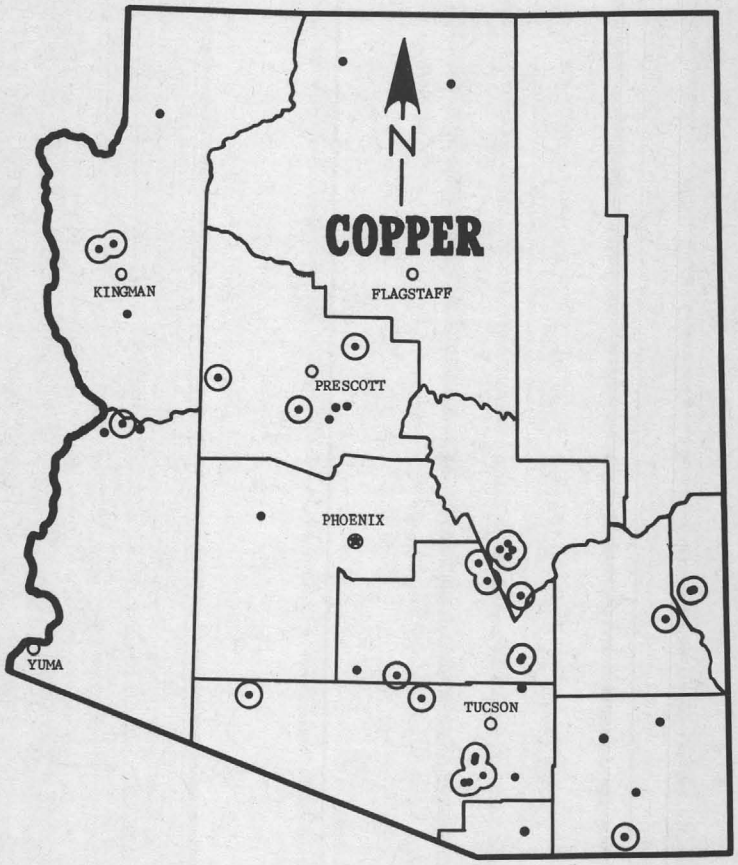
DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
PHOENIX, ARIZONA

FRANK P. KNIGHT, DIRECTOR



30TH ANNUAL REPORT

FOR

YEAR ENDING JUNE 30, 1969

Honorable Jack Williams
Governor of Arizona
Capitol Building
Phoenix, Arizona

Dear Sir:

The Annual Report of the Department of Mineral Resources, covering the fiscal year July 1, 1968 to June 30, 1969, is submitted herewith.

The report contains, as formerly, a review of mining activity in the State, and of this department's activities which are directed towards the development and welfare of Arizona's mining industry.

Very truly yours,

Frank P. Knight

FRANK P. KNIGHT,
Director.

TABLE OF CONTENTS

ARIZONA'S MINERAL PRODUCTION

The value of Arizona's mineral production in 1968 increased to $617,549,000, 33 percent above 1967, and was less than one percent below 1966, although in terms of 1957-59 constant dollars it was 9 percent below 1966. Copper accounted for $525,566,000 or 85 percent of the 1968 total mineral production value. The 1968 tonnage of copper recovered from ores was 627,961 short tons, 126,220 tons more than in 1967 but an estimated 141,656 tons less than might have been produced had the mines operated the full year at the production rate of the last six months, instead of being curtailed by the strike and recovery periods of the first half of the year.

The total value of Arizona's mineral production at the end of 1968, is more than $12.2 billion, of which approximately 83.9 percent has come from copper. Arizona mined 52.1 percent of the Nation's copper production in 1968, ranking first among the United States as it has done since 1910. It ranked 3rd in silver, 4th in gold, 10th in lead, 16th in zinc and 3rd or 4th in molybdenum production. Arizona has at San Manuel the largest underground copper mine, and at Morenci, the second largest open pit copper mine in the Nation.

Details of the mineral production are to be found in the following tables of the Appendix to this report:

I. Arizona Production and Value of the Six Principal Metals in 1968.

II. Mineral Production in Arizona in 1968.

III. Arizona's Mine Production of the Six Principal Metals, 1958 to 1968.

IV. Relative 1968 Production in the United States for the Six Principal Metals.

V. Copper, Gold, Silver and Molybdenum Recovered from Metal Mines in Arizona in 1966, 1967 and 1968.

VII. Value of Mineral Production by Counties - 1966 and 1967.

ACTIVE MINES

A new major open pit copper operation was started late in the fiscal year; two very large copper projects came near to start of production; two large copper expansion projects were started; an important copper discovery was announced; and other developments were added to the progress of an important year. The State's only large lead-zinc mine closed but her largest copper-zinc mine of recent years resumed production. The number of producing mines is shown in Table VI on page VII of the Appendix. In April 1969, a department survey showed 33 producing

copper mines, including the one with ore containing important amounts of zinc; 3 lead and/or zinc mines; 6 gold and/or silver; and 37 other producers of metallic or non-metallic minerals; making a total of 79, 18 less than in 1968. Sand, gravel, stone, common clay and solid and liquid fuel producers are omitted from the lists. The United States Bureau of Mines has reported the following number of producing base metal mines during 1968: 46 copper, 2 with copper-zinc ores; 8 gold and/or gold-silver; 21 silver; and 10 lead and/or zinc; ranging in size from a placer gold mine with production of 4 ounces of the metal, to the largest of the State's copper mines with production of 106,857 tons of copper.

