7.9

What Is At Risk?

This industry provides just under 26,800 jobs in California with average annual wages and benefits of \$80,440.

26,780 jobs

\$ 2.2 billion
Labor Income

\$ 6.9 billion
Industry Output

\$ 4.0 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-25.

Exhibit 7-25

Products of the Mining and Mining Support Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Coal mining	\$ 235.9	7.8
Metal ore mining	470.9	15.7
Stone mining and quarrying	435.7	14.5
Sand, gravel and other nonmetallic mining	968.4	32.2
Support activities for oil and gas	937.1	31.2
Metal and other minerals services	71.2	2.4
Total Industry Sales in California	\$ 3,119.2	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-26 lists the user industries in California of this industry's goods and services.

Exhibit 7-26

Top 20 User Industries of Mining and Mining Support

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
23	Construction	\$ 654.5
211	Oil and gas extraction	481.6
327	Nonmetallic mineral product manufacturing	440.3
487,488	Support activities for transportation	244.8
221	Utilities	203.0
325	Chemical manufacturing	191.2
331	Primary metal manufacturing	188.7
541	Professional and technical services	47.8
324	Petroleum and coal products manufacturing	32.7
111,112,115	Agriculture	29.2
531	Real estate	24.3
339	Miscellaneous manufacturing	22.3
332	Fabricated metal product manufacturing	21.8
335	Electrical equipment and appliance mfg.	17.7
311	Food manufacturing	16.0
336	Transportation equipment manufacturing	7.6
713	Amusements, gambling, and recreation	5.9
812	Personal and laundry services	5.1
532	Rental and leasing services	4.9
322	Paper manufacturing	4.1
	Top 20	\$ 2,643.3
	All Other Industries	\$ 475.9
	Purchases from California Firms in Industry	\$ 3,119.2

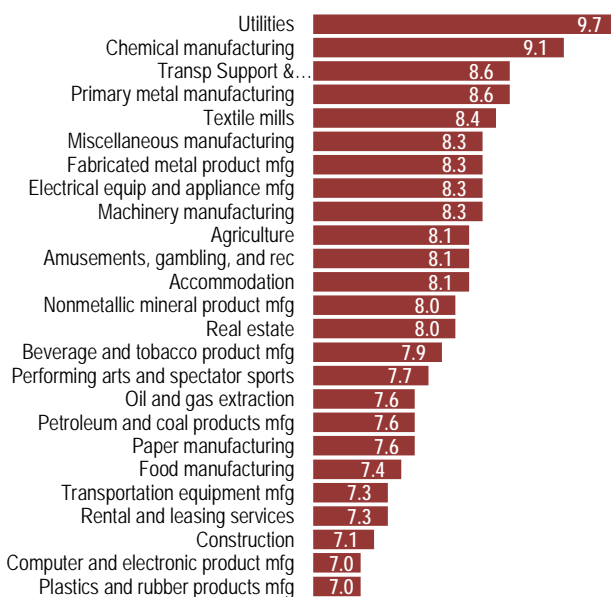
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-27.

Exhibit 7-27

Mining and Mining Support Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

FORESTRY, HUNTING AND FISHING (NAICS 113, 114)

Industry Description

Forestry, hunting and fishing include two subsectors (1) forestry and logging and (2) fishing, hunting and trapping. Industries in the forestry and logging subsector grow and harvest timber on a long production cycle (i.e., of 10 years or more). Long production cycles use different production processes than short production cycles, which require more horticultural interventions prior to harvest, resulting in processes more similar to those found in the crop production subsector.

Consequently, production involving production cycles of less than 10 years, are classified in the crop production subsector. Industries in the fishing, hunting and trapping subsector harvest fish and other wild animals from their natural habitats and are dependent upon a continued supply of the natural resource.

The harvesting of fish is the predominant economic activity of this subsector and it usually requires specialized vessels that, by the nature of their size, configuration and equipment, are not suitable for any other type of production, such as transportation.

Vulnerability
Index:

7.9



What Is At Risk?

This industry provides
over 11,000 jobs
in California, with
average annual wages
and benefits of
\$39,820.

11,060 jobs

\$ 440 million
Labor Income

\$ 656 million
Industry Output

\$ 442 million
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by the forestry, hunting and fishing industry in California are shown in Exhibit 7-28.

Exhibit 7-28

Products of the Forestry, Hunting and Fishing Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Forest, timber and forest nursery products	\$166.5	29.8
Logs and roundwood	339.1	60.7
Fish	49.4	8.8
Wild game products, pelts and furs	3.6	0.6
Total Industry Sales in California	\$ 558.5	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries this Primary Industry Sell To

Exhibit 7-29 lists the user industries in California of this industry's goods and services.

Exhibit 7-29

Top 20 User Industries of California Forestry, Hunting and Fishing

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
321	Wood product manufacturing	\$ 201.9
221	Utilities	114.7
311	Food manufacturing	56.3
326	Plastics and rubber products manufacturing	43.3
722	Food services and drinking places	26.9
322	Paper manufacturing	16.3
325	Chemical manufacturing	13.0
339	Miscellaneous manufacturing	10.0
312	Beverage and tobacco product manufacturing	5.8
315	Apparel manufacturing	4.3
323	Printing and related support activities	2.2
111,112,115	Agriculture	2.2
337	Furniture and related product manufacturing	1.6
445	Food and beverage stores	1.3
721	Accommodation	1.0
813	Membership associations and organizations	0.8
541	Professional and technical services	0.8
713	Amusements, gambling, and recreation	0.7
335	Electrical equipment and appliance mfg.	0.7
622	Hospitals	0.6
	<i>Top 20</i>	<i>\$ 504.8</i>
	<i>All Other Industries</i>	<i>\$ 53.8</i>
	<i>Total Industry Sales in California</i>	<i>\$ 558.5</i>

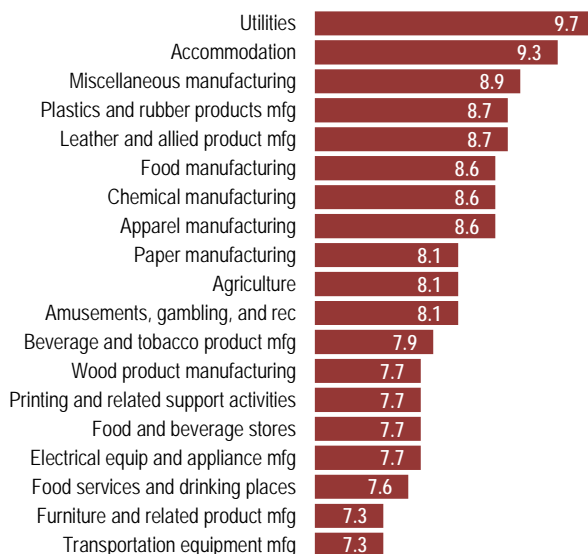
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-30.

Exhibit 7-30

Forestry, Hunting and Fishing Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

MACHINERY MANUFACTURING
(NAICS 333)

**Vulnerability
Index:**

7.7

**Industry Description**

Industries in this subsector create end products that apply mechanical force, for example, the application of gears and levers, to perform work. Some important processes for the manufacture of machinery are forging, stamping, bending, forming, and machining that are used to shape individual pieces of metal. Processes, such as welding and assembling are used to join separate parts together. Although these processes are similar to those used in metal fabricating establishments, machinery manufacturing is different because it typically employs multiple metal forming processes in manufacturing the various parts of the machine. Moreover, complex assembly operations are an inherent part of the production process.

What Is At Risk?

This industry provides over 78,100 jobs in California with average annual wages and benefits of \$98,110.

78,130 jobs

\$ 7.6 billion
Labor Income

\$ 32.7 billion
Industry Output

\$ 11.7 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-31.

Exhibit 7-31

Products of the Machinery Manufacturing Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Agriculture, construction, mining machinery mfg	\$ 306.7	10.8
Industrial machinery	157.1	5.5
Commercial and service industry machinery	555.5	19.5
HVAC and commercial refrigeration eqpmt	787.6	27.7
Metalworking machinery	264.9	9.3
Engine, turbine and power transmission eqpmt	99.1	3.5
Other general purpose machinery	677.4	23.8
Total Industry Sales in California	\$ 2,848.4	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-32 lists the user industries in California of this industry's goods and services.

Exhibit 7-32

Top 20 User Industries of Machinery Manufacturing

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
23	Construction	\$ 746.7
312	Beverage and tobacco product manufacturing	229.5
111,112,115	Agriculture	149.8
561	Administrative and support services	108.9
487,488	Support Activities for Transportation	108.0
332	Fabricated metal product manufacturing	103.8
336	Transportation equipment manufacturing	82.7
541	Professional and technical services	71.4
611	Educational services	63.9
562	Waste management and remediation services	49.8
325	Chemical manufacturing	43.4
311	Food manufacturing	41.5
811	Repair and maintenance	38.2
334	Computer and electronic product manufacturing	35.7
339	Miscellaneous manufacturing	34.1
212,213	Mining and Mining Support	30.4
517	Telecommunications	29.0
722	Food services and drinking places	25.7
326	Plastics and rubber products manufacturing	22.1
331	Primary metal manufacturing	21.2
	Top 20	\$2,035.8
	<i>All Other Industries</i>	<i>\$ 812.6</i>
	Total Industry Sales in California	\$ 2,848.4

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-33.

Exhibit 7-33

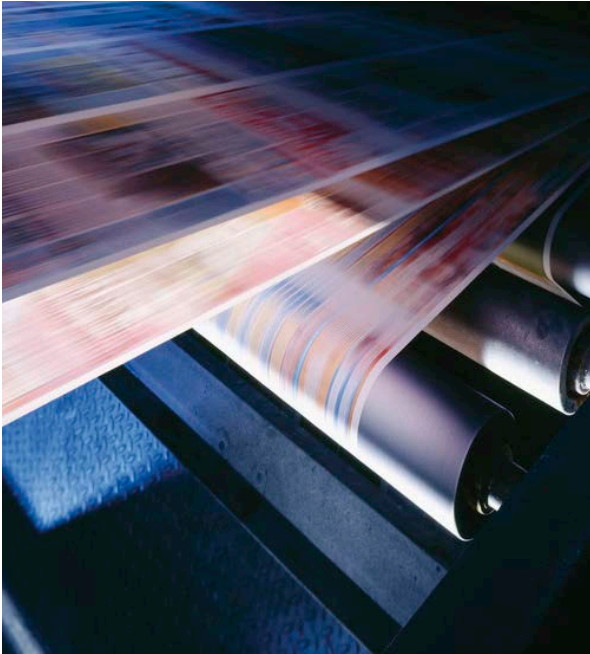
Machinery Manufacturing Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)

Beverage and tobacco product...	9.0
Transportation equipment...	9.0
Miscellaneous manufacturing	8.9
Transp Support &...	8.6
Mining and Mining Support	8.4
Fabricated metal product...	8.3
Electrical equipment and appliance...	8.3
Agriculture	8.1
Plastics and rubber products...	8.1
Chemical manufacturing	8.0
Primary metal manufacturing	8.0
Printing and related support activities	7.7
Waste management and...	7.6
Computer and electronic product...	7.6
Utilities	7.4
Forestry, Hunting and Fishing	7.3
Construction	7.1
Repair and maintenance	7.1
Warehousing and storage	7.1
Oil and gas extraction	7.0
Paper manufacturing	7.0

Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

PRINTING AND RELATED SUPPORT ACTIVITIES (NAICS 323)



Vulnerability
Index:

7.7

Industry Description

Industries in this subsector print products, such as newspapers, books, labels, business cards, stationery, business forms, and other materials, and perform support activities, such as data imaging, platemaking services, and bookbinding. The support activities included here are an integral part of the printing industry, and a product (a printing plate, a bound book, or a computer disk or file) that is an integral part of the printing industry is almost always provided by these operations.

What Is At Risk?

This industry provides almost 58,200 jobs in California with average annual wages and benefits of \$47,180.

58,160 jobs

\$ 2.7 billion
Labor Income

\$ 8.9 billion
Industry Output

\$ 3.8 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-34.

Exhibit 7-34

Products of the Printing Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Printed materials	\$3,739.6	92.0
Printing support services	323.8	8.0
Total Industry Sales in California	\$ 4,063.4	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-35 lists the user industries in California of this industry's goods and services.

Exhibit 7-35

Top 20 User Industries of Printing Activities

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
519	Other information services	\$ 841.7
541	Professional and technical services	573.4
42	Wholesale Trade	365.2
511	Publishing industries, except internet	359.6
523	Securities, commodity contracts, investments	235.7
524	Insurance carriers and related activities	155.2
561	Administrative and support services	122.1
325	Chemical manufacturing	120.6
621	Ambulatory health care services	100.5
512	Motion picture and sound recording industries	86.3
813	Membership associations and organizations	86.2
624	Social assistance	79.9
55	Management of companies and enterprises	66.7
622	Hospitals	54.0
812	Personal and laundry services	49.0
611	Educational services	46.8
721	Accommodation	45.6
454	Nonstore retailers	44.4
722	Food services and drinking places	42.3
448	Clothing and clothing accessories stores	31.0
	<i>Top 20</i>	<i>\$ 3,506.4</i>
	<i>All Other Industries</i>	<i>\$ 557.0</i>
	Total Industry Sales in California	\$ 4,063.4

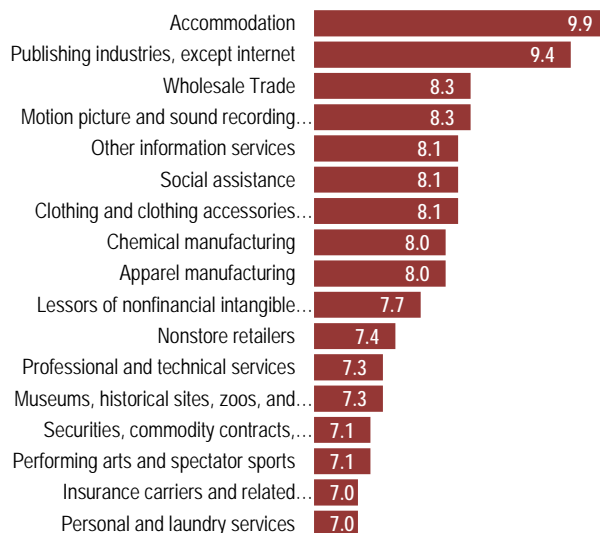
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-36.

Exhibit 7-36

Printing and Related Support Activities Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:**PLASTICS AND RUBBER PRODUCTS MANUFACTURING
(NAICS 326)**

**Vulnerability
Index:**

7.6

Industry Description

Industries in this subsector make goods by processing plastics materials and raw rubber. The core technology employed by establishments in this subsector is that of plastics or rubber product production. Plastics and rubber are combined in the same subsector because plastics are increasingly being used as a substitute for rubber; however the subsector is generally restricted to the production of products made of just one material, either solely plastics or rubber.

What Is At Risk?

This industry provides close to 47,000 jobs in California with average annual wages and benefits of \$60,730.

46,960 jobs

\$ 2.9 billion
Labor Income

\$ 16.3 billion
Industry Output

\$ 4.6 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-37.

Exhibit 7-37

Products of the Plastics and Rubber Products Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Plastics packaging materials, unlaminated film	\$1,615.9	17.7
Laminated / unlaminated sheets and shapes	361.4	4.0
Plastics pipes and pipe fittings	1,152.4	12.7
Polystyrene, urethane and other foam products	1,094.5	12.0
Plastics bottles	1,015.8	11.2
Other plastics products	3,064.7	33.7
Tires, hoses, belts and other rubber products	802.1	8.8
Total Industry Sales in California	\$ 9,106.8	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-38 lists the user industries in California of this industry's goods and services.

Exhibit 7-38

Top 20 User Industries of Plastics and Rubber Products

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
23	Construction	\$ 1,579.2
311	Food manufacturing	785.7
334	Computer and electronic product manufacturing	631.5
325	Chemical manufacturing	630.7
312	Beverage and tobacco product manufacturing	503.5
336	Transportation equipment manufacturing	423.4
42	Wholesale Trade	366.0
722	Food services and drinking places	350.1
339	Miscellaneous manufacturing	349.6
337	Furniture and related product manufacturing	317.8
541	Professional and technical	233.1
621	Ambulatory health care services	231.9
333	Machinery manufacturing	230.9
811	Repair and maintenance	222.0
332	Fabricated metal product manufacturing	113.9
517	Telecommunications	93.9
622	Hospitals	80.9
492	Couriers and messengers	73.3
445	Food and beverage stores	65.0
335	Electrical equipment and appliance mfg.	63.6
	Top 20	\$ 7,346.1
	All Other Industries	\$ 1,760.7
	Total Industry Sales in California	\$ 9,106.8

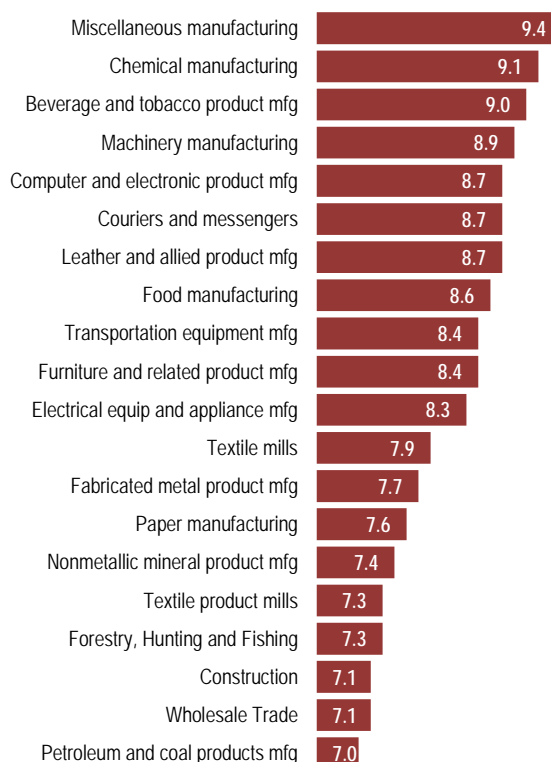
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-39.

Exhibit 7-39

Plastics and Rubber Products Manufacturing Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

PETROLEUM AND COAL PRODUCTS MANUFACTURING (NAICS 324*)

Industry Description

The Petroleum and Coal Products Manufacturing subsector is based on the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining that involves the separation of crude petroleum into component products through such techniques as cracking and distillation.

In addition, this subsector includes establishments that primarily further process refined petroleum and coal products and produce products, such as asphalt coatings and petroleum lubricating oils. However, establishments that manufacture petrochemicals from refined petroleum are classified in Industry 32511, Petrochemical Manufacturing.

* For the purposes of this report, this industry has been modified to remove Petroleum Refineries (NAICS 32411) to avoid double-counting.

Vulnerability
Index:

7.6



What Is At Risk?

This industry provides
2,300 jobs
in California with
average annual wages
and benefits of
\$143,500.

2,300 jobs

\$ 330 million
Labor Income

\$ 2.3 billion
Industry Output

\$ 988 million
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-40.

Exhibit 7-40

Products of the Petroleum and Coal Products Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Asphalt paving mixtures and blocks	\$ 398.4	19.0
Asphalt shingles and coating materials	688.3	32.7
Petroleum lubricating oil and grease	932.5	44.4
All other petroleum and coal products	83.4	4.0
Total Industry Sales in California	\$ 2,102.6	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 6-41 lists the user industries in California of this industry's goods and services.

Exhibit 7-41

Top 20 User Industries of Petroleum and Coal Products

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
23	Construction	\$ 979.3
484	Truck transportation	162.2
481	Air transportation	87.7
325	Chemical manufacturing	81.3
111,112,115	Agriculture	69.3
492	Couriers and messengers	53.4
483	Water transportation	41.7
42	Wholesale Trade	40.4
221	Utilities	29.3
482	Rail transportation	28.3
561	Administrative and support services	24.3
722	Food services and drinking places	23.0
311	Food manufacturing	18.9
485	Transit and ground passenger transportation	16.4
813	Membership associations and organizations	14.3
622	Hospitals	13.8
487,488	Support activities for transportation	13.3
541	Professional and technical services	13.3
212,213	Mining and Mining Support	9.8
333	Machinery manufacturing	9.5
Top 20		\$ 1,729.47
All Other Industries		\$ 373.12
Total Industry Sales in California		\$ 2,102.6

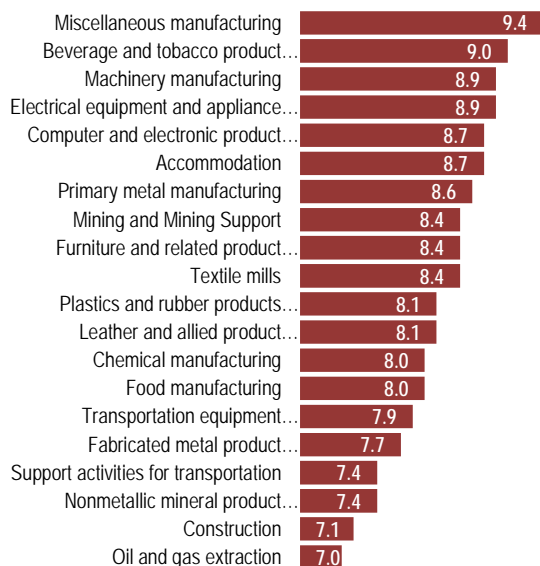
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-42.

Exhibit 7-42

Petroleum and Coal Products Manufacturing Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

SUPPORT ACTIVITIES FOR TRANSPORTATION (NAICS 487, 488)

Industry Description

This primary industry is comprised of two subsectors: (1) scenic and sightseeing transportation; and (2) support activities for transportation—the latter being by far the largest contributor. Industries in Scenic and Sightseeing Transportation utilize transportation equipment to provide recreation and entertainment. These activities have a production process distinct from passenger transportation carried out for the purpose of other types of for-hire transportation. This process does not emphasize efficient transportation; in fact, such activities often use obsolete vehicles, such as steam trains, to provide some extra ambience.

Industries in the Support Activities for Transportation subsector provide services which support transportation. These services may be provided to transportation carrier establishments or to the general public. This subsector includes a wide array of establishments, including air traffic control services, marine cargo handling, and motor vehicle towing. The subsector is separated by type of mode serviced (air, rail, water and road). The subsector also includes freight transportation arrangement and packing and crating services.

Vulnerability
Index:

7.4



What Is At Risk?

This industry provides over 100,700 jobs in California with average annual wages and benefits of \$76,670.

100,710 jobs

\$ 7.7 billion
Labor Income

\$ 18.0 billion
Industry Output

\$ 9.9 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-43.

Exhibit 7-43

Products of the Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Support activities for transportation, and scenic and sightseeing transportation	\$ 13,711.4	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-44 lists the user industries in California of this industry's goods and services.

