

1973

Continued

Type of activity	County
Pit; stationary plant; river dredging.	Saline.
Dredge -----	Pulaski.
Pits; portable and stationary plants.	Calhoun and Union.
Pit; stationary plant.	Hot Spring.
Stationary plants; river dredging.	Jackson and Pope.
Dredge -----	Jefferson.
Pits; stationary plants.	Ashley, Calhoun, Craighead, Poinsett, St. Francis.
Underground mine; stationary plant; silica sand used for glass, filter, moulding, hydrofrac.	Izard.
Quarry -----	Little River.
do -----	Crawford, and Sebastian.
do -----	Lonoke, Sharp, Van Buren, White.
do -----	Lawrence, Pope, White.
do -----	Howard.
do -----	Benton, Madison, Washington.
do -----	Pulaski.
do -----	Independence.
do -----	Do.
do -----	Independence and Izard.
Byproduct sulfur recovery.	Columbia.
do -----	Do.
do -----	Lafayette.
do -----	Union.
Mine and plant --	Saline.
Mine -----	Garland.
Mine and mill ---	Do.
Processing plant -	Pulaski.
do -----	Jefferson.

The Mineral Industry of California

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, U.S. Department of the Interior, and the California Department of Conservation, Division of Mines and Geology.

By Walter C. Woodmansee¹

In terms of output value, the mineral industry of California advanced more than 10% in 1973, following a decrease in 1972. The principal reason for the turnaround was the inflationary trend in mineral commodity prices that prevailed during the year.

Crude petroleum again was the most significant commodity in output value, accounting for slightly more than half the total value, although actual production continued downward. Other major mineral products, in decreasing order of output value, were cement, sand and gravel, natural gas, boron minerals, stone, iron ore, and diatomite.

Most of the nonmetallic minerals showed increased output in 1973. Among the metals, production of iron ore, molybdenum, and rare-earth concentrates also was significantly higher, but most of the

other metallic minerals (copper, gold, lead-zinc, mercury, and silver) showed decreases. Reduced output of natural gas, natural gasoline, and liquefied petroleum gases corresponded to the decrease in crude oil production.

Significant oil and gas discoveries were made during the year, although they were not large enough to offset the continuing decline in oil and gas reserves in the State. The existing moratorium on drilling for oil and gas in State offshore areas continued in effect, but it appeared that a resumption of exploration activity in these areas would be permitted in 1974. Efforts were also made by Federal authorities to increase exploration and production in Federal waters.

¹ Physical scientist, Division of Nonferrous Metals—Mineral Supply.

Table 1.—Mineral production in California¹

Mineral	1972		1973	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Asbestos ----- short tons	90,967	\$8,673	105,663	\$10,886
Barite ----- thousand short tons	4	34	11	152
Boron minerals ----- do	1,121	95,882	1,225	113,648
Cement, portland ----- do	9,086	182,308	9,395	201,892
Clays ----- do	2,706	7,387	2,723	6,853
Copper (recoverable content of ores, etc.) -- short tons	598	612	369	440
Gem stones ----- NA	215	NA	220	220
Gold (recoverable content of ores, etc.) -- troy ounces	3,974	233	3,647	357
Gypsum ----- thousand short tons	1,525	4,965	1,778	5,834
Lead (recoverable content of ores, etc.) ----- short tons	1,153	347	44	14
Lime ----- thousand short tons	608	13,059	632	13,602
Magnesium compounds from seawater bitterns short tons MgO equivalent	175,654	18,421	184,105	19,233
Mercury ----- 76-pound flasks	5,835	1,274	1,219	349
Natural gas ----- million cubic feet	487,278	179,318	449,369	167,615
Natural gas liquids:				
Natural gasoline and cycle products				
thousand 42-gallon barrels	8,468	27,664	6,865	23,475
LP gases ----- do	5,847	15,962	5,329	19,824
Peat ----- thousand short tons	29	620	21	373
Petroleum (crude) ----- thousand 42-gallon barrels	347,022	940,430	336,075	1,045,193
Pumice ----- thousand short tons	731	1,507	768	3,237
Salt ----- do	1,621	14,860	1,507	15,533
Sand and gravel ----- do	117,288	162,619	117,470	176,286
Silver (recoverable content of ores, etc.) thousand troy ounces	175	296	56	143
Stone ----- thousand short tons	37,213	65,811	43,838	77,175
Talc ----- short tons	155,155	1,186	179,191	1,501
Zinc (recoverable content of ores, etc.) ----- short tons	1,202	427	20	8
Value of items that cannot be disclosed:				
Bromine, calcium-magnesium chloride, carbon dioxide, cement (masonry), coal, diatomite, feldspar, iron ore, lithium minerals, molybdenum, perlite, potassium salts, rare-earth metals, sodium carbonates and sulfates, and tungsten -----	XX	107,266	XX	137,843
Total -----	XX	1,851,376	XX	2,041,686
Total 1967 constant dollars -----	XX	1,527,570	XX	1,499,006

¹ Preliminary. ^r Revised. NA Not available. XX Not applicable.
² Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in California, by county¹
 (Thousands)

County	1972	1973	Minerals produced in 1973 in order of value
Alameda -----	\$26,683	\$28,932	Sand and gravel, salt, stone, petroleum, clays.
Alpine -----	W	W	Gold, silver, sand and gravel, zinc, copper, lead.
Amador -----	5,149	5,040	Sand and gravel, stone, clays.
Butte -----	W	W	Sand and gravel, natural gas.
Calaveras -----	17,966	21,186	Cement, asbestos, stone, sand and gravel, clays.
Colusa -----	3,419	3,334	Natural gas, stone, sand and gravel.
Contra Costa -----	10,760	11,301	Stone, natural gas, petroleum, lime, clays, sand and gravel, peat.
Del Norte -----	649	W	Stone, sand and gravel, gold.
El Dorado -----	2,596	W	Stone, lime, sand and gravel, talc.
Fresno -----	49,548	51,828	Petroleum, sand and gravel, natural gas, natural gas liquids, asbestos, stone, gold, clays, silver.
Glenn -----	W	6,151	Natural gas, sand and gravel, lime.
Humboldt -----	W	W	Natural gas, sand and gravel, stone.
Imperial -----	4,673	W	Gypsum, sand and gravel, lime, clays, stone.
Inyo -----	18,398	19,592	Tungsten, molybdenum, talc, boron minerals, copper, sand and gravel, stone, perlite, silver, clays, lead, gold, zinc.
Kern -----	469,442	528,711	Petroleum, boron minerals, cement, natural gas, natural gas liquids, stone, sand and gravel, gypsum, sodium carbonates and sulfates, clays, salt, copper.
Kings -----	7,734	7,045	Natural gas, natural gas liquids, petroleum.
Lake -----	W	W	Pumice, sand and gravel, stone, mercury.
Lassen -----	W	W	Stone, sand and gravel, pumice.

See footnotes at end of table.

Table 2.—V

County
Los Angeles -----
Madera -----
Marin -----
Mariposa -----
Mendocino -----
Merced -----
Modoc -----
Mono -----
Monterey -----
Napa -----
Nevada -----
Orange -----
Placer -----
Plumas -----
Riverside -----
Sacramento -----
San Benito -----
San Bernardino -----
San Diego -----
San Francisco -----
San Joaquin -----
San Luis Obispo -----
San Mateo -----
Santa Barbara -----
Santa Clara -----
Santa Cruz -----
Shasta -----
Siskiyou -----
Solano -----
Sonoma -----
Stanislaus -----
Sutter -----
Tehama -----
Trinity -----
Tulare -----

Tuolumne -----
Ventura -----
Yolo -----
Yuba -----
Undistributed ² -----

Total³ -----
^r Revised. W
 "Undistributed."
¹ Value of petroleum
² Includes Federal
 tungsten (1972) that
 values indicated by
³ Data may not add

Table 2.—Value of mineral production in California, by county¹—Continued
(Thousands)

1973						
	Quantity	Value (thousands)	County	1972	1973	Minerals produced in 1973 in order of value
373	105,663	\$10,886	Los Angeles	\$346,126	\$367,770	Petroleum, sand and gravel, natural gas, natural gas liquids, stone, lime, clays, gold, silver.
34	11	152	Madera	1,530	2,386	Natural gas, stone, sand and gravel, pumice.
382	1,225	113,648	Marin	2,357	2,359	Stone, clays, sand and gravel, mercury.
308	9,395	201,892	Mariposa	81	86	Sand and gravel, stone, gold, silver.
387	2,723	6,853	Mendocino	587	784	Sand and gravel, stone.
312	369	440	Merced	1,658	1,524	Sand and gravel, gold, silver.
315	NA	220	Modoc	938	W	Peat, sand and gravel, pumice, stone.
333	3,647	357	Mono	528	1,727	Pumice, sand and gravel, clays, tungsten, gold, stone.
365	1,778	5,834	Monterey	54,351	62,561	Petroleum, magnesium compounds, lime, stone, sand and gravel, feldspar, natural gas.
347	44	14	Napa	3,032	2,829	Stone, salt, clays, sand and gravel, diatomite, mercury.
359	632	13,602	Nevada	1,876	1,968	Sand and gravel, stone, pumice.
321	184,105	19,233	Nevada	1,876	1,968	Petroleum, sand and gravel, natural gas liquids, natural gas, clays, lime, stone.
374	1,219	349	Orange	121,489	137,768	
318	449,369	167,615	Placer	2,027	2,184	Sand and gravel, clays, stone, gold.
364	6,865	23,475	Plumas	W	428	Stone, sand and gravel, pumice, gold.
362	5,329	19,824	Riverside	60,262	86,163	Iron ore, cement, sand and gravel, stone, clays, petroleum, natural gas.
320	21	373	Sacramento	23,023	21,885	Natural gas, sand and gravel, stone, gold, petroleum, clays, silver.
330	336,075	1,045,193	San Benito	14,135	14,706	Cement, asbestos, stone, sand and gravel, clays, petroleum, natural gas, mercury.
307	768	3,237	San Bernardino	151,694	170,492	Cement, boron minerals, sodium carbonates and sulfates, rare-earth metals, stone, sand and gravel, potassium salts, iron ore, lime, salt, petroleum, clays, talc, calcium chloride, pumice, bromine, lithium minerals, tungsten, natural gas, gypsum.
360	1,507	15,533	San Diego	25,446	30,934	Sand and gravel, stone, salt, magnesium compounds, clays, tungsten, gold, silver.
319	117,470	176,286	San Francisco	W	---	
296	56	143	San Joaquin	21,995	19,162	Natural gas, sand and gravel, stone, lime, peat, gold, silver.
311	43,838	77,175	San Luis Obispo	7,619	7,890	Petroleum, stone, sand and gravel, natural gas, clays.
356	179,191	1,501	San Mateo	8,825	11,182	Magnesium compounds, stone, salt, sand and gravel, petroleum, clays, natural gas.
327	20	8	Santa Barbara	126,479	105,826	Petroleum, diatomite, natural gas, natural gas liquids, sand and gravel, lime, stone.
376	XX	137,843	Santa Clara	W	36,807	Cement, stone, sand and gravel, mercury, clays.
370	XX	2,041,686	Santa Cruz	11,426	W	Cement, sand and gravel, stone, clays.
370	XX	1,499,006	Shasta	7,076	8,867	Cement, sand and gravel, stone, clays, pumice, barite, copper, gold, silver.
370	XX	1,499,006	Sierra	13	W	Gold, sand and gravel, silver, stone.
370	XX	1,499,006	Siskiyou	873	W	Sand and gravel, stone, pumice, gold.
370	XX	1,499,006	Solano	27,407	31,142	Natural gas, stone, petroleum, sand and gravel, clays.
370	XX	1,499,006	Sonoma	5,946	W	Sand and gravel, stone, mercury, clays.
370	XX	1,499,006	Stanislaus	2,846	W	Sand and gravel, gold, clays, silver.
370	XX	1,499,006	Sutter	11,472	10,189	Natural gas, sand and gravel, clays.
370	XX	1,499,006	Tehama	1,808	W	Natural gas, sand and gravel, stone, pumice.
370	XX	1,499,006	Trinity	512	452	Sand and gravel, stone, gold, silver.
370	XX	1,499,006	Tulare	2,634	2,428	Sand and gravel, stone, natural gas, petroleum, barite, clays.
370	XX	1,499,006	Tuolumne	1,272	W	Stone, lime, sand and gravel.
370	XX	1,499,006	Ventura	87,531	96,535	Petroleum, natural gas, natural gas liquids, sand and gravel, clays, stone, pumice.
370	XX	1,499,006	Yolo	6,430	8,860	Sand and gravel, natural gas, lime, stone.
370	XX	1,499,006	Yuba	W	1,204	Sand and gravel, stone, clays.
370	XX	1,499,006	Undistributed ²	91,053	109,465	
370	XX	1,499,006	Total ³	1,851,376	2,041,686	

¹ Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
² Value of petroleum is based on an average price per barrel for the State.
³ Includes Federal offshore petroleum and natural gas, some sand and gravel, stone (1972), and tungsten (1972) that cannot be assigned to specific counties, gem stones, natural carbon dioxide, and values indicated by symbol W.
⁴ Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of California business activity

	1972	1973 ^P	Change, percent
Employment and labor force, annual average:			
Total labor force ----- thousands ---	8,596	8,792	+2.3
Unemployment ----- do -----	653	613	-6.1
Employment:			
Mining ----- do -----	29.5	30.4	+3.1
Contract construction ----- do -----	307.7	333.4	+8.4
Manufacturing ----- do -----	1,530.2	1,648.1	+7.7
Government ----- do -----	1,494.4	1,521.5	+1.8
Wholesale and retail trade ----- do -----	1,620.1	1,719.2	+6.1
Services ----- do -----	1,358.3	1,469.2	+8.2
Transportation and public utilities ----- do -----	455.7	469.9	+3.1
Finance, insurance, and real estate ----- do -----	419.6	443.2	+5.6
Personal income:			
Total ----- millions ---	\$102,099	\$112,038	+9.7
Per capita ----- do -----	\$4,988	\$5,488	+9.0
Construction activity:			
Total private nonresidential construction - millions ---	\$2,351.6	\$2,558.3	+8.8
Number of new housing units authorized -----	280,955	218,606	-22.2
Portland cement shipments to and within California thousand short tons ---	8,491	8,614	+1.4
Farm marketing receipts ----- millions ---	\$5,618.9	\$7,283.6	+29.6
Mineral production value ----- do -----	\$1,851.4	\$2,042.0	+10.3
Exports through California ports ----- do -----	\$4,152.6	\$6,647.2	+60.1
Imports through California ports ----- do -----	\$6,493.7	\$8,595.6	+32.4

^P Preliminary.

Source: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment; Highlights of U.S. Export and Import Trade, and U.S. Bureau of Mines.