EMPLOYMENT

Information supplied by the Arizona Employment Security Commission is that in 1968 (1967 in parentheses) there were employed in Arizona mining, quarrying and smelting an average of 16,913 (14,789) covered employees on payrolls with total wages of $144,782,917 ($118,073,881) or an average of $8,560 ($7,984) per year per employee. The annual wages paid by the copper producers were the highest in State. The "total covered wages" reported by the Commission represent only the amount paid by the employer directly to the employees as compensation for employment including compensation paid during time-off for vacations, jury duty, holidays, etc. and including additional premium wages paid for hours worked in excess of a standard work-week of 40 hours and for shift differentials. In addition to the above stated "fringe benefits" there are others consisting of labor costs not paid directly to the worker, such as statutory employer payroll taxes for social security and unemployment compensation, supplementary unemployment compensation reserves, group life and health insurance, retirement plan contributions, etc. Exclusive of payroll insurance and taxes paid by the employer, this group of fringe benefits alone is estimated to cost well in excess of $15,000,000 per annum. In addition, over $5,000,000 was spent by employers as the cost of operating hospitals and recreational facilities for the benefit of employees of the companies, their families, and other residents of the community. It is conservatively estimated that the total "fringe benefits" amount to well in excess of 25 percent of the total labor costs for hours actually worked on a straight time basis. This does not include costs of workmen's compensation and disability expenses which are regarded as business operating costs included in insurance against injuries.

COPPER

The start of the fiscal year found the copper industry well on the road back to normal after the long strike, which is estimated to have caused losses of copper production of 424,941 tons for Arizona and 854,970 tons for the United States. Wages lost by "production workers" because of the strike approximate $59,272,000 in Arizona and $282,451,000 in the nation. Losses to companies and others affected by the strike are multiples of the cost to the workers.

By August 1968 copper production was at a high level and it continued so, reaching record levels in the first half of 1969. Employment in the industry also rose to record highs including the record of 17,400 employees in June 1969. Major

domestic producers increased prices from 42 cents per pound in July 1968 to 44 cents in January and 46 cents in April 1969. Prices for foreign copper varied much more widely and in mid-June 1969 were at 70 cents per pound.

Over one-half of the State's 1968 copper production of 627,961 tons came from Pima and Pinal Counties, with Pima first in rank, Pinal second, followed by Greenlee, Gila, Cochise, Mohave and Yavapai in the order named. Arizona's production of recoverable copper for the first half of 1969 was 396,424 tons, 59.4 percent above that of the first half of 1968, according to reports of the U. S. Bureau of Mines. It was 2.6 percent higher than the 386,476 tons produced in the last half of 1968. The Bureau in its recent report, The Mineral Industry in Arizona, 1968, wrote, "Output from the 13 large open pits and three principal underground properties accounted for 97 percent (608,300 tons) of the total output of primary copper; 80 percent was derived from open pits; 17 percent from large underground mines; and 3 percent was produced from 70 smaller operations."

Phelps Dodge Corp. was the state's largest producer of copper, as it has been for a number of years. 15,474,029 tons of ore were mined in 1968 at its Morenci mine. 106,857 tons of copper were recovered, including that from precipitates. This was 24 percent below its all-time record of 141,178 tons in 1966 and 30% above its 1967 production. The Morenci pit continued to expand to the southwest into Hill AC and the old town. New houses, shopping center, hospital and offices at new locations were replacing the old. An $11 million expansion of smelter capacity was started in the latter part of 1968 to take care of concentrates from the company's new mine at Tyrone, New Mexico and elsewhere. In June 1969, the company announced plans for a new mine near the Morenci pit to cost over $100 million. The operation is named the Metcalf and will involve both open pit and underground mining, the former requiring the removal of 45 million tons of overburden. A 30,000 tons per day concentrator will provide capacity to replace the company's production at Bisbee, expected to be about done by 1975. At its New Cornelia Branch at Ajo in 1968, Phelps Dodge produced 58,544 tons of copper from 9,018,377 tons of ore; 46 percent more copper than in 1967. The Copper Queen Branch at Bisbee produced 47,306 tons of copper, 22,605 from the Copper Queen mine and 24,701 from the Lavender pit. The Bisbee total was up 44 percent from that in 1967. The total copper production of Phelps Dodge's Arizona properties in 1968 was 212,707 tons, up 36 percent from 1967, and was 34 percent of the State's total.

In November 1968, Phelps Dodge started sinking an 18 foot diameter shaft to a depth of 1875 feet at its Safford project to provide access for work necessary to evaluate the feasibility of mining the low grade orebody.

The San Manuel Division of Magma Copper Co. produced 72,074 tons of copper in 1968, up 34 percent from 1967. Magma's Superior Division produced 14,706 tons of copper, up 54 percent from 1967. The Magma total was 86,780 tons of copper from 11,367,640 tons of San Manuel ore and 333,607 tons of Magma ore.

In July 1968 Magma announced a $100 million expansion program at its two Arizona mines. Contracts were awarded for two new shafts involving over 6,000 feet at

San Manuel and for surface facilities at both mines, in September. Preparations for sinking a new 22 foot diameter shaft to a depth of 4800 feet for the Superior mine were well along at the end of June. Boring of a 9,000 foot haulage tunnel was to start about September 1969. Late in the fiscal year Magma was merged into Newmont Mining Corp., holder of 80.6 percent of Magma's stock.