Exhibit 7-44

Top 20 User Industries of Support Activities for Transportation

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
481	Air transportation	\$ 2,403.1
42	Wholesale Trade	2,219.0
484	Truck transportation	1,755.1
492	Couriers and messengers	921.2
541	Professional and technical services	697.3
221	Utilities	466.4
483	Water transportation	409.4
519	Other information services	387.7
523	Securities, commodity contracts, investments	287.6
518	Data processing, hosting and related services	157.8
512	Motion picture and sound recording industries	143.4
561	Administrative and support services	131.0
511	Publishing industries, except internet	127.0
454	Nonstore retailers	122.9
452	General merchandise stores	120.8
621	Ambulatory health care services	111.3
533	Lessors of nonfinancial intangible assets	96.0
448	Clothing and clothing accessories stores	85.9
493	Warehousing and storage	74.1
524	Insurance carriers and related activities	68.4
Top 20		\$ 10,785.48
All Other Industries		\$ 2,925.90
Total Industry Sales in California		\$ 13,711.4

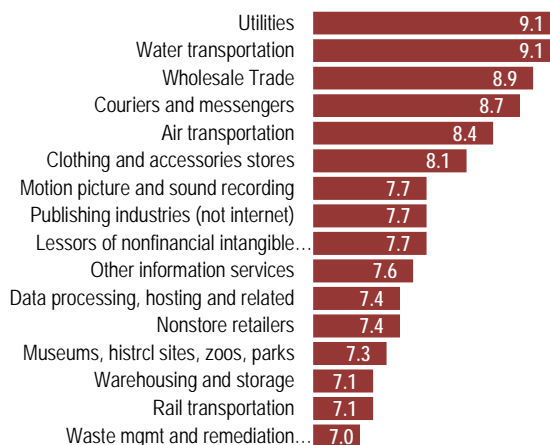
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-45.

Exhibit 7-45

Support Activities for Transportation Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

TEXTILE MILLS
(NAICS 313)



Vulnerability
Index:

7.3

Industry Description

Industries in this subsector group establishments that transform a basic fiber (natural or synthetic) into a product, such as yarn or fabric that is further manufactured into usable items, such as apparel, sheets, towels, and textile bags for individual or industrial consumption. The further manufacturing may be performed in the same establishment and classified in this subsector, or it may be performed at a separate establishment and be classified elsewhere in manufacturing. The main processes in this subsector include preparation and spinning of fiber, knitting or weaving of fabric, and the finishing of the textile.

What Is At Risk?

This industry provides almost 8,900 jobs in California with average annual wages and benefits of \$44,460.

8,870 jobs

\$ 394 million
Labor Income

\$ 2.4 billion
Industry Output

\$ 529 million
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-46.

Exhibit 7-46

Products of the Textile Mill Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Fiber filaments, yarn and thread	\$55.75	10.9
Fabrics and machine embroidery	77.4	15.1
Finished textiles and fabrics	360.1	70.1
Coated fabric coating	20.2	3.9
Total Industry Sales in California	\$513.48	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-47 lists the user industries in California of this industry's goods and services.

Exhibit 7-47

Top 20 User Industries of Textile Mills

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
339	Miscellaneous manufacturing	\$130.6
315	Apparel manufacturing	112.1
314	Textile product mills	36.4
337	Furniture and related product manufacturing	31.1
321	Wood product manufacturing	11.4
713	Amusements, gambling, and recreation	11.2
454	Nonstore retailers	9.4
336	Transportation equipment manufacturing	9.2
448	Clothing and clothing accessories stores	6.6
326	Plastics and rubber products manufacturing	6.5
512	Motion picture and sound recording industries	6.4
322	Paper manufacturing	6.2
42	Wholesale Trade	5.5
444	Building material and garden supply stores	4.7
446	Health and personal care stores	4.2
316	Leather and allied product manufacturing	4.0
323	Printing and related support activities	3.8
811	Repair and maintenance	3.6
333	Machinery manufacturing	3.2
453	Miscellaneous store retailers	2.8
	Top 20	\$408.8
	All Other Industries	\$104.6
	Purchases from California Firms in Industry	\$513.5

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-48.

Exhibit 7-48

Textile Mills

Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)

Miscellaneous manufacturing	9.4
Apparel manufacturing	9.1
Machinery manufacturing	8.9
Leather and allied product mfg	8.7
Textile product mills	8.4
Furniture and related product mfg	8.4
Motion picture and sound recording	8.3
Amusements, gambling and recr	8.1
Clothing and accessories stores	8.1
Plastics and rubber products mfg	8.1
Paper manufacturing	8.1
Transportation equipment mfg	7.9
Wood product manufacturing	7.7
Printing and related support activities	7.7
Computer and electronic product mfg	7.6
Agriculture	7.6
Nonstore retailers	7.4
Nonmetallic mineral product mfg	7.4
Electrical equipand appliance mfg	7.1
Publishing industries (not internet)	7.1

Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:**TRANSIT AND GROUND PASSENGER
TRANSPORTATION**

(NAICS 485)

**Vulnerability
Index:****7.1****Industry Description**

Industries in the Transit and Ground Passenger Transportation subsector include a variety of passenger transportation activities, such as urban transit systems; chartered bus, school bus, and interurban bus transportation; and taxis. These activities are distinguished based primarily on such production process factors as vehicle types, routes, and schedules.

In this subsector, the principal splits identify scheduled transportation as separate from nonscheduled transportation. The scheduled transportation industry groups are Urban Transit Systems, Interurban and Rural Bus Transportation, and School and Employee Bus Transportation. The nonscheduled industry groups are the Charter Bus Industry and Taxi and Limousine Service. The Other Transit and Ground Passenger Transportation industry group includes both scheduled and nonscheduled transportation.

What Is At Risk?

This industry provides nearly 84,500 jobs in California with average annual wages and benefits of \$31,060.

84,470 jobs**\$ 2.6 billion**
Labor Income**\$ 6.1 billion**
Industry Output**\$ 3.7 billion**
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-49.

Exhibit 7-49

Products of the Transit and Ground Passenger Transport Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Transit and ground passenger transportation	\$ 2,014.6	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-50 lists the user industries in California of this industry's goods and services.

Exhibit 7-50

Top 20 User Industries of Transit and Ground Passenger Transport.

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
541	Professional and technical services	\$ 404.2
711	Performing arts and spectator sports	243.4
561	Administrative and support services	145.3
521,522	Monetary auth, credit intermediation and related	100.8
531	Real estate	90.7
621	Ambulatory health care services	84.8
518	Data processing, hosting and related services	72.4
523	Securities, commodity contracts, investments	68.3
524	Insurance carriers and related activities	61.6
519	Other information services	48.3
42	Wholesale trade	47.4
611	Education services	44.5
622	Hospitals	41.3
23	Construction	40.2
517	Telecommunications	36.0
511	Publishing industries (not internet)	31.8
722	Food services and drinking places	30.8
623	Nursing and residential care facilities	29.9
813	Membership associations and organizations	27.2
532	Rental and leasing services	24.3
Top 20		\$ 1,673.3
All Other Industries		\$ 341.3
Total Industry Sales in California		\$ 2,014.6

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-51.

Exhibit 7-51

Transit and Ground Passenger Transportation Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)

Performing arts and spectator sports	8.9
Publishing industries (not internet)	8.3
Rail transportation	8.3
Accommodation	8.1
Professional and technical services	7.9
Rental and leasing services	7.9
Miscellaneous manufacturing	7.7
Machinery manufacturing	7.7
Printing and related support activities	7.7
Fabricated metal product mfg	7.7
Credit intermediation and related	7.7
Leather and allied product mfg	7.6
Nonmetallic mineral product mfg	7.4
Utilities	7.4
Data processing, hosting and related	7.4
Furniture and related product mfg	7.3
Administrative and support services	7.3
Motion picture and sound recording	7.1
Wood product manufacturing	7.1
Plastics and rubber products mfg	7.0
Paper manufacturing	7.0
Amusements, gambling and rec	7.0
Petroleum and coal products mfg	7.0
Other information services	7.0
Insurance carriers and related	7.0
Waste mgmt and remediation services	7.0

Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:

AMUSEMENTS, GAMBLING AND
RECREATION
(NAICS 713)

Vulnerability
Index: 7.0

Industry Description

Industries in the Amusement, Gambling, and Recreation Industries subsector (1) operate facilities where patrons can primarily engage in sports, recreation, amusement, or gambling activities and/or (2) provide other amusement and recreation services, such as supplying and servicing amusement devices in places of business operated by others; operating sports teams, clubs, or leagues engaged in playing games for recreational purposes; and guiding tours without using transportation equipment.

The industry groups in this subsector highlight particular types of activities: amusement parks and arcades, gambling industries, and other amusement and recreation industries.

**What Is At Risk?**

*This industry provides
245,400 jobs in
California with average
annual wages and
benefits of \$28,020.*

245,400 jobs

\$ 6.9 billion
Labor Income

\$ 20.5 billion
Industry Output

\$ 12.2 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-52.

Exhibit 7-52

Products of the Amusement, Gambling and Recreation Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Amusement parks and arcades	\$ 28.7	2.1
Gambling industries (not casino hotels)	39.5	2.9
Other amusement and recreation industries	702.2	51.7
Fitness and recreational sports centers	587.5	43.2
Bowling centers	0.7	0.0
Total Industry Sales in California	\$ 1,358.6	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-53 lists the user industries in California of this industry's goods and services.

Exhibit 7-53

Top 20 User Industries of Amusement, Gambling and Recreation

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
521,522	Monetary auth, credit intermediation and related	\$ 336.1
541	Professional and technical services	242.5
561	Administrative and support services	110.6
55	Management of companies and enterprises	90.9
42	Wholesale Trade	83.6
621	Ambulatory health care services	54.4
518	Data processing, hosting and related services	45.3
523	Securities, commodity contracts, investments	43.5
531	Real estate	37.7
721	Accommodation	36.1
722	Food services and drinking places	34.1
524	Insurance carriers and related activities	33.0
519	Other information services	30.2
611	Educational Services	25.1
23	Construction	24.8
517	Telecommunications	22.2
511	Publishing industries (not internet)	21.0
454	Nonstore retailers	18.9
813	Membership associations and organizations	16.7
311	Food manufacturing	14.5
	Top 20	\$ 1,321.0
	All Other Industries	\$ 37.6
	Total Industry Sales in California	\$ 1,358.6

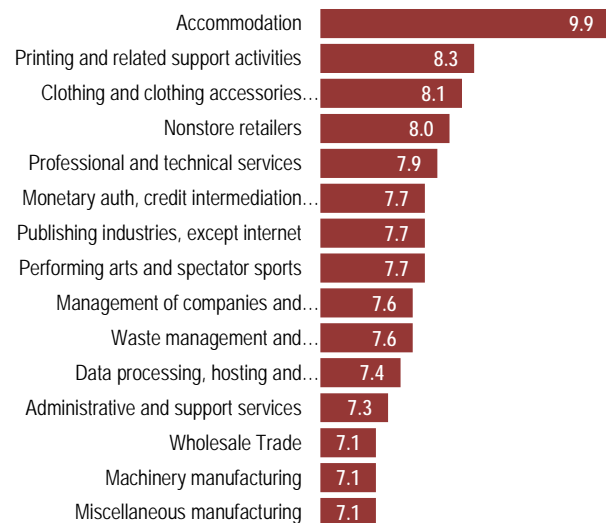
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-54.

Exhibit 7-54

Amusement, Gambling and Recreation Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:**OIL AND GAS EXTRACTION
(NAICS 211)****Vulnerability
Index:****7.0****Industry Description**

Industries in the Oil and Gas Extraction subsector operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum and natural gas; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids.

What Is At Risk?

This industry provides over 43,900 jobs in California with average annual wages and benefits of \$112,560.

43,920 jobs**\$ 4.9 billion**
Labor Income**\$ 10.8 billion**
Industry Output**\$ 7.7 billion**
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-55.

Exhibit 7-55

Products of the Oil and Gas Extraction Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Natural gas and crude petroleum	\$9,269.0	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-56 lists the user industries in California of this industry's goods and services.

Exhibit 7-56

Top 20 User Industries of Oil and Gas Extraction

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
324	Petroleum and coal products manufacturing	\$ 6,287.5
221	Utilities	2,530.4
486	Pipeline transportation	35.7
325	Chemical manufacturing	34.6
722	Food services and drinking places	5.8
55	Management of companies and enterprises	4.4
42	Wholesale Trade	3.4
622	Hospitals	3.2
532	Rental and leasing services	2.8
721	Accommodation	2.5
541	Professional and technical services	2.3
812	Personal and laundry services	1.6
623	Nursing and residential care facilities	1.5
813	Membership associations and organizations	1.3
531	Real estate	1.0
811	Repair and maintenance	1.0
621	Ambulatory health care	1.0
624	Social assistance	0.8
713	Amusements, gambling and recreation	0.8
452	General merchandise stores	0.8
<i>Top 20</i>		<i>\$ 8,922.5</i>
<i>All Other Industries</i>		<i>\$ 346.5</i>
Total Industry Sales in California		\$ 9,269.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-57.

Exhibit 7-57

Oil and Gas Extraction Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

Primary Industry:
PAPER MANUFACTURING
 (NAICS 322)

Vulnerability Index: 7.0



Industry Description

Industries in this subsector make pulp, paper, or converted paper products. The manufacturing of these products is grouped together because they constitute a series of vertically connected processes. More than one is often carried out in a single establishment. There are essentially three activities. The manufacturing of pulp involves separating the cellulose fibers from other impurities in wood or used paper. The manufacturing of paper involves matting these fibers into a sheet. Converted paper products are made from paper and other materials by various cutting and shaping techniques and includes coating and laminating activities.

What Is At Risk?

This industry provides more than 21,200 jobs in California with average annual wages and benefits of \$89,130.

21,240 jobs

\$ 2.0 billion
Labor Income

\$ 11.1 billion
Industry Output

\$ 2.7 billion
Contribution to GDP

What This Primary Industry Sells

The products and services that are sold by this industry in California are shown in Exhibit 7-58.

Exhibit 7-58

Products of the Paper Manufacturing Industry

Commodity	Sales in California (\$ millions)	% of Industry Sales
Wood pulp	\$ 29.5	0.3
Paper from pulp	415.0	4.5
Paperboard from pulp	199.3	2.2
Paperboard containers	5,715.5	61.7
Paper bags and coated and treated paper	528.1	5.7
Stationery products	111.1	1.2
Sanitary paper products	162.7	1.8
All other converted paper products	183.3	2.0
Total Industry Sales in California	\$ 9,269.0	100.0

Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Use this Industry's Products?

Exhibit 7-59 lists the user industries in California of this industry's goods and services.

Exhibit 7-59

Top 20 User Industries of Paper Manufacturing

NAICS	Industry Description	Purchases From This CA Industry (\$ millions)
324	Petroleum and coal products manufacturing	\$ 6,287.5
221	Utilities	2,530.4
211	Oil and gas extraction	143.2
486	Pipeline transportation	35.7
325	Chemical manufacturing	34.6
722	Food services and drinking places	5.8
55	Management of companies and enterprises	4.4
42	Wholesale Trade	3.4
622	Hospitals	3.2
532	Rental and leasing services	2.8
721	Accommodation	2.5
541	Professional and technical services	2.3
812	Personal and laundry services	1.6
623	Nursing and residential care facilities	1.5
813	Membership associations and organizations	1.3
531	Real estate	1.0
811	Repair and maintenance	1.0
621	Ambulatory health care services	1.0
624	Social assistance	0.8
713	Amusements, gambling and recreation	0.8
<i>Top 20</i>		\$ 9,064.9
<i>All Other Industries</i>		\$ 204.1
<i>Total Industry Sales in California</i>		\$ 9,269.0

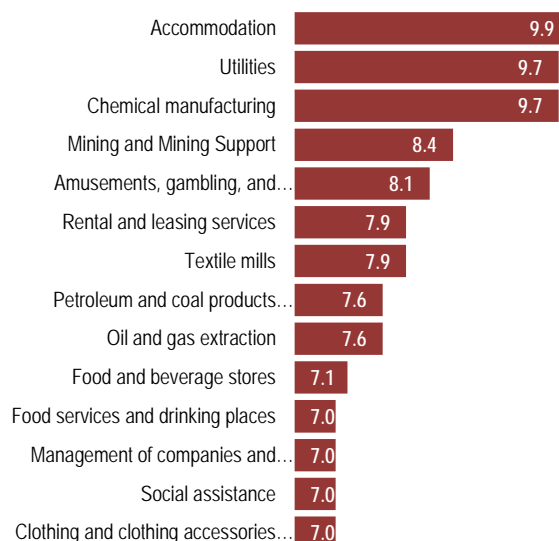
Source: IMPLAN Data for California; Analysis by LAEDC

Which Industries Are Most Vulnerable to Disruptions in this Industry?

Although large purchases from this industry may be important, a secondary user industry's vulnerability depends on the three component metrics of the composite vulnerability index: (1) total purchases of these products as a share of total output; (2) trade intensity; and (3) gross operating surplus as a share of output. Secondary industries with a vulnerability index of 7.0 or greater to this primary industry are shown in Exhibit 7-60.

Exhibit 7-60

Paper Manufacturing Most Vulnerable User Industries (Vulnerability Index ≥ 7.0)



Source: IMPLAN Data for California; Analysis by LAEDC

8 Geography of the Jobs at Risk

Changes that occur in the direct activity associated with production and the refinery industry will not only affect employment in the industries themselves, but will also have a ripple affect across user industries that rely upon the use of refined products in their supply chain, or who are users of the dependent industry's output. Individuals whose employment are in these industries have jobs at risk.

Crude oil is the primary input for production in petroleum refineries. In California, the refinery industry (petroleum refineries and petrochemical products manufacturing) directly employs 10,220 and industry sectors identified to be the most at risk due to their interconnectedness with the refining industry (manufacturing, transportation and agriculture), provide 2.2 million jobs statewide (Exhibit 8-1).



Exhibit 8-1

Jobs At Risk Due to Industry Interconnectedness California 2015

	Payroll Jobs	Ave Annual Wage in CA
Agriculture	421,213	\$ 30,280
Manufacturing	1,284,296	83,870
Transportation and Warehousing	478,309	51,580
Total Jobs in At-Risk Sectors	2,183,818	\$ 66,460
Share of Total Jobs	13.4%	
Total Covered	16,295,204	\$ 61,700

Source: Estimates by LAEDC

These jobs are dispersed across different geo-political boundaries in the state, with each area boasting unique mixes and concentrations of the respective industries. This section identifies both (mix and concentrations) for industries most at risk across the different counties and across different congressional districts located in California.

County Level

California is comprised of 58 counties, each with a distinctive mix of industries. Counties in the state vary significantly in land area, population size, total employment, demographics, industry mix and more.

Employment and wage data is available at the county level from the California Employment Development Department (EDD) Labor Market Information Division, Quarterly Census of Employment & Wages (QCEW). Data

is obtained from the Unemployment Insurance program and represents approximately 99.7 percent of all private payroll employment in the nation (excluding the self-employed). The most current annual data available is for 2015. These are job counts, and may be full- or part-time.

Exhibit 8-2

Petroleum Refineries: Jobs Most At-Risk by County California 2015

County	Total Jobs At-Risk	Jobs At-Risk by Industry Sector			Share of Total Jobs in County (Percent)
		Agriculture	Manufacturing	Transportation	
Alameda County	97,817	452	71,520	25,845	13.4%
Alpine County *	34	-	20	15	6.8%
Amador County	1,340	368	841	131	11.5%
Butte County	8,117	3,076	4,136	905	10.4%
Calaveras County	577	112	322	143	6.8%
Colusa County	4,151	2,660	1,362	129	46.0%
Contra Costa County *	22,088	701	15,014	6,373	6.4%
Del Norte County	452	322	77	53	5.7%
El Dorado County	3,558	545	2,561	452	6.9%
Fresno County	82,066	47,196	25,205	9,665	22.5%
Glenn County	3,416	2,383	648	385	38.6%
Humboldt County *	4,165	1,175	2,035	955	8.9%
Imperial County	15,824	13,062	1,180	1,582	24.7%
Inyo County	381	67	273	41	5.0%
Kern County	81,273	58,739	13,996	8,538	26.0%
Kings County	13,066	7,400	4,847	819	28.6%
Lake County	1,516	1,056	313	147	9.8%
Lassen County	867	794	19	54	8.5%
Los Angeles County	514,569	4,957	357,554	152,058	12.1%
Madera County	15,154	10,958	3,559	637	32.9%
Marin County *	5,310	334	3,946	1,030	4.7%
Mariposa County	152	22	99	31	2.9%
Mendocino County	4,674	1,650	2,490	534	14.8%
Merced County	25,728	14,077	9,639	2,012	33.8%
Modoc County *	423	392	15	16	16.8%
Mono County	204	52	56	96	3.0%
Monterey County	61,766	52,813	5,484	3,469	33.4%
Napa County	18,765	5,010	11,972	1,783	25.0%
Nevada County	1,957	212	1,362	383	6.5%
Orange County	180,997	2,417	155,569	23,011	11.9%
Placer County *	9,104	314	6,507	2,283	6.1%
Plumas County	600	55	452	93	10.0%
Riverside County	85,133	12,562	41,210	31,361	12.9%
Sacramento County	35,455	2,682	20,749	12,024	5.7%
San Benito County	4,378	1,746	2,222	410	27.5%
San Bernardino County	111,585	2,189	53,485	55,911	16.2%
San Diego County	135,310	9,016	104,092	22,202	9.9%
San Francisco County *	18,104	143	10,219	7,742	2.7%

Exhibit 8-2 (cont'd)

County	Total Jobs At-Risk	----- Jobs At-Risk by Industry Sector -----			<u>Share of Total Jobs in County</u> (Percent)
		Agriculture	Manufacturing	Transportation	
San Joaquin County	53,551	16,518	18,436	18,597	23.1%
San Luis Obispo County	13,739	5,035	6,945	1,759	12.0%
San Mateo County	54,195	1,762	25,352	27,081	14.1%
Santa Barbara County	36,871	20,809	12,781	3,281	19.0%
Santa Clara County	174,236	3,706	158,210	12,320	17.1%
Santa Cruz County *	16,155	8,378	6,569	1,208	16.0%
Shasta County	4,842	1,205	2,321	1,316	7.6%
Sierra County *	28	14	11	4	5.6%
Siskiyou County	1,847	982	681	184	14.1%
Solano County	16,760	1,768	11,550	3,442	12.8%
Sonoma County	30,999	5,938	21,566	3,495	15.7%
Stanislaus County	42,589	14,536	21,153	6,900	23.8%
Sutter County	6,330	4,060	1,508	762	21.8%
Tehama County	5,065	1,867	1,817	1,381	29.7%
Trinity County	276	53	202	21	10.2%
Tulare County	57,010	39,001	12,091	5,918	36.5%
Tuolumne County	1,056	132	797	127	6.2%
Ventura County	61,192	26,206	30,179	4,807	19.4%
Yolo County	18,332	5,834	6,334	6,164	18.8%
Yuba County	1,793	814	686	293	11.1%

Source: CA EDD, LMID, QCEW; * nondisclosed estimates by IMPLAN

Congressional Districts

The United States and its House of Representatives is split into 435 congressional districts according to population size, with approximately 710,000 residents in each district. California, the most populous state, has 53 congressional districts accounting for just over twelve percent of districts nationwide.