2,100
1,800
1,500
1,200
900
600
300
0

VALUE, million dollars

Figure 1

Legislative
The following
directly affect
California
State
signed by
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Assembly
State Of
the during
abandonment

1973 P	Change, percent
8,792	+2.3
613	-6.1
30.4	+3.1
333.4	+8.4
1,648.1	+7.7
1,521.5	+1.8
1,719.2	+6.1
1,469.2	+8.2
469.9	+3.1
443.2	+5.6
\$112,038	+9.7
\$5,438	+9.0
\$2,558.3	+8.8
218,606	-22.2
8,614	+1.4
\$7,283.6	+29.6
\$2,042.0	+10.3
\$6,647.2	+60.1
\$8,595.6	+32.4

Income Situation; Con- and Import Trade, and

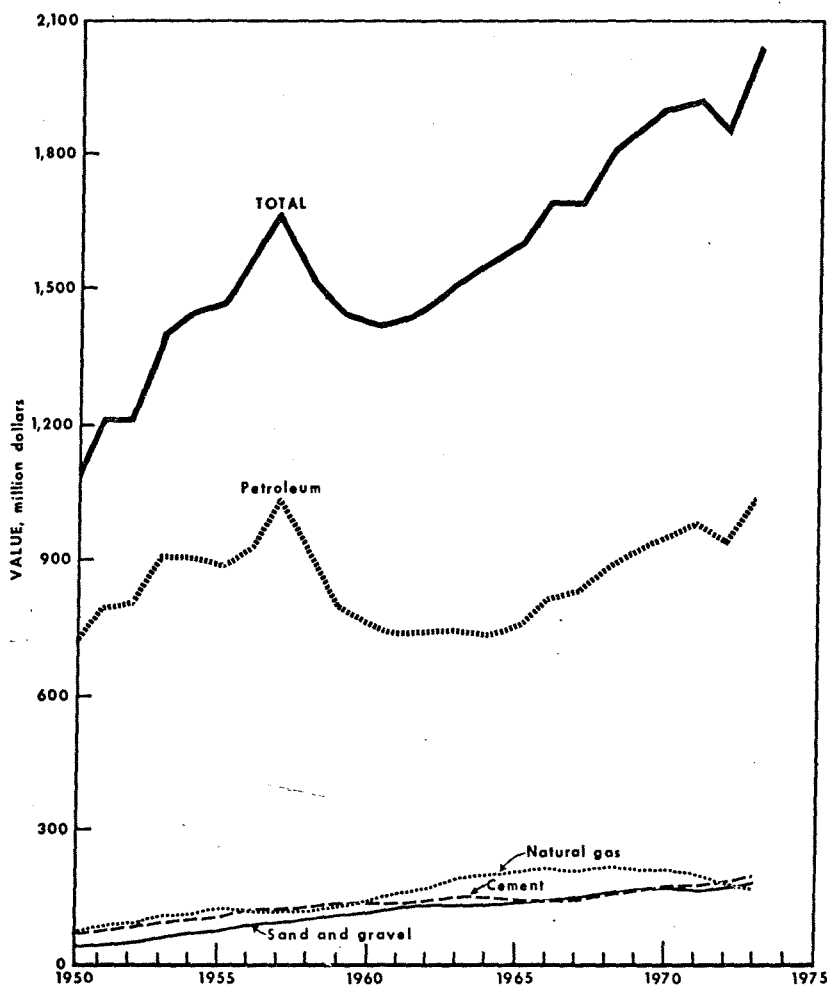


Figure 1.—Value of petroleum, natural gas, cement, sand and gravel, and total value of production in California.

Legislation and Government Programs.—The following eight bills, directly or indirectly affecting the mineral industry in California, were passed by the 1972 Regular Session of the State Legislature, signed by the Governor, and became effective March 7, 1973:

Assembly Bill (AB) 890.—Requires the State Oil and Gas Supervisor to supervise the drilling, maintenance, operation, and abandonment of geothermal resource wells

to prevent land subsidence and compaction.

AB 901.—Revises State mining law regarding location work and affidavits; false statements on locations and labor papers ruled a misdemeanor.

AB 2064.—Establishes a State mining and minerals policy with responsibility vested in the State Geologist.

AB 2341.—Authorizes the Governor to adopt an oil spill contingency plan, makes

expenses for this plan recoverable from the State Water Quality Control Fund, and makes offending party liable for cost of cleanup.

Senate Bill (SB) 5.—Creates, within the Resources Agency, the State Solid Waste Management Board and the State Solid Waste Management and Resource Recovery Advisory Council.

SB 520.—Creates a Geologic Hazards Special Fund to finance special studies on earthquake hazards by the California Division of Mines and Geology (CDMG).

SB 1022.—Revises provisions for filing bonds with the California Division of Oil and Gas (CDOG) for oil drilling operations.

SB 1193.—Extends for 2 years (to March 7, 1975) the requirement to notify the California Department of Fish and Game concerning permits to alter the flow or bed of any river, stream, or lake.

The following selected new legislation, also significant to the State's mineral industry, was enacted during 1973:²

SB 869.—Revises provisions for abandonment of oil or gas wells; authorizes State Oil and Gas Supervisor to undertake actions deemed necessary to protect life, health, property, or natural resources if emergency arises during oil and gas operations.

SB 868.—Authorizes Oil and Gas Supervisor to adopt a special well-spacing pattern for a designated oil pool, where requirement deemed necessary.

SB 1289.—Requires Oil and Gas Supervisor to order recording of oil or gas development unit agreement in office of County Recorder after approval granted to agreement.

Assembly Joint Resolution (AJR) 42.—Memorializes the President to support, and Congress enact, legislation requiring authorization for offshore superports for large tankers, whether or not port would be located in State waters.

AB 2209.—Requires Oil and Gas Supervisor to promulgate rules and regulations for adequate screening of oil sumps to protect wildlife.

SB 893.—Requires annual report of State Geologist to include sections reviewing status of measures taken concerning geologic hazards and economic utilization and conservation of mineral resources.

Senate Joint Resolution (SJR) 26.—Memorializes President to restore author-

ized funding level to Environmental Education Act of 1970 and Congress to enact legislation extending act.

AB 1095.—Requires State Lands Commission, acting with Resources Agency and Office of Planning and Research, to identify State school lands and tide and submerged lands which possess significant environmental values and to submit report to Legislature by January 15, 1975; specifies that leases from State Lands Commission are subject to environmental impact statements by the Environmental Quality Act of 1970.

AB 606.—Makes clarifying technical revisions to California Coastal Zone Conservation Act of 1972, concerning permit areas and membership in Coastal Zone Conservation Commission.

AB 1507.—Requires State Lands Commission to promulgate regulations requiring party extracting oil, gas, or other minerals from lands under jurisdiction of the Commission to remove beach and underwater obstructions.

SB 632.—Revokes, as of January 31, 1984, conveyance to San Diego Unified Port District of tidelands and submerged lands now subject to lease to Western Salt Co.; directs Resources Agency and State Lands Commission to undertake study to determine jurisdiction over these lands.

The Coastal Zone Conservation Act of 1972, which resulted from Proposition 20, the Coastal Zone Conservation Initiative, became effective on February 1. Proposed developments within 3,000 feet of the coastline require a permit, issued by six Regional Coastal Zone Conservation Commissions. These permits were required to insure maximum access to beaches and recreation areas, reservation of public recreation areas and wildlife preserves, and minimum adverse environmental and scenic effects. Impacts of the act included a freeze on proposed construction work, financing problems for such projects, and changing land values in the coastal zone.

In January, the U.S. Forest Service announced that it will study 16 new areas in California, comprising nearly 1.5 million acres, for possible inclusion in the National Wilderness Preservation System.

Also in January, the Bay Area Pollution

² California Legislature, Senate Committee on Natural Resources and Wildlife. Final Summary of Selected Legislation Relating to the Environment, Natural Resources, and Wildlife Enacted during 1973. 120 pp.

Control District cited air pollution and required corrective action. Mineral lease included the Rodeo Union Oil Co. of California plant of Humble Oil and Standard Oil Company, and the United plant at Pittsburg.

In February, the California Department released a report coordinated—Its Supply. The report examined the in the State during a doubling of energy that period and a natural gas. In 1985, the oil and gas for energy needs and a fold increase in oil.

Occidental Petroleum County of San Diego for a 200-ton-per-day plant. The plant process developed by research and development would convert into products. The plant Escondido, San Diego.

In April, the Control District and companies for execution.

In May, 50 representing the oil, automobile manufacturing and environmental under the sponsorship Governor to consider number of revenue for energy conversion new forms of energy agencies.

The basic \$2.3 billion California signed primarily northern to the system was completed system includes 22 pumping plants.

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to undertake study to
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Conservation Initiative,
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permit, issued by six
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mits were required to
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and wildlife preserves,
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U.S. Forest Service an-
study 16 new areas in
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reservation System.

the Bay Area Pollution

are. Senate Committee on
Wildlife. Final Summary
elating to the Environment,
and Wildlife Enacted during

Control District cited 40 companies for air pollution and recommended appropriate action. Mineral-related industries included the Rodeo petroleum refinery of Union Oil Co. of Calif., the Beneficia acid plant of Humble Oil Co., the sulfuric acid plant of Allied Chemical Corp. at the Standard Oil Co. of Calif. at Richmond, and the United States Steel Corp. plant at Pittsburg.

In February, the Resources Agency, California Department of Conservation, released a report entitled, "Energy in California—Its Supply, Demand, Problems," coordinated and prepared by the CDOG. The report examines the energy situation in the State during 1970-85 and forecasts a doubling of energy consumption during that period and a severe shortage of natural gas. In 1985, the State will rely on oil and gas for more than 75% of its energy needs and will require an eight-fold increase in oil imports.

Occidental Petroleum Corp. and the County of San Diego signed an agreement for a 200-ton-per-day solid waste processing plant. The plant would utilize a new process developed by Occidental's Garrett research and development division, which would convert solid wastes to marketable products. The plant would be located at Escondido, San Diego County.

In April, the Bay Area Air Pollution Control District issued 30 violations to oil companies for excessive smoke emissions.

In May, 50 specialists on energy, representing the oil, gas, and utility industries, automobile manufacturers, State agencies, and environmental organizations, met under the sponsorship of the Lieutenant Governor to consider energy problems. A number of recommendations were made for energy conservation, development of new forms of energy, and new control agencies.

The basic construction phase of the \$2.3 billion California Water Project, designed primarily to carry water from the northern to the southern part of the State, was completed on May 18. The complex system includes 21 dams, 7 powerplants, 22 pumping plants, 486 miles of lined

canals, 163 miles of pipelines, 21 miles of conveyance tunnels, and 16 miles of unlined channels. During an operating year, more than 4.2 million acre-feet of water will flow to more than 250 water-delivery turnouts.

A new organization, California Council for Environmental and Economic Balance, will attempt to bridge the differences between development-minded interests and conservationists. Financial support will be provided by oil companies, utilities, and certain trade unions. The Council will comprise up to 60 members from labor, business, and the public sector.

In "Urban Geology—Master Plan for California," a 3-year study of geologic problems in California conducted by the CDOG in cooperation with the State Office of Planning and Research, it was estimated that the economic loss due to urbanization would amount to \$55 billion during 1970-2000, if unmitigated. Ten geologic problems discussed included earthquakes, loss of mineral resources, landslides, flooding, erosion, expansive soils, fault displacement, volcanic hazards, tidal wave hazards, and subsidence. Broad recommendations were made that could reduce anticipated damages.

A State report, "Energy Dilemma: California's 20-year Power Plant Siting Plan," was released by the State Resources Agency in October. The report stated that 11 major new powerplants (oil, gas, coal, nuclear, or geochemical) must be approved by 1991 to prevent a shortage of electricity in the State.

In conformance with a Public Utilities Commission edict to utilities in the State, Pacific Gas & Electric Co. (PG&E) outlined a plan for energy conservation, mutual assistance agreements, and possible mandatory curtailments of electric service.

In October, the Governor approved a broad State energy policy calling for resumption of offshore oil drilling, reduced freeway speed limits, deepwater port construction for large tankers, and other related actions to produce and conserve energy. An advisory State Energy Planning Council was established.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Geothermal Resources.—At yearend 1973, 10 geothermal generating units (396,000 kilowatts) were operating at The Geysers geothermal field, Sonoma and Lake Counties, one was under construction, and four were planned. Completion of units 12 to 15, scheduled by 1977, would increase geothermal generating capacity to more than 900,000 kilowatts.³ Thirty steam wells were completed to production.

Signal Oil and Gas Co. and PG&E, contracted for a 135-megawatt unit in the Castle Rock Springs area, Lake County, where Signal Oil was to drill three additional development wells. One well, 1 mile south of the Castle Rock Springs wells, was drilled to 7,088 feet but was unsuccessful.

Union Oil Co. of Calif. held hearings with the Public Utilities Commission for a 106-megawatt plant, and feasibility tests were underway for a 110-megawatt plant in the Little Geysers area of the field.

PG&E and Pacific Energy Corp. (PEC) contracted for unit 15 near PEC's Rora-baugh production area. PG&E will purchase geothermal steam from PEC's Happy Jack-Sulphur Bank production area, Sonoma County. PEC agreed to continue steam well development work.

At the Salton Sea Project, Imperial Valley, where geothermal potential was considered high, Magma Power Co., Chevron Oil Co. (operating subsidiary of Standard Oil Co. of Calif.), and New Albion Resources Co. (subsidiary of San Diego Gas & Electric Co.) were conducting production and injection tests in the Heber area, south of El Centro, Imperial County. Magma Power Co. completed the third of six wells for New Albion in the Niland area, Salton Sea geothermal field, where one well confirmed a bottom-hole temperature of 610°F at 3,000 feet, the highest temperature recorded, relative to depth, for one geothermal area in the State. Near Heber, New Albion was building a 10-megawatt prototype pilot plant, which will use energy developed by a downhole heat exchanger, developed by Geo-Energy Systems, Inc. Heat would be exchanged by circulating water or some other heat transfer fluid to the bottom of the well in a closed system. Under this process, there would be no corrosion of pipes, valves, and

turbines by brines, no removal of brines and possible land subsidence, no depletion of well temperature and pressure, and no atmospheric or watershed pollution.⁴

The Federal Bureau of Reclamation, and Office of Saline Water continued evaluation of the East Mesa area, Imperial Valley. The Bureau planned eight development wells to a maximum depth of 6,000 feet and 30 shallow wells from 100 to 1,500 feet deep. In July, the first fresh water was processed from geothermal brines by a flash distillation unit of Envirogenetics, Inc., El Monte, Calif.⁵

Phillips Petroleum Co., Mono Power Co. (subsidiary of Southern California Edison Co.), and Southern Pacific Land Co. jointly held a 30,000-acre tract of the Buttes field, southeast of the Salton Sea, Imperial County. Drilling was in progress for testing geothermal power potential and recovery of chemicals and minerals from brines. Union Oil Co. of Calif. also had important holdings in the Imperial Valley.

Gulf Oil Corp. was drilling in Honey Lake Valley, Lassen County, and Surprise Valley, Modoc County. Phillips Petroleum Co. completed a shallow geothermal well test in Plumas County.