The American Smelting and Refining Co. (Asarco) produced a total of 62,545 tons of copper in 1968; 38,059 from its Mission mine south of Tucson; 24,287 from its Silver Bell property at Silver Bell and 199 from its San Xavier pit near the Mission. The Mission production was up 6.6 percent from 1967 and the Silver Bell was down 2.3 percent from 1967. A total of 9,959,473 tons of ore was mined at the three properties.

A new reverberatory furnace went into operation in July 1968 at Asarco's Hayden smelter. It was part of an expansion project to increase capacity by 35 percent.

The Ray Mines Division of Kennecott Copper Corp. mined 6,746,163 tons of ore and recovered 55,407 tons of copper in 1968, up 22 percent from 1967 copper recovery. Its $35 million Ray project involving facilities for production of 24,000 tons per year of copper from low grade silicate ores by open pit mining, vat leaching, and electrowinning had its first full production early in June 1969. Included in the project was a 750 tons-per-day sulphuric acid plant near the Hayden smelter which was completed in the second quarter of 1969.

Inspiration Consolidated Copper Co. in 1968 mined 8,410,771 tons of ore at three mines and recovered 42,875 tons of copper - 34,862 from its open pits at Inspiration; 372 from the Ox-Hide pit west of Miami started late in the year; and 7,641 from its open pit mine at Christmas. The combined copper output was up 36 percent from 1967. The company's new plant to convert its refined copper into rod for wire-making at the rate of 15 tons of rod per hour went into production in January 1969. Its new smelter and other facilities for increasing production were at work fruitfully in the first half of 1969.

Duval Corporation's Arizona mines produced a total of 53,094 tons of copper in 1968, up 3.6 percent from 1967. Its Mineral Park property north of Kingman mined 6,226,284 tons of ore and recovered 28,704 tons of copper. Its Esperanza mine south of Tucson mined 5,473,156 tons of ore and recovered 24,390 tons of copper. Both mines operated through the strike period.

Duval's $150 million Sierrita project adjacent to the Esperanza mine, operated by its subsidiary, Duval Sierrita Corp., was ahead of schedule at the end of the fiscal year. The copper-molybdenum mine, including the largest single mill installation in the United States, was expected to start production before the end of 1969 and to reach its designed capacity of 72,000 ore tons per day within six months thereafter.

Miami Copper Company Division of Tennessee Copper Corporation in 1968 produced a total of 23,541 tons of copper from its three Arizona properties, up 31 percent from 1967. Its Copper Cities, Miami and Castle Dome mines produced 16,787, 5,539 and 1,215 tons respectively. Copper Cities, the only mining unit, extracted 3,359,097 tons of ore. Copper from the Miami and Castle Dome units derived from leaching of old mine workings and dumps.

Bagdad Copper Corporation produced 18,238 tons of copper in 1968 of which 7,129 tons derived from heap leaching of oxide ores. The 2,099,223 tons of ore mined

yielded 11,109 tons. The total was off nearly 1% from 1967. The company proceeded with plans for a $5 million LIX solvent extraction plant with construction to start at Bagdad in the summer of 1969.

Pima Mining Company recovered 64,487 tons of copper from 13,060,328 tons of ore mined from its Pima mine south of Tucson. The copper production was up 31 percent above 1967. Pima operated throughout the strike period and continued to the end of 1968 to mine and mill for Banner Mining Co. ores from Banner's section of the Pima pit.

Ranchers Exploration and Development Corporation produced 4,395 tons of copper in the fiscal year ending June 30, 1969 from its Bluebird mine near Miami. This was an increase of 31 percent over the previous year. Its solvent extraction-electrowinning plant turned out high purity cathodes throughout the year.

At the Anaconda Company's Twin Buttes property south of Tucson strippping of overburden and construction of concentration and other facilities was ahead of schedule at the end of the fiscal year and a section of the mill (30,000 tons of ore per day capacity) was expected to start up in September.

McAlester Fuel Co. at its Zonia mine east of Kirkland Junction produced 1,964 tons in 1968, up 20% from 1967. Increased area of leach heaps and spraying of leach solutions contributed to better recovery of copper.

El Paso Natural Gas Co. produced 1,611 tons of copper in 1968 from its open pit mine and leach-precipitation-flotation mill at its Emerald Isle property south of and near to Chloride. The company also continued to improve the operation of its segregation process facilities, treating stockpiled ore, at the Lakeshore mine, 30 miles south of Casa Grande. The El Paso company's program of exploration drilling at the Lakeshore and other properties in the district resulted in the discovery, announced in February 1969, of 472 million tons of copper ore averaging 0.75 percent copper. Thereafter Hecla Mining Co. acquired a one-half interest and agreed to operate the property subject to provisions including 50-50 split of net profits.

Production of cement copper continued at the Mineral Hill property in northern Yuma County, the largest mining operation in the county.

The Scruggs Mining Company also produced some cement copper by heap-leaching of ores from the old San Juan property north of Safford in the fiscal year.

Copper-Zinc

Cyprus Mines Corporation completed its Bruce shaft development at the Old Dick mine in the Bagdad district of Yavapai County and resumed mining and milling late in 1968. It was operating at full capacity rate of 9,000 tons per month in the late months of the fiscal year. It was the State's largest zinc producer.

Standard Metals Corporation of Denver started construction of a 250 tons-per-day mill at the last of the fiscal year at the Antler mine east of Yucca.