Employment data at the industry sector level by congressional district in California is available through the U.S. Census Bureau, the most recent available is for 2014.

Exhibit 8-3

Petroleum Refineries: Jobs Most At-Risk by Congressional District California 2014

District	Total Jobs At-Risk	----- Jobs At-Risk by Sector -----			Share of Total Jobs in CD (Percent)
		Agriculture	Manufacturing	Transportation	
Congressional District 1	23,260	7,641	11,386	4,233	10.7%
Congressional District 2	30,416	7,421	18,207	4,788	11.6%
Congressional District 3	37,667	15,667	14,072	7,928	17.0%
Congressional District 4	14,511	1,760	9,828	2,923	6.2%
Congressional District 5	41,912	7,601	28,328	5,983	15.4%
Congressional District 6	24,916	311	12,318	12,287	6.4%
Congressional District 7	14,802	950	10,909	2,943	6.3%
Congressional District 8	9,899	426	5,099	4,374	7.6%
Congressional District 9	37,683	13,670	14,193	9,820	18.9%
Congressional District 10	52,076	14,757	25,638	11,681	23.2%
Congressional District 11	14,060	183	10,028	3,849	5.8%
Congressional District 12	24,693	178	9,654	14,861	3.8%
Congressional District 13	41,082	408	20,138	20,536	11.3%
Congressional District 14	48,733	804	22,884	25,045	13.9%
Congressional District 15	33,767	286	25,960	7,521	11.7%
Congressional District 16	56,441	24,440	24,065	7,936	25.4%
Congressional District 17	149,067	412	139,569	9,086	30.0%
Congressional District 18	21,098	1,367	18,070	1,661	5.4%
Congressional District 19	26,668	1,532	18,867	6,269	11.4%
Congressional District 20	72,302	53,387	13,676	5,239	26.3%
Congressional District 21	100,916	76,050	18,354	6,512	47.5%
Congressional District 22	58,320	37,778	14,909	5,633	21.6%
Congressional District 23	35,683	18,162	9,616	7,905	14.9%
Congressional District 24	47,869	24,316	18,332	5,221	16.7%
Congressional District 25	25,106	309	20,046	4,751	14.9%
Congressional District 26	65,400	30,782	30,435	4,183	22.8%
Congressional District 27	10,320	839	6,652	2,829	3.6%
Congressional District 28	24,959	184	19,276	5,499	5.7%
Congressional District 29	35,083	430	27,352	7,301	19.4%
Congressional District 30	20,889	299	18,829	1,761	5.9%
Congressional District 31	32,491	493	17,020	14,978	11.2%
Congressional District 32	49,614	645	38,380	10,589	18.2%
Congressional District 33	38,493	1,941	31,648	4,904	7.8%
Congressional District 34	36,415	177	22,428	13,810	6.9%
Congressional District 35	67,222	1,373	33,302	32,547	24.2%
Congressional District 36	17,775	9,743	4,963	3,069	9.2%
Congressional District 37	13,804	137	9,909	3,758	4.1%
Congressional District 38	46,115	276	33,428	12,411	16.3%

Exhibit 8-3 (cont'd)

District	Total Jobs At-Risk	----- Jobs At-Risk by Industry Sector -----			<u>Share of Total Jobs in CD</u> (Percent)
		Agriculture	Manufacturing	Transportation	
Congressional District 39	39,084	373	30,163	8,548	13.8%
Congressional District 40	62,906	262	51,887	10,757	25.5%
Congressional District 41	32,342	1,231	12,207	18,904	14.5%
Congressional District 42	23,207	1,531	17,333	4,343	14.1%
Congressional District 43	77,668	222	34,752	42,694	25.5%
Congressional District 44	60,125	367	38,822	20,936	30.8%
Congressional District 45	52,337	2,089	46,351	3,897	13.0%
Congressional District 46	49,914	210	42,263	7,441	12.0%
Congressional District 47	41,811	218	20,500	21,093	15.3%
Congressional District 48	34,937	250	29,684	5,003	10.2%
Congressional District 49	33,872	2,483	28,350	3,039	11.9%
Congressional District 50	27,033	7,518	16,775	2,740	12.4%
Congressional District 51	33,837	8,923	19,115	5,799	17.5%
Congressional District 52	48,147	758	37,270	10,119	9.3%
Congressional District 53	10,204	200	7,241	2,763	3.9%

Source: U.S. Census Bureau

A description of the industry sectors is provided in the Appendix. ❖

9 Backward and Forward Linkages in California by County

Alameda County

Exhibit 9-1

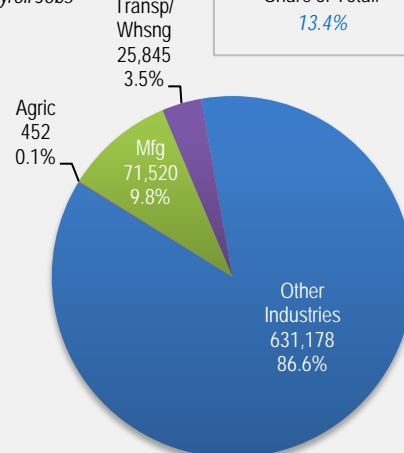
Direct Activity of Oil and Gas Industry Alameda County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	780	26.6
213111 Drilling oil and gas wells	125	4.5
213112 Support activities for oil and gas operations	13	0.5
2212 Natural gas distribution	1,469	274.7
23712 Oil and gas pipeline construction	2	0.1
32411 Petroleum refineries	109	23.4
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing	3	0.6
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	88	8.6
447 Gasoline stations	272	17.9
45431 Fuel dealers	27	0.9
486 Pipeline transportation	9	1.6
TOTAL DIRECT ACTIVITY	2,897	359.3

Exhibit 9-2

Forward Linkages: Refinery Industry

At-Risk Industry Sectors
Payroll Jobs



Total Jobs in 2015:
728,995
Jobs At-Risk Sectors:
97,817
Share of Total:
13.4%

Source: CA EDD; IMPLAN

Exhibit 9-3

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Alameda County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,896	\$ 359.3	\$ 775.4	\$ 2,140.9
Indirect	1,780	118.4	182.1	288.0
Induced	2,280	119.9	208.4	335.1
TOTAL CONTRIBUTION	6,956	\$ 597.7	\$ 1,165.9	\$ 2,764.1
Percent of Total CA Contribution	1.9%	1.8%	1.8%	1.9%
Percent of County Total	0.7%	0.8%	1.0%	1.4%

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 446.7	\$ 133.1	\$ 579.8
Property taxes	80.6	0.0	80.6
Personal income taxes	19.2	54.6	73.7
Corporate profits taxes	4.3	26.6	30.9
Social insurance taxes	1.5	60.5	62.0
Other taxes	26.5	6.5	33.0
Fees, fines and permits	5.5	1.1	6.6
TOTAL TAX REVENUES	\$ 584.2	\$ 282.4	\$ 866.6

Source: Estimates by LAEDC

Butte County

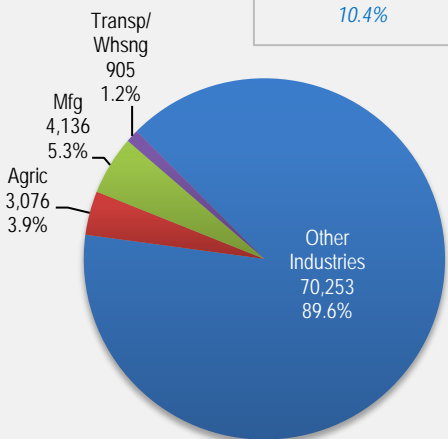
Exhibit 9-4

Direct Activity of Oil and Gas Industry Butte County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	135	1.5
213111 Drilling oil and gas wells	17	0.2
213112 Support activities for oil and gas operations	2	0.0
2212 Natural gas distribution	332	52.1
23712 Oil and gas pipeline construction		
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	23	1.4
447 Gasoline stations	34	3.5
45431 Fuel dealers	74	2.7
486 Pipeline transportation	9	1.1
TOTAL DIRECT ACTIVITY	626	62.6

Exhibit 9-5

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Total Jobs in 2015:
78,370
Jobs At-Risk Sectors:
8,117
Share of Total:
10.4%

Source: CA EDD; IMPLAN

Exhibit 9-6

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Butte County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	625	\$ 62.6	\$ 124.1	\$ 304.4
Indirect	323	13.7	23.6	40.9
Induced	398	15.3	28.9	49.7
TOTAL CONTRIBUTION	1,347	\$ 91.6	\$ 176.6	\$ 395.1
<i>Percent of Total CA Contribution</i>	<i>0.4%</i>	<i>0.3%</i>	<i>0.3%</i>	<i>0.3%</i>
<i>Percent of County Total</i>	<i>1.2%</i>	<i>1.8%</i>	<i>2.1%</i>	<i>2.5%</i>

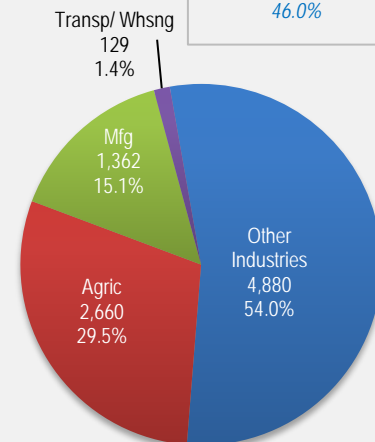
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 66.5	\$ 20.7	\$ 87.2
Property taxes	11.2	-	11.2
Personal income taxes	2.7	7.5	10.2
Corporate profits taxes	0.5	3.5	4.0
Social insurance taxes	0.3	10.2	10.5
Other taxes	2.3	1.5	3.8
Fees, fines and permits	0.5	0.2	0.8
TOTAL TAX REVENUES	\$ 84.0	\$ 43.6	\$ 127.7

Source: Estimates by LAEDC

Colusa County

Exhibit 9-7**Direct Activity of Oil and Gas Industry
Colusa County 2015**

		Employment	Labor Income (\$ millions)
211	Oil and gas extraction	43	0.9
213111	Drilling oil and gas wells	5	0.1
213112	Support activities for oil and gas operations	10	0.9
2212	Natural gas distribution	52	9.0
23712	Oil and gas pipeline construction		
32411	Petroleum refineries		
324191	Petroleum lubricating oil and grease mfg		
32511	Petrochemical manufacturing		
333132	Oil and gas field machinery and eqmt mfg		
4247	Petroleum and petroleum prods wholesalers	24	2.2
447	Gasoline stations	11	0.2
45431	Fuel dealers		0.0
486	Pipeline transportation	0	0.1
TOTAL DIRECT ACTIVITY		145	13.2

Exhibit 9-8**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Source: CA EDD; IMPLAN

Exhibit 9-9**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Colusa County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	146	\$ 13.2	\$ 24.8	\$ 59.4
Indirect	30	1.6	2.7	4.4
Induced	30	1.1	2.3	4.0
TOTAL CONTRIBUTION	205	\$ 15.9	\$ 29.9	\$ 67.8
<i>Percent of Total CA Contribution</i>	<i>0.1%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>
<i>Percent of County Total</i>	<i>1.6%</i>	<i>2.0%</i>	<i>2.7%</i>	<i>2.4%</i>

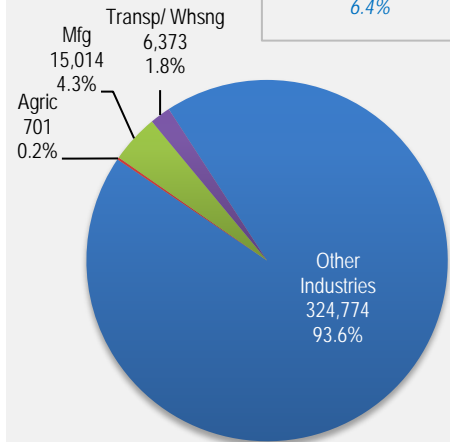
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 9.0	\$ 3.5	\$ 12.5
Property taxes	3.7	0.0	3.7
Personal income taxes	0.5	1.3	1.8
Corporate profits taxes	0.1	0.5	0.6
Social insurance taxes	0.0	1.5	1.6
Other taxes	0.6	0.3	0.9
Fees, fines and permits	0.4	0.0	0.4
TOTAL TAX REVENUES	\$ 14.3	\$ 7.2	\$ 21.5

Source: Estimates by LAEDC

Contra Costa County

Exhibit 9-10
**Direct Activity of Oil and Gas Industry
Contra Costa County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	898	\$ 286.9
213111 Drilling oil and gas wells	271	61.4
213112 Support activities for oil and gas operations	287	48.1
2212 Natural gas distribution	6,097	1,111.8
23712 Oil and gas pipeline construction	155	11.1
32411 Petroleum refineries	4,265	1,221.5
324191 Petroleum lubricating oil and grease mfg	132	17.4
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	35	4.8
4247 Petroleum and petroleum prods wholesalers	396	39.7
447 Gasoline stations	177	10.9
45431 Fuel dealers	91	2.0
486 Pipeline transportation	141	542.3
TOTAL DIRECT ACTIVITY	12,945	\$ 3,357.8

Exhibit 9-11
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**


Total Jobs in 2015:
346,862
Jobs At-Risk Sectors:
22,088
Share of Total:
6.4%

Source: CA EDD; IMPLAN

Exhibit 9-12
**Backward Linkages: Oil and Gas
Total Economic and Fiscal Contribution
Contra Costa County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	12,945	\$ 3,357.8	\$ 10,712.9	\$ 30,408.2
Indirect	10,908	718.2	1,143.2	1,821.2
Induced	15,640	780.7	1,441.7	2,278.4
TOTAL CONTRIBUTION	39,494	\$ 4,856.7	\$ 13,297.8	\$ 34,507.8
Percent of Total CA Contribution	10.7%	14.7%	20.2%	23.3%
Percent of County Total	7.4%	13.7%	20.3%	29.1%

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 656.0	\$ 173.5	\$ 829.4
Property taxes	410.9	0.0	410.9
Personal income taxes	164.3	468.5	632.8
Corporate profits taxes	91.1	580.3	671.5
Social insurance taxes	10.3	488.9	499.2
Other taxes	114.2	33.6	147.8
Fees, fines and permits	39.9	5.5	45.3
TOTAL TAX REVENUES	\$ 1,486.7	\$ 1,750.3	\$ 3,237.0

Source: Estimates by LAEDC

El Dorado County

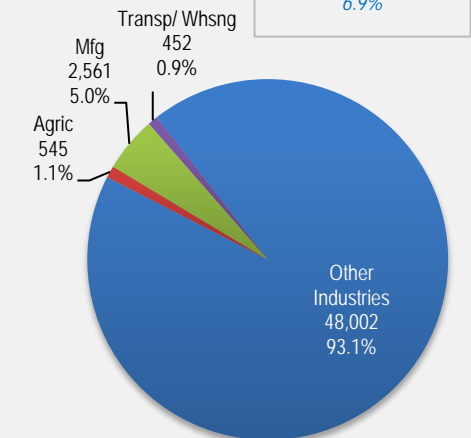
Exhibit 9-13

Direct Activity of Oil and Gas Industry El Dorado County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	256	\$ 4.0
213111 Drilling oil and gas wells	66	3.5
213112 Support activities for oil and gas operations	21	1.3
2212 Natural gas distribution	26	3.0
23712 Oil and gas pipeline construction	1	0.1
32411 Petroleum refineries	230	57.8
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	6	0.3
447 Gasoline stations	45	4.0
45431 Fuel dealers	146	1.5
486 Pipeline transportation	0	0.0
TOTAL DIRECT ACTIVITY	797	\$ 75.4

Exhibit 9-14

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Source: CA EDD; IMPLAN

Exhibit 9-15

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution El Dorado County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	796	\$ 75.4	\$ 387.7	\$ 1,304.1
Indirect	382	16.5	25.8	52.9
Induced	390	13.8	26.5	48.6
TOTAL CONTRIBUTION	1,568	\$ 105.7	\$ 440.1	\$ 1,405.6
<i>Percent of Total CA Contribution</i>	<i>0.4%</i>	<i>0.3%</i>	<i>0.7%</i>	<i>0.9%</i>
<i>Percent of County Total</i>	<i>1.6%</i>	<i>2.5%</i>	<i>6.2%</i>	<i>10.2%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 55.5	\$ 18.6	\$ 74.1
Property taxes	14.2	-	14.2
Personal income taxes	3.5	9.9	13.4
Corporate profits taxes	3.2	20.0	23.2
Social insurance taxes	0.3	12.7	13.0
Other taxes	3.0	1.1	4.1
Fees, fines and permits	1.4	0.2	1.5
TOTAL TAX REVENUES	\$ 81.1	\$ 62.4	\$ 143.5

Source: Estimates by LAEDC

Fresno County

Exhibit 9-16

Direct Activity of Oil and Gas Industry Fresno County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	358	6.6
213111 Drilling oil and gas wells	49	1.1
213112 Support activities for oil and gas operations	143	14.8
2212 Natural gas distribution	1,331	316.5
23712 Oil and gas pipeline construction	16	0.9
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	230	17.6
447 Gasoline stations	161	9.3
45431 Fuel dealers	118	2.1
486 Pipeline transportation	62	7.1
TOTAL DIRECT ACTIVITY	2,468	375.8

Exhibit 9-17

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs

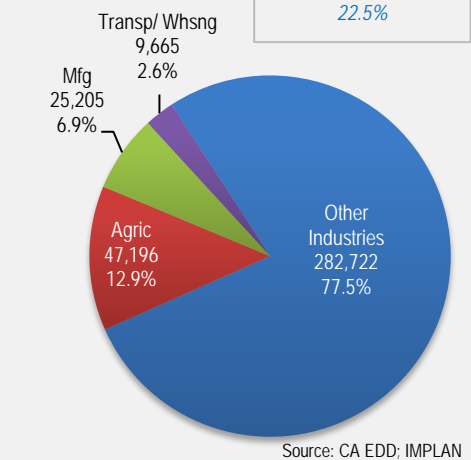


Exhibit 9-18

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Fresno County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,468	\$ 375.8	\$ 658.2	\$ 1,455.3
Indirect	1,650	78.5	128.3	215.1
Induced	2,344	98.2	174.3	300.3
TOTAL CONTRIBUTION	6,463	\$ 552.5	\$ 960.9	\$ 1,970.7
<i>Percent of Total CA Contribution</i>	<i>1.8%</i>	<i>1.7%</i>	<i>1.5%</i>	<i>1.3%</i>
<i>Percent of County Total</i>	<i>1.4%</i>	<i>2.2%</i>	<i>2.5%</i>	<i>2.8%</i>

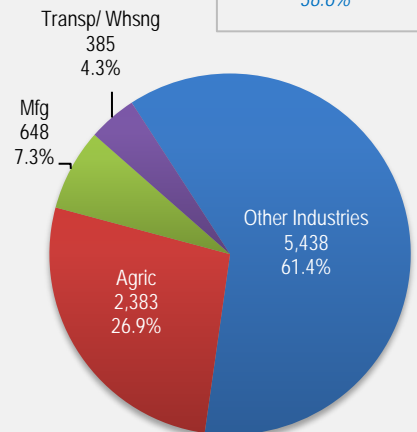
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 298.8	\$ 88.6	\$ 378.4
Property taxes	50.8	0.0	50.8
Personal income taxes	17.6	49.1	66.6
Corporate profits taxes	2.9	18.3	21.2
Social insurance taxes	2.1	59.5	61.6
Other taxes	13.6	5.9	19.5
Fees, fines and permits	6.8	1.0	7.8
TOTAL TAX REVENUES	\$ 383.6	\$ 222.3	\$ 605.9

Source: Estimates by LAEDC

Glenn County

Exhibit 9-19**Direct Activity of Oil and Gas Industry
Glenn County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	129	7.0
213111 Drilling oil and gas wells	16	0.9
213112 Support activities for oil and gas operations	2	0.1
2212 Natural gas distribution	54	9.3
23712 Oil and gas pipeline construction	32	1.6
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	18	1.1
447 Gasoline stations	10	0.9
45431 Fuel dealers	1	0.0
486 Pipeline transportation	0	0.1
TOTAL DIRECT ACTIVITY	262	21.0

Exhibit 9-20**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
8,854
Jobs At-Risk Sectors:
3,416
Share of Total:
38.6%

Source: CA EDD; IMPLAN

Exhibit 9-21**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Glenn County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	263	\$ 21.0	\$ 38.0	\$ 81.0
Indirect	46	1.8	2.7	5.1
Induced	63	1.9	4.0	7.2
TOTAL CONTRIBUTION	372	\$ 24.7	\$ 44.7	\$ 93.2
<i>Percent of Total CA Contribution</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>
<i>Percent of County Total</i>	<i>2.7%</i>	<i>3.3%</i>	<i>3.7%</i>	<i>3.9%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 11.8	\$ 4.0	\$ 15.8
Property taxes	3.7	0.0	3.7
Personal income taxes	0.7	2.1	2.8
Corporate profits taxes	0.1	0.8	0.9
Social insurance taxes	0.1	2.5	2.6
Other taxes	0.8	0.3	1.1
Fees, fines and permits	0.9	0.0	1.0
TOTAL TAX REVENUES	\$ 18.2	\$ 9.7	\$ 28.0

Source: Estimates by LAEDC

Humboldt County

Exhibit 9-22

Direct Activity of Oil and Gas Industry Humboldt County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	340	0.6
213111 Drilling oil and gas wells	43	0.1
213112 Support activities for oil and gas operations	6	0.0
2212 Natural gas distribution	31	5.1
23712 Oil and gas pipeline construction		
32411 Petroleum refineries	24	4.4
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	49	1.4
447 Gasoline stations	54	4.5
45431 Fuel dealers	73	1.2
486 Pipeline transportation	0	0.0
TOTAL DIRECT ACTIVITY	620	17.4

Exhibit 9-23

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs

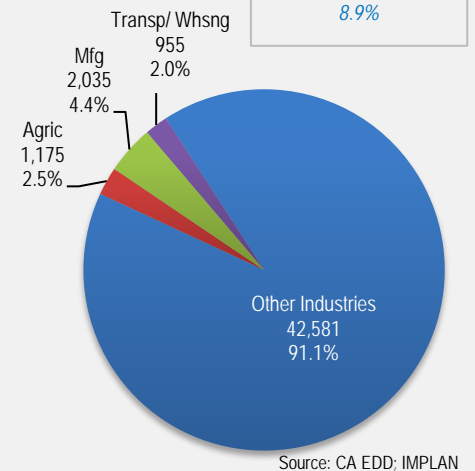


Exhibit 9-24

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Humboldt County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	620	\$ 17.4	\$ 52.4	\$ 193.7
Indirect	140	5.3	8.7	17.9
Induced	114	4.0	7.4	13.1
TOTAL CONTRIBUTION	874	\$ 26.7	\$ 68.5	\$ 224.6
Percent of Total CA Contribution	0.2%	0.1%	0.1%	0.2%
Percent of County Total	1.3%	0.9%	1.5%	2.6%