Natural Gas.—The quantity of natural gas marketed continued its downward trend, decreasing nearly 8% compared with that of 1972. Although production was lower for associated gas and dry gas, both onshore and offshore, new exploration activity resulted in discovery of several new gasfields and extensions to existing fields. A high level of drilling prevailed in the northern San Joaquin Valley and in the Sacramento Valley. Dry gas exploration was more successful than oil exploration. Dry gas reserves increased 90 billion cubic feet during the year, although total gas reserves were slightly lower.

Natural gas within the State remained in tight supply. According to the Conservation Committee of California Oil Producers (CCCOP), an average of 4.5 billion cubic feet per day was delivered from sources in Canada, west Texas, New

³ California Division of Oil and Gas. Geothermal Hot Line. V. 3, No. 2, April 1973, 5 pp.

⁴ Engineering and Mining Journal. Technological "Breakthrough" Promises to Tap Geothermal Power Cheaply. V. 174, No. 3, March 1973, p. 26.

⁵ Chemical Week. Will Geothermal Steam Projects Sizzle or Fizzle? V. 113, No. 8, Aug. 22, 1973, pp. 57-58.

Mexico, Colorado, utility companies on natural gas and Utilities Commissioning gas shortage supply are developed

Pacific Lighting for possible new supsion plants in New natural gas from Alaska natural gas pipeline Arctic.

PG&E announced increase gas withdren California from facilities on Mod Stockton, and Plea

Table 4.—

Crude oil	-----	Comma
Natural gas liquids	-----	
Natural gas	-----	
Sources: American		

Petroleum.—Pro put was again low a downward trend However, value of cause of increasing principal production (onshore and set, Kern River, offshore), and H offshore). About

Production:	
Crude oil:	1
Quantity	-----
Value	-----
Daily rate	-----
Price, aver	-----
Natural gas, net	-----
Quantity, net	-----
Value	-----
Price at we	-----
Natural gas, net	-----
Quantity	-----
Value	-----
Price, aver	-----
Number of operat	-----
See footnotes at	

Mexico, Colorado, Utah, and Arizona to utility companies in California. A study on natural gas availability for the Public Utilities Commission indicated a worsening gas shortage unless new sources of supply are developed.⁹

Pacific Lighting Corp. announced plans for possible new supplies from coal conversion plants in New Mexico, liquefied natural gas from Alaska and Indonesia, and natural gas pipelined from the Canadian Arctic.

PG&E announced projects designed to increase gas withdrawal capacity in northern California from underground storage facilities on MacDonald Island, near Stockton, and Pleasant Creek, near Win-

ters. New facilities would include storage wells, pipelines, and cleaning, measuring, and control equipment. Withdrawal capacity would be increased from 200 million cubic feet per day to 1.2 billion cubic feet per day at MacDonald Island and from 10 million cubic feet per day to 60 million cubic feet per day at Pleasant Creek.

At hearings before the Public Utilities Commission in August, it was estimated that natural gas supply would decrease by 20% during the next 3 years and that natural gas, which comprised 70% of the fuel supply to power companies in 1973, would provide only 2% in 1976, the large power companies switching to fuel oil.

Table 4.—California: Estimated proved recoverable reserves of crude oil, natural gas liquids, and natural gas

Commodity	Reserves Dec. 31, 1972	Revisions during 1973	Reserves Dec. 31, 1973 (production deducted)	Changes from 1972 (percent)
Crude oil ----- thousand barrels --	3,553,735	(65,635)	3,488,100	-1.8
Natural gas liquids ----- do ----	126,726	(8,527)	105,963	-16.4
Natural gas ----- million cubic feet --	5,328,862	50,488	5,199,837	-2.4

Sources: American Petroleum Institute and American Gas Association.

Petroleum.—Production.—Crude oil output was again lower in 1973, continuing a downward trend that started in 1969. However, value of output was rising because of increasing crude oil prices. The principal producing fields were Wilmington (onshore and offshore), Midway-Sunset, Kern River, Dos Cuadras (Federal offshore), and Huntington Beach (State offshore). About 73% of the total output

was from onshore wells, 21% from the State waters, and 6% from Federal waters. Steam, other thermal, and water flooding were significant factors in maintaining production. According to the CCCOP, the daily production rate was 910,000 barrels at yearend, a loss of 17,000 barrels from yearend 1972.

⁹ Oil and Gas Journal. PUC Paints Black California Gas-Supply Picture. V. 71, No. 48, Nov. 26, 1973, p. 40.

Table 5.—California: Oil and gas salient statistics

	1972	1973
Production:		
Crude oil:¹		
Quantity ----- thousand 42-gallon barrels --	347,022	336,075
Value ----- thousands --	\$940,430	\$1,045,193
Daily rate ----- thousand 42-gallon barrels --	951	921
Price, average ----- per barrel --	\$2.71	\$3.11
Natural gas, marketed:		
Quantity, net ----- million cubic feet --	487,278	449,369
Value ----- thousands --	\$179,318	\$167,615
Price at wellhead, average ----- per thousand cubic feet --	\$0.368	\$0.373
Natural gas liquids:		
Quantity ----- thousand 42-gallon barrels --	14,315	12,194
Value ----- thousands --	\$43,626	\$43,299
Price, average ----- per barrel --	\$3.05	\$3.55
Number of operating companies (yearend) -----	802	776

See footnotes at end of table.

removal of brines
and depletion
and pressure, and no
pollution.⁴

U.S. Bureau of Reclamation,
water continued eval-
uation in the Imperial
Valley area, Imperial
Valley planned eight develop-
ment projects with a maximum
depth of 6,000 feet. The
wells from 100 to 150 feet
deep, the first fresh water
from geothermal wells in
California. The Imperial
Valley unit of Enyria, Calif.⁵

The Mono Power Co. in
California Edison Co. and
Pacific Land Co. own a
100-acre tract of the
Imperial Valley of the Salton Sea,
where drilling was in progress
to evaluate power potential and
minerals from the Imperial
Valley. The Imperial Valley
drilling in Honeywell
County, and Surprise
County. Phillips Petroleum
is developing a geothermal well

quantity of natural gas
continued its downward
trend nearly 8% compared
with 1972. Although production
of natural gas and dry gas,
however, new exploration
and discovery of several
extensions to existing
drilling prevailed in the
Imperial Valley and in
Imperial County. Dry gas exploration
was more successful than oil
exploration. Reserves increased 90
percent during the year, although
production was slightly lower.

The State remained
committed to the Conservation
California Oil Program with an
average of 4.5 billion gallons
of oil was delivered to
California, west Texas, New

¹ Oil and Gas Journal. Geothermal
Production in California, April 1973, 5 pp.
² Oil and Gas Journal. Technological
Advances in Geothermal Energy,
March 1973, p. 26.
³ Oil and Gas Journal. Geothermal Steam Pro-
duction in California, No. 8, Aug. 22,

Table 5.—California: Oil and gas salient statistics—Continued

	1972	1973
Number of producing wells:		
Oilfield (average) -----	39,586	38,762
Gasfield (maximum) -----	1,086	1,098
Exploration and development: Well completions:		
Exploration:		
Oil -----	17	17
Gas -----	9	17
Dry -----	160	168
Development:²		
Oil -----	1,028	862
Gas -----	53	48
Dry (abandoned) -----	128	95
Total -----	1,395	1,207
Footage ----- thousands	4,347	4,108
Refineries:		
Number in operation (yearend) -----	37	36
Crude oil throughput capacity (operating) thousand 42-gallon barrels per day --	1,759	1,775
Gasoline output capacity (operating) thousand 42-gallon barrels per day --	1,019	1,028

¹ Includes field condensate but not plant condensate; also includes output from offshore State and Federal leases.

² Includes service wells.

Sources: California Department of Conservation, Division of Oil and Gas; Conservation Committee of California Oil Producers; American Petroleum Institute; and U.S. Bureau of Mines.

Table 6.—California: Production of crude petroleum and natural gas in 1973, by county¹

County	Number of Producing wells		Production		
	Oil (average)	Dry gas (maximum)	Petroleum (thousand barrels)	Natural gas (net)	
				Oil zones (million cubic feet)	Dry gas zones (million cubic feet)
Alameda -----	7	--	103	--	--
Butte -----	--	21	--	--	3,370
Colusa -----	--	94	--	--	9,227
Contra Costa -----	44	54	3,378	3,116	7,700
Fresno -----	2,524	6	12,276	9,451	1,067
Glenn -----	--	111	--	--	13,952
Humboldt -----	--	25	--	--	2,989
Kern -----	21,329	44	111,845	74,920	1,567
Kings -----	147	8	475	9,293	361
Los Angeles -----	6,077	3	98,486	56,347	361
Madera -----	--	15	--	--	3,230
Monterey -----	912	--	12,677	493	--
Orange -----	3,241	--	36,262	9,989	--
Riverside -----	13	5	56	17	223
Sacramento -----	--	106	24	--	43,611
San Benito -----	16	--	51	20	--
San Bernardino -----	38	--	238	119	--
San Joaquin -----	--	127	--	--	43,834
San Luis Obispo -----	205	--	1,765	1,243	--
San Mateo -----	10	--	17	1	--
Santa Barbara -----	1,595	26	19,235	21,869	24,559
Solano -----	--	190	163	--	88,410
Sutter -----	--	142	--	--	30,690
Tehama -----	--	41	--	--	3,971
Tulare -----	21	17	38	--	923
Ventura -----	2,583	6	23,593	25,666	1,589
Yolo -----	--	57	--	--	10,390
Total -----	38,762	1,098	317,672	212,444	291,984

¹ Includes State offshore but not Federal offshore production.

² Includes field condensate from dry gas zones.

Source: California Department of Conservation, Division of Oil and Gas.

Table 7.—C

State:	Field
Algeria -----	
Belmont -----	
Caliente: Gas zone	
Carpinteria -----	
Coal Oil Point -----	
Conception -----	
Cuarta: Gas zone	
Elwood -----	
Elwood, South -----	
Gaviota: Gas zone	
Huntington Beach -----	
Molino: Gas zone	
Montalvo, West -----	
Newport, West -----	
Point Conception -----	
Rincon -----	
Summerland -----	
Torrance -----	
Venice Beach -----	
Wilmington -----	
Total -----	
Federal:	
Carpinteria -----	
Dos Cuadras -----	
Total -----	
Grand total -----	

¹ Includes production

Source: California

Exploration and continued relative economic factors, the offshore development environmental and as discoveries. The most important Tule Elk field Hills field, in the Co. of Calif., the

Table B.

Butte -----
Colusa -----
Contra Costa -----
Fresno -----
Glenn -----
Kern -----
Kings -----
Los Angeles -----
Offshore -----
Madera -----
Monterey -----

See footnote

Table 7.—California: Offshore oil and gas production in 1973, by field¹

Field or area	Number of producing wells	Production	
		Oil (thousand barrels)	Gas (million cubic feet)
State:			
Algeria	1	42	164
Belmont	77	2,218	367
Caliente: Gas zone	2	—	1,473
Carpinteria	58	1,605	2,477
Coal Oil Point	2	29	61
Conception	3	39	18
Cuarta: Gas zone	2	—	4
Elwood	12	59	395
Elwood, South	10	1,176	66
Gaviota: Gas zone	2	—	398
Huntington Beach	332	16,050	2,287
Molino: Gas zone	7	—	7,800
Montalvo, West	6	98	—
Newport, West	15	118	37
Point Conception	2	124	45
Rincon	80	537	310
Summerland	21	260	1,663
Torrance	22	404	335
Venice Beach	4	145	59
Wilmington	948	47,526	12,638
Total	1,606	70,480	30,597
Federal:			
Carpinteria	49	2,190	1,474
Dos Cuadras	129	16,591	7,684
Total	178	18,781	9,158
Grand total	1,784	89,261	39,755

¹ Includes production from offshore portions of onshore fields.

Source: California Department of Conservation, Division of Oil and Gas.

Exploration and Development.—Activity continued relatively slow, owing to economic factors, the ongoing moratorium on offshore development, and the impact of environmental controls. Of 34 wells listed as discoveries, 5 oil wells were significant.⁷ The most important discovery was the Tule Elk field, 2 miles north of the Elk Hills field, in Kern County. Standard Oil Co. of Calif., the operator, reported a flow

of 6,940 barrels per day at 8,985 to 9,240 feet. At yearend, five drill rigs were on development work, defining the field limits. Recoverable reserves were estimated at 30 million to 80 million barrels.⁸

⁷ Pfeiffer, D. H. Developments in West Coast Area in 1973. AAPG Bull., v. 58, No. 8, August 1974, pp. 1536-1546.
⁸ Oil and Gas Journal. Social Moving Fast in Big New Oilfield. V. 71, No. 45, Nov. 5, 1973, p. 27.

Table 8.—California: Oil and gas well drilling completion in 1973, by county

County	Development wells ¹			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Butte	—	—	—	—	—	1	1	3,600
Colusa	1	4	1	—	—	5	11	72,040
Contra Costa	—	—	1	—	1	6	8	57,619
Fresno	51	4	5	—	—	10	70	265,312
Glenn	—	1	3	—	—	1	5	30,083
Kern	527	1	30	4	—	28	590	1,177,786
Kings	—	—	1	—	—	2	3	7,162
Los Angeles:								
Onshore	49	—	3	—	—	8	60	283,579
Offshore ²	24	—	—	—	—	—	24	106,063
Madera	—	1	—	—	—	3	4	22,069
Merced	—	1	1	—	1	2	5	32,813
Monterey	45	—	1	—	—	5	51	137,708

See footnotes at end of table.

Continued

1972	1973
39,586	38,762
1,086	1,098
17	17
9	17
160	168
1,028	862
53	48
128	95
1,395	1,207
4,347	4,108
37	36
1,759	1,775
1,019	1,023

Production from offshore State and

Conservation Committee
 Bureau of Mines.

natural gas in 1973,

Production	
Natural gas (net)	
Oil zones	Dry gas zones
(million cubic feet)	(million cubic feet)
—	—
—	3,370
—	9,227
3,116	7,700
9,451	1,067
—	13,952
—	2,989
74,920	1,557
9,293	331
56,347	361
—	3,230
493	—
9,989	—
17	223
—	43,611
20	—
119	—
—	43,834
1,243	—
1	—
21,869	24,559
—	88,410
—	30,690
—	3,971
—	923
25,566	1,589
—	10,390
212,444	291,984

Gas.

Table 8.—California: Oil and gas well drilling completions in 1973, by county—Continued

County	Development wells ¹			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Orange:								
Onshore	24	--	--	--	--	2	26	62,994
Offshore ²	23	--	1	--	--	--	24	79,943
Sacramento	--	1	--	--	--	5	6	27,299
San Benito	--	1	--	--	--	3	4	16,971
San Bernardino	--	--	--	--	--	1	1	3,477
San Joaquin	--	3	1	--	--	7	11	84,229
San Luis Obispo	4	--	--	--	--	4	8	46,136
Santa Mateo	--	--	--	--	--	1	1	2,451
Santa Barbara	76	--	3	7	--	8	94	439,581
Solano	--	9	15	--	5	12	41	298,275
Stanislaus	--	--	--	--	--	3	3	21,586
Sutter	--	5	2	--	--	5	12	69,814
Tehama	--	1	3	--	--	5	9	36,820
Tulare	--	2	4	--	--	2	8	23,849
Ventura	37	--	8	5	--	7	57	338,191
Yolo	--	14	12	--	10	30	66	369,180
Yuba	--	--	--	--	--	2	2	3,446
Other: Federal offshore	1	--	--	1	--	--	2	15,675
Total	862	48	95	17	17	168	1,207	4,107,985

¹ As defined by American Petroleum Institute.² State leases.

