The Importance of Aggregates and Construction to California's Economy
The Importance of the Aggregates and Construction Industry to the California Economy

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Prepared by:
Randy Evans
Applied Development Economics
2029 University Avenue
Berkeley, CA 94704 (510) 548-5912
1029 "J" St., Suite 310
Sacramento, CA 95814 (916) 441-0323
www.adeusa.com

In Association with:
S. L. Prager
e concepts
711 9th Ave.
San Mateo, CA 94402
(650) 579-5839
slprager@yahoo.com
Forward

This study updates a 2001 report entitled *The Aggregates Industry: Its Importance to California’s Economy and Infrastructure*. Since 1998, the latest available data used in the 2001 report, major transformations have occurred within California’s economy. From 1998-2003, California’s population increased 7%, and housing 5%. At the same time, extensive economic shifts included a high technology slump, record home prices, outsourcing, a net migration into the Great Central Valley, and changes in the local economies of the San Francisco Bay Area and Southern California.

As both literally and figuratively the foundation for almost all economic activity, and fundamental for public infrastructure, the aggregates and construction industry reflect many of these systemic changes, as well as serving as a significant statewide economic indicator. This report measures changes in the aggregates and construction industry from 1998-2003, including growth in output and employment. The results indicate that the industry’s importance has grown as well.

Since the 2001 state study, several county studies of this industry have also been conducted. While the original state study focused on the economic impacts of the aggregates and construction industry, the county studies compared aggregates and construction to other important local industries. This study creates a new method of examining aggregates and construction in California in order to compare and track the economic importance of aggregates and construction at both the state and local (county) levels.

In addition to *The Aggregates Industry: Its Importance to California’s Economy and Infrastructure – 2001*, other studies in this series include:

- *Construction & Aggregates in Tulare County* 
  August, 2002
- *Construction & Aggregates in Merced County* 
  August, 2003
- *Construction & Aggregates in Fresno County* 
  October, 2003
- *Construction & Aggregates in Shasta County* 
  December, 2003
The purpose of this study is to provide economic data on the importance of the aggregates and construction industry to the California economy. While this industry is a major economic force whose contributions are widely dispersed throughout the state, the full scope of its economic benefits are generally unknown by the public and policymakers.

This report presents the economic contribution of the aggregate and construction industry's importance by:

- Examining the interconnection between California's infrastructure, economic growth, and need for aggregates;
- Defining the aggregates and construction sectors and their relationship;
- Describing the full range of economic benefits of the industry by calculating direct, indirect, and induced impacts;
- Measuring aggregate and construction's economic contributions to other major California industries;
- Determining aggregate and construction's importance to local economies as evidenced by California's Metropolitan Statistical Areas (MSAs).

California's overall population growth, rapidly growing regional areas, and neglect of decades-old infrastructure, as well as need for new infrastructure, will continue to stimulate construction activity, and in turn, demand for local supplies of millions of tons of high quality aggregates.

Through an analysis of California's MSAs, this report shows that there is a direct correlation between population and the industry's economic impacts. However, the report also shows that in areas experiencing rapid growth, aggregates and construction have even greater economic value relative to a region's size, and measured by the industry's per capita output.

Finally, while the economic information herein is impressive, the benefits that flow to communities extend beyond the economic to all aspects of daily life. Products and services from the aggregates and construction industry are essential for supporting and sustaining all three interdependent spheres of society: the economy, social well-being, and the environment. Ultimately, this industry's economic impacts have even greater importance as an indicator of community livability, and for how California chooses to plan its future.
Executive Summary

This report assesses the economic contributions of the aggregates and construction industry in California measured by industry output, including revenues, employment, wages, and value-added impacts; input into the production of other major industries; and the importance of aggregates and construction to local economies.

SIGNIFICANT FINDINGS:
Based on 2003 data, this study finds that:

- The aggregates and construction industry is California’s 4th largest industry. Only manufacturing, financial services, and professional and business services are larger.

- The aggregate and construction industry’s total economic impact on the California economy is $230 billion – 16% of all California industry output.

- The direct output of the aggregates and construction industry in California is $121 billion – an increase of 7% since 1998.

- Aggregates and construction contribute $13.8 billion to other California industries. Of this, the largest beneficiary is financial services, including real estate development, at $4.7 billion, followed by manufacturing at $2.4 billion.

- Job growth outpaced other industries in California. Between 1998-2003, employment growth in aggregates and construction was 34%, compared to overall California employment growth of 6%.

- Aggregates and construction creates and supports over 1.8 million California jobs, a 49% increase over 1998.

- California workers earned over $86 billion from aggregates and construction activities. Direct wages and compensation paid by aggregates and construction totaled $43 billion – an increase of $18 billion from 1998.

- Aggregate and construction workers earn above average wages and compensation. The average salary and compensation for workers in aggregates and construction is $52,100.

- At $63,300, the aggregates industry alone pays some of the highest wages and compensation in the state. Compared to other industries, aggregate salary packages rank 4th overall. Construction’s average wage and compensation is $51,700, ranking it as the 8th highest average wage.

- The aggregate and construction industry’s contribution of $116 billion in value-added impacts benefits local California communities.