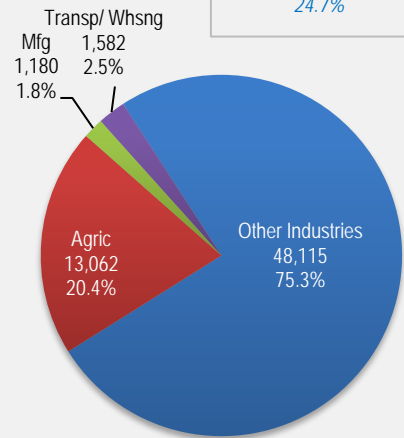
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 43.1	\$ 14.1	\$ 57.2
Property taxes	6.1	0.0	6.1
Personal income taxes	0.8	2.2	3.0
Corporate profits taxes	0.2	1.3	1.5
Social insurance taxes	0.1	2.6	2.7
Other taxes	1.3	0.6	1.9
Fees, fines and permits	0.4	0.1	0.5
TOTAL TAX REVENUES	\$ 51.9	\$ 20.9	\$ 72.8

Source: Estimates by LAEDC

Imperial County

Exhibit 9-25**Direct Activity of Oil and Gas Industry
Imperial County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	399	21.2
213111 Drilling oil and gas wells	48	2.6
213112 Support activities for oil and gas operations	77	3.0
2212 Natural gas distribution	49	6.4
23712 Oil and gas pipeline construction		0.0
32411 Petroleum refineries		0.0
324191 Petroleum lubricating oil and grease mfg		0.0
32511 Petrochemical manufacturing		0.0
333132 Oil and gas field machinery and eqmt mfg		0.0
4247 Petroleum and petroleum prods wholesalers	60	4.0
447 Gasoline stations	55	2.5
45431 Fuel dealers	1	0.0
486 Pipeline transportation	7	0.9
TOTAL DIRECT ACTIVITY	696	40.5

Exhibit 9-26**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
63,939
Jobs At-Risk Sectors:
15,824
Share of Total:
24.7%

Source: CA EDD; IMPLAN

Exhibit 9-27**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Imperial County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	696	\$ 40.5	\$ 74.4	\$ 142.9
Indirect	99	3.8	6.4	12.6
Induced	139	4.4	9.2	16.7
TOTAL CONTRIBUTION	934	\$ 48.7	\$ 90.0	\$ 172.2
<i>Percent of Total CA Contribution</i>	<i>0.3%</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>
<i>Percent of County Total</i>	<i>1.2%</i>	<i>1.1%</i>	<i>1.4%</i>	<i>1.5%</i>

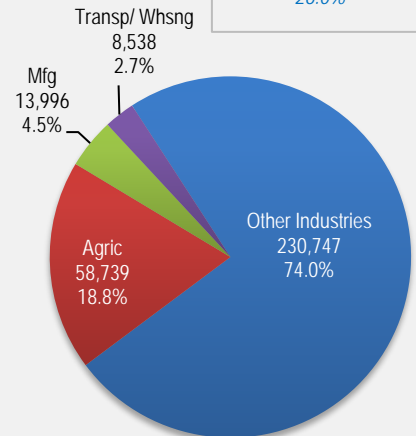
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 43.9	\$ 13.4	\$ 57.3
Property taxes	6.1	-	6.1
Personal income taxes	1.5	4.0	5.5
Corporate profits taxes	0.3	1.6	1.8
Social insurance taxes	0.3	4.6	4.9
Other taxes	1.5	0.0	1.5
Fees, fines and permits	0.3	0.6	1.0
TOTAL TAX REVENUES	\$ 53.8	\$ 24.3	\$ 78.1

Source: Estimates by LAEDC

Kern County

Exhibit 9-28**Direct Activity of Oil and Gas Industry
Kern County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	7,555	1,448.2
213111 Drilling oil and gas wells	1,998	276.7
213112 Support activities for oil and gas operations	5,288	443.6
2212 Natural gas distribution	411	88.5
23712 Oil and gas pipeline construction	3,379	181.7
32411 Petroleum refineries	1,051	235.5
324191 Petroleum lubricating oil and grease mfg	12	0.7
32511 Petrochemical manufacturing	25	0.7
333132 Oil and gas field machinery and eqmt mfg	444	32.1
4247 Petroleum and petroleum prods wholesalers	379	28.6
447 Gasoline stations	323	25.2
45431 Fuel dealers	83	0.9
486 Pipeline transportation	400	230.1
TOTAL DIRECT ACTIVITY	21,348	2,992.6

Exhibit 9-29**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Source: CA EDD; IMPLAN

Exhibit 9-30**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Kern County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	21,348	\$ 2,992.6	\$ 5,660.5	\$ 11,614.4
Indirect	5,401	280.8	416.8	763.0
Induced	13,441	532.1	969.0	1,662.7
TOTAL CONTRIBUTION	40,190	\$ 3,805.5	\$ 7,046.3	\$ 14,040.1
<i>Percent of Total CA Contribution</i>	<i>10.9%</i>	<i>11.5%</i>	<i>10.7%</i>	<i>9.5%</i>
<i>Percent of County Total</i>	<i>9.8%</i>	<i>15.9%</i>	<i>18.9%</i>	<i>21.6%</i>

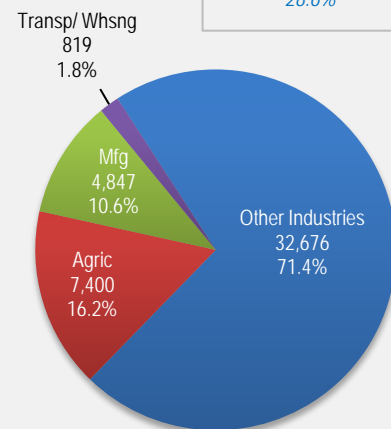
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 471.4	\$ 148.4	\$ 619.7
Property taxes	236.1	0.0	236.1
Personal income taxes	120.3	335.9	456.2
Corporate profits taxes	33.5	209.0	242.5
Social insurance taxes	11.8	369.1	381.0
Other taxes	41.2	18.8	60.0
Fees, fines and permits	30.8	3.1	33.8
TOTAL TAX REVENUES	\$ 945.0	\$ 1,084.3	\$ 2,029.3

Source: Estimates by LAEDC

Kings County

Exhibit 9-31**Direct Activity of Oil and Gas Industry
Kings County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	143	0.0
213111 Drilling oil and gas wells	17	0.0
213112 Support activities for oil and gas operations	2	0.0
2212 Natural gas distribution	70	11.8
23712 Oil and gas pipeline construction		
32411 Petroleum refineries	1	1.1
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	31	2.2
447 Gasoline stations	31	2.5
45431 Fuel dealers	35	0.3
486 Pipeline transportation	1	0.2
TOTAL DIRECT ACTIVITY	331	18.1

Exhibit 9-32**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
45,742
Jobs At-Risk Sectors:
13,066
Share of Total:
28.6%

Source: CA EDD; IMPLAN

Exhibit 9-33**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Kings County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	331	\$ 18.1	\$ 36.6	\$ 94.2
Indirect	48	2.1	3.5	6.0
Induced	58	2.1	4.3	7.6
TOTAL CONTRIBUTION	437	\$ 22.3	\$ 44.4	\$ 107.8
<i>Percent of Total CA Contribution</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>
<i>Percent of County Total</i>	<i>0.7%</i>	<i>0.6%</i>	<i>0.7%</i>	<i>0.8%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 33.8	\$ 11.6	\$ 45.4
Property taxes	5.0	-	5.0
Personal income taxes	0.7	1.9	2.6
Corporate profits taxes	0.1	0.7	0.8
Social insurance taxes	0.1	2.0	2.1
Other taxes	1.2	0.3	1.5
Fees, fines and permits	0.5	0.1	0.5
TOTAL TAX REVENUES	\$ 41.4	\$ 16.5	\$ 57.9

Source: Estimates by LAEDC

Los Angeles County

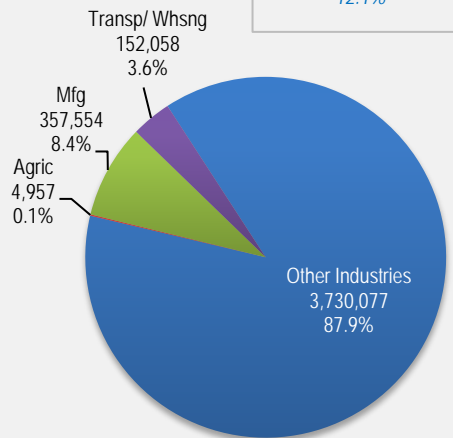
Exhibit 9-34

Direct Activity of Oil and Gas Industry Los Angeles County 2015

		Employment	Labor Income (\$ millions)
211	Oil and gas extraction	9,881	1,919.3
213111	Drilling oil and gas wells	1,306	237.3
213112	Support activities for oil and gas operations	1,606	149.7
2212	Natural gas distribution	6,961	992.8
23712	Oil and gas pipeline construction	2,961	162.8
32411	Petroleum refineries	3,799	967.8
324191	Petroleum lubricating oil and grease mfg	350	42.1
32511	Petrochemical manufacturing	2	0.3
333132	Oil and gas field machinery and eqmt mfg	187	14.1
4247	Petroleum and petroleum prods wholesalers	1,565	124.5
447	Gasoline stations	1,649	118.0
45431	Fuel dealers	317	7.9
486	Pipeline transportation	652	506.8
TOTAL DIRECT ACTIVITY		31,236	5,243.5

Exhibit 9-35

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Total Jobs in 2015:
4,244,646
Jobs At-Risk Sectors:
514,569
Share of Total:
12.1%

Source: CA EDD; IMPLAN

Exhibit 9-36

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Los Angeles County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	31,235	\$ 5,243.5	\$ 12,371.9	\$ 32,248.2
Indirect	16,920	1,134.4	1,800.3	2,908.8
Induced	29,846	1,515.3	2,647.7	4,290.5
TOTAL CONTRIBUTION	77,846	\$ 7,893.2	\$ 16,819.9	\$ 39,447.5
<i>Percent of Total CA Contribution</i>	<i>21.1%</i>	<i>23.8%</i>	<i>25.6%</i>	<i>26.7%</i>
<i>Percent of County Total</i>	<i>1.3%</i>	<i>2.0%</i>	<i>2.5%</i>	<i>3.6%</i>

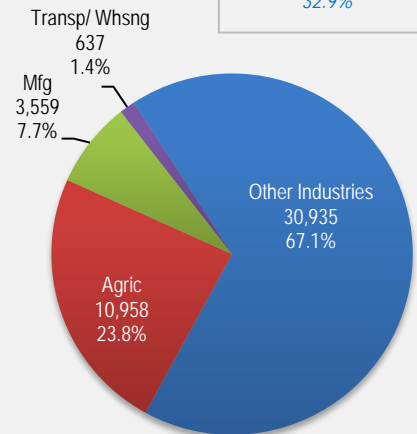
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 2,862.8	\$ 854.2	\$ 3,717.0
Property taxes	552.7	-	552.7
Personal income taxes	253.8	717.7	971.5
Corporate profits taxes	89.9	570.1	660.1
Social insurance taxes	18.2	744.2	762.3
Other taxes	150.6	55.0	150.6
Fees, fines and permits	69.5	8.9	133.4
TOTAL TAX REVENUES	\$ 3,997.5	\$ 2,950.1	\$ 6,947.6

Source: Estimates by LAEDC

Madera County

Exhibit 9-37**Direct Activity of Oil and Gas Industry
Madera County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	343	0.5
213111 Drilling oil and gas wells	42	0.1
213112 Support activities for oil and gas operations	6	0.0
2212 Natural gas distribution	82	12.1
23712 Oil and gas pipeline construction		
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	88	6.2
447 Gasoline stations	33	3.3
45431 Fuel dealers	41	0.5
486 Pipeline transportation	0	0.1
TOTAL DIRECT ACTIVITY	635	22.8

Exhibit 9-38**Forward Linkages:
Refinery Industry***At-Risk Industry Sectors
Payroll Jobs*

Source: CA EDD; IMPLAN

Exhibit 9-39**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Madera County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	635	\$ 22.8	\$ 52.8	\$ 134.0
Indirect	113	4.6	7.4	14.0
Induced	91	3.6	6.9	12.2
TOTAL CONTRIBUTION	838	\$ 31.1	\$ 67.2	\$ 160.1
Percent of Total CA Contribution	0.2%	0.1%	0.1%	0.1%
Percent of County Total	1.4%	0.9%	1.3%	1.7%

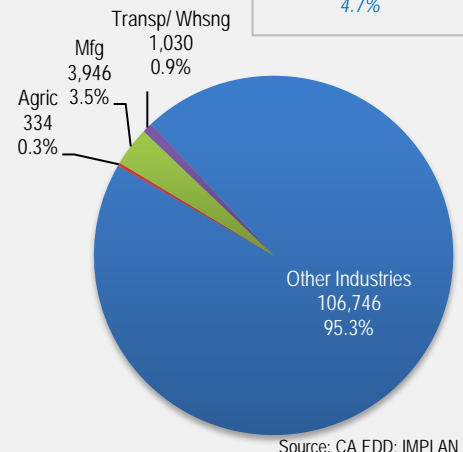
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 47.8	\$ 17.0	\$ 64.8
Property taxes	8.0	-	8.0
Personal income taxes	1.0	2.8	3.8
Corporate profits taxes	0.2	1.0	1.2
Social insurance taxes	0.1	3.2	3.3
Other taxes	2.1	0.6	2.6
Fees, fines and permits	0.9	0.1	1.0
TOTAL TAX REVENUES	\$ 60.0	\$ 24.6	\$ 84.7

Source: Estimates by LAEDC

Marin County

Exhibit 9-40**Direct Activity of Oil and Gas Industry
Marin County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	417	38.4
213111 Drilling oil and gas wells	51	4.7
213112 Support activities for oil and gas operations	7	0.7
2212 Natural gas distribution	26	2.6
23712 Oil and gas pipeline construction		
32411 Petroleum refineries	13	1.8
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	15	1.4
447 Gasoline stations	44	8.5
45431 Fuel dealers	4	0.1
486 Pipeline transportation		
TOTAL DIRECT ACTIVITY	577	58.2

Exhibit 9-41**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs****Exhibit 9-42****Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Marin County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	577	\$ 58.2	\$ 84.1	\$ 181.8
Indirect	86	5.6	8.4	14.2
Induced	201	10.3	18.0	28.7
TOTAL CONTRIBUTION	863	\$ 74.4	\$ 110.5	\$ 224.7
<i>Percent of Total CA Contribution</i>	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>
<i>Percent of County Total</i>	<i>0.4%</i>	<i>0.6%</i>	<i>0.5%</i>	<i>0.7%</i>

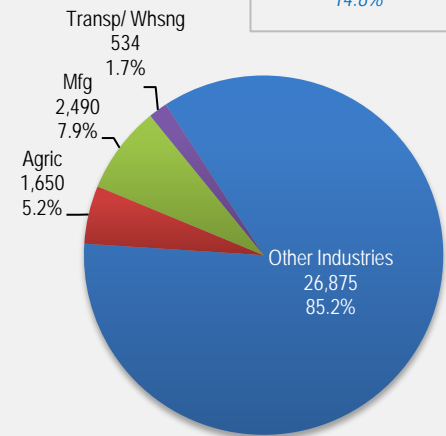
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 68.9	\$ 22.2	\$ 91.1
Property taxes	6.9	0.0	6.9
Personal income taxes	2.6	7.5	10.1
Corporate profits taxes	0.1	0.9	1.1
Social insurance taxes	0.1	5.6	5.7
Other taxes	2.3	0.4	2.7
Fees, fines and permits	0.8	0.1	0.9
TOTAL TAX REVENUES	\$ 81.7	\$ 36.7	\$ 118.4

Source: Estimates by LAEDC

Mendocino County

Exhibit 9-43
**Direct Activity of Oil and Gas Industry
Mendocino County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	121	1.2
213111 Drilling oil and gas wells	15	0.1
213112 Support activities for oil and gas operations	2	0.0
2212 Natural gas distribution	198	38.9
23712 Oil and gas pipeline construction		
32411 Petroleum refineries	1	1.9
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	61	3.0
447 Gasoline stations	30	3.5
45431 Fuel dealers	47	0.6
486 Pipeline transportation	1	0.2
TOTAL DIRECT ACTIVITY	476	49.5

Exhibit 9-44
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**


Source: CA EDD; IMPLAN

Exhibit 9-45
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Mendocino County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	477	\$49.5	\$ 92.3	\$ 222.1
Indirect	232	7.4	12.9	25.3
Induced	262	8.6	16.8	30.0
TOTAL CONTRIBUTION	971	\$ 65.4	\$ 122.0	\$ 277.4
<i>Percent of Total CA Contribution</i>	<i>0.3%</i>	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>
<i>Percent of County Total</i>	<i>2.0%</i>	<i>3.3%</i>	<i>3.9%</i>	<i>4.6%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 39.7	\$ 12.2	\$ 51.8
Property taxes	10.1	0.0	10.1
Personal income taxes	2.0	5.7	7.7
Corporate profits taxes	0.3	1.6	1.8
Social insurance taxes	0.2	7.5	7.7
Other taxes	1.6	0.8	2.4
Fees, fines and permits	0.7	0.1	0.9
TOTAL TAX REVENUES	\$ 54.6	\$ 27.8	\$ 82.4

Source: Estimates by LAEDC

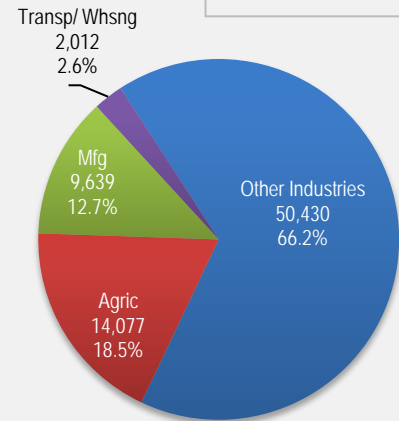
Merced County

Exhibit 9-46
**Direct Activity of Oil and Gas Industry
Merced County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	497	0.1
213111 Drilling oil and gas wells	61	0.0
213112 Support activities for oil and gas operations	8	0.0
2212 Natural gas distribution	8	0.8
23712 Oil and gas pipeline construction		
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	36	1.2
447 Gasoline stations	86	5.6
45431 Fuel dealers	45	0.6
486 Pipeline transportation		
TOTAL DIRECT ACTIVITY	741	8.2

Exhibit 9-47
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
76,158
Jobs At-Risk Sectors:
25,728
Share of Total:
33.8%



Source: CA EDD; IMPLAN

Exhibit 9-48
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Merced County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,157	\$ 8.2	\$ 27.1	\$ 76.6
Indirect	364	3.1	4.7	9.4
Induced	366	1.4	2.7	4.9
TOTAL CONTRIBUTION	2,888	\$ 12.8	\$ 34.6	\$ 90.9
<i>Percent of Total CA Contribution</i>	<i>0.2%</i>	<i>0.0%</i>	<i>0.1%</i>	<i>0.1%</i>
<i>Percent of County Total</i>	<i>0.8%</i>	<i>0.2%</i>	<i>0.4%</i>	<i>0.5%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 73.3	\$ 29.5	\$ 102.8
Property taxes	6.1	0.0	6.1
Personal income taxes	0.4	1.2	1.6
Corporate profits taxes	0.0	0.2	0.3
Social insurance taxes	0.0	1.0	1.1
Other taxes	1.5	0.6	2.1
Fees, fines and permits	0.6	0.1	0.7
TOTAL TAX REVENUES	\$ 82.8	\$ 32.7	\$ 114.7

Source: Estimates by LAEDC

Monterey County

Exhibit 9-49

Direct Activity of Oil and Gas Industry Monterey County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	302	7.2
213111 Drilling oil and gas wells	37	0.9
213112 Support activities for oil and gas operations	127	15.3
2212 Natural gas distribution	15	2.1
23712 Oil and gas pipeline construction	1	0.1
32411 Petroleum refineries	29	6.7
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	115	13.2
447 Gasoline stations	105	8.8
45431 Fuel dealers	16	0.3
486 Pipeline transportation		
TOTAL DIRECT ACTIVITY	747	54.5

Exhibit 9-50

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs

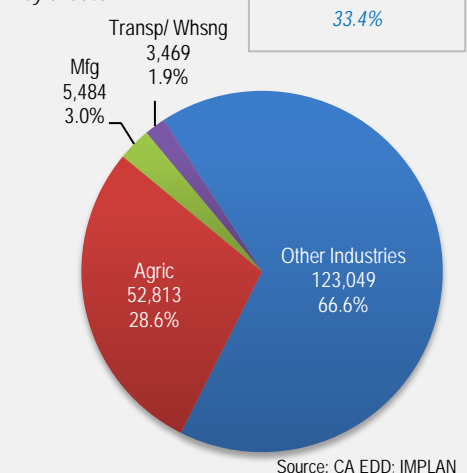


Exhibit 9-51

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Monterey County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	746	\$ 54.5	\$ 112.9	\$ 273.7
Indirect	176	9.2	14.9	26.1
Induced	260	11.4	20.5	34.0
TOTAL CONTRIBUTION	1,182	\$ 75.1	\$ 148.2	\$ 333.8
<i>Percent of Total CA Contribution</i>	<i>0.3%</i>	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>
<i>Percent of County Total</i>	<i>0.5%</i>	<i>0.5%</i>	<i>0.7%</i>	<i>1.0%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 98.8	\$ 35.5	\$ 134.3
Property taxes	7.9	0.0	7.9
Personal income taxes	2.4	6.7	9.1
Corporate profits taxes	0.6	3.8	4.4
Social insurance taxes	0.2	6.9	7.1
Other taxes	1.9	0.0	1.9
Fees, fines and permits	0.7	0.7	1.4
TOTAL TAX REVENUES	\$ 112.5	\$ 53.7	\$ 166.2