Source: American Petroleum Institute.

Geophysical work was higher than in 1972. Onshore, crew-months totaled 77 (50 crew-months in 1972), largely in the Sacramento Valley. Offshore, crew-months increased from 3.2 in 1972 to 13 in 1973. Much of this offshore work was in the Outer Basins areas, south of the Santa Barbara Channel islands.

Great Basins Petroleum Co. established a new depth record at its Buttonwillow well, Kern County.⁹ The well was bottomed at 21,640 feet. The former record had been held by Ohio Oil Co. (now Marathon Oil Co.), which drilled a well 21,482 feet deep in the Paloma field in 1953. Great Basins reported a flow of 900 barrels per day from an undetermined zone below 17,728 feet and planned to test several intervals. This was the first successful test of deep structures in central California.

In August and September, public hearings were held by the State Lands Commission on resumption of drilling in State waters. In December, the Commission lifted the ban on development drilling from fixed platforms and artificial islands, but approval was also required by the regional Coastal Zone Conservation Commissions.¹⁰ The trend toward renewal of drilling permits in State waters was prompted by the need for oil supplies, stricter drilling regulations to avoid oil spills, and development of new oil spill cleanup procedures.

Concerning Federal waters of the Outer Continental Shelf (OCS), beyond the State 3-mile limit, the Department of the Interior scheduled public hearings and sales of island tracts during 1974, following environmental, technologic, and economic studies. The prospective area comprised 6.5 million acres in 1,100 tracts extending from the seaward side of the Santa Barbara Channel islands southward to the Mexican border.¹¹

A U.S. Geological Survey report conservatively indicated production of 75,000 barrels per day and recoverable reserves of 730 million barrels to 1.1 billion barrels in the Santa Ynez field of Exxon USA on the OCS. Other estimates indicated reserves at 1 billion to 3 billion barrels. Exxon planned development with deep-water platforms and a prototype submerged production system.¹² In the large Dos Cuadros field, 5 miles offshore from Santa Barbara and also in the OCS, two operators were seeking permits for additional platforms.

⁹ Oil and Gas Journal. Great Basins' 21,518-Foot Test Breaks California Depth Record. V. 71, No. 14, Apr. 2, 1973, p. 27.

¹⁰ Oil and Gas Journal. California Agency Relaxes Offshore Drilling Ban. V. 71, No. 51, Dec. 17, 1973, p. 37.

¹¹ Oil and Gas Journal. Interest Keen in Southern California's Outer Banks. V. 71, No. 30, July 23, 1973, pp. 9-12.

¹² Rintoul, W. Operations Off West Coast Stay Locked in the Doldrums. Offshore, v. 33, No. 7, June 20, 1973, pp. 95-104.

Refineries.—A total of 10 refineries were operating in California in 1972. However, 10 additional refineries, crude oil refineries, are slightly larger. Standard Oil of California is the largest refinery, Contra Costa is second, and Richmond, the expansion of which is under way, is third. The expansion of the Richmond refinery includes facilities to permit the 100,000-deadweight-ton barrel-per-day unit, two sulfur-recovery units, and a facility for low-sulfur fuel oil. Atlantic Richfield is expanding its refinery in Los Angeles County. Considering a 100,000-deadweight-ton barrel-per-day for low-sulfur fuel oil, Kern County Electric Co. and Los Angeles Electric Co. announced a total of 100,000-barrel-per-day synthetic natural gas plant in San Diego County.

ASBESTOS

Asbestos.—Production of asbestos in California increased 16% over 1972. The major producer and shipper is the California Asbestos Corp. at its mine in the Sierra Nevada, Calaveras County. Other producers are Atlas Asbestos Co. at the Santa Cruz mine, and the California Asbestos Co. at the Christy mine, Santa Rita mine, and the Santa Rita mine.

Barite.—Barite was produced in California by the Minerals Co. at the Paloma mine, Tulare County, and by the California Asbestos Co. at the Paloma mine, Tulare County.

A barite circuit was installed at the Molybdenum (Molycorp) mine at the Pass, San Bernardino County. The barite heads contain 20% barite. Production was reported to be 60 tons per day at 4.25% gravity.

A total of 30,000 tons of barite was processed by four companies in California in 1972. The Los Angeles County and Chemical Co. and FMC Corp. were approximately

Productions in 1973,

Company	Total	
	Number of wells	Footage
Dry		
2	26	62,904
--	24	70,943
5	6	27,209
3	4	16,071
1	1	3,477
7	11	84,229
4	8	46,136
1	1	2,453
8	94	430,581
12	41	298,275
3	3	21,986
5	12	60,814
5	9	36,820
2	8	23,849
7	57	338,103
30	66	369,180
2	2	3,446
--	2	15,675
168	1,207	4,107,985

erial waters of the Outer (OCS), beyond the State Department of the Interior public hearings and sales of 1974, following environmental, and economic prospective area comprised in 1,100 tracts extending side of the Santa Barbara Islands southward to the

ical Survey report conserved production of 75,000 and recoverable reserves of oil to 1.1 billion barrels in the field of Exxon USA on estimates indicated reserves to 3 billion barrels. development with deep-sea and a prototype submerged platform.¹² In the large Dos wells offshore from Santa Barbara in the OCS, two operators permits for additional plat-

Journal. Great Basins' 21,518. California Depth Record. V. 1973, p. 27.
Journal. California Agency Review Ban. V. 71, No. 51, Dec.
Journal. Interest Keen in Southern Offshore. V. 71, No. 30, July 23, 1973.
Operations Off West Coast State Offshore, v. 33, No. 7, 195-104.

Refineries.—A total of 36 refineries were operating in California, one less than in 1972. However, owing to several expansions, crude oil refining capacity increased slightly. Standard Oil Co. of Calif. planned major expansions at the Richmond refinery, Contra Costa County, and the El Segundo refinery, Los Angeles County. At Richmond, the expansion included wharf enlargement, new mooring and pipeline facilities to permit handling of tankers in the 100,000-deadweight-ton class, a 175,000-barrel-per-day crude oil distillation unit, two sulfur-removal units, and a plant for low-lead gasoline. At El Segundo, new units included a 130,000-barrel-per-day facility for low-sulfur distillates.

Atlantic Richfield Co. announced plans for refinery expansion at Carson, Los Angeles County. Getty Oil Co. was considering a 100,000-barrel-per-day refinery for low-sulfur fuel oil in the Kern River field, Kern County. San Diego Gas and Electric Co. and Pacific Resources, Inc., announced a feasibility study for a 100,000-barrel-per-day refinery and synthetic natural gas complex at Carlsbad, San Diego County.

NONMETALS

Asbestos.—Production at four mines increased 16% over that of 1972. Leading producer and shipper was Pacific Asbestos Corp. at its mine and mill near Copperopolis, Calaveras County. The other producers were Atlas Asbestos Co. at the Santa Cruz mine and Coalinga Asbestos Co. at the Christie mine, both in Fresno County, and Union Carbide Corp. at the Santa Rita mine, San Benito County.

Barite.—Barite was mined by Industrial Minerals Co. at the Castilla mine, Shasta County, and by L. G. Embree at the La Paloma mine, Tulare County.

A barite circuit was completed in 1972 at the Molybdenum Corp. of America (Molycorp) rare-earths mill at Mountain Pass, San Bernardino County, where mill heads contain 20% BaSO₄, but no production was reported in 1973. Capacity is 60 tons per day of product averaging 4.25% gravity.

A total of 56,125 tons of barite was processed by four companies—Wilbur Ellis Co., Fresno County; Calada Materials Co., Los Angeles County; Industrial Minerals and Chemical Co., Sacramento County; and FMC Corp., Stanislaus County. Uses were approximately as follows: Chemicals,

62%; well drilling mud, 37%; and filler and extender, 1%.

Boron.—Output of boron compounds, in terms of B₂O₃ content continued upward in 1973. United States Borax and Chemical Corp. accounted for a large share of total output. The company produced borax, anhydrous sodium tetraborate, boric acid, and rasorite at its chemical plant from sodium and calcium borate minerals mined at the large open pit.

Kerr-McGee Chemical Corp. recovered borax products, anhydrous sodium tetraborate, and boric acid from Searles Lake brines at Trona, San Bernardino County. A study was underway on possible new products from the Searles Lake brines, and a pilot plant was planned for testing new processing techniques.

Stauffer Chemical Co. produced borax in its chemical plant at the west end of the lake.

Tenneco Oil Co., an affiliate of Tenneco, Inc., produced colemanite (hydrous calcium borate) at its open pit near Ryan, in Death Valley National Monument. Mining was underway in Boraxo pits 2 and 3, and waste rock was backfilled into pit 1, which was mined out in 1972. The ore receives primary crushing (to minus 8 inches) before shipment by truck 31 miles to the calcining plant in Nevada. The colemanite ore body occurs on the northern limb of a tight east-west fold. The ore bed is up to 40 feet thick. The mineral extends to a depth of 175 feet and a 2,000-foot strike length. High-quality mineral specimens were collected near the water table in pit 1.¹³

Cement.—Production and shipments of portland cement increased slightly over those of 1972, but sales value rose nearly 11%, owing to increasing prices. Uses were distributed as follows: Ready-mix concrete, 70%; concrete products, 12%; building materials dealers, 9%; and miscellaneous, 9%.

Ideal Basic Industries, Inc., abandoned plans for a new cement plant at San Juan Bautista, San Benito County, to replace the existing 60-year-old facilities, which had operated since 1971 under temporary air pollution control variances. Production was phased out during August and September.

¹³ Minette, J. W., and G. Muehle. Colemanite From the Thompson Mine. Miner. Record, v. 5, No. 2, March-April 1974, pp. 67-73.

Table 9.—California: Portland cement salient statistics (Short tons)

	1972	1973
Number of active plants -----	13	13
Production -----	9,392,509	9,502,477
Shipments from mills:		
Quantity -----	9,085,891	9,395,462
Value -----	\$182,307,515	\$201,891,876
Stocks at mills, Dec. 31 -----	572,846	554,805

Table 10.—California: Salient portland cement statistics (Short tons)

	Northern California		Southern California	
	1972	1973	1972	1973
Number of active plants -----	5	5	8	8
Production -----	2,783,076	2,797,471	6,609,433	6,705,006
Shipments from mills:				
Quantity -----	2,854,914	3,074,722	6,230,977	6,320,740
Value -----	\$57,319,542	\$64,952,633	\$124,987,973	\$136,939,244
Stocks at mills, Dec. 31 -----	267,184	230,768	305,662	324,037

Clays and Shale.—There were 89 recorded operations in 31 counties in 1973. Production increased slightly over that of 1972. Nearly 93% of that sold or used was common clay; the remainder was largely fire clay, bentonite, and kaolin. The principal producers, accounting for nearly half the total output, were Light-weight Processing Co., The Flintkote Co., Interpace Corp., Homestake Mining Co., and Pacific Clay Products Co.

Industrial Mineral Ventures, Inc., located a number of placer claims for hectorite, a magnesium-bearing bentonitic clay, near Death Valley Junction. The deposit was sampled to a depth of 30 feet, using a 4-inch auger drill. If tests prove successful, a pilot plant will be erected near the deposit. The hectorite would be sold for use in cosmetics, pharmaceuticals, ceramics, and paints.

White kaolin was mined from a deposit in Trabuco Canyon, Orange County, and processed by Schaeppé Clay Products Co. in Modjeska Canyon. The high-grade kaolin product, prepared by washing, was sold to Norris Industries, Inc., for use in white-ware china.

The American Olean Tile Co., a subsidiary of National Gypsum Corp., built a tile plant, located north of Roseville. Placer County. Clay raw materials will be

obtained from deposits near Lincoln, Placer County.

Paul Brothers Excavating Co., Ridgecrest, San Bernardino County, acquired rights to the Pacific bentonite mine, 6 miles north of Johannesburg, San Bernardino County. Early in the year, truckload lots of crude bentonite were sold to Calcite Corp. for processing at its mill in Rosamond. The product was for use in oil well drilling mud.

Diatomite.—Production at four operations increased 6% over that of 1973. Processed material was used in filtration (66%), filters (22%), insulation (5%), and miscellaneous applications (7%). Johns-Manville Products Corp., Celite Div., at Lompoc, Santa Barbara County, accounted for about 73% of the total output. Other producers were Airox, Inc., and GREFCO, Inc., both in Santa Barbara County, and Basalt Rock Co., Inc., which mined pozzolan in Napa County for special uses.

Feldspar.—Owens-Illinois, Inc., and Wedron Silica Co. were the only active feldspar producers in 1973. The former, which accounted for a large share of the output, produced a feldspar-silica mixture; the latter produced a crude flotation concentrate. Total crude feldspar output was 6% below that of 1972.

Gypsum.—Output of gypsum was 17% below that of 1972. United States Gypsum Co. was the leading producer at its pit mine and calciner in Placer County. H. M. Hollister (Hollister mine), Temblor (Temblor mine), and C. L. Gypsum (C. L. Gypsum mine), also were producers.

Seven companies produced gypsum in 1973. Following United States Gypsum Co. as major producers were Kaiser Cement & Gypsum Co. at Long Beach and at Richmond, Kaiser Cement & Gypsum Co. at Long Beach, Los Angeles, Contra Costa County, Kaiser Cement & Gypsum Co. at Fremont, California Gypsum Co., and Kaiser Cement & Gypsum Co. at Fremont, Contra Costa County. Kaiser Cement & Gypsum Co. is developing a new manufacturing process for a pollution control system at Long Beach.

Valley Nitrogen Chemicals, Inc., a subsidiary of Federal Petroleum Products Co., produced gypsum in Contra Costa County.

Lime.—Production of lime increased 4% over that of 1972. Ten companies produced lime in 12 counties. Kaiser Cement & Gypsum Co. at Natividad was the largest producer.

Consumption of lime for sugar refining, sugar, and miscellaneous uses was 10% below that of 1972.

Magnesium.—California has several magnesium refractory magnesite deposits, and magnesite was produced at Moss Landing.

ment

1973
13
502,477
395,462
391,876
554,805

ment statistics

Southern California		
	1972	1973
5	8	8
71	6,609,438	6,705,006
22	6,230,977	6,320,740
33	\$124,987,973	\$136,939,244
38	305,662	324,037

deposits near Lincoln, Placer

Excavating Co., Ridge-
 Bernardino County, acquired
 Pacific bentonite mine, 6
 Johannesburg, San Bernar-
 Early in the year, truckload
 bentonite were sold to Cal-
 processing at its mill in
 product was for use in
 mud.