- There is a direct correlation between population and aggregate and construction’s direct output. However, measured by per capita output, the industry has even greater economic impacts in rapidly growing regional areas such as Sacramento, Santa Rosa, Stockton, San Jose, and Riverside-San Bernardino.

- There is a direct correlation between population and need for building and maintaining infrastructure. Californians use nearly 7 tons of aggregates per person per year. The State Department of Conservation forecasts a 30% shortfall of construction aggregates statewide – 3 billion tons – over the next 4 decades.

- California’s economic future, building and maintenance of infrastructure, and sustainable quality of life all depend on the accessibility and availability of large local supplies of high quality aggregates.
Part 1: The Aggregates and Construction Industry: Key Contributor to California’s Economy, Infrastructure, and Quality of Life

CALIFORNIA’S INSUFFICIENT INFRASTRUCTURE

In 2003, California’s population exceeded 36 million. New data released by the California Department of Finance indicate that the state is projected to pass the 40 million mark in 2012, and exceed 50 million by 2036.

There is a direct correlation between increased population and infrastructure requirements. Infrastructure comprises public works such as roads, highways, bridges, water and sewer systems, airports, dams, and power plants, as well as schools, libraries, and other public buildings. Residential and commercial construction is also included as infrastructure in this report.

As indicated in a 2001 study issued by California’s Commission on Building for the 21st Century, an estimated $90 billion is needed for infrastructure over the next decade. Currently, California is only producing one-half its housing needs, and although the state’s population has grown more than 50% during the past 25 years, road capacity has barely increased 7%. In the 1960s approximately 20% of state spending was directed towards infrastructure. Today that figure is closer to 3% despite tremendous growth, and outdated and crumbling infrastructure.

Keeping up with population growth, as eminent California journalist Dan Walters noted, will require California “…to build 200,000 units of housing each year, find space on the roads for 1,000-plus more vehicles each day and accommodate tens of thousands of new kids in school each year. And that doesn’t count such factors as water or sewage treatment capacity.”

In addition, while California is one of the world’s largest economies, it faces aggressive global competition for business – both to remain and to relocate in the state. Attracting highly skilled workers is also substantially influenced by quality of life issues that are directly determined by the condition of infrastructure. A dynamic economy, sustainable environment, quality school system, and a healthy quality of life all depend upon infrastructure investment.

BUILDING INFRASTRUCTURE REQUIRES AGGREGATES

Infrastructure investment by business and government depends upon the availability of products from California’s aggregate industry. Without these products the construction industry cannot build the infrastructure necessary for the state’s future. The following sections define the aggregate and construction sectors.

THE AGGREGATES INDUSTRY

Aggregates and its Uses

Sand, gravel, and crushed stone are referred to as “aggregates”. These natural resources are the first step in the construction process and used in a wide variety of products. Virtually every construction application needs and uses aggregates, whether residential, commercial, industrial, or for our public works. Construction aggregates are used in portland cement concrete (PCC), asphaltic concrete (AC), plaster, stucco, road base, subbase, and fill, and generally provide from 80-100% of the material volume in those uses. Without aggregates there would be no buildings, hospitals, roads, airports, shopping centers, homes, sewer systems, or any other structure used by Californians. Approximately 60% of all aggregates are used in public works projects, and nearly 90% of all materials required to build federal, state, and local roads consists of sand, gravel, and stone.

The chart below gives examples of infrastructure categories and related structures:

<table>
<thead>
<tr>
<th>INFRASTRUCTURE CATEGORIES</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRANSPORTATION</td>
<td>Roads, highways, bridges, ports, airports, railroad beds, and public transit</td>
</tr>
<tr>
<td>WATER RESOURCES</td>
<td>Water and sewer systems, pumping and power plants, canals, pipelines, reservoirs, and flood control structures</td>
</tr>
<tr>
<td>PUBLIC BUILDINGS</td>
<td>Schools, libraries, hospitals, laboratories, correctional facilities, and government offices; churches, synagogues, and mosques; sports’ complexes and stadiums</td>
</tr>
<tr>
<td>OUTDOOR AND RECREATIONAL</td>
<td>Parks, trails, fire stations, forest and agricultural stations</td>
</tr>
<tr>
<td>RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL BUILDINGS</td>
<td>Homes, shopping centers manufacturing plants, office complexes, agricultural structures</td>
</tr>
</tbody>
</table>
• Aggregates make up more than 94% of asphalt and 80% of concrete pavements.

• Construction of an average home requires 400 tons of aggregates, or 16 truck trailer loads.

• 38,000 tons of aggregates are required for one lane-mile of a four-lane highway, or 1,520 truck trailer loads.

• Water and sewer facilities use aggregates for filtration in water purification and sewage treatment.

• Thousands of tons of aggregates are required for water and sewage treatment plants, water storage, power plants, prisons, dams, tunnels, and erosion control.

• A school or hospital requires at least 15,000 tons of aggregates, or 600 truck trailer loads.

• Aggregates are also used in agriculture and forestry, environmental protection, and in the manufacturing of glass, paint, cosmetics, pharmaceuticals, and many other consumer products.

