

CALIFORNIA NON-FUEL MINERALS 2006

By Susan Kohler, Senior Geologist, California Geological Survey

Based on the U.S. Geological Survey's (USGS) preliminary data for 2006, California ranked third behind Arizona and Nevada in non-fuel mineral production, accounting for approximately 7% of the nations' total. The market value of mineral production for California was \$4.6 billion. California produced about 30 different industrial minerals during the year. The only metals produced were gold, silver, and iron (used in cement manufacturing). California led the nation in the production of sand and gravel, portland cement, diatomite and natural sodium sulfate, and was the only producer of boron. The state ranked second behind Texas for masonry cement. California ranked 7th in gold production out of 10 states that reported for the year. Other minerals produced include common clay, bentonite clay (including hectorite), crushed stone, dimension stone, feldspar, fuller's earth, gemstones, gypsum, iron ore, kaolin clay, lime, magnesium compounds, perlite, pumice, pumicite, rare earths, salt, silver, soda ash, and zeolites.

There were about 800 active mines producing non-fuel minerals during 2006. Approximately 10,300 people are employed at these mines and their processing plants.

INDUSTRIAL MINERALS

Construction sand and gravel was California's leading industrial mineral in terms of value, with an estimated total of \$1.5 billion for 178.6 million tons produced. Vulcan Materials Company led the state in the production of sand and gravel. California's second largest mineral commodity was portland cement valued at nearly \$1.3 billion, an increase of about 10.6% from 2005. Portland cement production in 2006 amounted to 12.9 million tons. U.S. Borax and Chemical Inc, (a subsidiary of Rio Tinto Inc.), led the state and nation in the production of boron at their Boron Mine facility in Kern County. California produces about 25% of the world's boron. Valued at \$731 million, boron was California's third highest dollar-value mineral produced in 2006. Crushed stone ranked fourth in the state with a value of \$482 million, a 6% increase from last year. Granite Rock's Wilson Quarry continued to be California's largest crushed rock mine for 2006.

AGGREGATE

Hanson Aggregates began mining a 139-acre expansion of its existing Sunol sand and gravel operation in Alameda County. Hanson purchased the Sunol mine from Mission Valley Rock Company in June 2005. The expansion adds 43 million tons of construction sand and gravel reserves to the south San Francisco Bay region, which currently is in short supply of aggregate.

A revised EIR was submitted to Tulare County for Kaweah River Rock Company's proposal to mine 280 acres of land south of the company's existing operation. In 2005, a superior court ruled that the environmental impact report prepared for the project failed to adequately address environmental issues. The EIR currently is undergoing public review. The Board of Supervisors is scheduled to make its decision on the revised EIR in spring 2007. If approved, Kaweah River Rock expects to start mining the additional acreage by July 2007. The mine expansion will add 15-20 million tons of alluvial sand and gravel reserves to the northern Tulare County area.

The Madera Ranch Quarry project in Madera County was approved in October 2006. The permit allows for approximately 45 million tons of construction aggregate to be mined over a period of 50 years. Production is limited to 900,000 tons annually. The project will include an asphaltic concrete plant. Rock mined at the site will be marketed largely in Madera and Fresno areas.

San Benito Supply Inc. began mining its Hidden Canyon Rock Quarry located near the city of Greenfield in Monterey County that was approved in March 2005. The permit allows for approximately 7 million tons of crushed granite and 3.5 million tons of decomposed granite to be mined over a period of 20 years. A maximum of 300,000 tons of rock can be mined annually from the site.

Granite Construction Company, Inc. announced its plans for the Liberty Quarry project, a proposed 155-acre crushed rock quarry located in southeastern Riverside County, about 3 miles south of Temecula near the Riverside/San Diego county border. If approved, the quarry would provide approximately 270 million tons of construction aggregate to the eastern San Diego County region over the next 75 years. The proposed operation would produce up to 5 million tons annually. The eastern San Diego County region currently has about 17 percent of the permitted aggregate resources that it will need for the next 50 years.