LEAD - ZINC

The domestic price of pig lead f.o.b. New York fell off 1/2 cent to 12.5 cents per pound in July 1968 because of a weakened market and low foreign prices but returned to 13 cents in October and was at 15 at the end of fiscal 1969. The domestic price

for prime western zinc f.o.b. East St. Louis was 13.5 cents through 1968. It climbed 1/2 cent in January and again in April and ended the fiscal year at 14-1/2.

Arizona's lead production in 1968 was 1,704 tons, which was only 36% of production in 1967. Zinc production was 5,441 tons, 62 percent below 1967. Arizona dropped from ranks of 5th in lead and 13th in zinc production among the United States in 1967, to 10th and 16th respectively. There was worse to come. In the first half of 1969 Arizona produced only 110 tons of lead. In June 1969 she produced only two. However, the resumption of production at the Old Dick copper-zinc mine has assured a larger zinc output in 1969 than in 1968.

The Iron King mine at Humboldt which produced most of Arizona's lead and zinc output in 1967 and 1968, and in 1967 ranked 12th in lead, 19th in zinc, 11th in gold and 18th in silver among the United States producers of these metals, was forced to close in December 1968 after 27 years as one of the leading U. S. producers of these metals. Much of the mine and mill equipment has been sold.

In the first half of 1969 Silver King Mining Co. mined and milled north of Wikieup about 60 tons per day of lead-silver ore. Western Minerals Corp. installed a small mill in 1968 and shipped some lead-silver concentrates. Several dumps were worked over for lead-silver ores in the Castle Dome area and small amounts of lead ores were produced elsewhere, but in the first half of 1969 Arizona was producing at the average rate of less than 25 tons per month of lead.

Far Mining Enterprises prospected, developed and mined in the Aravaipa area, reconditioned the mill at Klondyke and built a new crushing plant in fiscal 1969. Ore was stockpiled until the spring of 1969 when the mill was reported to be operating. Mill capacity was reported to be 175 tons of ore per day.

Magnum Consolidated Mining Co. after doing exploration drilling at the McCracken mine near Signal, Mohave County, purchased the mill at the CWT mine south of Tucson and at the end of the fiscal year was grading a millsite at the mine and doing considerable road work.

GOLD - SILVER - MOLYBDENUM

Practically all of Arizona's production of these metals comes as by-products from copper, lead-zinc and complex ores.

Gold

In 1968 Arizona produced 95,999 troy ounces of gold worth $3,769,000 or 19 percent more quantity and 33 percent more value than in 1967. In the first half of 1969 it produced 58,912 ounces, 63 percent more than in the first half of 1968, according to figures of the U. S. Bureau of Mines. The Bureau reported one placer gold mine in Arizona in 1968 which produced 4 ounces only, and one dry gold lode mine which produced a total of 68 ounces.

Seven of Arizona's larger base metal mines were in the top 25 gold producers in the Nation in 1967. They, with their ranks in parentheses, were New Cornelia (8), Bisbee (9), Iron King (11), San Manuel (13), Morenci (17) and Magma (20). All except Iron King were copper mines.

Silver

Silver rose in price from $1.55 per troy ounce in 1967 to $2.14 in 1968 and accounted for much of the increase in value of Arizona's production from $7,112,000 to $10,633,000, according to the Bureau of Mines. However, the price declined in the first half of 1969 and was at $1.90 at the end of June. The State's production of silver for 1968 was 4,958,000 ounces, up 8 percent from 1967. Production for the first half of 1969 was 2,999,000 ounces, up 51 percent from the first half of 1968. The major Arizona silver producing mines, with their national ranking in 1967 in parentheses were Mission (12), Pima (14), Mineral Park (17), Iron King (18), Bisbee (19), Morenci (20), and New Cornelia (21).

Excitement in Tombstone silver district over a rich silver showing developed by Ernest B. Escapule and son at the Santa Ana mine early in 1968, cooled when Austral Oil of Houston, Texas gave up its lease and option agreement and stopped exploration and development work at the mine. The Escapules later resumed mining and cyaniding to extract the silver. Consolidated Minerals, Inc. recovered silver at the White Hills mine north of Kingman by cyaniding dump material.

The U. S. Bureau of Mines reported that 95 percent of Arizona's 1968 silver output came from copper ores; and that a combined production of 35,800 ounces was produced at 21 lode silver mines.

Molybdenum

Molybdenum has become the most important by-product of a number of the copper producers of Arizona. Its total value in 1968 was $19,207,000, 25 percent over 1967 and 33 percent above the combined value of the gold and silver produced in 1968. It ranked second behind copper in value of minerals produced. Miami Copper Co.'s Copper Cities and Kennecott's Ray mine were added to the list of molybdenum producers in 1968.

URANIUM - VANADIUM

Uranium

Arizona's production of U_3O_8 in 1968 was 295,000 lbs. with estimated value of $1,923,000. The quantity was up 255 percent from 1967. In April 1969 Cotter Corp. of Roswell, New Mexico stopped production at the Orphan mine at Grand Canyon. The mine, producer of some $40,000,000 worth of uranium and by-products, mainly copper, was the last uranium producer of much consequence active in Arizona.

Vanadium

Processing plants outside of Arizona extracted from Apache County uranium ores an undisclosed amount of vanadium in 1968.

IRON

In 1968 Arizona produced 16,000 long tons of usable iron ore valued at $124,000.

Archean Exploration Corporation in 1968 operated intermittently its small pilot iron reduction plant 18 miles west of Snowflake with ore from the Frog Pond iron deposit northeast of Young near Fort Apache Indian Reservation.