Production at four oper-
 ed 6% over that of 1973.
 material was used in filtration
 (22%), insulation (5%),
 neous applications (7%).
 Products Corp., Celite Div.,
 Santa Barbara County, ac-
 about 73% of the total out-
 producers were Airox, Inc.,
 Inc., both in Santa Bar-
 and Basalt Rock Co., Inc.,
 pozzolan in Napa County

Dwens-Illinois, Inc., and Wed-
 were the only active feld-
 in 1973. The former, which
 a large share of the output,
 feldspar-silica mixture; the
 a crude flotation concen-
 crude feldspar output was 6%
 1972.

Gypsum.—Output of crude and calcined gypsum was 17% higher than in 1972. United States Gypsum Co. again was the leading producer at its Plaster City open pit mine and calcining plant, Imperial County. H. M. Holloway, Inc. (Lost Hills mine), Temblor Gypsum Co. (Richfield mine), and C. L. Fannin, all in Kern County, also were important producers.

Seven companies produced calcined gypsum. Following United States Gypsum, major producers were National Gypsum Co. at Long Beach, Los Angeles County, and at Richmond, Contra Costa County; Kaiser Cement & Gypsum Corp. at Long Beach, Los Angeles County, and at Antioch, Contra Costa County; The Flintkote Co. at Fremont, Butte County; and California Gypsum Co.'s Pabco plant, Alameda County. Kaiser completed installation of new manufacturing equipment and a pollution control system at its wallboard plant at Long Beach.

Valley Nitrogen Producers, Inc., Occidental Petroleum Corp., and Collier Carbon and Chemical Corp. recovered by-product gypsum in Fresno, San Joaquin, and Contra Costa Counties, respectively.

Lime.—Production of quicklime and hydrated lime recovered during 1973, increasing 4%, following a sharp drop in 1972. Ten companies were active at 15 plants in 12 counties. The leading producer was Kaiser Aluminum & Chemicals Corp. at Natividad, Monterey County.

Consumption totaled 872,400 tons, used for precipitating magnesia from seawater, sugar refining, soil stabilization, refractories, and miscellaneous minor applications.

Magnesium Compounds.—Kaiser Refractories, a division of Kaiser Industries Corp., produced increased quantities of refractory magnesia, caustic-calcined magnesia, and magnesium hydroxide from seawater at Moss Landing, Monterey County.

In 1973, Kaiser installed Venturi scrubbers for dust abatement at the last of three rotary kilns and started effluent discharge into the bay rather than in the harbor area.

Other products derived from seawater were the extra-light to heavy oxide, carbonate, hydroxide, and trisilicate by Merck & Co., Inc., in San Mateo County, and magnesium chloride flakes and brines by FMC Corp., San Diego County.

Perlite.—American Perlite Co., sole producer of crude perlite in the State, increased by 58% sales and plant consumption of crude perlite produced at its Fish Springs quarry, near Big Pine, Inyo County. Six companies, four of which were in Los Angeles County, prepared expanded perlite for use (in order of importance) as filter aids, horticultural aggregate, plaster aggregate, concrete aggregate, and in miscellaneous small applications. Production of expanded perlite was 24,442 tons, 15% more than in 1972.

Potassium Salts.—The production rate of Kerr-McGee Chemical Corp., the only producer in the State, was similar to the 1972 level. Marketed products were K_2SO_4 , which contained about 52.5% K_2O equivalent, and standard and coarse muriate containing 60% K_2O equivalent.

Pumice.—Combined output of crude and prepared pumice, pumicite (volcanic ash), and scoria (volcanic cinder) continued upward in 1973. There were 27 companies, 56 mines, and 30 preparation plants in operation during the year. The U.S. Forest Service used about 36% of total output for road construction. The Forest Service mined volcanic cinder at 23 operations, mainly in Lassen, Modoc, and Siskiyou Counties. About two-thirds of the total consumed was in road building. The remainder was used in concrete aggregate (12%), railroad ballast (3%), and a number of miscellaneous applications.

Table 12.—California: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County ¹	
Short tons	Value
3,452	\$553,703
4,189	262,296
W	W
W	W
W	W
340	325
5,500	28,315
7,671	269,458
7,390	130,199
1,879	373,630
W	W
W	W
7,765	1,619,320
8,186	3,237,246

County	1972			1973		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Alameda	13	8,746	11,988	12	9,044	13,140
Alpine	2	37	8	1	8	11
Amador	6	933	4,213	5	W	W
Butte	10	878	1,180	8	1,018	1,355
Contra Costa	6	400	351	5	207	193
Del Norte	5	214	W	3	149	W
El Dorado	6	189	210	6	163	206
Fresno	10	3,758	5,023	10	3,781	5,351
Glenn	6	356	433	5	W	W
Humboldt	12	545	881	11	451	746
Imperial	7	619	330	7	714	681
Inyo	8	236	400	8	124	294
Kern	18	2,178	3,511	11	1,714	2,413
Kings	1	21	40	—	—	—
Lake	11	332	460	9	323	450
Lassen	5	147	267	5	267	494
Los Angeles	28	21,306	29,303	27	22,195	33,054
Marin	2	3	6	2	33	82
Mariposa	4	39	68	4	23	44
Mendocino	13	403	582	10	403	763
Merced	6	1,249	1,656	8	1,108	1,520
Modoc	4	136	250	6	274	192
Mono	6	153	201	7	198	267
Monterey	10	689	2,590	9	643	W
Napa	2	W	W	3	43	89
Nevada	6	1,226	1,806	4	871	1,958
Orange	19	9,340	12,311	21	13,343	17,434
Placer	8	906	1,644	5	W	W
Plumas	6	93	79	6	117	132
Riverside	17	5,039	8,520	15	3,149	6,266
Sacramento	11	5,836	8,594	12	4,476	6,429
San Bernardino	22	12,995	9,316	23	12,268	10,031
San Diego	29	9,813	20,326	26	9,377	24,799
San Joaquin	6	2,360	3,033	8	2,083	3,403
San Luis Obispo	6	278	636	5	361	696
Santa Barbara	8	1,536	1,780	7	1,504	1,864
Santa Clara	13	4,337	6,008	10	1,884	2,612
Santa Cruz	7	2,126	2,508	6	2,367	3,030
Shasta	17	824	937	17	1,115	1,130
Sierra	3	21	13	1	7	2
Siskiyou	7	474	499	11	830	1,544
Solano	1	86	285	1	90	312
Sonoma	12	3,213	4,933	13	4,079	6,542
Stanislaus	11	1,912	2,568	9	1,403	2,196
Tehama	7	164	217	6	170	222
Trinity	9	133	266	9	135	W
Tulare	6	1,069	1,530	4	W	W
Tuolumne	5	271	W	5	W	W
Ventura	10	4,430	4,608	11	5,119	6,239
Yolo	9	2,616	2,643	9	3,862	4,516
Yuba	5	742	871	4	568	912
Undistributed ²	20	1,830	2,732	20	5,410	12,664
Total³	481	117,288	162,619	450	117,470	176,286

¹ Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

² Includes Calaveras, Colusa, Madera, San Benito, San Francisco (1972), San Mateo, Sutter, and some sand and gravel that cannot be assigned to specific counties.

³ Data may not add to totals shown because of independent rounding.

50 million tons
as of January
the need for
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Rehabilitation
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pit at Duarte.
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plants formerly
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Sand and Gravel
Technical and Plan-
No. 11, Novem-

Table 13.—California: Sand and gravel sold or used by producers, by class of operation and use
(Thousand short tons and thousand dollars)

Class of operation and use	1972		1973	
	Quantity	Value	Quantity	Value
Commercial operations:				
Sand:				
Blast	223	1,095	149	638
Building	23,370	34,737	22,276	34,924
Engine	56	180	51	186
Fill	4,338	3,560	4,395	3,895
Foundry	113	586	W	W
Glass	878	4,547	1,421	7,154
Paving	17,507	23,313	17,856	24,316
Other uses ¹	1,197	6,077	622	3,346
Total²	47,681	74,096	46,773	74,460
Gravel:				
Building	23,334	35,278	21,107	32,662
Fill	1,590	1,356	1,611	1,381
Paving	29,964	40,990	27,019	39,383
Railroad ballast	W	W	313	433
Miscellaneous	689	938	909	1,389
Other uses	1,161	1,886	1,147	1,735
Total²	56,737	80,448	52,106	76,982
Government-and-contractor operations:				
Sand:				
Building	36	37	(³)	1
Fill	1,154	397	875	266
Paving	1,094	1,563	4,766	9,576
Other uses	2	4	69	153
Total²	2,285	2,000	5,710	9,996
Gravel:				
Building	77	139	1	2
Fill	6,599	862	451	170
Paving	3,906	5,069	6,591	12,909
Other uses	2	4	5,837	1,768
Total	10,584	6,074	12,880	14,849
Total sand and gravel²	117,288	162,619	117,470	176,286

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

¹ Includes fire or furnace, glass, filtration, oil (hydrofrac), filler, foundry (1973), molding, pottery (1972), railroad ballast, and other underground sand.

² Data may not add to totals shown because of independent rounding.

³ Less than 1/2 unit.

Kaiser Sand and Gravel Co., Chevreux Materials, Inc., and Fresno Paving Co. worked jointly to provide rock, sand, and plant mix for highway construction near Auburn, Placer County. Quarry-run rock was reduced in a portable crushing unit supplied by Kaiser, mixed with sand from Chevreux's nearby Bear River plant, and delivered to an asphalt plant of Fresno Paving for preparation of road-surfacing material.

Teichert Aggregates, Inc., installed a modern, electrically operated, semiportable asphalt plant near its sand and gravel operation at Woodland, Yolo County. Batching, mixing, and discharge of aggregate and asphalt were automatically controlled.

Lone Star Industries, Inc., was seeking a new operating site; a use permit for the pit and crushing plant at Fair Oaks,

Sacramento County, was scheduled for expiration on June 30, 1975.

Granite Construction Co. was granted a 10-year permit on a 55-acre site near Mather Air Force Base, Sacramento County.

Early in the year, Owens-Illinois, Inc., closed its sand-processing plant near San Juan Capistrano, Orange County, for plant adjustments. The company's Corona plant, Riverside County, was temporarily reopened until the San Juan Capistrano plant was readied for full operation.

Wedron Silica Co. purchased a property 2 miles west of Byron, Contra Costa County, which was formerly owned by Delta Silica Co. A massive sandstone bed will be mined with a self-loading scraper and delivered to a screening plant via conveyor belt. The sandstone will be screened, washed, graded, flotation-created to re-

move iron and feldspar impurities and ground to specifications for industry.

Sodium Compounds.—Production of sodium carbonate (soda ash) and sulfate (salt cake) was at a level similar to that of 1972. Kerr-McGee Corp. and Stauffer Chemical Co. produce both chemical products from sea brines; San Bernardino County produces Borax & Chemical Corp. produces salt cake at its open pit and chemical plant in Boron, Kern County.

Stone.—The number of stone

Table 14.—California: Quarries (Thousand short tons)

County	1972	
	Number of quarries	Quantity
Alameda	8	2,638
Colusa	1	35
Contra Costa	7	1,902
El Dorado	8	377
Humboldt	10	99
Imperial	3	24
Kern	13	2,975
Kings	1	1
Lake	7	276
Lassen	2	W
Los Angeles	8	1,586
Mariposa	4	1
Mendocino	2	3
Modoc	6	188
Mono	—	—
Nevada	5	W
Plumas	4	141
Riverside	15	2,492
San Bernardino	30	6,770
San Diego	14	1,689
San Mateo	6	749
Santa Barbara	22	W
Santa Clara	12	W
Santa Cruz	6	W
Sierra	—	—
Siskiyou	12	141
Sonoma	10	426
Stanislaus	1	93
Tehama	—	—
Tuolumne	14	92
Ventura	8	466
Yuba	4	W
Undistributed ²	110	14,051
Total³	353	37,213

¹ Revised.

W Withheld to avoid disclosing individual company confidential data.

² Less than 1/2 unit.

³ Includes Alpine (1972), Amador, Napa, Orange (1973), Placer, San Bernardino, Solano, Trinity, Tulare, Yolo and Yuba.

⁴ Data may not add to totals shown because of independent rounding.

Producers, by class

1973	
Quantity	Value
149	638
22,276	34,924
61	186
4,395	3,895
W	W
1,421	7,154
17,856	24,316
622	3,346
46,773	74,460
21,107	32,662
1,611	1,381
27,019	39,383
313	433
909	1,389
1,147	1,735
52,106	76,982

(3)	1
875	266
4,766	9,676
69	153
5,710	9,996

1	2
451	170
6,591	12,909
5,837	1,768
12,880	14,849
117,470	176,286

cluded with "Other uses."
undry (1973), molding,

was scheduled for
0, 1975.

on Co. was granted
a 55-acre site near
Base, Sacramento

Owens-Illinois, Inc.,
ssing plant near San
nge County, for plant
pany's Corona plant,
was temporarily re-
an Juan Capistrano
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massive sandstone bed
a self-loading scraper
reening plant via con-
stone will be screened,
ation-created to re-

move iron and feldspar impurities, dried,
and ground to specifications for the glass
industry.

Sodium Compounds.—Production of sodium carbonate (soda ash) and sodium sulfate (salt cake) was at a rate similar to that of 1972. Kerr-McGee Chemical Corp. and Stauffer Chemical Co. recovered both chemical products from Searles Lake brines, San Bernardino County, and U.S. Borax & Chemical Corp. produced salt cake at its open pit and chemical plant at Boron, Kern County.

Stone.—The number of stone quarries

reporting production decreased sharply in 1973 from 1972. The quantity produced and its value was substantially higher, owing to steadily rising prices. Demand for crushed rock continued to expand during the year. Limestone and dolomite accounted for about half the crushed rock sold or used. Crushed granite, sandstone, and traprock were also in high demand. Principal uses were in cement (34%), roadbase (19%), construction aggregate and roadstone (13%), concrete aggregate (9%), and bituminous aggregate (9%).