Granite Construction Company Inc. began mining and processing aggregate in June 2006 at its Handley Ranch Quarry, located about 15 miles southeast of Salinas in Monterey County. The permit, approved in 2004, allows for about 120 million tons of construction grade aggregate to be mined over a period of 113 years.

Canyon Rock Inc. was granted a permit expansion in December 2006 to mine an additional 32 acres at its Canyon Rock Quarry located in Sonoma County. The new permit allows for an additional 15 million tons of construction aggregate to be mined over a period of 20 years. Canyon Rock plans to begin construction on a new plant in the winter of 2007.

In November 2006, a State appellate court reversed a 2004 superior court ruling that halted Teichert Inc.'s plans for a 696-acre aggregate mine and processing plant located about four miles northwest of Lincoln in Placer County. The

proposed Lincoln project will provide about 70 million tons of construction sand and gravel to Placer and Sacramento counties.

Importation of aggregate by ship and barge continued to take place from Canada and Mexico. Most of the aggregate was shipped into the San Francisco and San Diego areas. California imported about 3.2 million tons of sand and gravel during 2006. Hanson Aggregate is the largest importer of aggregate in the state.

OTHER INDUSTRIAL MINERALS

Molycorp Inc.'s world class Mountain Pass Mine in San Bernardino County remains closed for mining, but rare earths are still being produced at the mine site from bastnasite ore stockpiled in the late 1990's and in 2002. Most of the product currently produced at the mine is lanthium concentrate, used mainly as a fluid cracker for oil refining. A reclamation permit was approved in July 2004 allowing some processing activities to take place, but separation facilities are temporarily closed subject to the resolution of wastewater disposal issues. Molycorp has not set a date for resuming mining.

The modernization of Texas Industries, Inc.'s Oro Grande cement plant and mining/crushing facilities in San Bernardino County began in late 2005. The \$360 million two-year project will almost double the annual cement processing capacity from 1.2 to 2.3 million tons. The new facilities are scheduled for completion in fall of 2007.

Mitsubishi Cement Corp. continued to mitigate environmental impacts associated with its proposed 200-acre Cushenbury Limestone Mine expansion in San Bernardino County. The expansion, approved in October 2004, added 50 million tons of cement-grade limestone to the company's existing reserves at the mine.

METALS

Despite the continued increasing gold prices during the year, California's production continued to decline in 2006. Annual production amounted to about 32,400 ounces – a 50 percent decrease from 2005 production of 65,300 ounces. Gold value amounted to \$19.6 million for 2006 as compared to \$29 million for 2005.

Production from existing leach pads continued during 2006 at Western Goldfields Inc.'s Mesquite Mine in Imperial County and Canyon Resources Corporation's Briggs Mine in Inyo County. Mining ceased at these properties in 2001 and 2004, respectively.

Western Goldfields, Inc. continued activities to reopen and expand its Mesquite Gold Mine in Imperial County. Mining ceased in 2001 when gold prices dropped and mining became unprofitable. Since Western Goldfields purchased the

property from Newmont Mining Corporation in 2003, considerable progress has been made towards reopening the mine. In preparation, the company has made a fleet purchase commitment of \$67 million and has also committed \$30.9 million to upgrade the plant and infrastructure, including construction of new leach pads. The company expects stripping operations to begin in June 2007 and the first ore to be placed on leach pads by January 2008. Full production is anticipated by April 2008. Once in full operation, projected annual production is 165,000 ounces. Drilling during the first half of 2006 confirmed gold reserves of 2.36 million ounces. Western Goldfields anticipates a substantial increase in reserves upon completion of a 70,000-foot drilling program initiated in September 2006.