All Aggregates Are Not Alike
Geological conditions determine where deposits of aggregates are located. Not only are the deposits decided by nature and not people, certain physical property characteristics and qualities must be present depending on the ultimate use. Not all aggregates can be used for every construction application. For example, much of the aggregate required for making portland cement concrete (PCC) needs to be high-quality, or what is known as “concrete aggregate”, to ensure strength and durability. These aggregates are used for making PCC and asphaltic concrete (AC) because of rigorous and restrictive engineering specifications, and are the rarest and most valuable aggregate resources.

Various government agencies such as the California Department of Transportation (Caltrans), Federal Highway Administration, the US Army Corps of Engineers, and the US Bureau of Reclamation have set specifications to ensure the suitability of aggregates for specific uses. The California Geological Survey (formerly the California Division of Mines and Geology) states that “Most aggregate specifications have been established to ensure the manufacture of strong, durable structures, capable of withstanding the physical and chemical effects of weathering and use.”

Regulatory Compliance
California aggregate companies are heavily regulated and must meet the requirements of up to 80 agencies overseeing federal, state, county, and local laws. Regulations cover environmental, technical, health and safety, aesthetic, cultural, land use, and reclamation standards. Obtaining an operating permit is both intensive and extensive, involving in-depth studies and thorough data compilation. Consulting with communities, regulatory agencies, government officials, and all other interested or affected stakeholders is an equally important procedure. The permitting process often takes from 2-10 years to complete, includes substantial up-front investment by the company, and offers no guarantee of project approval. Once the permit is granted, the regulatory process continues throughout the life of the operation with continued submission of data, and inspections.

Restoring, Reclaiming, and Reusing Aggregate Lands
Our society depends upon aggregates as much as on gasoline, electricity, and food products. For most uses, there are no substitutes for aggregates — they can’t be manufactured or duplicated, and their locations are determined by geological conditions. There are few other industries that can’t be moved or grown elsewhere, or that are so critical and unique to their applications.

Nevertheless, aggregate production is an interim land use. First, aggregates and derivative materials are produced that are critical to communities and building infrastructure, and second, reclaimed land is designed and developed for diverse uses. In California, aggregate producers reclaim land to nearly 50 different and desirable uses, including open space, agriculture, recreation, parks, golf courses, commercial and residential development, lakes, and many other valuable public uses. While over 90% of California’s wetlands have been lost over the past 100 years due to statewide settlement, California’s sand and gravel producers are a major resource for creating and restoring thousands of acres of wetlands and wildlife habitat. The California Office of Mine Reclamation reports that statewide, aggregate producers have reclaimed over 50 square miles of land during the decade of 1990-2000, a size comparable to the City and County of San Francisco.
Many land use projects are the result of successful partnerships between aggregate producers, communities, and local and county governments. Whether reclaimed to residential or commercial developments that generate additional economic value, or to recreational uses for the public's enjoyment, reclaimed aggregate land is a community asset.

**Looming Aggregate Shortages Compromise California's Future**

Building and maintaining California's infrastructure requires hundreds of millions of tons of locally produced high quality aggregates. Currently, Californians use nearly 7 tons of aggregates per person per year. As aggregate use levels are directly related to population, it is likely that statistic will rise. In the US, the average per capita demand for aggregates is nearly 11 tons per person per year.

In 2001, the California Department of Conservation forecast a 50-year aggregates demand of 10 billion tons. However, total permitted aggregate reserves at that time stood at 7 billion tons, resulting in a shortage of 3 billion tons, or a 30% shortfall statewide. Of even more concern is the Department's 2002 report itemizing counties and regions having less than 10 years of permitted aggregate resources available, and other areas having less than half of their projected 50-year aggregate demand.

Aggregates are a low-value, high weight commodity, and supplies must be obtained locally or transportation costs can rapidly exceed the value of the aggregates. The farther aggregates are transported, the more expensive they become. Hence, transportation costs are a principal factor in establishing the market area of an aggregates operation. For example, a one-way haulage distance of 20-25 miles, or a round trip of about 40-50 miles, "approximately doubles the final delivered price of aggregates to the consumer." These costs increase home prices, and are much higher in large projects such as highways, shopping centers, office buildings, schools, hospitals, and airports.

There are also additional environmental and safety impacts associated with longer-distance transport. Increased fuel consumption, air pollution, traffic congestion, and road maintenance all affect the environment, and longer transportation distances also raise safety concerns.

Finally, lands hosting aggregate deposits must be locally available and accessible if they are to benefit their communities. To ensure that is possible, earlier land-use planning had to have recognized the area's natural resources and their importance to the entire community and/or county.

The aggregates industry includes the following:
- Dimension Stone
- Sand & Gravel
- Nonmetallic Minerals
- Misc. Nonmetallic Minerals
- Paving Mixtures & Blocks
- Asphalt Felts & Coatings
- Cement, Hydraulic
- Concrete Block & Brick
- Concrete Products
- Ready-Mixed Concrete
- Gypsum Products

**THE CONSTRUCTION INDUSTRY**

The construction industry is the largest single industry in the U.S. accounting for 15% of the gross national product. While California often describes itself as a "knowledge-based service economy," emphasizing its strengths in high-tech, biotech, and professional services, 1 out of every 7 new jobs in the state is in the construction industry.

In fact, 12% of all construction in the US is in California, and according to the Bureau of Economic Analysis, more than $55 billion was invested in construction in California in 2000. One-fourth of the top 50 contractors, and 22% of the top 50 specialty contractors in the US are based in California.