Table 14.—California: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1972			1973			Type of stone produced in 1973
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Alameda	8	2,638	3,588	7	3,602	4,306	Limestone, sandstone, traprock, other stone.
Colusa	1	35	121	1	55	194	Sandstone.
Contra Costa	7	1,902	3,955	8	2,244	5,126	Sandstone, traprock, other stone.
El Dorado	8	377	W	8	442	1,917	Limestone, other stone.
Humboldt	10	99	113	2	W	W	Other stone.
Imperial	3	24	91	1	1	(1)	Do.
Kern	13	2,975	4,314	8	3,211	4,856	Limestone, granite, quartzite, other stone.
Kings	1	1	2	—	—	—	—
Lake	7	W	19	6	W	W	Traprock, other stone.
Lassen	2	276	W	2	298	W	Do.
Los Angeles	8	1,586	2,952	12	683	1,321	Granite, limestone, other stone.
Mariposa	4	1	13	2	W	41	Slate.
Mendocino	2	3	5	3	5	21	Traprock.
Modoc	6	188	206	4	13	10	Sandstone, traprock, other stone.
Mono	—	—	—	1	(1)	(1)	Other stone.
Nevada	5	W	W	4	19	10	Quartzite.
Plumas	4	141	219	5	W	265	Granite, marble, other stone.
Riverside	15	2,492	3,948	17	3,479	5,004	Limestone, granite, quartzite, traprock.
San Bernardino	30	6,770	11,300	30	7,173	13,339	Dolomite, granite, sandstone, quartzite, other stone.
San Diego	14	1,689	3,981	17	2,051	4,665	Granite, traprock.
San Mateo	6	749	1,507	8	1,652	3,351	Limestone, sandstone, traprock, other stone.
Santa Barbara	22	W	W	6	4	42	Limestone, sandstone, granite, other stone.
Santa Clara	12	W	5,089	10	6,323	8,248	Limestone, sandstone, traprock, other stone.
Santa Cruz	6	W	W	4	1,076	1,684	Limestone, granite.
Sierra	—	—	—	1	(1)	(1)	Other stone.
Siskiyou	12	141	211	3	385	419	Traprock, other stone.
Sonoma	10	426	734	8	760	1,063	Shell, traprock, other stone.
Stanislaus	1	93	246	—	—	—	—
Tehama	—	—	—	2	17	39	Other stone.
Tuolumne	14	92	464	10	172	703	Dolomite, marble, sandstone, other stone.
Ventura	8	466	1,716	7	213	559	Limestone, granite, sandstone, traprock, other stone.
Yuba	4	W	185	2	74	241	Traprock, other stone.
Undistributed ²	110	14,051	20,832	76	9,886	19,753	—
Total³	353	37,213	65,811	275	43,838	77,175	—

¹ Revised.

² W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

³ Less than 1/2 unit.

⁴ Includes Alpine (1972), Amador, Calaveras, Del Norte, Fresno, Inyo, Madera, Marin, Monterey, Napa, Orange (1973), Placer, Sacramento, San Benito, San Joaquin, San Luis Obispo, Shasta, Solano, Trinity, Tulare, Yolo and counties for which no breakdown is available (1972).

⁵ Data may not add to totals shown because of independent rounding.

Table 15.—California: Stone sold or used by producers, by type
(Thousand short tons and thousand dollars)

Type of stone	1972		1973	
	Quantity	Value	Quantity	Value
Dimension:				
Granite	5	329	8	591
Sandstone, quartz, and quartzite	1	23	1	24
Traprock	(1)	2	(1)	4
Slate	W	13	W	W
Other stone ²	17	138	7	149
Total³	24	503	16	767
Crushed and broken:				
Limestone and dolomite	18,058	29,270	21,796	37,450
Granite	5,337	9,604	6,108	10,119
Marble ⁴	192	368	155	334
Sandstone	5,097	10,164	5,506	8,847
Quartzite ⁵	221	580	231	593
Traprock	4,068	7,548	5,359	9,423
Miscellaneous stone	4,217	7,774	4,668	9,591
Total³	37,190	65,307	43,822	76,407

W Withheld to avoid disclosing individual company confidential data.

¹ Less than 1/2 unit.

² Includes data for limestone, miscellaneous stone, and any data with symbol W in dimension stone.

³ Data may not add to totals shown because of independent rounding.

⁴ Data include shell.

⁵ Data include quartz.

Table 16.—Ca.

	Use
Dimension:	
Rough stone:	
Rough blocks	-----
Construction	-----
Flagging	-----
Dressed stone:	
Architectural	-----
Construction	-----
Flagging	-----
Roofing slate (architectural)	-----
Other uses ¹	-----
Total²	-----
Crushed and broken:	
Bituminous aggregate	-----
Concrete aggregate	-----
Dense graded roadbase stone	-----
Macadam aggregate	-----
Surface treatment aggregate	-----
Unspecified construction aggregate	-----
Agricultural purposes ³	-----
Cement manufacture	-----
Fill	-----
Glass manufacture	-----
Lime manufacture	-----
Mineral fillers, extenders	-----
Riprap and jetty stone	-----
Manufactured fine aggregate	-----
Filter stone	-----
Sugar refining	-----
Terrazzo and exposed aggregate	-----
Roofing aggregates, chips	-----
Other uses ⁴	-----
Total²	-----
Grand total²	-----

W Withheld to avoid disclosing individual company confidential data.

¹ Includes stone used for non-dimensional purposes (1972).

² Data may not add to totals shown because of independent rounding.

³ Includes agricultural limestone.

⁴ Includes whitening or whitening stone.

⁵ Includes stone used for stone, chemicals, magnesium, and other uses. Data also include stone used for other purposes.

Sulfur.—Thirteen producing oil companies, recovered 12 tons of sulfur, compared with 10 tons in 1972. Sales totaled \$4,539,087. Production was by Texaco, Inc., at the refinery, Los Angeles County Oil Co. of Calif. at Los Angeles County, and El Comite de Costa County; and Exxon, Solano County.

Talc, Soapstone, and Pyrophyllite.—Production increased 10 percent in 1972. There were 14 producers, most of which were talc producers. Inyo County, and at Bernardino County) pro-

by type

Table 16.—California: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Value	1973	
	Quantity	Value
29	8	591
23	1	24
2	(1)	4
13	W	W
38	7	149
303	16	767
270	21,796	37,450
304	6,108	10,119
68	155	384
64	5,506	8,847
80	231	593
48	5,359	9,423
74	4,668	9,591
307	43,822	76,407

symbol W in dimension

Use	1972		1973	
	Quantity	Value	Quantity	Value
Dimension:				
Rough stone:				
Rough blocks	8	261	4	274
Construction	11	83	5	79
Flagging	W	W	1	18
Dressed stone:				
Architectural	1	31	3	220
Construction	2	26	2	23
Flagging	1	17	W	10
Roofing slate (architectural)	W	W	W	30
Other uses ¹	1	85	2	114
Total²	24	503	16	767
Crushed and broken:				
Bituminous aggregate	2,628	6,185	3,865	8,568
Concrete aggregate	3,460	5,017	4,160	5,604
Dense graded roadbase stone	8,253	13,373	8,289	13,173
Macadam aggregate	W	W	367	927
Surface treatment aggregate	695	850	409	601
Unspecified construction aggregate and roadstone	2,285	3,917	5,616	8,991
Agricultural purposes ³	155	960	156	321
Cement manufacture	12,981	15,384	15,080	19,121
Fill	455	559	352	429
Glass manufacture	233	1,355	389	2,250
Lime manufacture	465	1,434	470	1,838
Mineral fillers, extenders and whiting ⁴	W	W	403	3,003
Riprap and jetty stone	2,499	6,300	1,502	3,682
Manufactured fine aggregate (stone sand)	59	552	W	W
Filter stone	W	W	W	840
Sugar refining	216	W	230	W
Terrazzo and exposed aggregate	51	412	126	879
Roofing aggregates, chips and granules	W	W	733	1,616
Other uses ⁵	2,757	9,009	1,677	4,065
Total²	37,190	65,307	43,822	76,407
Grand total²	37,213	65,811	43,838	77,175

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
¹ Includes stone used for monumental purposes, curbing, flooring slate (1973), and uses not specified (1972).

² Data may not add to totals shown because of independent rounding.

³ Includes agricultural limestone, soil conditioners, and poultry grit and mineral food.

⁴ Includes whiting or whiting substitute and other fillers or extenders.

⁵ Includes stone used for railroad ballast, dead-burned dolomite, ferrosilicon, flux stone, refractory stone, chemicals, magnesium metal manufacture, waste material (1973) and uses not specified. 1972 data also include stone used for building products, abrasives, and neutralization and paper manufacture.

Sulfur.—Thirteen producers, including 12 oil companies, recovered 414,121 long tons of sulfur, compared with 330,157 long tons in 1972. Sales totaled 432,564 long tons (\$4,539,087). Principal producers were Texaco, Inc., at the Long Beach oil refinery, Los Angeles County; Standard Oil Co. of Calif. at El Segundo, Los Angeles County, and Richmond, Contra Costa County; and Exxon USA at Benicia, Solano County.

Talc, Soapstone, and Pyrophyllite.—Mine production increased 15% over that of 1972. There were 14 producing mines, most of which were talc producers; two (Interpace Corp. at the Holiday mine, Inyo County, and at Victorville, San Bernardino County) produced only pyro-

phyllite, and one (Commercial Minerals Co. at the Doc mine, El Dorado County) mined only soapstone. Leading talc producer was L. Grantham Corp. at the Warm Springs mine in Death Valley, Inyo County. Other major producers were Pfizer, Inc., R. T. Vanderbilt, and Cyprus Mines Corp. The Panamint mine in the Panamint Range, Death Valley, Inyo County, was reopened by the United Sierra Div., Cyprus Mines Corp. The company also acquired rights to the Monarch mine, near Ibex Springs, San Bernardino County, which was in operation during the year. Pfizer, Inc., also acquired rights to talc properties in Death Valley, Inyo County.

Sales of prepared, ground material in-

creased 35%, reaching 238,144 tons valued at \$7.65 million, for use in ceramics (33%), paint (16%), refractories (6%), paper (5%), a number of other applications, and for the export market.

Vermiculite.—Output increased 18% over that of 1972. There were two producers—W. R. Grace & Co., Zonolite Construction Products Div., in Los Angeles, Los Angeles County, Newark, Alameda County, and Santa Ana, Orange County; and La Habra Products Inc., at Anaheim, Orange County.

Consumption, by end use, during the year was as follows: Acoustical and fireproofing, 48%; concrete aggregate, 27%; fertilizer carrier, 13%; and miscellaneous (ceiling textures, plaster aggregate, insulation, horticulture, soil conditioner), 12%.

Wollastonite.—Western American Minerals Co. obtained a conditional land use permit from the Inyo County Planning Commission for 24 lode claims, located north of Hunter Mountain, Inyo County. The company planned wollastonite quarrying, a crushing and grinding plant at Olancha or Lone Pine, and rail shipment of a product in 200- and minus 325-mesh production in bulk and in bags. Principal uses are as filler-extender in ceramics,

paints, plastics, rubber, and paper, and in abrasives.

METALS

Copper.—The small production of recoverable copper, largely a byproduct at Union Carbide Corp.'s Pine Creek mine, Inyo County, was substantially lower than that of 1972. Six other producers recovered byproduct copper at precious metal, lead, and lead-zinc operations, and a 65% copper precipitate was recovered from mine waters by Stauffer Chemical Co. at Iron Mountain, near Redding, Shasta County.

There was renewed interest in copper exploration in the Copper Basin, San Bernardino and Imperial Counties, and in the Foothill Copper Belt and Moonlight Valley, both in Plumas County. Louisiana Land and Exploration Co. was drilling in the Copper Basin and was considering a heap-leaching operation.

Prices for scrap copper and brass were rising in the bay area and Los Angeles markets during the year. Supplies were often short, and demand continued high. In the bay area, No. 1 heavy copper scrap was selling at 50 cents per pound early in the year and at 80 cents per pound late in the year.

Table 17.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mines producing ¹		Material sold or treated ² (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
1971, total	8	5	89,757	2,966	\$122,351	443,761	\$686,033
1972, total	5	4	18,005	3,974	232,876	175,467	295,641
1973:							
Del Norte	—	1	—	1	98	—	219
Fresno	—	—	—	655	64,066	82	74
Los Angeles	—	—	—	135	13,204	10	31
Mariposa	1	—	45	12	1,174	20	31
Merced	—	—	—	41	4,010	4	—
Plumas	—	3	—	32	3,130	—	124
San Diego	1	—	10	15	1,467	50	113
San Joaquin	—	—	—	522	51,057	50	43
Shasta	1	—	58	209	20,442	19	134
Stanislaus	—	—	—	603	58,980	60	51
Trinity	1	—	1,300	25	2,445	20	—
Undistributed ³	4	3	5,528	1,397	136,639	55,582	142,147
Total	8	7	6,941	3,647	366,712	56,897	142,147

See footnotes at end of table.

Table 17.—California: Mi

County
1971, total
1972, total
1973:
Del Norte
Fresno
Los Angeles
Mariposa
Merced
Plumas
San Diego
San Joaquin
Shasta
Stanislaus
Trinity
Undistributed ³
Total

¹ Operations from which vol
ations not counted as producing
² Does not include gravel wash
³ Alpine, Inyo, Kern, Mono,
disclosing individual company e

Table 18.—California: M
zinc in 1973, by

Type of material and method of r
Lode:
Smelting of concentrates
Direct smelting of ore
Copper precipitates
Gold cleanup
Total lode material
Placer
Grand total

¹ Includes byproduct recover

Table 19.—California:
zinc in

Source
Lode ore:
Dry gold, gold-silver ¹
Copper, lead, lead-zinc, tungsten ore ²
Total
Placer lode material:
Gold cleanup
Copper precipitates
Total
Total lode material
Placer
Grand total

¹ Operations from which f
ations not counted as produc
² Does not include gravel wa
³ Does not include direct
less than 1/2 unit.
⁴ Includes tungsten ore t

Table 17.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county—Continued

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1971, total	515	\$535,704	2,284	\$630,356	3,003	\$967,016	\$2,941,482
1972, total	598	612,246	1,153	346,736	1,202	426,768	1,914,287
1973:							
Del Norte	--	--	--	--	--	--	98
Fresno	--	--	--	--	--	--	64,276
Los Angeles	--	--	--	--	--	--	13,230
Mariposa	--	--	--	--	--	--	1,225
Merced	--	--	--	--	--	--	4,020
Plumas	--	--	--	--	--	--	3,130
San Diego	--	--	--	--	--	--	1,595
San Joaquin	--	--	--	--	--	--	51,186
Shasta	37	43,622	--	--	--	--	64,113
Stanislaus	--	--	--	--	--	--	59,134
Trinity	--	--	--	--	--	--	2,496
Undistributed ³	332	396,074	44	14,320	20	8,229	697,442
Total	369	439,696	44	14,320	20	8,229	961,944

¹ Operations from which gold and silver are recovered as byproducts from sand and gravel operations not counted as producing mines.

² Does not include gravel washed.

³ Alpine, Inyo, Kern, Mono, Placer, Sacramento, Sierra, and Siskiyou Counties combined to avoid disclosing individual company confidential data.

Table 18.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1973, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Smelting of concentrates ¹	427	53,018	331	10	12
Direct smelting of ore	54	2,618	1	34	8
Copper precipitates	--	--	37	--	--
Gold cleanup	56	24	--	--	--
Total lode material	537	55,660	369	44	20
Placer	3,110	237	--	--	--
Grand total	3,647	55,897	369	44	20

¹ Includes byproduct recovery from tungsten ore.