Feasibility studies for restarting both open pit and underground mine operations were conducted throughout the year by Canyon Resource Corporation at their Briggs Mine in Inyo County. The studies included exploratory drilling on two high-grade underground mining targets associated with the Goldtooth Fault and an open pit target located between the previously mined Briggs North and Goldtooth pits. Proven reserves for these deposits are estimated at 130,000 ounces. Canyon Resources also explored the Cecil R deposit, a non-permitted property located four miles north of the Briggs Mine. Six holes totaling 2,030 feet were drilled during the year. Information from these holes and prior drilling in the area show an estimated 5.75 million tons of gold ore averaging 0.024 ounces per ton. In July 2006, Canyon Resources acquired the Suitcase and Mineral Hill properties (also non-permitted) located in close proximity to the Cecil R deposit. Previous exploration in these areas by a number of companies has delineated favorable gold ore zones.

Sutter Gold Mining Inc. conducted a \$1.2 million 18,000-foot drilling program during the year at its Sutter Gold project in Amador County. Results from this program should be out in spring 2007. The project comprises 535 acres along a 3.2-mile segment of the Mother Lode belt and includes the historic Lincoln Mine. In 2005, Sutter Gold Mining Company was granted its last major permit needed to begin mining at the property. The company is waiting on an evaluation of the drilling program results and subsequent financing before mining commences.

Emgold Mining Corporation, a subsidiary of Idaho Maryland Mine Corporation, continued its permitting process during 2006 to reopen the historic Idaho Maryland Gold Mine located in the town of Grass Valley, Nevada County. A major permitting milestone was met in 2006 when the Master Environmental Assessment for the mine was completed for the city of Grass Valley. Emgold is currently working on some of the environmental issues raised in the document. Two workshops took place during the year to educate the public and to gain local support for the project. The Idaho Maryland Corporation has identified measured and indicated resources of 472,000 ounces. A key component of the proposed Idaho Maryland Mine project is an on-site manufacturing facility that will use waste rock for the production of ceramic products.

In addition to the above-mentioned mines, placer gold is produced as a secondary mineral at numerous sand and gravel mines located mainly in the northern and central part of the state. California also has several small underground gold mines that mainly produce specimen gold.

Silver production makes up less than 1% of California's total metal production. All of the silver produced in California is a byproduct of gold production. Iron ore mined in California is used in the production of portland cement and is considered an industrial mineral.

LEGISLATION

Californians approved a \$19.9 billion transportation bond package in November 2006 that will increase California's demand for construction aggregate and portland cement throughout the next 10 years. The bond money will be used for safety improvements and repairs to state highways, upgrades to freeways to reduce congestion, repairs to local streets and roads, improvements to the seismic safety of local bridges, and expansion of public transit. One billion dollars of the bond money is specifically earmarked for improvements in the Route 99 corridor in the San Joaquin and Sacramento Valleys. The package also authorizes state and regional agencies to engage in public and private partnerships to attract billions of additional dollars in private investment for the development of transportation infrastructure in the state.

THE CALIFORNIA GEOLOGICAL SURVEY

The California Geological Survey (CGS) completed an updated statewide aggregate resource map in December 2006 (*CGS Map Sheet 52, updated 2006, Aggregate Availability in California*). The map and report compare projected aggregate demand for the next 50 years with currently permitted aggregate resources in 31 regions of the state. These 31 regions cover about 25 percent of the state and provide aggregate for roughly 90 percent of California's population. The map also shows aggregate production areas and highlights regions where there are less than 10 years of permitted aggregate resources remaining. A report provided with the map discusses supply and demand of the state's permitted aggregate resources, aggregate quality and use, current aggregate prices, and transportation issues. The map and report are available on line at: <http://www.consrv.ca.gov/CGS/minerals/mlc/index.htm>

CGS's Mineral Land Classification Project, a mandate of the Surface Mining and Reclamation Act, continued to provide lead agencies with mineral resource maps that have proved to be of great value in land-use planning and mineral resource conservation. To date, CGS has completed mineral resource studies in about one third of the state. CGS currently is working on aggregate classification projects in the San Bernardino and Palm Springs areas (San Bernardino County), the Claremont-Upland area (San Bernardino and Los Angeles

counties), the North San Francisco Bay area (Marin and Napa counties) and in San Joaquin County. These reports are scheduled for completion in 2007-2008.