Charles Pfizer & Co. shipped hematite ore from the Cowden mine near Seligman for use as a paint pigment.

MERCURY

The price of mercury dropped from $550 per flask at the first of the fiscal year to $495 at the end.

During the fiscal year there was some intermittent activity in the Sunflower district, Maricopa County. Arizona production in the year 1968 was 192 flasks (76 lb.) valued at $103,000.

ALUMINUM

Royal Aluminum Refining Company and Thomas Enterprises each operated plants at Humboldt in the fiscal year. The aluminum was separated from drosses and formed into ingots.

EXPLORATION

Exploration, especially for copper, continued to be very active in 1968-69.

Search for new uranium deposits continued actively, in line with the rapid growth in use of nuclear energy for electric power generation.

Among the many areas in which exploration work was reported are:

Apache County:	Carizzo Mts. and Lukachukai districts; Black Mesa and Four Corners areas.
Cochise:	Tombstone, Warren, Turquoise, Swisshelm, Dragoon, Cochise, Ash Springs, Johnson Camp, Hartford and Dos Cabezas districts.
Coconino:	Francis, Grand Canyon and Cameron districts.

Gila:	Miami, Sunflower, Ellison, Payson, Banner, Sierra Ancha and Richmond Basin districts.
Graham:	Lone Star, Aravaipa and Rattlesnake districts.
Greenlee:	Copper Mt., Metcalf, Copper King Mt., and Ash Peak districts.
Maricopa:	Sunflower district.
Mohave:	Mineral Park, Cerbat, White Hills, Minnesota, Union Pass, Maynard, Oatman, Owens, Cedar Valley and Cleopatra districts.
Navajo:	Black Mesa, Monument Valley and Holbrook areas.
Pima:	Gunsight, Ajo, Helvetia, Amole, Greaterville, Coyote, Silver Bell, Fresnal, Mineral Hill, Pima, Montezuma, Olive, Twin Buttes and Arivaca districts.
Pinal:	Superior, Copper Creek, Mineral Creek, Vekol, Owl Head, Pioneer, Black Mt., San Manuel, Canada del Oro, Control and Sacaton districts.
Santa Cruz:	Oro Blanco, Duquesne, Patagonia, Palmetto, Tyndall, Wrightson and Harshaw districts.
Yavapai:	Walnut Grove, Verde, Camp Verde, Eureka and Big Bug districts; Santa Maria River area.
Yuma:	Ellsworth, Plomosa and Planet districts.

FLUXING ORES

Siliceous ores, with or without metal content, were produced for flux or slurry for copper smelters from the Nancy # 2 and Burro mines in the Turquoise and Johnson districts in Cochise County; the Copper Hill mine, Globe district, and Chillito mine, Banner district, Gila County; the Harmony mine, Metcalf district and Ash Peak mine, Ash Peak district, Greenlee County; the Anderson mine, Gunsight Hills district, Chief mine, and San Antonio mine, Ajo district, Pima County; Orizaba, Tiger, Copper Butte and Gold Hills mines in the Silver Reef, Mammoth, Mineral Creek and Canada del Oro districts, Pinal County; and others, including those operated by the smelting companies.

NON- METALLIC MINERALS

Arizona's production of non-metallic minerals exclusive of petroleum and natural gas in 1968 was valued at $44,554,000, up 11 percent from 1967. Production and values of individual items are given in Table II page IV of the Appendix.

Percent changes in 1968 production values from 1967 for some individual items were: sand and gravel, down 22; stone up 79; lime up 45; pumice up 8.

The Arizona production of helium for 1968 was 64,800 Mcf of raw gas, 12 percent less than in 1967. It was valued at $1.6 million and was processed at 3 plants, two at Navajo and one at Teec Nos Pos.

Peabody Coal Co. continued development of its Black Mesa coal deposit south of Kayenta, which is expected to start producing in 1970 to supply energy for the first of two 750,000 KW generators to be installed near Bullhead City. A $33 million, 18-inch slurry pine line from the deposit to the power plant was under construction and a plant for preparation of slurry was started in the fiscal year.

Arizona's petroleum production in 1968 was 3,370,000 bbls. valued at $9,606,000. This was up 15% in quantity and 17% in value in 1968 over 1967. Natural gas output decreased from 1,255 million cubic feet valued at $193,000 in 1967 to 881 million cubic feet valued at $142,000 in 1968.

In the first half of 1969, 1,272,942 bbls. of oil and 720,486 Mcf of natural gas were produced, according to the Oil and Gas Conservation Commission. The oil production was down 33 percent and the natural gas output was up 12 percent, compared to the first half of 1968.

Apache County was the only producer of helium, oil and gas in the state in 1968.

DEPARTMENT ACTIVITIES

Mineral rights in the public lands continued to be the subject of numerous inquiries and a matter of concern to the department, whose primary objective is assisting in the development of the State's mineral resources. Many papers relating to mining law, public lands, mine taxation, import controls, mine safety, gold, silver and monetary policies, air and water pollution, radiation, land classification, mineral land reclamation and mineral economics, were received from government agencies, Congress, State mining associations, the American Mining Congress and others. Many of them invited comment and required study.