The construction industry builds structures for both the public and private sectors, including roads, highways, bridges, dams, commercial buildings, hospitals, power plants, pipelines, sewage treatment facilities, homes, apartments, railroads, and airports. The term "construction" includes new work, additions, alterations, reconstruction, installations, and repairs. In other words, virtually every project that needs building, remodeling, or repairing involves some sector of the construction industry.

The industry employs a wide range of trades and craftspeople, as well as architects, engineers, contractors, supervisors, truck drivers, equipment operators, and skilled and unskilled labor.

Generally, the construction industry is classified into four broad categories based on the kinds of work
performed by contractors: a) highway, b) heavy construction, c) general building (including home building), and d) special trade contractors.

Highway contractors usually work under a federal, state, county, or city contract, and build roads, highways, bridges, and airports. All of these activities require large amounts of aggregates. For example, road and highway pavement is generally either asphaltic concrete or portland cement concrete. Asphaltic concrete pavement consists of a mixture of fine and coarse aggregates and asphalt binders. In the case of portland cement concrete pavement, cement is mixed with fine and coarse aggregates, sand, and water which produce a rigid high-strength concrete.

Along with highway contractors, heavy construction contractors are big earthmovers. This sector of the industry builds foundations, bridges, dams, and tunnels. Huge quantities of concrete are used in these projects, and aggregates make up between 70-80% of the volume of concrete.

General building contractors erect commercial and industrial buildings, as well as homes and apartments. All of these structures use significant amounts of aggregates in the building process. The special trade contractors are the skilled craftspeople who work in sequence after the foundation is completed; e.g., iron workers, form builders, electricians, plumbers, steam fitters, glaziers, plasterers, tile setters, painters, and woodworkers are some of the specialties often required.11

For this report, the construction industry includes:
- New Residential Structures
- New Industrial & Commercial
- New Utility Structures
- New Highways & Streets
- New Farm Structures
- New Mineral Extraction Facilities
- New Government Facilities
- Maintenance & Repair, Residential
- Maintenance & Repair Other Facilities

Footnotes
5. Don Dupras, Mineral Land Classification of Alluvial Sand and Gravel, Crushed Stone, Volcanic Cinder, Limestone, and Diatomite within Shasta County, California (Sacramento: California Department of Conservation, Division of Mines and Geology, 1997), 25.
Part 2: The Importance of Aggregates and Construction to California’s Economy

Introduction
Part 2 of this study describes the full range of the economic impacts of the aggregates and construction industry to the California economy in 2003. Because aggregates — sand, gravel, and crushed stone — are the basic raw materials integral to construction, aggregates and construction are analyzed together. The economic information provided herein includes the following:

- Direct, indirect, and induced impacts of the industry;
- Economic contributions to other major California industries;
- The importance of aggregates and construction to local economies as evidenced by California’s Metropolitan Statistical Areas (MSAs).

Output of California’s Industries – 2003
Aggregates and Construction is California’s 4th largest industry

Between 1998-2003, California’s industrial output grew 27%. In 2003, California industries produced over $1.4 trillion in revenue and wages (output), increasing from $1.1 trillion in 1998. With $361 billion in output, manufacturing is the largest economic contributor, followed by financial services with $228 billion, and professional and business services with $198 billion.

The fourth largest industry in the state is aggregates and construction with over $121 billion in output.¹

The aggregate and construction industry’s output exceeded other large industries in the state including retail and wholesale trade, education and health services, and leisure and hospitality. Chart 1 ranks California’s major industries by their 2003 output.

Aggregates and Construction Benefit California’s Economy
In 2003, Aggregates & Construction Contributed $13.8 billion to other California Industries

The aggregates and construction industry is not only a major economic force throughout California, but is also important to other industries. As such, the economic activities of aggregates and construction also include contributions that are measured by their input into the production of goods and services of other business sectors. In some cases, such as agriculture, these linkages are in the form of direct commodity production, while in other industries,

¹ Aggregate industries that are in mining and manufacturing have been removed from those categories so that their impact is not double counted. Therefore, the mining and manufacturing industries are "the remainder" with the aggregate-related industries removed.
such as financial services, the contributions are in the form of new construction or maintenance of existing structures.

In 2003, the aggregates and construction industry contributed $13.8 billion to other California industries. The largest beneficiary of aggregates and construction was financial services. Financial services, including developers of real estate, realized a direct contribution of $4.7 billion from the products and services of aggregates and construction. With $2.4 billion in input for its production needs, manufacturing was the second largest beneficiary of aggregates and construction. Other industries using significant contributions from aggregates and construction were utilities, education and health services, and leisure and hospitality. Chart 2 shows the contributions made by the aggregates and construction industry to California's other industries in 2003.

**Aggregate and Construction's Total Impact on the California Economy is $230 billion**

In addition to the direct impact on the California economy, and on the commodity production of other industries, the aggregates and construction industry creates wealth through the linkages of wages paid and products purchased. These linkages create jobs and produce impacts directly and indirectly throughout the economy.

As shown in Chart 3, the direct output of the aggregates and construction industry was $121 billion. The products and services purchased by aggregates and construction in turn created an additional output of $51 billion. Finally, the spending and benefits from the jobs created through the industry's purchases had an impact of $57 billion. When all economic data are included, the total magnitude of the aggregates and construction industry on the California economy is nearly $230 billion, or 16% of California's $1.4 trillion output.