Photo 1



Elementis Specialties, Inc's world class Hector Clay Mine located 32 miles east of Barstow in the Mojave Desert (San Bernardino County). The deposit is hectorite, a magnesium-rich high quality thixotropic clay used in the manufacture of a variety of products including cosmetics, industrial coatings, and paint. High quality hectorite may sell for over \$2,000 per ton. The Hectorite Mine has been operated continuously for over 60 years. (Photo by Dinah Shumway, TerraMins Inc.)

Photo 2



Mitsubishi Cement Corporation's Cushenbury limestone mine and plant looking northeast from Burnt Flat in the San Bernardino Mountains. Highway 18 is in the middle ground (Photo by Dinah Shumway, TerraMins Inc.)

Amount and value of non-fuel mineral production for 2004, 2005, 2006.^{1,2}

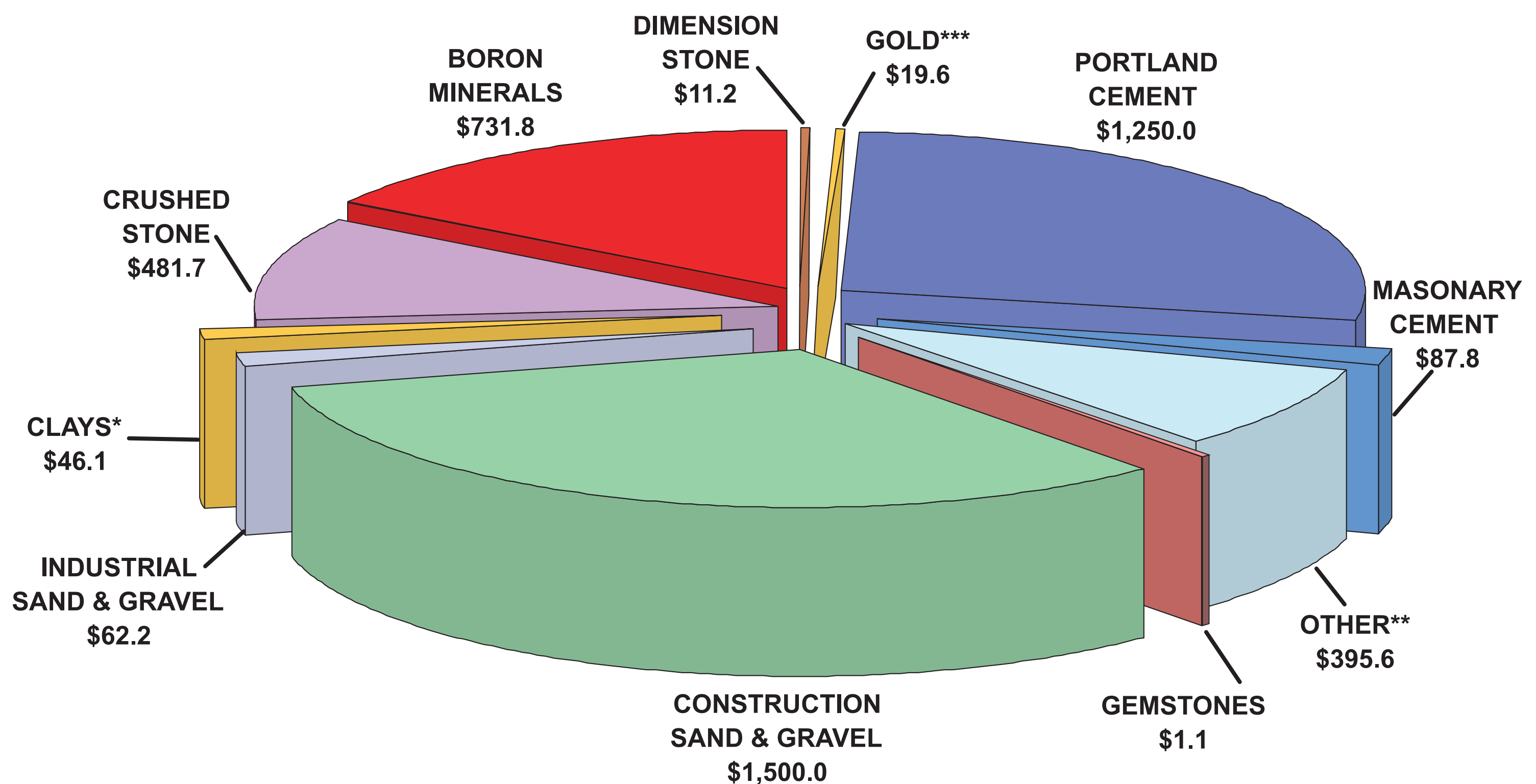
Mineral		2004		2005		2006 ^P	
		Quantity	Value (thousands \$)	Quantity	Value (thousands \$)	Quantity	Value (thousands \$)
Boron (B ₂ O ₃)	short tons	702,300	626,400	674,700	713,000	674,700	731,800
Cement							
Masonry	short tons	W	W	^e 765,100	^e 80,600	^e 771,700	^e 87,800
Portland	short tons	^e 13,150,600	^e 1,040,000	^e 12,749,300	^e 1,130,000	^e 12,899,200	^e 1,250,000
Clays							
Bentonite	short tons	26,500	2,600	22,000	2,200	22,000	2,300
Common	short tons	1,359,400	20,700	1,114,600	16,600	1,102,500	16,600
Fullers Earth	short tons	217,200	W	208,400	W	209,500	W
Gemstones		NA	1,100	NA	1,100	NA	1,100
Gold ³	troy ounces	⁴ 95,700	⁴ 39,200	⁴ 65,300	⁴ 29,000	⁴ 32,430	⁴ 19,600
Sand and gravel:							
Construction	short tons	182,825,400	1,283,800	179,956,700	1,442,900	178,605,000	1,500,000
Industrial	short tons	2,190,700	55,700	2,239,200	60,400	2,260,100	62,200