Table 19.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1973, by class of ore or other source material

Source	Number of mines ¹	Material sold or treated ² (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Dry gold, gold-silver ³	4	3,412	403	13,125	(4)	1	2
Copper, lead, lead-zinc, tungsten ore ³	3	3,468	78	42,511	332	43	18
Total	7	6,880	481	55,636	332	44	20
Other lode material:							
Gold cleanup	--	3	56	24	--	--	--
Copper precipitates	1	58	--	--	37	--	--
Total	1	61	56	24	37	--	--
Total lode material	8	6,941	537	55,660	369	44	20
Placer	7	--	3,110	237	--	--	--
Grand total	15	6,941	3,647	55,897	369	44	20

¹ Operations from which gold and silver are recovered as byproducts from sand and gravel operations not counted as producing mines.

² Does not include gravel washed.

³ Combined to avoid disclosing individual company confidential data.

⁴ Less than 1/2 unit.

⁵ Excludes tungsten ore tonnage.

rubber, and paper, and in

METALS

small production of re-
er, largely a byproduct at
Corp.'s Pine Creek mine,
was substantially lower than

Six other producers re-
duct copper at precious
d lead-zinc operations, and
precipitate was recovered
eters by Stauffer Chemical
Mountain, near Redding,

renewed interest in copper
the Copper Basin, San
Imperial Counties, and in
Copper Belt and Moonlight
Plumas County. Louisiana
oration Co. was drilling in
basin and was considering a
operation.

Scrap copper and brass were
bay area and Los Angeles
ing the year. Supplies were
and demand continued high.
ea, No. 1 heavy copper scrap
50 cents per pound early in
at 80 cents per pound late in

gold, silver, copper, lead, and

Gold		Silver	
Troy ounces	Value	Troy ounces	Value
966	\$122,351	443,761	\$686,055
974	232,876	175,467	295,661
1	98	--	--
355	64,066	82	210
135	13,204	10	26
12	1,174	20	51
41	4,010	4	10
32	3,130	--	--
15	1,467	50	128
322	51,057	50	128
209	20,442	19	49
303	58,980	60	154
25	2,445	20	51
397	136,639	55,582	142,180
347	356,712	55,897	142,987

Gold.—Gold production was mainly from placer operations, including recovery from 15 sand-gravel washing operations. Because of prevailing high prices for gold, interest continued strong in prospecting and exploration throughout the State. According to the Office of Minerals Exploration (OME), U.S. Geological Survey, at Menlo Park, numerous applications were made for exploration assistance. The California Department of Fish and Game reported a large increase in permits for suction dredges. Discoveries of large nuggets were reported.

An OME-assisted project continued at the Brown Bear mine of American Primary Resources Co. near Lewiston, Trinity County. This mine has 20 miles of underground workings. Exploratory drilling was scheduled at 15 sites. OME projects were also underway at the Rex Montis mine, Mono County, and the Lucky Jack mine, Plumas County.

Alhambra-Atlanta Gold Mining Co. was rehabilitating the Yellowjack mine, near Kelsey, in the Mother Lode area. Homestake Mining Co. was conducting exploratory drilling programs at the Mountain King and Royal mines, Calaveras County.

Iron Ore and Concentrate.—Production increased 25%, following the reduced operations of 1972. Kaiser Steel Corp. reported record shipments of 2,497,000 long tons from the Eagle Mountain mine, Riverside County, and the other producer, Standard Slag Co., continued to expand operations following initial production in 1972 at the Beck mine, San Bernardino County. Kaiser shipped a 57% iron concentrate and a 63% iron agglomerate to its steelworks at Fontana, San Bernardino County. Early in the year, the company ordered a new 17-cubic-yard power shovel for use at Eagle Mountain. A modular hoist would permit removal of the hoist assembly as a unit, saving on downtime cost. Standard Slag marketed a 57% iron direct shipping ore and a 60% iron concentrate.

Iron and Steel.—Kaiser Steel Corp. reported new production and shipment records for crude steel at its Fontana steelworks.¹⁵ Production of crude steel was 3,168,000 tons, and shipments totaled 2,381,000 tons. Mill production was 2,225,000 tons.

In August, Kaiser announced a \$6 million program for design and construction of new air pollution control facilities at Fontana in order to meet emission standards. The program includes installation of afterburners on five coke-oven battery stacks, supplementary hoods and ducts at two oxygen steel furnaces, smoke collection and control devices in the oxygen steel and open hearth shops, and emission control devices at scrap preparation facilities.

Slag.—One million tons of blast furnace slag from Kaiser's Fontana steelworks was reclaimed by International Mill Services, Inc., for use in highway construction. Metallic content was recovered by magnetic separation and returned to Kaiser under a contractual agreement. Since 1968, 7 million tons of this slag has been recovered for use in road building, railroad ballast, filter media, roofing and landscaping, and concentrate aggregate.¹⁶

Scrap.—Demand for steel scrap was high in the Los Angeles and bay area markets, and prices were raised throughout the year. In the Los Angeles market, No. 1 heavy melting scrap was \$40 per ton at the beginning of the year and about \$60 per ton late in the year. In the bay area, prices were somewhat higher—about \$50 per ton in January and \$70, or more, at yearend. Exports to the Far East, mainly Japan, continued strong on contracts concluded early in the year. A price freeze and temporary export controls tended to cause uncertainty in the market.

Mercury.—Mining activity and output continued in a decline. Output was only 1,219 flasks, whereas in 1970, the annual rate had exceeded 18,000 flasks. Production was intermittent from 19 properties, many of which produced only a few flasks. The leading producers, both in Santa Clara County, were Guadalupe Mining Co., lessee at the Guadalupe mine, and Santa Clara Quicksilver Co., lessee at the neighboring New Almaden mine. At the latter, a limited exploration program was conducted at two underground locations. The Culver-Baer mine, near The Geysers geothermal field in Sonoma County, was sold to Pacific Energy Corp.

¹⁵ Kaiser Steel Corp. 1973 Annual Report 1973 P. 2.

¹⁶ Skillings' Mining Review. Million Tons of Slag for Building Freeway, V. 62, No. 47, Nov. 24, 1973, p. 25.

Table 20.—California: Mercury production, by method of recovery

Year	Oper- ating mines	Recovery method					Total 76-pound flasks	Value ² (thou- sands)
		Furnaced		Retorted		Unclas- sified (76-pound flasks) ¹		
		Ore treated (short tons)	76-pound flasks	Ore treated (short tons)	76-pound flasks			
1969	72	³ 215,495	16,093	37,199	2,387	W	18,480	\$9,333
1970	51	³ 222,495	17,587	15,005	547	459	18,593	7,582
1971	39	³ 131,120	12,485	19,089	698	306	13,489	3,944
1972 ^r	30	58,942	5,835	W	W	W	5,835	1,274
1973	18	14,280	1,133	W	W	86	1,219	349

^r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Furnaced."

¹ Includes mercury recovered from old surface ores, dumps, and placers.

² Value calculated at average New York price.

³ Includes ore and mercury from dumps not separable.

er announced a \$6 mil-
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to meet emission stand-
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five coke-oven battery
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urnaces, smoke collection
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shops, and emission con-
ap preparation facilities.
on tons of blast furnace
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was recovered by mag-
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in road building, rail-
media, roofing and land-
concentrate aggregate.¹⁶

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Corp. 1973 Annual Report 1973.

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Freeway, V. 62, No. 47, Nov.

Molybdenum.—Production more than doubled at the Union Carbide Corp. Pine Creek mine, Inyo County, where oxide and sulfide concentrates are recovered as a byproduct of tungsten.

A molybdenum deposit was located by M. S. & W. Resources, Inc., on the west slope of the Panamint Range in the Saline Valley area. The highest grade of molybdenite, the ore mineral, occurs in a monzonite, which intrudes a sequence of Paleozoic shale and limestone.

Nickel.—Hanna Mining Co. acquired lateritic nickel deposits at Red Mountain and Little Red Mountain, northwest of Laytonville, Mendocino County.

Rare-Earth Minerals.—Continued expansion of production at the Molycorp mine at Mountain Pass, San Bernardino County, was attributed to growing demand for rare-earth elements. Concentrate production increased 64% over that of 1972. Rare-earth oxide (REO) content was 19,341 tons. New mill capacity completed in 1973 will permit production of 30,000 tons REO. According to Molycorp's annual report, production at Mountain Pass was restricted by shortages of certain chemical reagents during the year.

Silver.—Output of mine silver again was sharply reduced in 1973. Principal producers were Union Carbide Corp. at the Pine Creek mine, Inyo County; Claude B.

Lovestedt at the Zaca mine, Alpine County; Montecito Minerals Corp. at the Darwin mine, Inyo County; and Brownstone Mining Co. at the Santa Rosa mine, Inyo County. In January, Montecito Minerals commenced mining a complex silver-lead-copper-tungsten ore in the Thompson workings, at and above the 400 level at the Darwin mine. The company also controlled a low-grade silver-bearing mill tailings pile, which it planned to run through its new 200-ton-per-day mill. The mill, operated intermittently during the year, produced a silver-lead-copper bulk flotation concentrate, which was shipped to American Smelting and Refining Co. at El Paso, Tex.

Tungsten.—There were 10 recorded producers in 1973, although the Union Carbide Corp., Pine Creek mine, Inyo County, accounted for about 98% of total output. The marketed product is ammonium paratungstate (APT). In March, Union Carbide opened a new plant for removal of sodium sulfate from the APT mill effluent, prior to release of this effluent into the Pine Creek drainage.

An exploratory diamond drilling program and geological studies were in progress at the Strawberry mine, Madera County. The mine was leased by Teledyne Wah Chang Corp. in 1972.

Table 21.—Principal producers

Commodity and company	Address	Type of activity	County
Asbestos:			
Atlas Asbestos Co -----	P.O. Box 805 Coalinga, Calif. 93210	Open pit mine	Fresno.
Coalinga Asbestos Co -----	P.O. Box 1045 Coalinga, Calif. 93210	do	Do.
Pacific Asbestos Corp -----	P.O. Box 127 Copperopolis, Calif. 95228	do	Calaveras.
Union Carbide Corp -----	P.O. Box K King City, Calif. 93930	do	San Benito.
Barite: Industrial Minerals Co --	1057 Commercial St. San Carlos, Calif. 94070	do	Shasta.
Boron minerals and compounds:			
Kerr-McGee Chemical Corp --	OMB-508, Kerr-McGee Bldg. Oklahoma City, Okla. 73102	Dry lake brines	San Bernardino.
Stauffer Chemical Co -----	636 California St. San Francisco, Calif. 94119	do	Do.
Tenneco, Inc -----	Tenneco Bldg. Houston, Tex. 77002	Open pit mine	Inyo.
United States Borax & Chemical Corp.	P.O. Box 75128 Stanford Station Los Angeles, Calif. 90005	do	Inyo and Kern.
Bromine and compounds: Kerr- McGee Chemical Corp.	OMB-508, Kerr-McGee Bldg. Oklahoma City, Okla. 73102	Dry lake brines	San Bernardino.
Calcium-magnesium chloride:			
Leslie Salt Co -----	P.O. Box 364 Newark, Calif. 94560	do	Do.
National Chloride Co. of America.	Suite 803, Willflower Bldg. 615 South Flower St. Los Angeles, Calif. 90017	do	Do.
Carbon dioxide: Standard Oil Co --	225 Bush St. San Francisco, Calif. 94120	Natural gasoline processing plant.	Kern.
Cement:			
Amcord Inc -----	610 Newport Center Drive Newport Beach, Calif. 92660	Dry process portland cement plants.	Riverside and San Bernardino
Calaveras Cement Div., The Flintkote Co.	215 Market St. San Francisco, Calif. 94104	Wet and dry process port- land cement plants.	Calaveras and Shasta.
California Portland Cement Co.	800 Wilshire Blvd. Los Angeles, Calif. 90017	Dry process portland ce- ment plants.	Kern and San Bernardino.
Ideal Cement Co., a division of Ideal Basic Industries, Inc.	420 Ideal Cement Bldg. Denver, Colo. 80202	Wet process portland ce- ment plants.	San Benito and San Mateo.
Kaiser Cement & Gypsum Corp.	300 Lakeside Dr. Oakland, Calif. 94612	do	San Bernardino and Santa Clara.
Monolith Portland Cement Co	3326 San Fernando Rd. Los Angeles, Calif. 90065	Wet process portland ce- ment plants.	Kern.
Lone Star Industries, Inc --	400 Alabama St. San Francisco, Calif. 94110	do	Santa Cruz.
General Portland, Inc -----	3810 Wilshire Blvd. Los Angeles, Calif. 90005	do	Kern.
Southwestern Portland Cement Co.	1034 Wilshire Blvd. Los Angeles, Calif. 90017	Wet and dry process port- land cement plant.	San Bernardino.
Clays and shale:			
Amcor, Inc., Riverside Cement Co.	P.O. Box 832 Riverside, Calif. 92501	Open pit mine	Orange, River- side, San Bernardino.
Basalt Rock, Co., Inc -----	Eighth and River Sts. Napa, Calif. 94458	do	Napa.
Calaveras Cement Div., The Flintkote Co.	San Andreas, Calif. 95249	do	Amador, Cala- veras, Shasta.
Crestlite Inc., a division of Susquehanna Corp.	Camino De Estrella San Clemente, Calif. 92672	do	Orange.
Homestake Mining Co -----	650 California St. San Francisco, Calif. 94108	do	Contra Costa.