**Aggregates and Construction Create Jobs and Output in other Industries**

As a major industry throughout California, aggregate and construction's economic activities extend beyond their operations by helping create jobs and output in other industries.
An input-output model analyzes the economic impacts that are caused by one industry on another. The model evaluates the effects of industries on each other based on the premise that industries use the outputs of other industries as inputs. This full range of economic activity is measured as direct, indirect, and induced impacts:

Direct Impacts consist of economic activity related exclusively to the aggregates and construction sector. This includes all expenditures made by the aggregates and construction industry, and directly-related employment, including wages and compensation.

Indirect Impacts is additional economic activity (e.g., revenues, wages and compensation, and taxes) created by linked businesses from the products and services purchased by aggregates and construction.

Induced Impacts measure the consumption expenditures of direct and indirect industry employees. Examples of induced impacts include employee expenditures on retail purchases, housing, and insurance.

Employment in the Aggregates and Construction Industry
1.8 Million California Jobs Resulted from Aggregates and Construction

From 1998-2003, employment in the aggregates and construction industry grew from 626,000 to 838,000—a 34% increase. In addition to direct employment, purchases made by aggregates and construction supported an additional 437,000 jobs, and spending from indirect employment resulted in another 561,000 induced jobs. Altogether, the aggregates and construction industry created and supported over 1.8 million jobs in 2003. This is a 49% increase from the estimated 1.2 million jobs that benefitted from aggregates and construction in 1998. Chart 4 shows the 2003 employment impact of the aggregates and construction industry.

Wages and Compensation of Aggregates and Construction
California Workers Earned over $86 Billion from Aggregate & Construction Activities

Chart 5 shows the total wages and compensation paid by the aggregates and construction industry. In 2003, the direct wages and compensation paid by
aggregates and construction totaled $43 billion. This is an $18 billion increase (non-inflation adjusted) from 1998’s estimate of $25 billion. The indirect wages and compensation paid due to the activities of aggregates and construction in 2003 was $20 billion, and induced wages and compensation were estimated at $21 billion. In total, California workers earned over $86 billion from the activities of the aggregates and construction industry.

**Average Wages Paid by Aggregates and Construction and Linked Industries**

Aggregate & Construction Workers Earn Above Average Wages and Compensation

Chart 6 shows that in 2003 aggregates and construction workers earned an average of $52,100 in wages and compensation. The average wage paid indirectly by industries linked to aggregates and construction is estimated at $47,900, and induced wages paid an average of $39,000.

**Industry Comparison of Average Wages and Compensation**

Aggregate Workers Paid One of State’s Highest Wages

At $63,300, the average wage and compensation paid by the aggregates industry is one of the highest in the state. When compared to other industries, wages and compensation for aggregates rank 4th highest overall. The only industries that pay higher wages than aggregates are utilities, manufacturing, and mining (not including aggregates). Construction’s average wage and compensation is $51,700 and is the 8th highest average wage. Chart 7 compares the average wage and compensation paid per employee in 2003 for all of California’s major industries.

**The Value-Added Contribution of the Aggregates and Construction Industry to the California Economy**

High Value-Added Impacts Benefit Local Communities

The value-added component of the impacts attributed to the aggregates and construction industry was $116 billion in 2003. As a measure of the net benefits provided by the industry in such areas as payments made to workers, interest paid, earned profits, and indirect business taxes, the value-added portion is an important indicator.
The direct value-added impact of aggregates and construction was $50 billion. The indirect value-added impact was $30 billion, and induced value-added impacts were $36 billion. The indirect and induced impact amounts are significant portions compared to direct output.

That is, with total output of $230 billion, indirect and induced impacts were 43 and 47% respectively, as percentages of direct output. In the case of value-added, the percentages of indirect and induced impacts are 59 and 71%.

In layman’s terms, value-added components usually mean a net benefit to a place, e.g., strong value-added contributions result in bigger economic benefits to local communities.

**Local Impacts of the Aggregates and Construction Industry in California**

The aggregates and construction industry has seen growth throughout California. This section looks at the local impacts of aggregates and construction,
and the changes that have occurred in output and employment, based on California's Metropolitan Statistical Areas (MSA). This information provides context for tracking the industry's greatest growth, and/or most significant economic impacts.

**Output of the Aggregates and Construction Industry by California MSA**

From 1998-2003, the direct output of the aggregates and construction industry increased in every California MSA. The MSA with the largest output is Los Angeles – Long Beach. In 1998, the Los Angeles – Long Beach area's direct output was a little under $15 billion, growing to over $24 billion in 2003.

**California MSAs Exceeding $10 Billion in Output:**
- Los Angeles – Long Beach
- Riverside – San Bernardino
- Orange County
- San Diego
- Oakland

**Smaller MSA's with a large impact include:**
- Santa Rosa
- Ventura
- Bakersfield
- Fresno

**Employment in the Aggregates and Construction Industry by California MSA**

In addition to output, employment in aggregates and construction has also seen growth throughout California. Like output, the greatest concentration in employment is in the Los Angeles – Long Beach MSA, with over 169,000. Other MSAs with large employment concentrations include Riverside – San Bernardino at 90,000, Orange County with 83,000, and San Diego at 77,000. Together these MSAs are 50% of all aggregates and construction employment in the state. Chart 10 shows the employment for aggregates and construction by MSA for California in 1998 and 2003.