Source: Estimates by LAEDC

Napa County

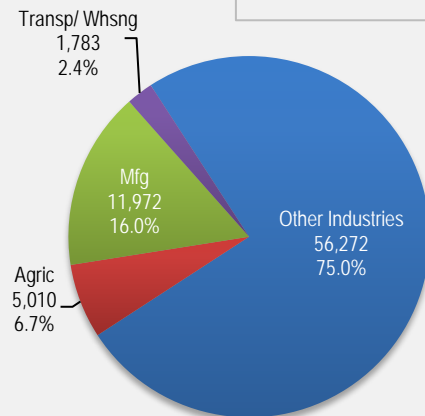
Exhibit 9-52

Direct Activity of Oil and Gas Industry Napa County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	522	3.0
213111 Drilling oil and gas wells	65	0.4
213112 Support activities for oil and gas operations	9	0.1
2212 Natural gas distribution	199	36.0
23712 Oil and gas pipeline construction	103	6.8
32411 Petroleum refineries	20	18.7
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	11	1.0
447 Gasoline stations	27	3.8
45431 Fuel dealers	17	0.4
486 Pipeline transportation	2	26.9
TOTAL DIRECT ACTIVITY	975	97.0

Exhibit 9-53

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Source: CA EDD; IMPLAN

Exhibit 9-54

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Napa County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	975	\$ 97.0	\$ 163.9	\$ 399.1
Indirect	259	13.3	21.0	34.6
Induced	432	19.2	34.6	55.7
TOTAL CONTRIBUTION	1,666	\$ 55.1	\$ 219.5	\$ 489.2
<i>Percent of Total CA Contribution</i>	<i>0.5%</i>	<i>0.4%</i>	<i>0.3%</i>	<i>0.3%</i>
<i>Percent of County Total</i>	<i>1.6%</i>	<i>2.2%</i>	<i>2.4%</i>	<i>3.0%</i>

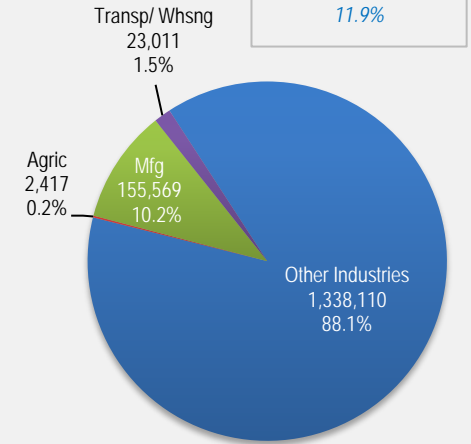
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 48.8	\$ 15.8	\$ 64.5
Property taxes	17.6	0.0	17.6
Personal income taxes	4.3	12.2	16.5
Corporate profits taxes	0.5	3.4	3.9
Social insurance taxes	0.2	10.8	11.0
Other taxes	2.9	1.2	4.2
Fees, fines and permits	0.9	0.2	1.1
TOTAL TAX REVENUES	\$ 75.2	\$ 43.6	\$ 118.8

Source: Estimates by LAEDC

Orange County

Exhibit 9-55
**Direct Activity of Oil and Gas Industry
Orange County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	4,368	274.1
213111 Drilling oil and gas wells	656	40.6
213112 Support activities for oil and gas operations	220	13.0
2212 Natural gas distribution	882	136.6
23712 Oil and gas pipeline construction	1,690	117.7
32411 Petroleum refineries	138	43.6
324191 Petroleum lubricating oil and grease mfg	8	3.1
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	592	59.0
4247 Petroleum and petroleum prods wholesalers	504	50.4
447 Gasoline stations	638	43.6
45431 Fuel dealers	207	6.0
486 Pipeline transportation	187	326.6
TOTAL DIRECT ACTIVITY	10,090	1,114.3

Exhibit 9-56
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**
**Exhibit 9-57**
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Orange County 2015**

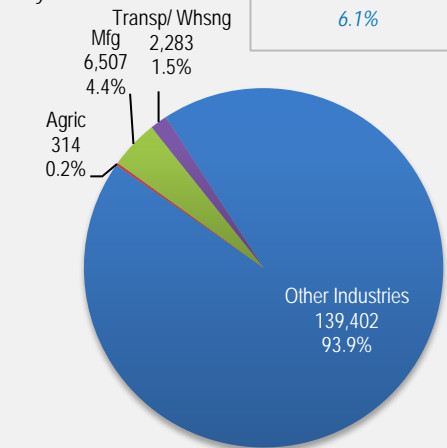
ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	10,089	\$ 1,114.3	\$ 1,771.9	\$ 3,625.5
Indirect	3,217	227.8	356.8	558.9
Induced	6,229	326.4	585.9	932.9
TOTAL CONTRIBUTION	19,535	\$ 1,668.5	\$ 2,714.5	\$ 5,117.3
<i>Percent of Total CA Contribution</i>	5.3%	5.0%	4.1%	3.5%
<i>Percent of County Total</i>	0.9%	1.2%	1.1%	1.3%

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 920.8	\$ 300.1	\$ 1,220.9
Property taxes	117.8	0.0	117.8
Personal income taxes	54.0	153.5	207.5
Corporate profits taxes	8.8	55.8	64.5
Social insurance taxes	2.2	145.7	147.9
Other taxes	25.4	11.9	25.4
Fees, fines and permits	9.7	1.9	23.5
TOTAL TAX REVENUES	\$ 1,138.6	\$ 669.0	\$ 1,807.5

Placer County

Exhibit 9-58
**Direct Activity of Oil and Gas Industry
Placer County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	243	7.7
213111 Drilling oil and gas wells	67	5.0
213112 Support activities for oil and gas operations	20	0.8
2212 Natural gas distribution	1,035	205.5
23712 Oil and gas pipeline construction	1	0.1
32411 Petroleum refineries	15	2.9
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	140	11.3
447 Gasoline stations	92	10.4
45431 Fuel dealers	51	1.5
486 Pipeline transportation	35	2.6
TOTAL DIRECT ACTIVITY	1,699	247.7

Exhibit 9-59
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**


Source: CA EDD; IMPLAN

Exhibit 9-60
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Placer County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,698	\$ 247.7	\$ 458.1	\$ 1,119.0
Indirect	1,277	67.3	109.0	179.4
Induced	1,627	75.9	136.8	227.2
TOTAL CONTRIBUTION	4,602	\$ 390.8	\$ 703.8	\$ 1,525.7
<i>Percent of Total CA Contribution</i>	1.2%	1.2%	1.1%	1.0%
<i>Percent of County Total</i>	2.2%	3.3%	3.6%	4.5%

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 167.1	\$ 49.6	\$ 216.7
Property taxes	48.0	-	48.0
Personal income taxes	12.5	35.2	47.7
Corporate profits taxes	2.3	14.3	16.6
Social insurance taxes	0.8	44.8	45.6
Other taxes	10.0	3.7	13.8
Fees, fines and permits	3.7	0.6	4.3
TOTAL TAX REVENUES	\$ 244.4	\$ 148.2	\$ 392.6

Source: Estimates by LAEDC

Riverside County

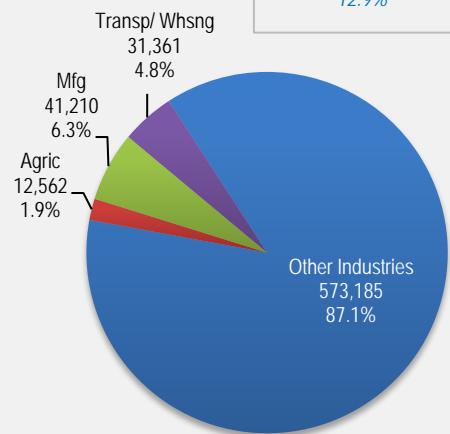
Exhibit 9-61

Direct Activity of Oil and Gas Industry Riverside County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	1,249	87.4
213111 Drilling oil and gas wells	195	12.4
213112 Support activities for oil and gas operations	59	2.5
2212 Natural gas distribution	835	102.2
23712 Oil and gas pipeline construction	29	1.5
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg	167	28.8
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	17	1.2
4247 Petroleum and petroleum prods wholesalers	315	31.5
447 Gasoline stations	472	26.7
45431 Fuel dealers	112	1.7
486 Pipeline transportation	22	113.6
TOTAL DIRECT ACTIVITY	3,472	409.5

Exhibit 9-62

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Source: CA EDD; IMPLAN

Exhibit 9-63

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Riverside County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	3,472	\$ 409.5	\$ 678.4	\$ 1,391.2
Indirect	1,347	55.8	90.2	163.0
Induced	2,391	89.1	167.7	292.5
TOTAL CONTRIBUTION	7,210	\$ 554.4	\$ 936.3	\$ 1,846.6
<i>Percent of Total CA Contribution</i>	<i>2.0%</i>	<i>1.7%</i>	<i>1.4%</i>	<i>1.2%</i>
<i>Percent of County Total</i>	<i>0.8%</i>	<i>1.2%</i>	<i>1.3%</i>	<i>1.4%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 606.4	\$ 203.4	\$ 809.8
Property taxes	55.3	0.0	55.3
Personal income taxes	17.1	47.9	65.0
Corporate profits taxes	2.8	17.3	20.1
Social insurance taxes	1.1	46.4	47.5
Other taxes	11.4	4.3	11.4
Fees, fines and permits	8.0	0.7	13.0
TOTAL TAX REVENUES	\$ 702.1	\$ 319.9	\$ 1,022.1

Source: Estimates by LAEDC

Sacramento County

Exhibit 9-64

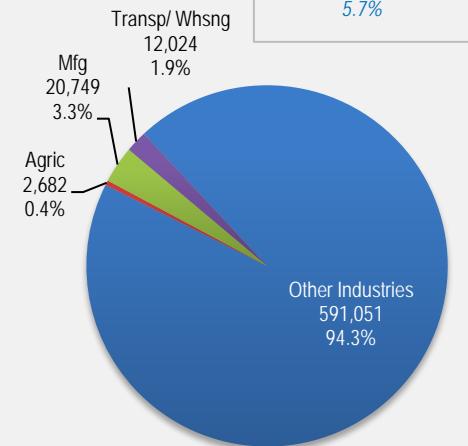
Direct Activity of Oil and Gas Industry Sacramento County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	600	13.3
213111 Drilling oil and gas wells	150	6.0
213112 Support activities for oil and gas operations	27	0.5
2212 Natural gas distribution	55	11.4
23712 Oil and gas pipeline construction	110	6.3
32411 Petroleum refineries	76	19.1
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	327	24.3
447 Gasoline stations	267	18.8
45431 Fuel dealers	58	0.8
486 Pipeline transportation	798	261.3
TOTAL DIRECT ACTIVITY	2,468	361.8

Exhibit 9-65

Forward Linkages: Refinery Industry

*At-Risk Industry Sectors
Payroll Jobs*



Source: CA EDD; IMPLAN

Exhibit 9-66

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Sacramento County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,467	\$ 361.8	\$ 458.1	\$ 1,056.2
Indirect	1,350	76.0	108.3	189.9
Induced	2,167	100.4	180.8	301.3
TOTAL CONTRIBUTION	5,984	\$ 538.2	\$ 747.2	\$ 1,547.4
<i>Percent of Total CA Contribution</i>	<i>1.6%</i>	<i>1.6%</i>	<i>1.1%</i>	<i>1.0%</i>
<i>Percent of County Total</i>	<i>0.7%</i>	<i>1.0%</i>	<i>0.9%</i>	<i>1.2%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 381.9	\$ 124.3	\$ 506.3
Property taxes	37.6	-	37.6
Personal income taxes	17.1	48.0	65.1
Corporate profits taxes	1.0	6.5	7.5
Social insurance taxes	2.2	42.7	44.9
Other taxes	11.2	4.1	15.3
Fees, fines and permits	6.1	0.7	6.7
TOTAL TAX REVENUES	\$ 457.1	\$ 226.3	\$ 683.4

Source: Estimates by LAEDC

San Bernardino County

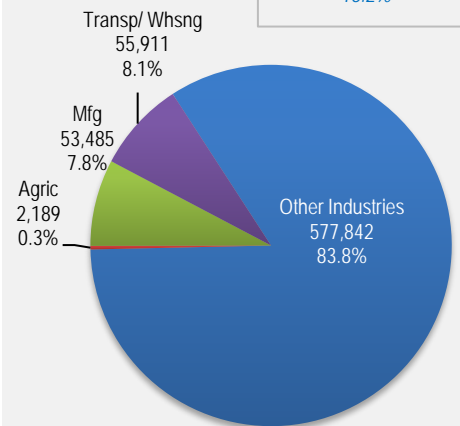
Exhibit 9-67

Direct Activity of Oil and Gas Industry San Bernardino County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	598	10.4
213111 Drilling oil and gas wells	88	1.6
213112 Support activities for oil and gas operations	52	2.3
2212 Natural gas distribution	1,695	198.6
23712 Oil and gas pipeline construction	718	37.0
32411 Petroleum refineries	43	3.7
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	176	11.3
4247 Petroleum and petroleum prods wholesalers	361	25.6
447 Gasoline stations	573	25.2
45431 Fuel dealers	108	1.8
486 Pipeline transportation	158	169.0
TOTAL DIRECT ACTIVITY	4,570	486.5

Exhibit 9-68

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Total Jobs in 2015:
689,427
Jobs At-Risk Sectors:
111,585
Share of Total:
16.2%

Source: CA EDD; IMPLAN

Exhibit 9-69

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution San Bernardino County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	4,570	\$ 486.5	\$ 813.8	\$ 2,153.4
Indirect	2,050	85.4	137.9	238.0
Induced	2,744	106.8	193.7	331.2
TOTAL CONTRIBUTION	9,364	\$ 678.7	\$ 1,145.4	\$ 2,722.5
<i>Percent of Total CA Contribution</i>	<i>2.5%</i>	<i>2.0%</i>	<i>1.7%</i>	<i>1.8%</i>
<i>Percent of County Total</i>	<i>1.0%</i>	<i>1.4%</i>	<i>1.5%</i>	<i>2.0%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 653.8	\$ 224.3	\$ 878.1
Property taxes	83.2	0.0	83.2
Personal income taxes	21.2	59.2	80.5
Corporate profits taxes	2.9	17.9	20.7
Social insurance taxes	1.9	63.9	65.7
Other taxes	16.3	7.6	23.8
Fees, fines and permits	5.7	1.2	6.9
TOTAL TAX REVENUES	\$ 785.0	\$ 374.1	\$ 1,159.0

Source: Estimates by LAEDC

San Diego County

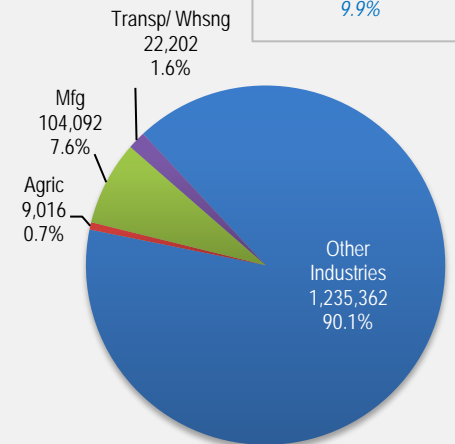
Exhibit 9-70

Direct Activity of Oil and Gas Industry San Diego County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	3,195	66.2
213111 Drilling oil and gas wells	424	8.9
213112 Support activities for oil and gas operations	246	8.8
2212 Natural gas distribution	7,187	1,275.7
23712 Oil and gas pipeline construction	19	1.1
32411 Petroleum refineries	35	7.2
324191 Petroleum lubricating oil and grease mfg	42	3.9
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	478	41.7
447 Gasoline stations	669	37.3
45431 Fuel dealers	181	4.6
486 Pipeline transportation	101	13.3
TOTAL DIRECT ACTIVITY	12,577	1,468.7

Exhibit 9-71

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Source: CA EDD; IMPLAN

Exhibit 9-72

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution San Diego County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	12,577	\$ 1,468.7	\$ 2,856.8	\$ 7,295.5
Indirect	7,924	466.9	744.7	1,176.1
Induced	9,835	463.7	828.3	1,370.0
TOTAL CONTRIBUTION	30,335	\$ 2,399.4	\$ 4,429.8	\$ 9,841.6
<i>Percent of Total CA Contribution</i>	8.2%	7.2%	6.7%	6.6%
<i>Percent of County Total</i>	1.5%	1.8%	2.0%	2.8%

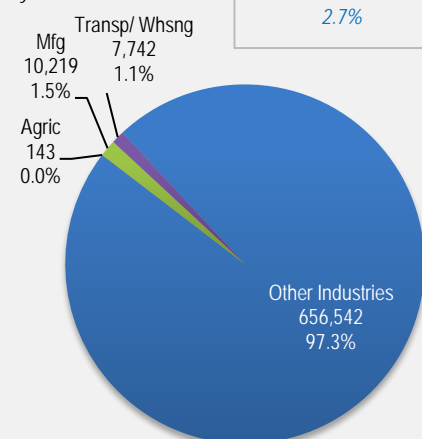
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 1,142.7	\$ 334.9	\$ 1,477.6
Property taxes	343.5	0.0	343.5
Personal income taxes	77.0	217.8	294.9
Corporate profits taxes	13.7	86.5	100.2
Social insurance taxes	5.5	247.5	253.0
Other taxes	69.1	28.6	97.7
Fees, fines and permits	17.2	4.6	21.8
TOTAL TAX REVENUES	\$ 1,668.6	\$ 920.1	\$ 2,588.7

Source: Estimates by LAEDC

San Francisco County

Exhibit 9-73**Direct Activity of Oil and Gas Industry
San Francisco County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	800	41.7
213111 Drilling oil and gas wells	97	5.1
213112 Support activities for oil and gas operations	57	1.5
2212 Natural gas distribution	2,041	585.9
23712 Oil and gas pipeline construction		
32411 Petroleum refineries	9	4.5
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	6	0.7
447 Gasoline stations	125	12.7
45431 Fuel dealers	6	0.4
486 Pipeline transportation	379	46.6
TOTAL DIRECT ACTIVITY	3,520	699.0

Exhibit 9-74**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
674,646
Jobs At-Risk Sectors:
18,104
Share of Total:
2.7%

Source: CA EDD; IMPLAN

Exhibit 9-75**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
San Francisco County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	3,519	\$ 699.0	\$ 1,124.5	\$ 2,401.1
Indirect	1,723	181.3	279.5	379.3
Induced	1,658	118.1	202.6	296.2
TOTAL CONTRIBUTION	6,900	\$ 998.4	\$ 1,605.5	\$ 3,076.6
<i>Percent of Total CA Contribution</i>	<i>1.9%</i>	<i>3.0%</i>	<i>2.4%</i>	<i>2.1%</i>
<i>Percent of County Total</i>	<i>0.8%</i>	<i>1.1%</i>	<i>1.1%</i>	<i>1.5%</i>

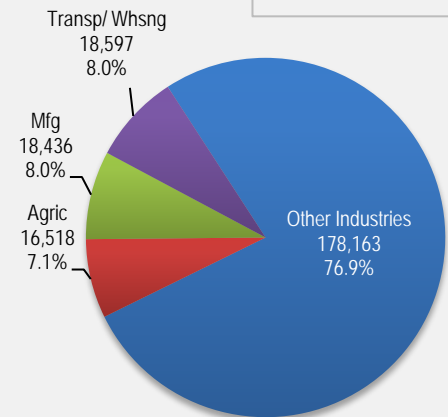
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 198.1	\$ 44.0	\$ 242.0
Property taxes	75.6	-	75.6
Personal income taxes	22.8	65.4	88.2
Corporate profits taxes	4.4	27.8	32.2
Social insurance taxes	2.5	96.2	98.7
Other taxes	48.7	5.5	54.2
Fees, fines and permits	3.5	0.9	4.4
TOTAL TAX REVENUES	\$ 355.5	\$ 239.8	\$ 595.4

Source: Estimates by LAEDC

San Joaquin County

Exhibit 9-76
**Direct Activity of Oil and Gas Industry
San Joaquin County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	184	5.9
213111 Drilling oil and gas wells	31	1.2
213112 Support activities for oil and gas operations	17	0.6
2212 Natural gas distribution	427	58.4
23712 Oil and gas pipeline construction	13	0.7
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg	3	0.2
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	204	13.6
447 Gasoline stations	163	10.6
45431 Fuel dealers	111	1.9
486 Pipeline transportation	45	116.8
TOTAL DIRECT ACTIVITY	1,198	210.0

Exhibit 9-77
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**


Total Jobs in 2015:
231,714
Jobs At-Risk Sectors:
53,551
Share of Total:
23.1%

Source: CA EDD; IMPLAN

Exhibit 9-78
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
San Joaquin County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,199	\$ 210.0	\$ 331.4	\$ 674.9
Indirect	594	26.6	43.1	75.1
Induced	1,037	41.7	77.0	129.7
TOTAL CONTRIBUTION	2,830	\$ 278.3	\$ 451.5	\$ 897.7
<i>Percent of Total CA Contribution</i>	<i>0.8%</i>	<i>0.8%</i>	<i>0.7%</i>	<i>0.6%</i>
<i>Percent of County Total</i>	<i>0.9%</i>	<i>1.7%</i>	<i>1.7%</i>	<i>1.8%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 240.4	\$ 86.1	\$ 326.6
Property taxes	31.1	0.0	31.1
Personal income taxes	9.0	25.2	34.2
Corporate profits taxes	0.9	5.6	6.5
Social insurance taxes	0.6	22.1	22.7
Other taxes	9.2	3.7	12.8
Fees, fines and permits	4.5	0.6	5.1
TOTAL TAX REVENUES	\$ 295.6	\$ 143.3	\$ 438.9

Source: Estimates by LAEDC

San Luis Obispo County

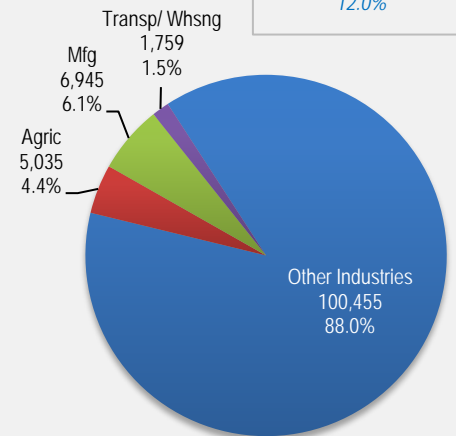
Exhibit 9-79

Direct Activity of Oil and Gas Industry San Luis Obispo County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	433	6.9
213111 Drilling oil and gas wells	97	4.0
213112 Support activities for oil and gas operations	45	2.6
2212 Natural gas distribution	141	22.9
23712 Oil and gas pipeline construction	12	0.6
32411 Petroleum refineries	79	31.3
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	225	16.2
4247 Petroleum and petroleum prods wholesalers	109	6.5
447 Gasoline stations	69	5.8
45431 Fuel dealers	61	1.0
486 Pipeline transportation	17	1.7
TOTAL DIRECT ACTIVITY	1,288	99.6

Exhibit 9-80

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Source: CA EDD; IMPLAN

Exhibit 9-81

Total Economic and Fiscal Contribution of Oil and Gas Industry San Luis Obispo County 2012