Department assistance was given to state agencies on matters pertaining to mining, including taxation, mineral rights, mineral properties, mineral production, industry development, industry problems and legislation; to Federal agencies concerned with legislation, public lands, Indian lands, mining statistics, mine and exploration loans and mining laws; and to the many companies, research and other private agencies and individuals in and out of the state who sought information about Arizona mining properties and mining. Among them were many of an estimated 50 exploration teams of substantial companies which were seeking new mineral deposits during the year.

The director was a delegate to the Western Governors' Mining Advisory Council, chairman of its committee on mining taxation, and attended out-of-state meetings of the Council. He also attended out-of-state meetings of the western division of

the American Mining Congress and of a mining advisory committee of the Four Corners Regional Commission. Numerous sectional meetings in the State of the A.I.M.E., Arizona Small Mine Operators Association, and professional and civic groups were attended, separately or at times together, by the director, assistant to director, administrative assistant and field engineers, at some of which mining talks were given or movies shown. Also attended were the meeting of the Rocky Mountain Mineral Law Institute; a meeting at Tucson of the Public Land Law Review Commission - as a member of the host committee; and a Symposium on Mine Taxation at the University of Arizona at which department engineer G. W. Irvin presented a well received paper on History of Arizona's Mine Taxation Program. The assistant to director closely followed mineral developments, especially in the copper industry in Arizona and worldwide and during the strike period, and his reports on the industry were favorably received.

Publications

The following department papers were mimeographed and distributed to a mailing list of over 200 parties (over 20 percent out-of-state) including legislators, mining companies, government agencies, banks, newspapers, libraries and individuals, and to those requesting them:

Arizona Producing Mines 3 pages

Inventory of Arizona Lands as of June 30, 1967 8 pages

Copper Industry - Statistics for 1967 Compared with Other Years; Arizona The United States and World 41 pages 2 page news release

Observations Pertinent to Arizona and United States Copper Mining as of December 31, 1968 6 pages

Lead and Zinc Industry - Statistics for 1967 Compared with Other Years, Arizona, the United States and World 12 pages

Arizona's Role in Gold, Silver and Molybdenum 2 pages

Molybdenum, Silver and Gold - Statistics for 1968 and Other Years, Arizona, the World and United States 12 pages

Record Copper Production 1 page

Also mimeographed and distributed were:

Active Mine List, October 1968
Active Mine List, April 1969
Directory of State and Federal Agencies in Arizona of Interest to Mining.
Revised list of registered Arizona Mining Engineers and Geologists available for consulting work.
Bibliography of the Tombstone Mining District.

The department's booklet, Laws and Regulations Governing Mineral Rights in Arizona, continued to be much in demand.

Information and Other Services

The department's library of Arizona mining, which was the recipient of the Charles F. Willis library in 1967, received in 1968 another welcome addition from Inspiration Consolidated Copper Corporation, including a bound set of the Engineering and Mining Journal, a complete set of the Copper Handbook - Mines Handbook - Mines Register series from volume I (1900) to volume XXV (1956) and many volumes of Transactions of the A.I.M.E.

The library, files on approximately 3,000 Arizona mining properties, and maps pertinent to Arizona mining, were in constant use. Information was perhaps the department's most important service. Most of the requests came to the main office at Phoenix, but many went to the field engineer for the southern district at the State building at Tucson. The field engineers were available for consultation at announced places and times. During the fiscal year, they travelled 27,210 miles, attended 114 meetings of the Arizona Small Mine Operators Association, made 357 mine visits, and discussed mining problems with individuals on 1660 occasions - 296 in the field, 507 in the offices and 857 by telephone. Reports of activities and findings were written and filed.

There were 2151 visitors and 5853 telephone calls to the department during the fiscal year. The administrative assistant was consulted daily on land matters.

Mineral Museum

The museum continued to be supported by the Arizona Mining Association; the support including employment of the curator. The department continued to furnish utilities and janitor.

APPROPRIATION - Fiscal 1968-69		$ 84,699.00
EXPENDITURES:		
Personal Services	$ 62,718.46	
Professional Services	4,690.00	
Travel - State	5,687.76	
Travel - Out of State	304.55	
Current Expenditures:		
Postage	937.64	
Tel & Tel	1,372.47	
Utilities	1,584.33	
Maintenance & Repairs	1,139.08	
Office Supplies	1,584.14	
Printing	227.36	
Maintenance & Other Supplies	155.50	
Other Contractual	76.48	
Subscriptions & Dues	212.15	
Fixed Charges	35.00	
Building & Equipment Insurance	209.00	
Capital Outlay	489.86	
TOTAL EXPENDITURES		$ 81,423.78
Balance - Returned to General Fund		3,275.22
		84,699.00

Unused appropriations for personal and professional services ($1,100); in and out-of-state travel ($949); and current expenditures ($1,123); were the principal items in the $3,275 returned to the General Fund.

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

BOARD OF GOVERNORS

William T. Elsing, Phoenix - Chairman
(term expires January 31, 1971)

Jack W. Still, Prescott
(term expired January 31, 1969)
(Replaced by Robert C. Bogart 8/25/69)
(Term expires January 31, 1974)

Matt Danenhauer, Clifton
(term expires January 31, 1972)

Kenrick L. Lamb, Kingman
(term expires January 31, 1973)

Stephen H. Congdon, Tucson
(term expires January 31, 1970)

PERSONNEL

Frank P. Knight	Director
B. H. Gerwin	Assistant to Director
Gerald W. Irvin	Field Engineer - Southern District
Fremont T. Johnson	Field Engineer - Northern District
John H. Soule'	Field Engineer - Central District
Mrs. Glenn W. Pare	Administrative Assistant
Mrs. Pauline Halloren	Secretary
Mrs. Ray E. Sparkes	Secretary
Mrs. Robert E. McIndoo	Secretary
Lester R. Brown	Consultant

OFFICES

Phoenix Office - Mineral Building, State Fairgrounds
Tucson Office - Room 106, State Office Building

APPENDIX I

STATUTORY POWERS AND DUTIES

"Aid in the promotion and development of the Mineral Resources of the State.