**MSA's with Exceptional Output and Employment Growth**

Although aggregates and construction has grown throughout the state, some areas have experienced greater change than others. In regions experiencing rapid growth, the local economic contributions of aggregates and construction can be, relative to a region's size, more important to those areas.
### Per Capita Output for the Aggregates and Construction Industry by California MSA, 2003

<table>
<thead>
<tr>
<th>MSA</th>
<th>Direct Output</th>
<th>Population</th>
<th>Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Rosa</td>
<td>$2,626,015,000</td>
<td>472,666</td>
<td>$5,600</td>
</tr>
<tr>
<td>San Francisco</td>
<td>$8,247,985,000</td>
<td>1,759,047</td>
<td>$4,700</td>
</tr>
<tr>
<td>San Jose</td>
<td>$8,079,878,000</td>
<td>1,729,917</td>
<td>$4,700</td>
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<tr>
<td>Oakland</td>
<td>$10,952,436,000</td>
<td>2,491,126</td>
<td>$4,400</td>
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<tr>
<td>Santa Cruz</td>
<td>$1,139,764,000</td>
<td>259,844</td>
<td>$4,400</td>
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<tr>
<td>San Luis Obispo</td>
<td>$1,107,752,000</td>
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<td>Sacramento</td>
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<td>$4,100</td>
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<td>San Diego</td>
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<td>Yolo</td>
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<td>Riverside – San Bernardino</td>
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<td>Santa Barbara</td>
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<td>Fresno</td>
<td>$2,451,347,000</td>
<td>972,591</td>
<td>$2,600</td>
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<td>$24,589,971,000</td>
<td>9,979,818</td>
<td>$2,500</td>
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<td>Yuba City</td>
<td>$358,556,000</td>
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<td>Chico-Paradise</td>
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<td>Visalia</td>
<td>$783,669,000</td>
<td>386,246</td>
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<tr>
<td>Merced</td>
<td>$348,090,000</td>
<td>225,138</td>
<td>$1,600</td>
</tr>
</tbody>
</table>

**TOTAL OF ALL MSA**  
$117,667,915,000  
34,429,467  
$3,500

Source: Applied Development Economics from the Minnesota Implan Group Input – Output model v.2; California Department of Finance Demographic Unit

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**Other MSA Areas with Significant Aggregate & Construction Growth:**
- **Stockton:** Output grew by 112% ($952 million)
- **San Jose:** Output grew by 107% ($4.1 billion)
- **Riverside – San Bernardino:** Output grew by 104% ($6.2 billion)

Altogether, output grew by 94% from 1998 to 2003 in the California MSAs and employment grew by 35%. Chart 11 shows the percentage change in employment into per capita output for aggregates and construction by California MSA from 1998-2003.

- **Per Capita Output by MSA**
  Another measure of the importance of aggregates and construction to local economies is the per capita output. Using this measure it is easy to see what areas of the state receive large benefits from aggregates and construction relative to their size:
  - **Santa Rosa:** On a per capita basis, the Santa Rosa MSA receives the largest economic impact from the aggregates and construction industry. In the Santa Rosa MSA, the direct output of aggregates and construction produced is $5,600 per resident.
  - **San Francisco/San Jose:** The next two largest beneficiaries of aggregate and construction's economic impacts measured on a per capita basis are San Francisco and San Jose. Both the San Francisco and San Jose MSAs receive an impact of $4,700 per resident of aggregates and construction output.
  - **Other MSAs with large per capita impacts include:**
  - Oakland
  - Santa Cruz
  - San Luis Obispo
  - Sacramento
  - Redding
  - Orange County
  - Vallejo

- **Sacramento:** From 1998-2003, the Sacramento MSA saw the most dramatic change in output and employment for aggregates and construction. During this period, the Sacramento MSA added 27,000 employees and grew by over $4 billion in output. For the Sacramento MSA this was a growth rate of over 200% for output, and 112% for employment.

- **Santa Rosa:** The next MSA with the greatest output growth was Santa Rosa. In this MSA, employment grew by 40% and output by 128%, resulting in an additional 4700 employees in aggregates and construction, and output growth of $1.4 billion.
Conclusion

As this report shows, the aggregate and construction industry provides the foundation for our infrastructure and our economy. Throughout California the full range of economic impacts of the aggregates and construction industry can be measured by the growth and magnitude of its output, as well as its significance to other industries and to local communities. This study finds that:

- The aggregates and construction industry is California's 4th largest industry and its total economic impact is $230 billion – 16% of all California industry output.

- The industry's direct output is $121 billion, and it contributes $13.8 billion to other California industries;

- Job growth outpaced other California industries. Aggregates and construction creates and supports over 1.8 million California jobs and workers earned over $86 billion from the industry's activities. Aggregates and construction pay some of the highest wages and compensation in the state.

- Value added impacts total $116 billion and particularly benefit local communities;

- While there is a direct correlation between population and the industry's direct output, measured by per capita output, the industry has even greater economic impacts in rapidly growing regional areas;

- Californians use nearly 7 tons of aggregates per person per year. The State Department of Conservation forecasts a 30% shortfall of construction aggregates statewide – 3 billion tons – over the next 4 decades.