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,286	\$ 99.6	\$ 285.0	\$ 820.9
Indirect	642	28.3	45.1	82.1
Induced	648	24.5	45.3	77.9
TOTAL CONTRIBUTION	2,576	\$ 152.4	\$ 375.4	\$ 980.9
<i>Percent of Total CA Contribution</i>	<i>0.7%</i>	<i>0.5%</i>	<i>0.6%</i>	<i>0.7%</i>
<i>Percent of County Total</i>	<i>1.6%</i>	<i>1.9%</i>	<i>2.8%</i>	<i>4.2%</i>

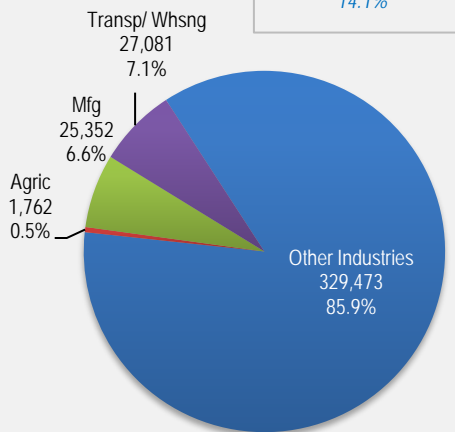
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 93.6	\$ 30.3	\$ 123.9
Property taxes	18.7	-	18.7
Personal income taxes	4.6	12.8	17.4
Corporate profits taxes	1.9	11.9	13.8
Social insurance taxes	0.7	16.3	17.0
Other taxes	3.2	0.0	3.2
Fees, fines and permits	0.9	1.8	2.6
TOTAL TAX REVENUES	\$ 123.4	\$ 73.2	\$ 196.6

Source: Estimates by LAEDC

San Mateo County

Exhibit 9-82
**Direct Activity of Oil and Gas Industry
San Mateo County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	698	7.1
213111 Drilling oil and gas wells	85	0.9
213112 Support activities for oil and gas operations	44	0.3
2212 Natural gas distribution	82	11.6
23712 Oil and gas pipeline construction	39	3.1
32411 Petroleum refineries	147	62.3
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	18	2.6
447 Gasoline stations	162	12.7
45431 Fuel dealers	1	0.0
486 Pipeline transportation	5	1.9
TOTAL DIRECT ACTIVITY	1,281	102.5

Exhibit 9-83
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**
**Exhibit 9-84**
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
San Mateo County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,281	\$ 102.5	\$ 446.2	\$ 1,112.0
Indirect	301	25.4	38.6	59.4
Induced	327	19.6	33.8	51.5
TOTAL CONTRIBUTION	1,909	\$ 147.4	\$ 518.5	\$ 1,222.8
<i>Percent of Total CA Contribution</i>	<i>0.5%</i>	<i>0.4%</i>	<i>0.8%</i>	<i>0.8%</i>
<i>Percent of County Total</i>	<i>0.3%</i>	<i>0.3%</i>	<i>0.6%</i>	<i>0.8%</i>

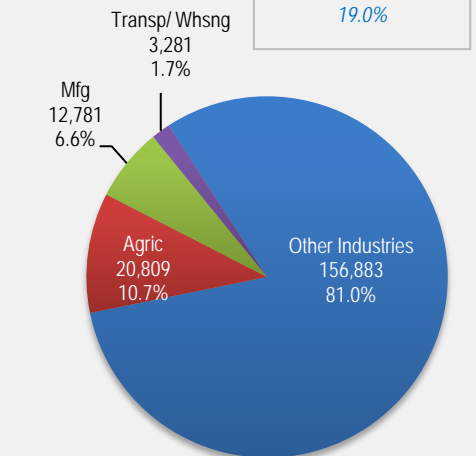
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 198.5	\$ 64.4	\$ 262.9
Property taxes	17.3	-	17.3
Personal income taxes	4.7	13.5	18.2
Corporate profits taxes	4.0	25.7	29.7
Social insurance taxes	0.1	13.0	13.1
Other taxes	4.6	1.4	6.1
Fees, fines and permits	0.7	0.2	0.9
TOTAL TAX REVENUES	\$ 230.0	\$ 118.3	\$ 348.3

Source: Estimates by LAEDC

Santa Barbara County

Exhibit 9-85
**Direct Activity of Oil and Gas Industry
Santa Barbara County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	1,080	201.8
213111 Drilling oil and gas wells	223	34.8
213112 Support activities for oil and gas operations	338	35.7
2212 Natural gas distribution	197	28.5
23712 Oil and gas pipeline construction	17	0.9
32411 Petroleum refineries	30	4.7
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	61	3.3
4247 Petroleum and petroleum prods wholesalers	39	3.4
447 Gasoline stations	85	6.7
45431 Fuel dealers	45	0.8
486 Pipeline transportation	19	2.3
TOTAL DIRECT ACTIVITY	2,134	322.9

Exhibit 9-86
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**


Source: CA EDD; IMPLAN

Exhibit 9-87
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Santa Barbara County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,135	\$ 322.9	\$ 517.4	\$ 887.9
Indirect	523	29.4	45.0	77.1
Induced	1,566	71.6	125.6	206.4
TOTAL CONTRIBUTION	4,224	\$ 423.8	\$ 688.0	\$ 1,171.4
<i>Percent of Total CA Contribution</i>	<i>1.1%</i>	<i>1.3%</i>	<i>1.0%</i>	<i>0.8%</i>
<i>Percent of County Total</i>	<i>1.5%</i>	<i>2.7%</i>	<i>2.8%</i>	<i>2.9%</i>

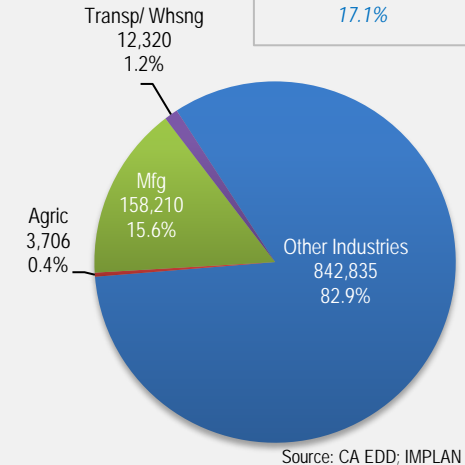
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 128.1	\$ 39.3	\$ 167.4
Property taxes	28.0	0.0	28.0
Personal income taxes	13.4	38.0	51.4
Corporate profits taxes	1.9	12.0	13.8
Social insurance taxes	1.1	40.5	41.6
Other taxes	6.3	0.0	6.3
Fees, fines and permits	2.3	2.2	4.5
TOTAL TAX REVENUES	\$ 181.1	\$ 131.9	\$ 313.0

Source: Estimates by LAEDC

Santa Clara County

Exhibit 9-88
**Direct Activity of Oil and Gas Industry
Santa Clara County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	1,346	24.7
213111 Drilling oil and gas wells	196	4.5
213112 Support activities for oil and gas operations	169	8.0
2212 Natural gas distribution	115	25.3
23712 Oil and gas pipeline construction	70	5.1
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	321	50.2
447 Gasoline stations	328	17.0
45431 Fuel dealers	46	7.0
486 Pipeline transportation	61	32.9
TOTAL DIRECT ACTIVITY	2,652	174.7

Exhibit 9-89
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**
**Exhibit 9-90**
**Backward Linkages: Total Economic and Fiscal Contribution of Oil and
Gas Industry
Santa Clara County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,652	\$ 174.7	\$ 341.1	\$ 674.3
Indirect	540	50.8	76.9	114.7
Induced	590	36.1	63.2	94.8
TOTAL CONTRIBUTION	3,782	\$ 261.6	\$ 481.2	\$ 883.8
<i>Percent of Total CA Contribution</i>	<i>1.0%</i>	<i>0.8%</i>	<i>0.7%</i>	<i>0.6%</i>
<i>Percent of County Total</i>	<i>0.3%</i>	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>

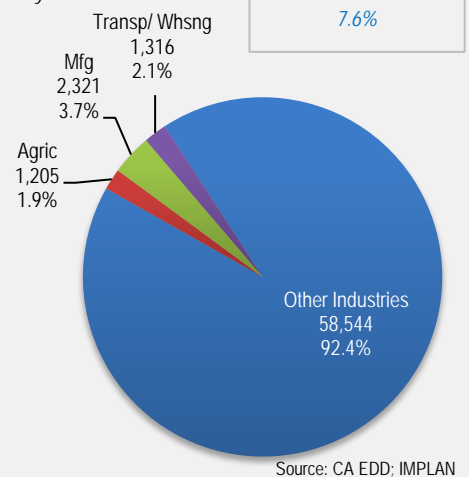
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 471.7	\$ 148.7	\$ 620.4
Property taxes	46.2	0.0	46.2
Personal income taxes	7.7	22.2	29.9
Corporate profits taxes	1.1	6.9	8.0
Social insurance taxes	0.2	21.3	21.5
Other taxes	12.4	3.4	15.7
Fees, fines and permits	1.8	0.6	2.3
TOTAL TAX REVENUES	\$ 541.0	\$ 203.1	\$ 744.1

Source: Estimates by LAEDC

Shasta County

Exhibit 9-91**Direct Activity of Oil and Gas Industry
Shasta County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	786	2.9
213111 Drilling oil and gas wells	96	0.4
213112 Support activities for oil and gas operations	27	0.3
2212 Natural gas distribution	160	27.1
23712 Oil and gas pipeline construction		
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	78	4.4
447 Gasoline stations	70	5.5
45431 Fuel dealers	25	0.5
486 Pipeline transportation	1	0.2
TOTAL DIRECT ACTIVITY	1,243	41.2

Exhibit 9-92**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs****Exhibit 9-93****Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Shasta County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,243	\$ 41.2	\$ 95.2	\$ 252.3
Indirect	324	12.6	19.9	38.5
Induced	303	11.9	20.8	36.6
TOTAL CONTRIBUTION	1,871	\$ 65.7	\$ 135.9	\$ 327.4
<i>Percent of Total CA Contribution</i>	<i>0.5%</i>	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>
<i>Percent of County Total</i>	<i>2.1%</i>	<i>1.6%</i>	<i>2.2%</i>	<i>3.0%</i>

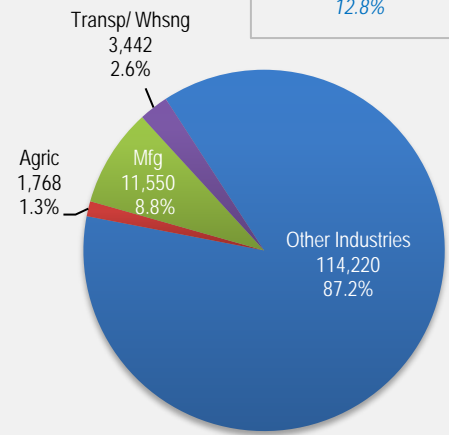
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 78.1	\$ 24.7	\$ 102.8
Property taxes	13.7	0.0	13.7
Personal income taxes	2.0	5.6	7.6
Corporate profits taxes	0.3	1.7	1.9
Social insurance taxes	0.2	7.3	7.5
Other taxes	2.8	1.4	4.2
Fees, fines and permits	0.3	0.2	0.6
TOTAL TAX REVENUES	\$ 97.4	\$ 40.9	\$ 138.3

Source: Estimates by LAEDC

Solano County

Exhibit 9-94**Direct Activity of Oil and Gas Industry
Solano County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	195	14.5
213111 Drilling oil and gas wells	177	13.0
213112 Support activities for oil and gas operations	19	1.0
2212 Natural gas distribution	612	122.7
23712 Oil and gas pipeline construction	243	16.5
32411 Petroleum refineries	421	132.8
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	38	3.3
447 Gasoline stations	130	6.5
45431 Fuel dealers	11	0.2
486 Pipeline transportation	17	1.9
TOTAL DIRECT ACTIVITY	1,863	312.5

Exhibit 9-95**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
130,980
Jobs At-Risk Sectors:
16,760
Share of Total:
12.8%

Source: CA EDD; IMPLAN

Exhibit 9-96**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Solano County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,862	\$312.5	\$ 1,116.4	\$ 3,097.0
Indirect	847	58.3	100.0	158.4
Induced	1,326	68.2	139.7	203.7
TOTAL CONTRIBUTION	4,035	\$ 412.9	\$ 1,295.0	\$ 3,390.2
<i>Percent of Total CA Contribution</i>	<i>1.1%</i>	<i>1.2%</i>	<i>2.0%</i>	<i>2.3%</i>
<i>Percent of County Total</i>	<i>2.3%</i>	<i>3.7%</i>	<i>5.8%</i>	<i>8.8%</i>

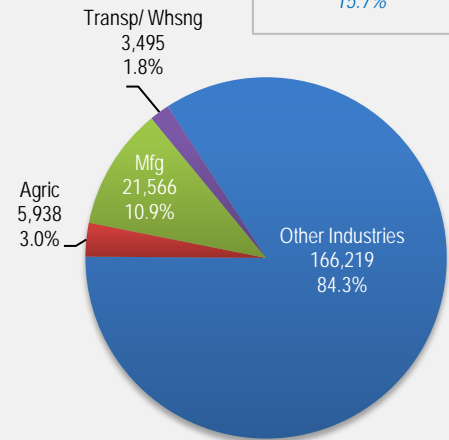
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 172.8	\$ 53.4	\$ 226.2
Property taxes	35.8	0.0	35.8
Personal income taxes	12.6	35.5	48.2
Corporate profits taxes	9.5	60.7	70.1
Social insurance taxes	1.1	43.9	45.0
Other taxes	10.7	3.6	14.3
Fees, fines and permits	3.0	0.6	3.5
TOTAL TAX REVENUES	\$ 245.5	\$ 197.6	\$ 443.1

Source: Estimates by LAEDC

Sonoma County

Exhibit 9-97**Direct Activity of Oil and Gas Industry
Sonoma County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	575	12.6
213111 Drilling oil and gas wells	84	1.6
213112 Support activities for oil and gas operations	10	0.2
2212 Natural gas distribution	64	8.5
23712 Oil and gas pipeline construction	78	4.5
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	115	8.8
447 Gasoline stations	116	7.1
45431 Fuel dealers	36	0.9
486 Pipeline transportation	0	0.0
TOTAL DIRECT ACTIVITY	1,078	44.3

Exhibit 9-98**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Source: CA EDD; IMPLAN

Exhibit 9-99**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Sonoma County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	1,079	\$ 44.3	\$ 87.3	\$ 187.3
Indirect	240	11.9	18.7	32.7
Induced	295	12.5	22.6	38.2
TOTAL CONTRIBUTION	1,613	\$ 68.7	\$ 128.5	\$ 258.2
Percent of Total CA Contribution	0.4%	0.2%	0.2%	0.2%
Percent of County Total	0.5%	0.4%	0.5%	0.6%

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 125.7	\$ 41.9	\$ 167.5
Property taxes	11.7	-	11.7
Personal income taxes	2.1	6.0	8.1
Corporate profits taxes	0.3	1.9	2.2
Social insurance taxes	0.2	7.0	7.2
Other taxes	2.4	1.0	3.3
Fees, fines and permits	0.9	0.2	1.1
TOTAL TAX REVENUES	\$ 143.2	\$ 57.9	\$ 201.1

Source: Estimates by LAEDC

Stanislaus County

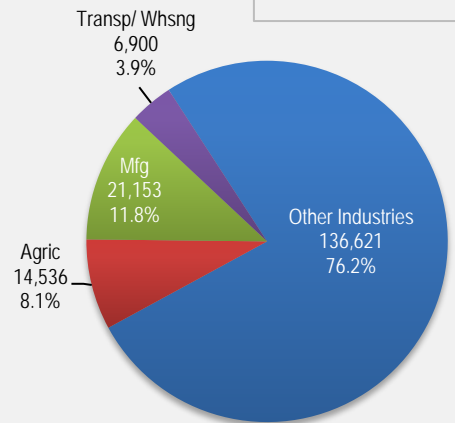
Exhibit 9-100

Direct Activity of Oil and Gas Industry Stanislaus County 2015

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	178	1.7
213111 Drilling oil and gas wells	32	0.4
213112 Support activities for oil and gas operations	3	0.0
2212 Natural gas distribution	97	10.7
23712 Oil and gas pipeline construction	150	7.8
32411 Petroleum refineries	33	8.8
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	273	8.2
447 Gasoline stations	110	5.7
45431 Fuel dealers	43	0.6
486 Pipeline transportation	1	0.1
TOTAL DIRECT ACTIVITY	920	44.1

Exhibit 9-101

Forward Linkages: Refinery Industry At-Risk Industry Sectors Payroll Jobs



Source: CA EDD; IMPLAN

Exhibit 9-102

Backward Linkages: Oil and Gas Industry Total Economic and Fiscal Contribution Stanislaus County 2015

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	920	\$ 44.1	\$ 128.1	\$ 361.6
Indirect	328	13.7	23.1	41.3
Induced	271	11.1	19.9	33.4
TOTAL CONTRIBUTION	1,520	\$ 68.9	\$ 171.1	\$ 436.4
Percent of Total CA Contribution	0.4%	0.2%	0.3%	0.3%
Percent of County Total	0.6%	0.5%	0.9%	1.1%

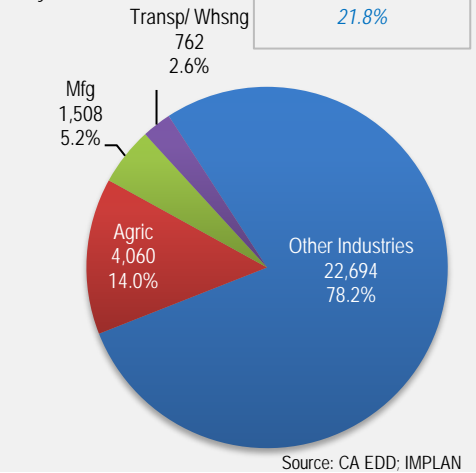
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 137.6	\$ 48.9	\$ 186.6
Property taxes	9.8	-	9.8
Personal income taxes	2.2	6.2	8.4
Corporate profits taxes	0.9	5.3	6.1
Social insurance taxes	0.2	7.2	7.4
Other taxes	2.5	1.5	4.0
Fees, fines and permits	1.1	0.2	1.3
TOTAL TAX REVENUES	\$ 154.3	\$ 69.3	\$ 223.6

Source: Estimates by LAEDC

Sutter County

Exhibit 9-103
**Direct Activity of Oil and Gas Industry
Sutter County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	81	10.8
213111 Drilling oil and gas wells	25	2.2
213112 Support activities for oil and gas operations	29	1.8
2212 Natural gas distribution		
23712 Oil and gas pipeline construction	28	1.3
32411 Petroleum refineries	1	0.6
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	4	0.3
447 Gasoline stations	16	3.5
45431 Fuel dealers	41	0.3
486 Pipeline transportation		
TOTAL DIRECT ACTIVITY	225	20.9

Exhibit 9-104
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**
**Exhibit 9-105**
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Sutter County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	225	\$ 20.9	\$ 36.4	\$ 59.7
Indirect	49	2.0	3.5	6.7
Induced	113	3.9	7.6	13.5
TOTAL CONTRIBUTION	387	\$ 26.8	\$ 47.5	\$ 79.9
<i>Percent of Total CA Contribution</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>	<i>0.1%</i>
<i>Percent of County Total</i>	<i>0.8%</i>	<i>1.3%</i>	<i>1.4%</i>	<i>1.3%</i>

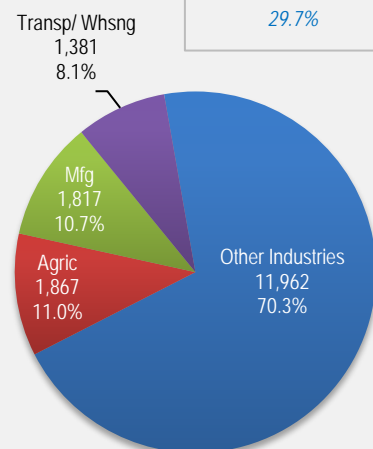
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 27.0	\$ 9.1	\$ 36.2
Property taxes	2.5	0.0	2.5
Personal income taxes	0.9	2.4	3.3
Corporate profits taxes	0.2	1.0	1.1
Social insurance taxes	0.1	2.7	2.8
Other taxes	0.8	0.3	1.0
Fees, fines and permits	0.3	0.0	0.3
TOTAL TAX REVENUES	\$ 31.7	\$ 15.5	\$ 47.2

Source: Estimates by LAEDC

Tehama County

Exhibit 9-106**Direct Activity of Oil and Gas Industry
Tehama County 2015**

		Employment	Labor Income (\$ millions)
211	Oil and gas extraction	40	0.0
213111	Drilling oil and gas wells	6	0.0
213112	Support activities for oil and gas operations		
2212	Natural gas distribution	46	7.2
23712	Oil and gas pipeline construction		
32411	Petroleum refineries		
324191	Petroleum lubricating oil and grease mfg		
32511	Petrochemical manufacturing		
333132	Oil and gas field machinery and eqmt mfg		
4247	Petroleum and petroleum prods wholesalers	6	0.3
447	Gasoline stations	41	2.1
45431	Fuel dealers	42	0.5
486	Pipeline transportation	0	0.0
TOTAL DIRECT ACTIVITY		181	10.3

Exhibit 9-107**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Source: CA EDD; IMPLAN

Exhibit 9-108**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Tehama County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	181	\$ 10.3	\$ 20.9	\$ 52.1
Indirect	41	1.4	2.2	4.3
Induced	38	1.4	2.6	4.7
TOTAL CONTRIBUTION	259	\$ 13.0	\$ 25.7	\$ 61.1
<i>Percent of Total CA Contribution</i>	<i>0.1%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>
<i>Percent of County Total</i>	<i>1.1%</i>	<i>1.2%</i>	<i>1.5%</i>	<i>1.8%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 29.5	\$ 13.8	\$ 43.3
Property taxes	2.6	-	2.6
Personal income taxes	0.4	1.0	1.4
Corporate profits taxes	0.1	0.4	0.4
Social insurance taxes	0.0	1.5	1.5
Other taxes	0.5	0.2	0.8
Fees, fines and permits	0.1	0.0	0.1
TOTAL TAX REVENUES	\$ 33.3	\$ 16.9	\$ 50.2

Source: Estimates by LAEDC

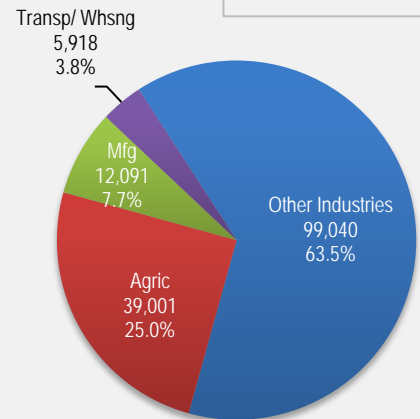
Tulare County

Exhibit 9-109
**Direct Activity of Oil and Gas Industry
Tulare County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	166	4.8
213111 Drilling oil and gas wells	46	1.2
213112 Support activities for oil and gas operations	3	0.1
2212 Natural gas distribution	210	30.4
23712 Oil and gas pipeline construction	1	0.0
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	243	17.5
447 Gasoline stations	102	13.1
45431 Fuel dealers	31	0.3
486 Pipeline transportation	2	87.4
TOTAL DIRECT ACTIVITY	804	154.9