Table 21.—Principal producers—Continued

Type of activity	County	Commodity and company	Address	Type of activity	County
Open pit mine	Fresno.	Clays and shale—Continued Interpace Corp	2901 Los Feliz Blvd. Los Angeles, Calif. 90039	Open pit mine	Amador, Placer, Riverside, San Bernardino, Sutter, Yuba.
do	Do.			do	Alameda.
do	Calaveras.	Kaiser Industries Corp	300 Lakeside Dr. Oakland, Calif. 94612	do	San Bernardino and Ventura.
do	San Benito.	Lightweight Processing Co	650 South Grand Ave. Los Angeles, Calif. 90017	do	Santa Cruz.
do	Shasta.	Pacific Cement & Aggregates, Div. of Lone Star Industries, Inc.	400 Alabama St. San Francisco, Calif. 94100	do	Amador, Orange, Riverside.
Dry lake brines	San Bernardino.	Pacific Clay Products, Inc	1255 West Fourth St. Los Angeles, Calif. 90017	do	Contra Costa.
do	Do.	Port Costa Products Co	P.O. Box 5 Port Costa, Calif. 94569	do	San Bernardino.
Open pit mine	Inyo.	Southwestern Portland Cement Co.	1034 Wilshire Blvd. Los Angeles, Calif. 90017	Underground mine.	Inyo.
do	Inyo and Kern.	Copper: Union Carbide Corp., Mining & Metals Div.	270 Park Ave., 38th Floor New York, N.Y. 10017	Open pit mine	Santa Barbara.
Dry lake brines	San Bernardino.	Diatomite: GREFCO, Inc	630 Shatto Pl. Los Angeles, Calif. 90005	do	Do.
do	Do.	Johns-Manville Products Corp., Celite Div.	Lompoc, Calif. 93436	do	Monterey.
do	Do.	Feldspar: Wedron Silica Co	P.O. Box 150 Pacific Grove, Calif. 93950	do	Do.
Natural gasoline processing plant.	Kern.	Owens-Illinois, Inc	P.O. Box 1035-1036 Toledo, Ohio 43601	Byproduct recovery.	Fresno, Merced, Sacramento, San Joaquin, Shasta, Stanislaus, Tulare.
Dry process portland cement plants.	Riverside and San Bernardino.	Gold: Santoni & Santoni	5078 West Shields Fresno, Calif. 93705	Open pit mine	Kern.
Wet and dry process port- land cement plants.	Calaveras and Shasta.	Gypsum: H. M. Holloway, Inc	714 Sixth St. Wasco, Calif. 93280	do	Do.
Dry process portland ce- ment plants.	Kern and San Bernardino.	Tembler Gypsum Co	Carrisa Plains, Star Route Box 80 Santa Margarita, Calif. 93453	Open pit mine and calcining plant.	Imperial.
Wet process portland ce- ment plants.	San Benito and San Mateo.	United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	Mine, concen- trator and pelletizing plant.	Riverside.
do	San Bernardino and Santa Clara.	Iron ore: Kaiser Steel Corp	P.O. Box 158 Eagle Mountain, Calif. 92241	Mine and con- centrator.	San Bernardino.
Wet process portland ce- ment plants.	Kern.	Standard Slag Co	Box 4400 Reno, Nev. 89505	Shaft kiln	Yolo.
do	Santa Cruz.	Lime: American Crystal Sugar Co	Box 419 Denver, Colo. 80201	Rotary kiln and continuous hydrator.	El Dorado.
do	Kern.	Diamond Springs Lime Co	P.O. Box 407 Diamond Springs, Calif. 95619	Shaft and rotary kilns, continuous hydrator.	Contra Costa and Tuolumne.
Wet and dry process port- land cement plant.	San Bernardino.	The Flintkote Co	P.O. Box 57367 Flint Station Los Angeles, Calif. 90057	Shaft kilns and continuous hydrator.	Glenn, Imperial, Orange, San Joaquin.
Open pit mine	Orange, River- side, San Bernardino.	Holly Sugar Corp	Box 1052 Colorado Springs, Colo. 80901	Rotary kiln and continuous hydrator.	Monterey.
do	Napa.	Kaiser Aluminum & Chemicals Corp.	Moss Landing, Calif. 95039	Fluidized-bed kiln and continuous hydrator.	San Bernardino.
do	Amador, Cala- veras, Shasta.	Pfizer, Inc	P.O. Drawer AD Victorville, Calif. 92392	Rotary kiln and continuous hydrator.	Do.
do	Orange.	Stauffer Chemical Co	636 California St. San Francisco, Calif. 94119	Shaft kiln	Santa Barbara.
do	Contra Costa.	Union Sugar Div	230 California St. San Francisco, Calif. 94111	Dry lake brines.	San Bernardino.
		Lithium minerals: Kerr-McGee Chemical Corp.	OMB-508, Kerr-McGee Bldg. Oklahoma City, Okla. 73102		

Table 21.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Magnesium compounds:			
FMC Corp	P.O. Box 344 Newark, Calif. 94560	Salt works bitterns.	San Diego.
Kaiser Aluminum & Chemical Corp.	Moss Landing, Calif. 95039	Sea water processing.	Monterey.
Merck & Co., Inc	Rahway, N.J. 07065	do	San Mateo.
Mercury:			
Guadalupe Mining Co	14900 Guadalupe Mine Rd. San Jose, Calif. 95120	Underground mine.	Santa Clara.
Santa Clara Quicksilver Co	21731 Almaden Rd. San Jose, Calif. 95120	do	Do.
Sulphur Creek Mining	201 Ridge Rd. Ukiah, Calif. 95482	do	Sonoma.
Molybdenum: Union Carbide Corp., Mining & Metals Div.	270 Park Ave., 38th Floor New York, N.Y. 10017	do	Inyo.
Natural gas liquids:			
Standard Oil Co. of California.	225 Bush St. San Francisco, Calif. 94120	Natural gasoline plants.	Fresno, Kern, Kings, Los Angeles, Orange, Santa Barbara, Ventura.
Union Oil Co. of California	P.O. Box 7600 Los Angeles, Calif. 90054	do	Fresno, Kern, Los Angeles, Orange, Santa Barbara, Ven- tura.
Peat:			
Delta Humas Co	P.O. Box 89 Holt, Calif	Reed-sedge bog	San Joaquin.
Peter J. Gambetta	Route 1, Box 78 Brentwood, Calif. 94513	do	Contra Costa.
Radel, Inc	P.O. Box 7075 Reno, Nev. 89502	Pit and plant	Alameda.
Perlite (crude): American Perlite Co.	11831 Vose St. North Hollywood, Calif. 91605	Open pit mine	Inyo.
Perlite (expanded):			
Harborlite Corp	P.O. Box 458 Escondido, Calif. 92025	Plant	San Diego.
Paramount Perlite Co., Inc	16236 South Illinois P.O. Box 83 Paramount, Calif. 90723	do	Los Angeles.
Redco, Inc	11831 Vose St. North Hollywood, Calif. 91605	do	Do.
Petroleum:			
Atlantic Richfield Co	5900 Cherry Ave. Long Beach, Calif. 90805	Oilfields	Kern, Los Ange- les, Orange, San Luis Obispo, Santa Barbara, Ventura.
Belridge Oil Co	1800 West Fourth St. Los Angeles, Calif. 90017	do	Kern and Santa Barbara.
Chanslor-Western Oil & Development Co.	4549 Produce Plaza Los Angeles, Calif. 90058	do	Kern, Los Ange- les, Orange, Ventura.
Continental Oil Co	Box 2197 Houston, Tex. 77001	do	Various.
Getty Oil Co	3810 Wilshire Blvd. Los Angeles, Calif. 90005	do	Fresno, Kern, Los Angeles, Monterey, Orange, River- side, San Ber- nardino, Santa Barbara, Ventura.
Mobil Oil Corp	612 South Flower St. Los Angeles, Calif. 90017	do	Fresno, Kern, Kings, Los Angeles, Monterey, Orange, San Benito, San Luis Obispo, Santa Barbara, Ventura.
Shell Oil Co	1008 West Sixth St. Los Angeles, Calif. 90017	do	Contra Costa, Fresno, Kern, Los Angeles, Orange, San Benito, Santa Barbara, Ventura.

Table 21.—Principal producers—Continued

Type of activity	County	Commodity and company	Address	Type of activity	County
Salt works Pit and plant Open pit mine	San Diego. Monterey. San Mateo.	Petroleum—Continued Signal Oil and Gas Co	1010 Wilshire Blvd. Los Angeles, Calif. 90017	Oilfields	Fresno, Kern, Los Angeles, Orange, San Luis Obispo, Santa Barbara, Ventura.
Underground mine.	Santa Clara. Do.	Standard Oil Co. of California.	225 Bush St. San Francisco, Calif. 94120	do	Contra Costa, Fresno, Kern, Kings, Los Angeles, Orange, San Luis Obispo, Santa Barbara, Ventura.
do	Sonoma.	Texaco, Inc	3350 Wilshire Blvd. Los Angeles, Calif. 90005	do	Fresno, Kern, Los Angeles, Monterey, Orange, Santa Barbara, Ventura.
do	Inyo.	Thumas Long Beach Co	840 Van Camp St. Long Beach, Calif. 90801	do	Los Angeles.
Natural gasoline plants.	Fresno, Kern, Kings, Los Angeles, Orange, Santa Barbara, Ventura.	Union Oil Co. of California	461 South Boylston Los Angeles, Calif. 90017	do	Fresno, Kern, Los Angeles, Orange, San Luis Obispo, Santa Barbara, Ventura.
do	Fresno, Kern, Los Angeles, Orange, Santa Barbara, Ven- tura.	Potassium salts: Kerr-McGee Chemical Corp.	OMB-508, Kerr-McGee Bldg. Oklahoma City, Okla. 78102	Dry lake brines	San Bernardino.
reed-sedge bog	San Joaquin.	Pumice:		Open pit mine	Do.
do	Contra Costa.	Aiken Builders Products	P.O. Box 878 Las Vegas, Nev. 89101	do	Lake.
Pit and plant	Alameda.	Cinder Products Co	3450 Lakeshore Ave. Oakland, Calif. 94610	do	Do.
Open pit mine	Inyo.	Red Lava Products of California.	Star Rte. Clearlake, Calif. 94523	do	Shasta.
Plant	San Diego.	Sanford Sand & Cinders	P.O. Box 184 Fall River, Calif. 96028	do	San Bernardino.
do	Los Angeles.	Rare-earth metals: Molybdenum Corp. of America.	Mountain Pass via Nipton, Calif. 92366	do	San Bernardino.
do	Do.	Salt:		Solar evap- oration and open pit mine.	Alameda, Napa, San Bernar- dino, San Mateo.
Oilfields	Kern, Los Ange- les, Orange, San Luis Obispo, Santa Barbara, Ventura.	Leslie Salt Co	505 Beach St. San Francisco, Calif. 94111	do	San Bernardino.
do	Kern and Santa Barbara.	Metropolitan Water Dist. of Southern California.	P.O. Box 54153 Los Angeles, Calif. 90054	Solar evap- oration.	Do.
do	Kern, Los Ange- les, Orange, Ventura.	Pacific Salt & Chemical Co	4262 Wilshire Blvd. Los Angeles, Calif. 90021	do	Do.
do	Various.	Southwest Salt Co	714 West Olympic Blvd. Los Angeles, Calif. 90015	do	Kern and San Diego.
do	Fresno, Kern, Los Angeles, Monterey, Orange, River- side, San Bern- ardino, Santa Barbara, Ventura.	Western Salt Co	P.O. Box 140 San Diego, Calif. 92112	do	Los Angeles.
do	Fresno, Kern, Kings, Los Angeles, Monterey, Orange, San Benito, San Luis Obispo, Santa Barbara, Ventura.	Sand and gravel: Azusa Western, Inc	P.O. Box 575 Azusa, Calif. 91702	Open pit mine	Los Angeles, Orange, San Bernardino.
do	Contra Costa, Fresno, Kern, Los Angeles, Orange, San Benito, Santa Barbara, Ventura.	Conrock Co	Box 2950, Terminal Annex Los Angeles, Calif. 90051	do	Los Angeles, Orange, San Bernardino, Ventura.
do	Contra Costa, Fresno, Kern, Los Angeles, Orange, San Benito, Santa Barbara, Ventura.	The Flintkote Co., Associated Rock Div.	P.O. Box 416 Upland, Calif. 91786	do	Alameda, Contra Costa, Glenn, Santa Clara, Santa Cruz, Sonoma.
do	Contra Costa, Fresno, Kern, Los Angeles, Orange, San Benito, Santa Barbara, Ventura.	Kaiser Sand and Gravel Co., division of Kaiser Industries Corp.	300 Lakeside Dr. Oakland, Calif. 94612	do	Los Angeles, Orange, San Bernardino, Ventura.
do	Contra Costa, Fresno, Kern, Los Angeles, Orange, San Benito, Santa Barbara, Ventura.	Livingston-Graham, Inc	5500 North Peck Rd. El Monte, Calif. 91731	do	Fresno, Los Angeles, Orange, Riverside.
do	Contra Costa, Fresno, Kern, Los Angeles, Orange, San Benito, Santa Barbara, Ventura.	Owl Rock Products Co	P.O. Box 47 Irwindale, Calif. 91707	do	

Table 21.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
Pacific Cement & Aggregates, Div. of Lone Star Cement Corp.	400 Alabama St. San Francisco, Calif. 94110	Open pit mine	Alameda, Fresno, Monterey, Sacramento, San Joaquin, San Mateo, Santa Cruz, Tulare, Yolo.
Rhodes & Jamieson Ltd	P.O. Box 118 Oakland, Calif. 94604	Pit and plant	Alameda.
Sully-Miller Construction Co	P.O. Box 432 Orange, Calif. 92669	Pit and 4 plants	Orange.
Teichert Aggregates, Inc., a subsidiary of A. Teichert & Son, Inc.	P.O. Box 15002 Sacramento, Calif. 95813	Open pit mine	Neveda, Sacramento, San Joaquin, Yolo, Yuba.
Silver: Union Carbide Corp., Mining & Metals Div.	270 Park Ave., 38th Floor New York, N.Y. 10017	Underground mine.	Inyo.
Sodium compounds:			
Kerr-McGee Chemical Corp	OMB-508, Kerr-McGee Bldg. Oklahoma City, Okla. 78102	Dry lake brines.	San Bernardino.
Stauffer Chemical Co	Box 3050, Rincon Ave. San Francisco, Calif. 94108	do	Do.
United States Borax & Chemical Corp.	P.O. Box 75128 Sanford Station Los Angeles, Calif. 90005	Open pit mine	Kern.
Stone:			
American Cement Corp	P.O. Box 832 Riverside, Calif. 92501	Open quarry and underground mine.	Los Angeles, Riverside, San Bernardino.
Basalt Rock Co., Inc	P.O. Box 2540 Napa, Calif. 94558	Open quarry	Marin, Napa, Sonoma.
Calaveras Cement Div., The Flintkote Co.	San Andreas, Calif. 95249	do	Calaveras and Shasta.
California Portland Cement Co.	612 South Flower St. Los Angeles, Calif. 90017	do	Kern and San Bernardino.
East Bay Excavating Co	28814 Mission Blvd. Hayward, Calif. 94544	do	Do.
Granite Rock Co	P.O. Box 151 Watsonville, Calif. 95076	do	San Benito.
Kaiser Cement & Gypsum Corp.	Permanente Rd. Permanente, Calif. 95014	do	San Bernardino and Santa Clara.
Kaiser Industries Corp	300 Lakeside Dr. Oakland, Calif. 94612	do	Contra Costa.
Lone Star Industries, Inc	400 Alabama St. San Francisco, Calif. 94110	do	San Mateo, Santa Cruz.
Monolith Portland Cement Co.	Box 65677, Glassell Station Los Angeles, Calif. 90065	2 quarries	Kern.
Southwestern Portland Cement Co.	1034 Wilshire Blvd. Los Angeles, Calif. 90017	Open quarry	San Bernardino.
Talc, pyrophyllite, soapstone:			
Cyprus Mines Corp	P.O. Box 1201 Trenton, N.J. 08606	Open pit and underground mines.	Inyo and San Bernardino.
L. Grantham Corp	1915 South Coast Hwy. Laguna Beach, Calif. 92651	Underground mine.	Inyo.
Minerals, Pigments & Metals Div., Pfizer, Inc.	P.O. Drawer AD Victorville, Calif. 92394	Open pit and underground mines.	Inyo and San Bernardino.
Pomona Tile Manufacturing Co.	216 South Reservoir St. Pomona, Calif. 91766	Underground mine.	San Bernardino.
Tungsten: Union Carbide Corp., Mining & Metals Div.	270 Park Ave., 38th Floor New York, N.Y. 10017	do	Inyo.