- California's economic future, infrastructure, and quality of life all depend on the accessibility and availability of large local supplies of high quality aggregates.

In addition to the aggregate and construction industry's major economic impacts throughout the state, a broader perspective indicates that the benefits of this industry far exceed the economic. Community livability depends upon three
interdependent spheres: economic, social well-being, and the environment. Aggregates are often used in projects that protect the environment; in the building of sports fields, golf courses, and other recreational uses; in the cultivation of forestry seedlings and the growth of agricultural crops, and for water filtration and storage. In short, there are few uses or activities in daily life that aggregates aren't part of, even if unknown or unrecognized. Aggregates are important contributors to the three key areas of community livability.

Local Aggregate Supplies are Essential for Preserving California’s Golden Dream

Somehow in the next 20 years infrastructure will need to be built and/or maintained to accommodate another 15 million people, including transportation systems, school facilities, and water projects. No matter how efficiently and effectively we use the current systems, many are crumbling after decades of use, and most are already straining at maximum levels of capacity. Local media, government, institutes, and trade associations regularly cite hundreds of statistics related to California's traffic congestion, economic and productivity losses, lack of affordable housing, longer commutes, overcrowded schools, insufficient energy capacity, and environmental degradation. Perhaps worst of all is the public's sense that the state is failing to plan both for growth and the existing growth-related problems that will be exacerbated in the future.¹

As described in this study, aggregates are fundamental to all construction. A 1996 study by Coopers & Lybrand reported that “90% of the production of aggregates is used directly or indirectly in construction...for road beds and building foundations and in concrete, asphalt and other building materials.”² Without aggregates there would be no buildings, hospitals, roads, airports, shopping centers, homes, sewer systems, or any other structure used by Californians.

Building and maintaining sufficient infrastructure will require large local supplies of high quality aggregates. Californians already use 7 tons of aggregates per person per year, and because of the state’s population projections and the correlation between population and need for aggregates, that figure is likely to increase. In the US, the average per capita demand for aggregates has grown to nearly 11 tons per person per year.³

In several county studies undertaken on this industry, as well as a report issued by the California Department of Conservation, it has been found that many areas in California are at risk of running out of aggregates in a few short years. The findings and conclusions of these reports have important implications for how California plans its future. California residents must be able to count on having aggregate lands available and accessible for production. To ensure that is possible, land-use planning must recognize the importance of this resource to communities and/or regions. Ironically, decisions favoring other land uses often preclude aggregate accessibility even though projections from the state have warned of the upcoming depletion of those very aggregates dependent upon by residents for economic growth, public infrastructure, environmental protection, and community livability.

California citizens and policymakers will need to direct much more attention to local aggregate availability to secure our infrastructure and ensure California’s future.


Glossary

Direct output: This is the contribution directly attributed to an industry— their employees, revenues and wages.

Employee compensation: wage and salary payments as well as benefits, including health and life insurance, retirement payments and other non-cash compensation.

Indirect effect: the secondary impact caused by changing input needs of directly affected industries (e.g., additional input purchases to produce additional output).

Indirect business taxes: consist primarily of excise and sales taxes paid by individuals to businesses; these taxes occur during the normal operation of the businesses but do not include taxes on profit and income.

Indirect output: the revenues, salaries and taxes generated by the purchases made by an industry.

Industries: the collection of businesses in an economy within a given region; purchasing goods and services and paying workers.

Labor income: represents all forms of employment income as the sum of employee compensation and proprietor income.

Output: industry output is a measure of the value of goods and services produced in a given area.

Proprietary income: consists of payments received by self-employed individuals as income. This includes income received by private business owners, doctors, lawyers and so forth.

Value-added: employee compensation, proprietary income, other property type income, and indirect business taxes. Generally, the value of goods and services less the cost of materials.

Appendix A

California Metropolitan Statistical Areas Defined

The general concept of a metropolitan area (MA) is one of a large population nucleus, together with adjacent communities that have a high degree of economic and social integration with that nucleus.

Each MA must contain either a place with a minimum population of 50,000 or a Census Bureau-defined urbanized area and a total MA population of at least 100,000. A MA comprises one or more counties. A MA may also include one or more outlying counties that have close economic and social relationships with the central county. An outlying county must have a specified level of commuting to the central counties and also must meet certain standards regarding metropolitan character, such as population density, urban population, and population growth.