Conduct studies of the economic problems of prospectors and operators of small mines for the purpose of assisting in their solution.

Assist in discovering sources of supply for persons desiring to buy minerals.

List and describe available mining properties.

Make mineral resource surveys and conduct other investigations which may interest capital in the development of the state's mineral resources.

Serve as a bureau of mining information in conjunction with the Arizona Bureau of Mines.

Publish and disseminate information and data necessary or advisable to attain its objectives.

Cooperate with the state land department to encourage mining activity on state lands.

Cooperate with the corporation commission in its investigations and administration of laws relating to the sale of mining securities.

Cooperate with the Arizona Bureau of Mines, and deliver to the Bureau problems which the field work of the division shows to be within the scope of the activities of the Bureau.

Cooperate with federal and other agencies designed to develop mines and minerals.

Oppose congressional acts favoring reciprocal or duty free imports of foreign minerals.

Use its authority in other ways to assist in more extensive exploration and development of the mineral resources of the state."

TABLE I

Arizona production and value of the six principal metals in 1968, as reported by the United States Bureau of Mines, were as follows:

627,961	tons copper	@ 41.8¢/lb	$525,566,000
1,704	tons lead	@ 13.2¢/lb	450,000
5,441	tons zinc	@ 13.5¢/lb	1,469,000
95,999	ozs. gold	@ $ 39.26/oz	3,769,000
4,958,000	ozs. silver	@ $ 2.145/oz	10,633,000
12,127,000	lbs. molybdenum	@ $ 1.584/lb	19,207,000
			$561,094,000

This compares with the following final figures for 1967:

501,741	tons copper	@ 38.2¢/lb	$383,501,000
4,771	tons lead	@ 14.0¢/lb	1,336,000
14,330	tons zinc	@ 13.8¢/lb	3,967,000
80,844	ozs. gold	@ $ 35.01/oz	2,830,000
4,588,081	ozs. silver	@ $ 1.550/oz	7,112,000
9,261,000	lbs. molybdenum	@ $ 1.661/lb	15,385,000
			$414,131,000

APPENDIX III

TABLE II

MINERAL PRODUCTION IN ARIZONA IN 1968 1/

		Quantity	Value (Thousands)
Clays	Thousand short tons	77	$ 347
Coal (Bituminous)	thousand short tons	W	W
Copper(recoverable content of ores, etc.)	short tons	627,961	525,566
Gem stones		NA	149
Gold(recoverable content of ores, etc.)	troy ounces	95,999	3,769
Helium 2/	thousand cubic feet	64,800	1,600
Iron Ore (usable)	thousand long tons, gross weight	16	124
Lead (recoverable content of ores, etc.)	short tons	1,704	450
Lime	thousand short tons	260	4,561
Mercury	76-pound flasks	192	103
Molybdenum (content of concentrate)	thousand pounds	12,127	19,207
Natural gas (marketed)	million cubic feet	881	142
Petroleum (crude)	thousand 42-gallon barrels	3,370	9,606
Pumice	thousand short tons	1,033	974
Sand and Gravel	thousand short tons	13,981	14,423
Silver(recov. content of ores,etc.)	" troy ounces	4,958	10,633
Stone	thousand short tons	3,293	6,239
Tungsten concentrate (60% WO_3 basis)	short tons	1	3
Uranium (recoverable content U_3O_8)	thousand pounds	295	1,923 3/
Zinc (recoverable content of ores,etc.)	short tons	5,441	1,469
Value of items that cannot be disclosed: Asbestos, cement, diatomite, feldspar, gypsum, mica (scrap), perlite, pyrites, vanadium, vermiculite, zeolite, and values indicated by sympol W		XX	16,261
Total		XX	$ 617,549
Total 1957-59 constant dollars		XX	464,544 p/

NA - Not Available XX - Not applicable p/ Preliminary

W - Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed".

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Bureau of Mines estimate from non-company sources.

3/ Estimated based on $8.00 per pound for sales to the Atomic Energy Commission and an assumed price of $6.50 per pound for commercial sales.

Source: U. S. Bureau of Mines

TABLE III

ARIZONA'S MINE PRODUCTION OF

	GOLD ozs.	SILVER ozs.	COPPER tons	MOLYBDENUM (Thousands) Lbs.	LEAD tons	ZINC tons	VALUE (Thousands)
1958	142,979	4,684,580	485,839	2,320	11,890	28,532	$ 276,225
1959	124,627	3,898,336	430,297	3,181	9,999	37,325	286,996
1960	143,064	4,774,992	538,605	4,359	8,495	35,811	371,551
1961	145,959	5,120,007	587,053	4,878	5,937	29,585	376,333
1962	137,207	5,453,585	644,242	4,412	6,966	32,888	422,282
1963	140,030	5,373,058	660,977	5,553	5,815	25,419	433,622
1964	153,676	5,810,510	690,988	6,296	6,147	24,690	481,275
1965	150,431	6,095,285	703,377	9,399	5,913	21,757	535,215
1966	142,528	6,338,696	739,569	10,161	5,211	15,985	572,211
1967	80,844	4,588,081	501,471	9,261	4,771	14,330	414,221
1968	95,999	4,958,162	627,961	12,127	1,704	5,441	561,094