Exhibit 9-110
**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
156,050
Jobs At-Risk Sectors:
57,010
Share of Total:
36.5%



Source: CA EDD; IMPLAN

Exhibit 9-111
**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Tulare County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	805	\$ 154.9	\$ 212.2	\$ 371.7
Indirect	317	13.3	21.8	38.2
Induced	592	20.6	41.2	72.6
TOTAL CONTRIBUTION	1,714	\$ 188.8	\$ 275.2	\$ 482.5
<i>Percent of Total CA Contribution</i>	<i>0.5%</i>	<i>0.6%</i>	<i>0.4%</i>	<i>0.3%</i>
<i>Percent of County Total</i>	<i>0.9%</i>	<i>1.7%</i>	<i>1.8%</i>	<i>1.6%</i>

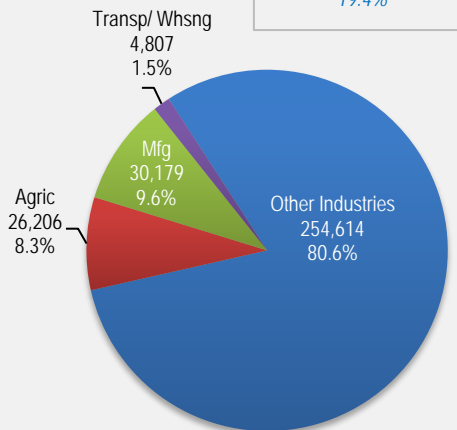
FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 111.0	\$ 36.7	\$ 147.7
Property taxes	11.8	0.0	11.8
Personal income taxes	6.4	17.7	24.0
Corporate profits taxes	0.6	3.4	3.9
Social insurance taxes	0.4	13.5	14.0
Other taxes	3.9	1.3	5.2
Fees, fines and permits	1.4	0.2	1.6
TOTAL TAX REVENUES	\$ 135.4	\$ 72.8	\$ 208.2

Source: Estimates by LAEDC

Ventura County

Exhibit 9-112**Direct Activity of Oil and Gas Industry
Ventura County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	1,270	343.7
213111 Drilling oil and gas wells	246	51.1
213112 Support activities for oil and gas operations	272	28.0
2212 Natural gas distribution	395	49.3
23712 Oil and gas pipeline construction	69	3.6
32411 Petroleum refineries	3	2.0
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg	101	7.5
4247 Petroleum and petroleum prods wholesalers	101	9.7
447 Gasoline stations	139	7.6
45431 Fuel dealers	51	1.0
486 Pipeline transportation	3	0.5
TOTAL DIRECT ACTIVITY	2,650	504.0

Exhibit 9-113**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs****Exhibit 9-114****Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Ventura County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	2,651	\$ 504.0	\$ 728.5	\$ 1,147.8
Indirect	808	43.9	71.2	119.0
Induced	2,526	109.2	204.3	339.8
TOTAL CONTRIBUTION	5,985	\$ 657.1	\$ 1,004.1	\$ 1,606.6
<i>Percent of Total CA Contribution</i>	<i>1.6%</i>	<i>2.0%</i>	<i>1.5%</i>	<i>1.1%</i>
<i>Percent of County Total</i>	<i>1.4%</i>	<i>2.6%</i>	<i>2.4%</i>	<i>2.3%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 226.5	\$ 74.1	\$ 300.5
Property taxes	41.4	0.0	41.4
Personal income taxes	21.7	61.5	83.1
Corporate profits taxes	2.9	18.4	21.3
Social insurance taxes	1.2	58.6	59.8
Other taxes	9.2	0.0	9.2
Fees, fines and permits	3.8	4.2	7.9
TOTAL TAX REVENUES	\$ 306.6	\$ 216.7	\$ 523.3

Source: Estimates by LAEDC

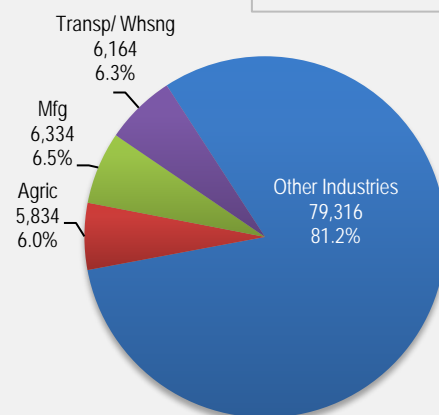
Yolo County

Exhibit 9-115**Direct Activity of Oil and Gas Industry
Yolo County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	203	10.0
213111 Drilling oil and gas wells	54	3.7
213112 Support activities for oil and gas operations	116	9.0
2212 Natural gas distribution	4	0.3
23712 Oil and gas pipeline construction		
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg	42	6.0
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	70	3.4
447 Gasoline stations	46	3.2
45431 Fuel dealers	21	0.4
486 Pipeline transportation	8	1.2
TOTAL DIRECT ACTIVITY	564	37.2

Exhibit 9-116**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
97,648
Jobs At-Risk Sectors:
18,332
Share of Total:
18.8%



Source: CA EDD; IMPLAN

Exhibit 9-117**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Yolo County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	564	\$ 37.2	\$ 83.3	\$ 145.5
Indirect	102	5.7	9.2	15.9
Induced	116	4.9	9.6	15.7
TOTAL CONTRIBUTION	783	\$ 47.8	\$ 102.1	\$ 177.1
<i>Percent of Total CA Contribution</i>	<i>0.2%</i>	<i>0.1%</i>	<i>0.2%</i>	<i>0.1%</i>
<i>Percent of County Total</i>	<i>0.6%</i>	<i>0.5%</i>	<i>0.8%</i>	<i>0.8%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 62.5	\$ 24.3	\$ 86.8
Property taxes	4.3	-	4.3
Personal income taxes	1.3	3.6	4.8
Corporate profits taxes	0.5	3.1	3.6
Social insurance taxes	0.3	3.6	3.9
Other taxes	1.9	0.5	2.4
Fees, fines and permits	0.7	0.1	0.8
TOTAL TAX REVENUES	\$ 71.3	\$ 35.2	\$ 106.5

Source: Estimates by LAEDC

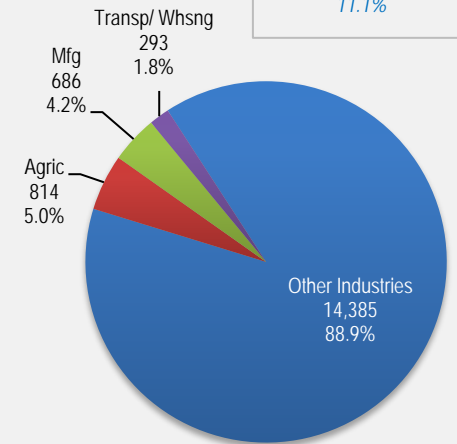
Yuba County

Exhibit 9-118**Direct Activity of Oil and Gas Industry
Yuba County 2015**

	Employment	Labor Income (\$ millions)
211 Oil and gas extraction	34	0.3
213111 Drilling oil and gas wells	4	0.0
213112 Support activities for oil and gas operations	1	0.0
2212 Natural gas distribution	41	7.1
23712 Oil and gas pipeline construction		
32411 Petroleum refineries		
324191 Petroleum lubricating oil and grease mfg		
32511 Petrochemical manufacturing		
333132 Oil and gas field machinery and eqmt mfg		
4247 Petroleum and petroleum prods wholesalers	37	0.9
447 Gasoline stations	18	1.3
45431 Fuel dealers	17	0.2
486 Pipeline transportation	0	0.0
TOTAL DIRECT ACTIVITY	152	9.8

Exhibit 9-119**Forward Linkages:
Refinery Industry
At-Risk Industry Sectors
Payroll Jobs**

Total Jobs in 2015:
16,178
Jobs At-Risk Sectors:
1,793
Share of Total:
11.1%



Source: CA EDD; IMPLAN

Exhibit 9-120**Backward Linkages: Oil and Gas Industry
Total Economic and Fiscal Contribution
Yuba County 2015**

ECONOMIC CONTRIBUTION	Employment	Labor Income (\$ millions)	Value Added (\$ millions)	Output (\$ millions)
Direct	153	\$ 9.8	\$ 20.1	\$ 49.6
Indirect	42	1.4	2.2	4.5
Induced	32	1.1	2.3	4.1
TOTAL CONTRIBUTION	226	\$ 12.3	\$ 24.6	\$ 58.2
<i>Percent of Total CA Contribution</i>	<i>0.1%</i>	<i>0.0%</i>	<i>0.0%</i>	<i>0.0%</i>
<i>Percent of County Total</i>	<i>0.8%</i>	<i>0.7%</i>	<i>0.8%</i>	<i>1.3%</i>

FISCAL CONTRIBUTION	State and Local (\$ millions)	Federal (\$ millions)	Total Taxes (\$ millions)
Sales and excise taxes	\$ 17.6	\$ 6.4	\$ 24.0
Property taxes	3.3	-	3.3
Personal income taxes	0.4	1.1	1.5
Corporate profits taxes	0.1	0.4	0.4
Social insurance taxes	0.0	1.2	1.3
Other taxes	0.7	0.3	0.9
Fees, fines and permits	0.4	0.0	0.5
TOTAL TAX REVENUES	\$ 22.5	\$ 9.4	\$ 31.9

Source: Estimates by LAEDC

Appendix

Detailed Tables

Exhibit A-1

Purchases from California Refineries by Industry

NAICS	Industry Description	\$ millions
23	Construction	\$ 3,287.7
484	Truck transportation	3,203.6
481	Air transportation	2,734.7
325	Chemical manufacturing	882.1
111,112,115	Agriculture	730.5
492	Couriers and messengers	556.4
483	Water transportation	547.0
221	Utilities	533.4
42	Wholesale Trade	511.9
482	Rail transportation	389.0
561	Administrative and support services	310.1
722	Food services and drinking places	253.4
324	Petroleum and coal products manufacturing	249.5
485	Transit and ground passenger transportation	211.9
813	Membership associations and organizations	197.1
622	Hospitals	174.7
487,488	Support activities for transportation	159.0
541	Professional and technical services	152.2
212,213	Mining and Mining Support	143.1
55	Management of companies and enterprises	132.6
333	Machinery manufacturing	101.5
532	Rental and leasing services	97.2
323	Printing and related support activities	94.6
721	Accommodation	90.2
562	Waste management and remediation services	88.4
311	Food manufacturing	87.3
521,522	Monetary auth, credit intermediation and related	71.9
327	Nonmetallic mineral product manufacturing	69.0
713	Amusements, gambling, and recreation	68.5
531	Real estate	65.7
812	Personal and laundry services	65.3
623	Nursing and residential care facilities	64.2
334	Computer and electronic product manufacturing	61.5
322	Paper manufacturing	55.0
332	Fabricated metal product manufacturing	53.4
493	Warehousing and storage	49.1
445	Food and beverage stores	47.3
811	Repair and maintenance	47.3
621	Ambulatory health care services	46.2
491	Postal service	45.1
326	Plastics and rubber products manufacturing	43.0
624	Social assistance	41.1
336	Transportation equipment manufacturing	40.6
611	Educational services	38.8
454	Nonstore retailers	32.8
486	Pipeline transportation	30.7
312	Beverage and tobacco product manufacturing	30.1
321	Wood product manufacturing	29.0
441	Motor vehicle and parts dealers	26.3
452	General merchandise stores	25.1
519	Other information services	25.1
331	Primary metal manufacturing	24.1
448	Clothing and clothing accessories stores	22.9
517	Telecommunications	22.5
211	Oil and gas extraction	18.3
444	Building material and garden supply stores	16.6
711	Performing arts and spectator sports	16.3
446	Health and personal care stores	14.7
518	Data processing, hosting and related services	14.3
511	Publishing industries, except internet	12.4
339	Miscellaneous manufacturing	12.3
335	Electrical equipment and appliance mfg.	12.2
453	Miscellaneous store retailers	9.7
523	Securities, commodity contracts, investments	9.5
442	Furniture and home furnishings stores	8.2
313	Textile mills	7.9
512	Motion picture and sound recording industries	7.8
113,114	Forestry, Hunting and Fishing	6.8
451	Sporting goods, hobby, book and music stores	6.0
337	Furniture and related product manufacturing	5.9
443	Electronics and appliance stores	5.8
712	Museums, historical sites, zoos, and parks	5.5
515	Broadcasting, except internet	5.1
447	Gasoline stations	5.0
524	Insurance carriers and related activities	3.6
315	Apparel manufacturing	3.4
533	Lessors of nonfinancial intangible assets	3.2
314	Textile product mills	2.5
525	Funds, trusts, and other financial vehicles	0.6
316	Leather and allied product manufacturing	0.3
Total Purchases		\$ 17,374.5

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Exhibit A-2

All Industries by Inputs of Refinery Products as a Percentage of Output

NAICS	Industry	Refinery Inputs as % of Output
324	Petroleum and coal products manufacturing	19.2%
481	Air transportation	15.1%
482	Rail transportation	12.4%
483	Water transportation	12.0%
484	Truck transportation	11.6%
492	Couriers and messengers	5.7%
325	Chemical manufacturing	4.4%
485	Transit and ground passenger transportation	4.3%
212,213	Mining and Mining Support	2.6%
23	Construction	2.4%
211	Oil and gas extraction	1.5%
111,112,115	Agriculture	1.4%
323	Printing and related support activities	1.3%
486	Pipeline transportation	1.3%
113,114	Forestry, Hunting and Fishing	1.3%
221	Utilities	1.1%
487,488	Support activities for transportation	1.1%
562	Waste management and remediation services	1.0%
326	Plastics and rubber products manufacturing	0.8%
327	Nonmetallic mineral product manufacturing	0.8%
491	Postal service	0.8%
322	Paper manufacturing	0.6%
721	Accommodation	0.6%
532	Rental and leasing services	0.6%
321	Wood product manufacturing	0.6%
493	Warehousing and storage	0.5%
333	Machinery manufacturing	0.4%
712	Museums, historical sites, zoos, and parks	0.4%
313	Textile mills	0.4%
623	Nursing and residential care facilities	0.4%
713	Amusements, gambling, and recreation	0.4%
561	Administrative and support services	0.4%
812	Personal and laundry services	0.4%
813	Membership associations and organizations	0.4%
622	Hospitals	0.3%
722	Food services and drinking places	0.3%
42	Wholesale Trade	0.3%
331	Primary metal manufacturing	0.3%
55	Management of companies and enterprises	0.3%
445	Food and beverage stores	0.2%
332	Fabricated metal product manufacturing	0.2%

441	Motor vehicle and parts dealers	0.2%
611	Educational services	0.2%
624	Social assistance	0.2%
314	Textile product mills	0.2%
811	Repair and maintenance	0.2%
448	Clothing and clothing accessories stores	0.1%
444	Building material and garden supply stores	0.1%
442	Furniture and home furnishings stores	0.1%
446	Health and personal care stores	0.1%
453	Miscellaneous store retailers	0.1%
451	Sporting goods, hobby, book and music stores	0.1%
454	Nonstore retailers	0.1%
335	Electrical equipment and appliance mfg.	0.1%
443	Electronics and appliance stores	0.1%
452	General merchandise stores	0.1%
311	Food manufacturing	0.1%
621	Ambulatory health care services	0.1%
312	Beverage and tobacco product manufacturing	0.1%
521,522	Monetary auth, credit intermediation and related	0.1%
447	Gasoline stations	0.1%
518	Data processing, hosting and related services	0.1%
337	Furniture and related product manufacturing	0.1%
316	Leather and allied product manufacturing	0.1%
336	Transportation equipment manufacturing	0.1%
711	Performing arts and spectator sports	0.1%
315	Apparel manufacturing	0.1%
339	Miscellaneous manufacturing	0.1%
541	Professional and technical services	0.1%
519	Other information services	0.1%
334	Computer and electronic product manufacturing	0.0%
517	Telecommunications	0.0%
531	Real estate	0.0%
511	Publishing industries, except internet	0.0%
515	Broadcasting, except internet	0.0%
523	Securities, commodity contracts, investments	0.0%
533	Lessors of nonfinancial intangible assets	0.0%
512	Motion picture and sound recording industries	0.0%
524	Insurance carriers and related activities	0.0%
525	Funds, trusts, and other financial vehicles	0.0%

Average of All Industries **0.7%**

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Exhibit A-3

All Industries by Trade Exposure as a Percentage of Output

NAICS	Industry	Trade Exposure as % of Output
316	Leather and allied product manufacturing	96.1%
315	Apparel manufacturing	77.0%
721	Accommodation	76.5%
333	Machinery manufacturing	76.1%
313	Textile mills	73.7%
512	Motion picture and sound recording industries	73.5%
334	Computer and electronic product manufacturing	72.9%
221	Utilities	72.8%
339	Miscellaneous manufacturing	66.2%
113,114	Forestry, Hunting and Fishing	64.0%
336	Transportation equipment manufacturing	58.5%
111,112,115	Agriculture	57.7%
335	Electrical equipment and appliance mfg.	55.3%
331	Primary metal manufacturing	53.1%
312	Beverage and tobacco product manufacturing	53.0%
325	Chemical manufacturing	52.4%
314	Textile product mills	52.2%
533	Lessors of nonfinancial intangible assets	48.1%
337	Furniture and related product manufacturing	46.9%
483	Water transportation	45.6%
332	Fabricated metal product manufacturing	44.1%
311	Food manufacturing	41.9%
326	Plastics and rubber products manufacturing	39.5%
511	Publishing industries, except internet	37.0%
541	Professional and technical services	34.4%
531	Real estate	32.1%
711	Performing arts and spectator sports	31.4%
624	Social assistance	31.3%
487,488	Support activities for transportation	28.3%
42	Wholesale Trade	24.6%
322	Paper manufacturing	24.2%
519	Other information services	24.1%
443	Electronics and appliance stores	22.9%
481	Air transportation	22.5%
448	Clothing and clothing accessories stores	21.4%
713	Amusements, gambling, and recreation	19.2%
515	Broadcasting, except internet	18.7%
492	Couriers and messengers	17.3%
445	Food and beverage stores	15.7%
323	Printing and related support activities	15.5%
212,213	Mining and Mining Support	15.5%
321	Wood product manufacturing	15.4%
518	Data processing, hosting and related services	14.5%
482	Rail transportation	14.3%
327	Nonmetallic mineral product manufacturing	14.2%
712	Museums, historical sites, zoos, and parks	13.6%
454	Nonstore retailers	13.3%
813	Membership associations and organizations	13.1%
55	Management of companies and enterprises	12.1%
621	Ambulatory health care services	12.1%
812	Personal and laundry services	11.1%
517	Telecommunications	10.7%
453	Miscellaneous store retailers	10.5%
523	Securities, commodity contracts, investments	10.3%
811	Repair and maintenance	10.0%
493	Warehousing and storage	9.8%
484	Truck transportation	9.6%
562	Waste management and remediation services	8.7%
532	Rental and leasing services	8.6%
211	Oil and gas extraction	6.9%
722	Food services and drinking places	6.7%
442	Furniture and home furnishings stores	6.7%
451	Sporting goods, hobby, book and music stores	6.5%
524	Insurance carriers and related activities	6.3%
486	Pipeline transportation	6.0%
324	Petroleum and coal products manufacturing	5.8%
521,522	Monetary auth, credit intermediation and related	5.2%
561	Administrative and support services	4.3%
611	Educational services	3.4%
446	Health and personal care stores	3.4%
525	Funds, trusts, and other financial vehicles	1.3%
491	Postal service	0.6%
622	Hospitals	0.2%
447	Gasoline stations	0.2%
441	Motor vehicle and parts dealers	0.1%
444	Building material and garden supply stores	0.0%
23	Construction	0.0%
485	Transit and ground passenger transportation	0.0%
452	General merchandise stores	0.0%
623	Nursing and residential care facilities	0.0%
Average of All Industries		28.2%

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Exhibit A-4

All Industries by Gross Operating Surplus as a Percentage of Output

NAICS	Industry	Surplus as % of Output
443	Electronics and appliance stores	-33.9%
812	Personal and laundry services	-24.0%
486	Pipeline transportation	-13.6%
113,114	Forestry, Hunting and Fishing	-8.1%
453	Miscellaneous store retailers	-3.3%
316	Leather and allied product manufacturing	-3.0%
712	Museums, historical sites, zoos, and parks	-2.4%
447	Gasoline stations	-2.4%
491	Postal service	0.4%
623	Nursing and residential care facilities	0.6%
811	Repair and maintenance	0.8%
611	Educational services	1.7%
523	Securities, commodity contracts, investments	2.6%
331	Primary metal manufacturing	3.0%
525	Funds, trusts, and other financial vehicles	3.7%
484	Truck transportation	3.8%
518	Data processing, hosting and related services	3.9%
446	Health and personal care stores	4.3%
313	Textile mills	4.5%
314	Textile product mills	4.8%
621	Ambulatory health care services	5.1%
337	Furniture and related product manufacturing	5.2%
322	Paper manufacturing	5.3%
624	Social assistance	5.4%
519	Other information services	5.6%
813	Membership associations and organizations	6.1%
311	Food manufacturing	6.2%
321	Wood product manufacturing	6.4%
335	Electrical equipment and appliance mfg.	6.6%
622	Hospitals	7.0%
452	General merchandise stores	7.1%
315	Apparel manufacturing	7.2%
312	Beverage and tobacco product manufacturing	8.0%
451	Sporting goods, hobby, book and music stores	8.4%
336	Transportation equipment manufacturing	9.0%
441	Motor vehicle and parts dealers	9.4%
541	Professional and technical services	9.9%
55	Management of companies and enterprises	10.0%
444	Building material and garden supply stores	10.5%
326	Plastics and rubber products manufacturing	10.5%
487,488	Support activities for transportation	10.7%
327	Nonmetallic mineral product manufacturing	10.8%