In California the Metropolitan Areas are:

- Bakersfield (Kern County)
- Chico-Paradise (Butte County)
- Fresno (Fresno and Madera Counties)
- Los Angeles-Long Beach (Los Angeles County)
- Merced (Merced County)
- Modesto (Stanislaus County)
- Oakland (Alameda and Contra Costa Counties)
- Orange County (Orange County)
- Redding (Shasta County)
- Riverside-San Bernardino (Riverside and San Bernardino Counties)
- Sacramento (Sacramento, Placer and El Dorado Counties)
- Salinas (Monterey County)
- San Diego (San Diego County)
- San Francisco (Marin, San Francisco and San Mateo Counties)
- San Jose (Santa Clara County)
- San Luis Obispo-Alascadero-Paso Robles (San Luis Obispo County)
- Santa Barbara-Santa Maria-Lompoc (Santa Barbara County)
- Santa Cruz-Watsonville (Santa Cruz County)
- Santa Rosa (Sonoma County)
- Stockton-Lodi (San Joaquin County)
- Vallejo-Fairfield-Napa (Napa and Solano Counties)
- Ventura (Ventura County)
- Visalia-Tulare-Porterville (Tulare County)
- Yolo (Yolo County)
- Yuba City (Sutter and Yuba Counties)
THE IMPLAN ECONOMIC MODEL
The IMPLAN United States Economic Model
The IMPLAN economic impact model was used to estimate the economic and tax contributions of the aggregate & construction to the California economy in 2003. The model, which is licensed by the Minnesota IMPLAN Group, Inc., was developed over a period of eight years at the University of Minnesota. IMPLAN is used by more than 500 universities and government agencies to estimate the economic and fiscal impacts of investments and/or changes in industry employment. IMPLAN is an economic impact assessment modeling system that estimates the national and local, private-sector impacts of economic changes.

IMPLAN Economic Impact Analysis
IMPLAN is an input-output model. Input-output accounting describes commodity flows from producers to intermediate and final consumers. The total industry purchases of commodities, services, employment compensation, value added, and imports is equal to the value of the commodities produced. Purchases for final use (final demand) drive the model. Industries producing goods and services for final demand purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the jurisdiction (imports and taxes) stop the cycle.

The model summarizes these complex interactions as economic multipliers, which can be used to estimate the total economic impact of the employment, sales and taxes generated by the industries in California. No adjustments were made to the model for specific industries or special conditions in California.

Industry Definition
IMPLAN industrial sectors are made up of BEA (Bureau of Economic Analysis) Commodity and Standard Industry Classifications (SIC). The industries defined for the model constructed for aggregates & construction in California contain aggregated and partial industry sectors as defined by Standard Industry Classifications. Below is a crosswalk for the industries from the IMPLAN model to the Standard Industry Classifications.

APPLIED DEVELOPMENT ECONOMICS (ADE)
Applied Development Economics, Inc. is a consulting firm specializing in economic planning and development services. Since its founding in 1985, the firm has established a distinguished body of work resulting in tangible benefits for clients. ADE’s private and public sector clients include government agencies, economic development organizations, foundations, research institutes, businesses, and private investors. ADE’s services include Economic Development Research and Strategy; Economic Analysis and Forecasting; Planning, including General, Strategic, and Downtown Revitalization; Funding, Financial Analysis, and Infrastructure Financing Plans.

ADE has worked on local and regional projects throughout the Western United States. The firm has received many national and regional awards.

<table>
<thead>
<tr>
<th>IMPLAN Sector to SIC Crosswalk</th>
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<tr>
<td>IMPLAN Sector</td>
</tr>
<tr>
<td>CONSTRUCTION</td>
</tr>
<tr>
<td>New Residential Structures</td>
</tr>
<tr>
<td>New Industrial And Commercial</td>
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<td>New Utility Structures</td>
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<tr>
<td>New Highways And Streets</td>
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<td>New Farm Structures</td>
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<tr>
<td>New Mineral Extraction Facilities</td>
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<td>New Government Facilities</td>
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<td>Maintenance And Repair Other Facilities</td>
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<td>AGGREGATES</td>
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<tr>
<td>Sand And Gravel</td>
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<td>Nonmetallic Minerals</td>
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<td>Paving Mixtures And Blocks</td>
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<tr>
<td>Ready-Mixed Concrete</td>
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Source: IMPLAN Pro
About the Authors

Randy Evans, ADE
As an associate with ADE, Randy Evans specializes in economic base analysis, industrial development studies, retail impacts, tourism analysis and downtown revitalization. He is also skilled in survey research and land use issues. Mr. Evans has conducted extensive analysis of employment and occupational trends for a variety of industries and has performed numerous input-output studies for different industries and geographies.

Mr. Evan's background is in economic geography, including use of Geographic Information Systems. Before ADE, Mr. Evans worked for the California Department of Fish and Game helping to expand the California Wildlife Habitat Relationship System, perform habitat evaluations and create species range maps.

Mr. Evans earned his B.A. in geography from California State University, Sacramento. Mr. Evans has also completed his masters in Social Science, with a concentration in globalization and cultural studies at Humboldt State University, where he was designated a Sally Casanova Pre-Doctoral Scholar.

Sharon Prager, e concepts
Sharon Prager is President and Principal Consultant of e concepts, a San Mateo firm specializing in communications and sociocultural research. e concepts consults to businesses and non-profits ranging from construction, aggregates, and mining, to county arts organizations.

Ms. Prager has over two decades experience in the transportation and mining industries, including over a decade with BHP Billiton, the world's largest diversified resources company. Her background includes co-authoring, with Applied Development Economics, a series of state and county economic impact studies of the construction and aggregates industry in California, as well as co-authorship of an investment study with The Fraser Institute in Vancouver, Canada. Ms. Prager's articles have appeared in trade magazines and environmental proceedings, and she is a speaker at major industry conferences.

Ms. Prager has a Masters degree from Stanford University, and as Development Director for "Broadway by the Bay" in San Mateo, is active in the arts.