TABLE IV

RELATIVE 1968 PRODUCTION

		U. S.	ARIZONA		LEADING STATE	
				Rank in U.S.		
Gold	ozs.	1,478,292	95,999	4th	South Dakota	593,052
Silver	ozs.	32,728,979	4,958,162	3rd	Idaho	15,958,715
Copper	tons	1,204,621	627,961	1st	Arizona	1,204,621
Lead	tons	359,156	1,704	10th	Missouri	212,611
Zinc	tons	529,446	5,441	16th	Tennessee	124,039
Molybdenum	lbs	93,477,000	12,127,000	3rd or 4th	Colorado	61,684,000

Source: U. S. Bureau of Mines

TABLE V

COPPER, GOLD, SILVER AND MOLYBDENUM RECOVERED

FROM METAL MINES IN ARIZONA IN 1966, 1967 and 1968

	1966	1967	1968
Ozs. gold from copper ores mined	127,431	66,933	89,419
Ozs. silver from copper ores mined	5,595,644	3,996,587	4,697,394
Lbs. molybdenum from copper concentrates	10,161,000	9,261,000	12,127,000
Lbs. copper from copper ores mined, including clean-up	1,359,580,900	902,150,000	1,146,574,400
Lbs. copper from precipitates	114,965,800	98,718,600	106,604,800
TOTAL LBS. COPPER FROM COPPER MINES	1,474,546,700	1,000,868,600	1,253,179,200
TOTAL LBS. COPPER FROM OTHER MINES	4,591,300	2,613,400	2,742,800
GRAND TOTAL LBS COPPER FROM ALL MINES	1,479,138,000	1,003,482,000	1,255,922,000
TOTAL TONS COPPER ORES MINED	101,558,298	74,289,203	101,293,963
TOTAL TONS ALL ORES MINED	102,151,074	74,809,009	101,643,870

Source: U. S. Bureau of Mines Minerals Yearbooks

TABLE VI

PRODUCING MINES IN ARIZONA IN 1968 AND 1969

MINES	During 1968*	April 1968**	April 1969**
Copper	44	35	32
Copper, with lead or zinc	2	5	1
Lead and/or zinc	10	4	3
Sub-total	56	44	36
Dry gold lode	1	1	-
Dry gold-silver lode	6	1	2
Dry silver lode	21	7	4
Sub total	28	9	6
Gold Placer	1		
Uranium		7	-
Mercury		2	2
Silica (with or without metal content)		11	11
Asbestos		3	3
Gemstone		-	1
Gypsum		4	4
Lime, limestone, cement . . .		5	5
Marble		2	2
Perlite		2	2
Bentonite		2	2
Mica		3	1
Feldspar		1	1
Iron ore or concentrate . . .		1	2
Diatomite		1	1
Totals		97	79

* Source: U.S. Bureau of Mines
** Source: Arizona Department of Mineral Resources

TABLE VII

VALUE OF MINERAL PRODUCTION IN ARIZONA, BY COUNTIES

County	1966	1967	Minerals produced in 1967 in order of value
Apache . .	r/$ 5,783,021	$ 11,894,526	Petroleum, helium, uranium, sand and gravel, clays, natural gas, vanadium, pumice, stone.
Cochise . .	51,094,213	30,668,887	Copper, lime, sand and gravel, stone, silver, gold, fluorspar, zinc, lead.
Coconino .	r/ 4,968,407	3,535,440	Sand and gravel, pumice, stone, copper, uranium.
Gila	72,186,623	43,679,807	Copper, sand and gravel, asbestos, lime, molybdenum, stone, silver, gold, clays, mercury.
Graham . . .	148,568	310,985	Sand and gravel, copper, stone, pumice.
Greenlee . .	105,583,016	64,893,359	Copper, lime, silver, stone, gold, sand & gravel, molybdenum.
Maricopa . .	7,739,805	5,698,147	Sand and gravel, lime, mercury, mica, stone, clays, copper, silver, vermiculite, gold.
Mohave . . .	24,412,574	26,681,969	Copper, molybdenum, silver, sand and gravel, zinc, stone, feldspar, gold, clays, lead.
Navajo . .	r/ 1,356,168	801,870	Sand and gravel, iron ore, stone.
Pima . . .	162,020,777	150,770,174	Copper, cement, molybdenum, silver, sand & gravel, zinc, gold, stone, lead, clays, tungsten concentrate.
Pinal . . .	151,631,186	91,298,718	Copper, molybdenum, sand & gravel, silver, gold, perlite, gypsum, stone, lime, pyrites, diatomite, iron ore, lead.
Santa Cruz . .	808,662	577,669	Sand and gravel, zinc, lead, stone, silver, copper, gold.
Yavapai .	r/ 31,860,644	30,487,994	Copper, cement, zinc, sand and gravel, lead, silver, molybdenum, stone, lime, gold, gypsum, clays, pumice, iron ore.
Yuma	2,364,802	2,409,053	Copper, sand and gravel, stone, lead, silver, gold, zinc.
Undistributed .	120,000	150,000	Gem stones.
Total. . .	r/$622,079,000	$ 463,858,000	

r/ Revised.

Source: U. S. Bureau of Mines