323	Printing and related support activities	10.9%
493	Warehousing and storage	11.3%
442	Furniture and home furnishings stores	11.5%
445	Food and beverage stores	11.5%
332	Fabricated metal product manufacturing	11.8%
333	Machinery manufacturing	11.8%
515	Broadcasting, except internet	12.3%
722	Food services and drinking places	12.4%
481	Air transportation	12.8%
211	Oil and gas extraction	13.0%
561	Administrative and support services	13.0%
524	Insurance carriers and related activities	13.2%
111-112 & 115	Agriculture	13.5%
562	Waste management and remediation services	13.5%
485	Transit and ground passenger transportation	14.1%
23	Construction	14.9%
42	Wholesale Trade	15.2%
711	Performing arts and spectator sports	15.9%
482	Rail transportation	16.8%
339	Miscellaneous manufacturing	17.5%
483	Water transportation	18.0%
221	Utilities	19.0%
448	Clothing and clothing accessories stores	19.0%
492	Couriers and messengers	20.0%
212-213	Mining and Mining Support	22.1%
334	Computer and electronic product manufacturing	22.1%
713	Amusements, gambling, and recreation	22.8%
721	Accommodation	23.0%
324*	Petroleum and coal products manufacturing	27.5%
532	Rental and leasing services	30.4%
325*	Chemical manufacturing	31.0%
454	Nonstore retailers	33.7%
517	Telecommunications	34.0%
521-522	Monetary auth, credit intermediation and related	36.1%
511	Publishing industries, except internet	40.5%
533	Lessors of nonfinancial intangible assets	41.1%
512	Motion picture and sound recording industries	53.4%
531	Real estate	59.5%

18.0%

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Exhibit A-5**All Industries by Vulnerability Index**

NAICS	Industry Description	Index			
325	Chemical manufacturing	9.7	454	Nonstore retailers	5.1
483	Water transportation	9.1	312	Beverage and tobacco product manufacturing	5.0
221	Utilities	9.1	339	Miscellaneous manufacturing	4.9
111,112,115	Agriculture	8.7	512	Motion picture and sound recording industries	4.9
492	Couriers and messengers	8.7	812	Personal and laundry services	4.7
721	Accommodation	8.7	316	Leather and allied product manufacturing	4.7
481	Air transportation	8.4	623	Nursing and residential care facilities	4.6
482	Rail transportation	8.3	311	Food manufacturing	4.6
113,114	Forestry, Hunting and Fishing	7.9	315	Apparel manufacturing	4.6
212,213	Mining and Mining Support	7.9	337	Furniture and related product manufacturing	4.4
323	Printing and related support activities	7.7	336	Transportation equipment manufacturing	4.4
333	Machinery manufacturing	7.7	811	Repair and maintenance	4.3
326	Plastics and rubber products manufacturing	7.6	622	Hospitals	4.3
324	Petroleum and coal products manufacturing	7.6	711	Performing arts and spectator sports	4.3
487,488	Support activities for transportation	7.4	511	Publishing industries, except internet	4.3
313	Textile mills	7.3	533	Lessors of nonfinancial intangible assets	4.3
485	Transit and ground passenger transportation	7.1	443	Electronics and appliance stores	4.1
322	Paper manufacturing	7.0	442	Furniture and home furnishings stores	4.0
211	Oil and gas extraction	7.0	531	Real estate	4.0
713	Amusements, gambling, and recreation	7.0	451	Sporting goods, hobby, book and music stores	3.9
484	Truck transportation	6.9	441	Motor vehicle and parts dealers	3.9
327	Nonmetallic mineral product manufacturing	6.9	541	Professional and technical services	3.9
532	Rental and leasing services	6.7	444	Building material and garden supply stores	3.9
23	Construction	6.6	611	Educational services	3.7
42	Wholesale Trade	6.6	519	Other information services	3.7
562	Waste management and remediation services	6.4	517	Telecommunications	3.7
331	Primary metal manufacturing	6.3	521,522	Monetary auth, credit intermediation and related	3.7
321	Wood product manufacturing	6.0	453	Miscellaneous store retailers	3.6
493	Warehousing and storage	6.0	518	Data processing, hosting and related services	3.6
445	Food and beverage stores	6.0	446	Health and personal care stores	3.3
332	Fabricated metal product manufacturing	6.0	621	Ambulatory health care services	3.3
486	Pipeline transportation	5.9	515	Broadcasting, except internet	3.3
448	Clothing and clothing accessories stores	5.9	452	General merchandise stores	3.1
712	Museums, historical sites, zoos, and parks	5.6	524	Insurance carriers and related activities	2.4
314	Textile product mills	5.6	447	Gasoline stations	2.1
561	Administrative and support services	5.6	523	Securities, commodity contracts, investments	2.0
491	Postal service	5.4	525	Funds, trusts, and other financial vehicles	1.4
813	Membership associations and organizations	5.4			
335	Electrical equipment and appliance mfg.	5.4			
624	Social assistance	5.3			
55	Management of companies and enterprises	5.3			
722	Food services and drinking places	5.3			
334	Computer and electronic product manufacturing	5.3			

* 325 excludes petrochemical products manufacturing; 324 excludes petroleum refineries
Source: IMPLAN Data for California; Analysis by LAEDC

Oil and Gas Industries

NAICS 211: Oil and gas extraction

Establishments within this industry subsector operate and/or develop oil and gas field properties, either on their own account or for others on a contract or fee basis. Activities include: exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum and natural gas; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, and the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids.

NAICS 213111: Drilling oil and gas wells

Establishments in this U.S. industry are primarily engaged in drilling oil and gas wells for others on a contract or fee basis. This industry includes contractors that specialize in spudding in, drilling in, redrilling, and directional drilling.

NAICS 213112: Support activities for oil and gas operations

Establishments in this U.S. industry are primarily engaged in performing support activities on a contract or fee basis for oil and gas operations (except site preparation and related construction activities). Services included are exploration (except geophysical surveying and mapping); excavating slush pits and cellars, well surveying; running, cutting, and pulling casings, tubes, and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.

NAICS 2212: Natural gas distribution

Establishments in this industry are: primarily engaged in: operating gas distribution systems (e.g., mains, meters); known as gas marketers that buy gas from the well and sell it to a distribution system; known as gas brokers or agents that arrange the sale of gas over gas distribution systems operated by others; and those primarily engaged in transmitting and distributing gas to final consumers. Only privately owned establishments are included in this report.

NAICS 23712: Oil and gas pipeline and related structures construction

Establishments in this industry include those primarily engaged in the construction of oil and gas lines, mains, refineries, and storage tanks. The work performed may include new work, reconstruction, rehabilitation, and repairs. Specialty trade contractors are included if they are engaged in activities primarily related to oil and gas pipeline and related structures construction. All structures (including buildings) that are integral parts of oil and gas networks (e.g., storage tanks, pumping stations, and refineries) are included in this industry.

NAICS 32411: Petroleum refineries

Establishments in this industry are primarily engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following activities: (1) fractionation; (2) straight distillation of crude oil; and (3) cracking.

NAICS 324191: Petroleum lubricating oil and grease manufacturing

Establishments in this U.S. industry are primarily engaged in blending or compounding refined petroleum to make lubricating oils and greases and/or re-refining used petroleum lubricating oils.

NAICS 32511: Petrochemical manufacturing

Establishments in this industry are primarily engaged in manufacturing acyclic (i.e., aliphatic) hydrocarbons such as ethylene, propylene, and butylene made from refined petroleum or liquid hydrocarbons and/or manufacturing cyclic aromatic hydrocarbons such as benzene, toluene, styrene, xylene, ethyl benzene, and cumene made from refined petroleum or liquid hydrocarbons.

NAICS 333132: Oil and gas field machinery and equipment manufacturing

This U.S. industry is comprised of establishments primarily engaged in (1) manufacturing oil and gas field machinery and equipment, such as oil and gas field drilling machinery and equipment; oil and gas field production machinery and equipment; and oil and gas field derricks and (2) manufacturing water well drilling machinery.

NAICS 4247: Petroleum and petroleum products merchant wholesalers

Establishments in this industry group are primarily engaged in the Petroleum Bulk Stations and Terminals industry, with bulk liquid storage facilities primarily engaged in the merchant wholesale distribution of

crude, petroleum and petroleum products, including liquefied petroleum gas, or the Petroleum and Petroleum Products Merchant Wholesalers industry, the merchant wholesale distribution of petroleum and petroleum products (except from bulk liquid storage facilities).

NAICS 447: Gasoline stations

Establishments in this subsector retail automotive fuels (e.g., gasoline, diesel fuel, gasohol, alternative fuels) and automotive oils or retail these products in combination with convenience store items. These establishments have specialized equipment for the storage and dispensing of automotive fuels.

NAICS 45431: Fuel dealers

Establishments in this industry are primarily engaged in retailing heating oil, liquefied petroleum (LP) gas, and other fuels via direct selling.

NAICS 486: Pipeline transportation

Industries in this subsector use transmission pipelines to transport products, such as crude oil, natural gas, refined petroleum products, and slurry. Industries are identified based on the products transported (i.e., pipeline transportation of crude oil, natural gas, refined petroleum products, and other products). The Pipeline Transportation of Natural Gas industry includes the storage of natural gas because the storage is usually done by the pipeline establishment and because a pipeline is inherently a network in which all the nodes are interdependent. ❖

Refinery and Petrochemical Industry

NAICS 32411: Petroleum refineries

Establishments in this industry are primarily engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following activities: (1) fractionation; (2) straight distillation of crude oil; and (3) cracking.

NAICS 32511: Petrochemical manufacturing

Establishments in this industry are primarily engaged in manufacturing acyclic (i.e., aliphatic) hydrocarbons such as ethylene, propylene, and butylenes made from refined petroleum or liquid hydrocarbons and/or manufacturing cyclic aromatic hydrocarbons such as benzene, toluene, styrene, xylene, ethyl benzene, and cumene made from refined petroleum or liquid hydrocarbons.

Methodology

Backward Linkages

Economic contribution analysis is used to describe that portion of a region's economy that can be attributed to an existing industry. Contribution analysis measures the value of the industry in terms of its *backward linkages*—its purchases of goods and services in its supply chain, its payment of labor income to regional workers, and the tax revenues generated on its operations and multiplier impacts. This analysis models what would happen if the industry did not exist in terms of those whose economic activity depends on supplying the industry.

The primary economic contribution to California's economy of the oil and gas industry is the expenditure of hundreds of millions of dollars towards goods and services from regional vendors. This injection of funds circulates from the initial recipients to the owners and employees of establishments that help supply the goods and services that the industry purchases.

The industry also spends billions of dollars every year for the wages and benefits of its employees and contract workers. These workers, as well as the employees of all the industry's suppliers, spend a portion of their incomes on groceries, rent, vehicle expenses, healthcare, entertainment, and so on. The recirculation of the original expenditures multiplies the initial spending through these indirect and induced effects.

The extent to which the initial expenditures multiply is estimated using economic models that depict the relationships between industries (such as oil production and its suppliers) and among different economic agents (such as industries and their employees).

These models are built upon actual data of expenditure patterns that are reported to the U.S. Bureau of Labor Statistics, the U.S. Census Bureau and the Bureau of Economic Analysis of the U.S. Department of Commerce. Data is regionalized so that it reflects and incorporates local conditions such as prevailing wages rates, expenditure patterns, and resource availability and costs.

The magnitude of the multiplying effect differs from one region to another depending on the extent to which the local region can fill the demand for all rounds of supplying needs. For example, the automobile manufacturing industry has high multipliers in Detroit and Indiana since these regions have deep and wide

supplier networks, while the same industry multiplier in Phoenix is quite small. In another example, the jobs multiplier for the construction industry is higher in, say, Arkansas, than in California because the same amount of spending will purchase fewer workers in Los Angeles than in Little Rock.

Multipliers can also differ from year to year as relative material and labor costs change and as the production “recipe” of industries change. For example, the IT revolution significantly reduced the job multiplier of many industries (such as manufacturing, accounting, architecture and publishing) as computers replaced administrative and production workers.

The metrics used to determine the value of the economic contribution are employment, labor income, value-added and the value of output. *Employment* includes full-time, part-time, permanent and seasonal employees and the self-employed, and is measured on a job-count basis regardless of the number of hours worked. *Labor income* includes all income received by both payroll employees and the self-employed, including wages and benefits such as health insurance and pension plan contributions. *Value-added* is the measure of the contribution to GDP made by the industry, and consists of compensation of employees, taxes on production and gross operating surplus. *Output* is the value of the goods and services produced. For most industries, this is simply the revenues generated through sales; for others, in particular retail industries, output is the value of the services supplied.

Estimates are developed using software and data from IMPLAN Group, LLC which traces inter-industry transactions resulting from an increase in demand in a given region. The economic region of interest is the state of California, and the activity is reported for 2015, the most recent year for which a complete set of data is available. Estimates for labor income, value added and output are expressed in 2015 dollars to maintain consistency with the reported industry activity.

The total estimated economic contribution includes *direct*, *indirect* and *induced* effects.

Direct activity includes the materials purchased and the employees hired by the industry itself. *Indirect effects* are those which stem from the employment and business revenues motivated by the purchases made by the industry and any of its suppliers. *Induced effects* are those generated by the spending of employees whose wages are sustained by both direct and indirect spending.

Contribution analysis differs from economic impact analysis in that linkages between the component industries as described below are removed so that indirect activity is not double-counted as also part of direct activity.

The correspondence between the identified NAICS and sectors used in IMPLAN are straightforward, with a few exceptions. Several IMPLAN sectors (32, 36, 319, and 331) include activities of NAICS unrelated to the oil and gas industry. Direct activity related to the oil and gas industry for these sectors was based on specific isolated employment estimates. ❖

Forward Linkages

Another prism through which the industry can be viewed is its *forward linkages*—the extent to which its products are incorporated into the manufacturing and service delivery operations of the rest of the economy. In the case of the refinery industry, for example, those industries which are highly dependent on transportation fuels, such as trucking, aviation and construction industries, and manufacturing industries dependent on petroleum byproducts in the production of their own products, such as plastics manufacturers and medical device manufacturers.

Understanding these linkages is important in evaluating how cost increases in oil and gas industry products might ripple through the manufacturing and service delivery chains.

In this report, refinery and petrochemical products are traced through the industry user chain and each *primary* user industry's *intensity of use* compared to its as a share of revenues, which represents a measure of the user industry's dependency on refined and petrochemical products. An industry that primarily depends on oil and gas inputs for production will be affected to a greater extent than other, less reliant industries.

This dependency is evaluated against the user industry's gross operating surplus, which points to the industry's ability to absorb higher costs of inputs.

Lastly, each user industry's *trade sensitivity* will be estimated to provide an indication of its ability to pass the higher costs of inputs through to its customers.

The combination of these measures provides the basis for a *vulnerability indicator*. The composite index is derived as discussed in the text.

For the top twenty user industries by vulnerability indicator, employment, labor income, output and direct contribution to GDP are estimated to provide orders of magnitude of the economic activity that is at immediate risk from disruption of supply of refined petroleum products and byproducts.

The metrics used to determine orders of magnitude for primary user industries are employment, labor income, value-added and the value of output as described above.

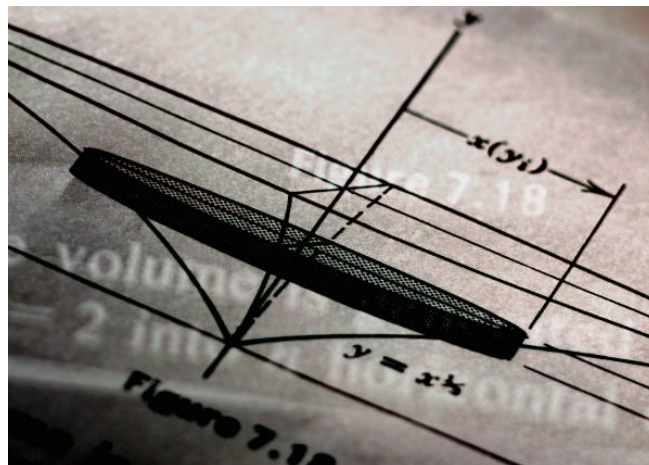
The data used to conduct this analysis is the Industry Economic Accounts produced by the Bureau of Economic Analysis of the Department of Commerce (specifically, the Make and Use tables) as estimated and aggregated by the IMPLAN Group, LLC in its latest software release for the 2015 calendar year. The economic region of interest is the state of California. Estimates for labor income and output are expressed in 2015 dollars to maintain consistency with the reported industry activity.



Workforce Characteristics Methodology

Data for worker characteristics according to industry is not available at the same detailed level as it is for employment. As such, some modifications were made to the industry definition in reporting workers characteristics. Specifically, the following industries from Exhibit 1-1 were excluded from the workforce analysis: 23712, 32511, 333132 and 45431.

The Center for Economic Studies at the U.S. Census Bureau provides several public-use data products derived from existing census, survey, and administrative data. One of these products is the Quarterly Workforce Indicators (QWI), which provides workforce statistics by



demography, geography and industry at the sector, subsector and 4-digit industry level.

The QWI is unique in that it reports data at the job-level, obtained from linked employer-employee microdata in the Longitudinal Employer-Household Dynamics (LEHD), a database covering more than 95 percent of U.S. private sector jobs. Additional sources include administrative records on employment by states, Social Security data, Federal tax records and other census and survey data.

Data available through the QWI allows for the analysis of the demographics of a particular labor market or specific industry, as is done in this report for the oil and gas industry. Estimates used to determine employment distributions of worker characteristics are stable full-quarter employment counts, the number of jobs held on both the first and last day of the quarter with the same employer. Quarterly data has been annualized. ❖

Description of NAICS Industry Sectors

The industry sectors used in this report are established by the North American Industry Classification System (NAICS). NAICS divides the economy into twenty sectors, and groups industries within these sectors according to production criteria. Listed below is a short description of each sector as taken from the sourcebook, *North American Industry Classification System*, published by the U.S. Office of Management and Budget (2012).

Agriculture, Forestry, Fishing and Hunting: Activities of this sector are growing crops, raising animals,

harvesting timber, and harvesting fish and other animals from farms, ranches, or the animals' natural habitats.

Mining: Activities of this sector are extracting naturally-occurring mineral solids, such as coal and ore; liquid minerals, such as crude petroleum; and gases, such as natural gas; and beneficiating (e.g., crushing, screening, washing and flotation) and other preparation at the mine site, or as part of mining activity.

Utilities: Activities of this sector are generating, transmitting, and/or distributing electricity, gas, steam,

and water and removing sewage through a permanent infrastructure of lines, mains, and pipes.

Construction: Activities of this sector are erecting buildings and other structures (including additions); heavy construction other than buildings; and alterations, reconstruction, installation, and maintenance and repairs.

Manufacturing: Activities of this sector are the mechanical, physical, or chemical transformation of material, substances, or components into new products.

Wholesale Trade: Activities of this sector are selling or arranging for the purchase or sale of goods for resale; capital or durable non-consumer goods; and raw and intermediate materials and supplies used in production, and providing services incidental to the sale of the merchandise.

Retail Trade: Activities of this sector are retailing merchandise generally in small quantities to the general public and providing services incidental to the sale of the merchandise.

Transportation and Warehousing: Activities of this sector are providing transportation of passengers and cargo, warehousing and storing goods, scenic and sightseeing transportation, and supporting these activities.

Information: Activities of this sector are distributing information and cultural products, providing the means to transmit or distribute these products as data or communications, and processing data.

Finance and Insurance: Activities of this sector involve the creation, liquidation, or change of ownership of financial assets (financial transactions) and/or facilitating financial transactions.

Real Estate and Rental and Leasing: Activities of this sector are renting, leasing, or otherwise allowing the use of tangible or intangible assets (except copyrighted works), and providing related services.

Professional, Scientific, and Technical Services: Activities of this sector are performing professional, scientific, and technical services for the operations of other organizations.

Management of Companies and Enterprises: Activities of this sector are the holding of securities of companies and enterprises, for the purpose of owning controlling interest or influencing their management decision, or

administering, overseeing, and managing other establishments of the same company or enterprise and normally undertaking the strategic or organizational planning and decision-making of the company or enterprise.

Administrative and Support and Waste Management and Remediation Services: Activities of this sector are performing routine support activities for the day-to-day operations of other organizations, such as: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

Educational Services: Activities of this sector are providing instruction and training in a wide variety of subjects. Educational services are usually delivered by teachers or instructors that explain, tell, demonstrate, supervise, and direct learning. Instruction is imparted in diverse settings, such as educational institutions, the workplace, or the home through correspondence, television, or other means.

Health Care and Social Assistance: Activities of this sector are operating or providing health care and social assistance for individuals.

Arts, Entertainment and Recreation: Activities of this sector are operating facilities or providing services to meet varied cultural, entertainment, and recreational interests of their patrons, such as: (1) producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; (2) preserving and exhibiting objects and sites of historical, cultural, or educational interest; and (3) operating facilities or providing services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure-time interests.

Accommodation and Food Services: Activities of this sector are providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption.

Other Services (except Public Administration): Activities of this sector are providing services not specifically provided for elsewhere in the classification system. Establishments in this sector are primarily engaged in activities, such as equipment and machinery repairing, promoting or administering religious activities, grant-making, advocacy, and providing dry-cleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services. ❖

Study Authors

Somjita Mitra, Ph.D.

Senior Economist, Institute for Applied Economics

Somjita Mitra manages the LAEDC Institute for Applied Economics. She is involved in planning, designing and conducting research and analysis for consulting clients and local businesses and governments, as well as for LAEDC's internal departments. Her focus is in regional analysis, economic impact studies and the industrial and occupational structure of local economies.

Before joining the LAEDC, Dr. Mitra was an Economist for a local economic research and litigation consulting company evaluating economic damages, estimating lost profits, identifying key economic issues and developing necessary analytical and empirical frameworks. Prior to this, Dr. Mitra was Project Director for a consumer research firm in Los Angeles where she managed projects that identified and analyzed key market issues for local firms as well as multinational corporations.

Dr. Mitra received her Bachelor of Arts in Economics and Political Science from the University of California, Los Angeles and her Master of Arts in Politics, Economics and Business as well as her Ph.D. in Economics from Claremont Graduate University. Dr. Mitra enjoys volunteering in the local community and is actively involved in both women's welfare and animal rescue organizations.

Shannon M. Sedgwick

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In her current capacity as an Economist at the LAEDC, Ms. Sedgwick develops subject-specific information and data interpretation for economic impact, demographic, transportation, industry and issue studies. She is involved in the planning and design of projects and performs research, data collection and organization, analysis and report preparation. Her work focuses on demographics, industry clusters, and occupational and industry contribution analyses. Ms. Sedgwick is also proficient at conducting geospatial analysis and working with IMPLAN.

Ms. Sedgwick joined the LAEDC in June of 2008 as an Economic Research Assistant with the Kyser Center for Economic Research. In that role she assisted both Economic Research and the Consulting Practice of the LAEDC with data collection and research covering the State of California, Southern California and its counties.

Before joining the LAEDC, Ms. Sedgwick managed an industrial and steel supply company located in the Inland Empire. There she identified and targeted a diverse customer base, and analyzed product and customer patterns in the local industrial market to successfully increase revenues.

A Southern California native, Ms. Sedgwick received her Bachelor of Arts in Economics from the University of Southern California (USC) with a minor in Architecture. She is actively involved with local animal rescue organizations and volunteers annually as a mentor to undergraduate students selected for the USC Dornsife Gateway Internship Program. ❖



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