Silver ³	troy ounces	⁴ 14,100	⁴ 90	⁴ 5,050	⁴ 40	W	W
Stone:							
Crushed	short tons	61,048,700	365,500	59,862,400	454,700	58,728,000	481,700
Dimension	short tons	46,300	10,200	45,200	10,200	47,400	11,200
Values for diatomite, feldspar gypsum (calcined and crude) iron ore (usable), kaolin clay, lime, masonry cement (2004), magnesium compounds, perlite (crude), pumice and pumicite, salt, silver, soda ash, sodium sulfate, and zeolites are combined to avoid disclosing company proprietary data							
Total combined and W values			363,500		331,400		422,900
Total annual value-all minerals			3,808,800		4,272,100		4,587,200
¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers). ² Quantity data are rounded to the nearest 100 units except for gold and silver; Values are rounded to the nearest \$100,000. ³ Recoverable content of ores, etc. ⁴ Data from California Department of Conservation, California Geological Survey. ^P Preliminary. ^e Estimate. NA=Not available. W=Withheld to avoid disclosing company proprietary data; value included with "combined value" data.							

Modified from unpublished U.S. Geological Survey (USGS) data, subject to change; official USGS final 2006 data will be published in the California chapter of the USGS Mineral Yearbook, Area Reports: Domestic 2006, Volume II.

CALIFORNIA NON-FUEL MINERAL PRODUCTION 2006

Total Value \$4.59 Billion

VALUES IN
MILLIONS OF
DOLLARS



*CLAYS Includes:
bentonite, common, kaolin, and fuller's earth

**OTHER Includes:
diatomite, feldspar, gypsum, iron ore, lime, magnesium compounds, perlite, pumice and pumicite, salt, soda ash, silver, talc, sodium sulfate, and zeolites

*** Data from California Geological Survey
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