PERFORMANCE AUDIT

# LAND DEPARTMENT

## MINERAL LEASING PROGRAM

Report to the Arizona Legislature
By the Auditor General
March 1992
92-2

DOUGLAS R. NORTON, CPA
AUDITOR GENERAL

STATE OF ARIZONA
OFFICE OF THE
AUDITOR GENERAL

March 10, 1992

Members of the Arizona Legislature

The Honorable Fife Symington, Governor

Mr. M. J. Hassell, Commissioner
State Land Department

Transmitted herewith is a report of the Auditor General, A Performance Audit of the State land mineral leasing program. This audit was conducted under the provisions of Session Laws 1989, Chapter 288, Section 9.

The report evaluates the performance of the State Land Department in enforcing the 1989 revisions to its mineral leasing program and the impact of those changes. We found that the changes in royalty rates for mines producing on State land generated an additional $12 million in royalty payments to the State over the past four years, approximately 93 percent more than would have been collected under the old formula. However, mining economists who reviewed the appraisals for the two copper mines producing on State land found that the appraisals were deficient. The deficiencies may have led to incorrect calculation of the State's interest in the mines and amount of royalty payments to the State.

My staff and I will be pleased to discuss or clarify items in the report.

This report will be released to the public on March 11, 1992.

Sincerely,

Douglas R. Norton

Douglas R. Norton
Auditor General

DRN:lmn

2700 NORTH CENTRAL AVENUE • SUITE 700 • PHOENIX, ARIZONA 85004 • (602) 255-4385 • FAX (602) 255-1251

## SUMMARY

The Office of the Auditor General has conducted a review of the State land mineral leasing program as modified by the provisions of Session Laws 1989, Chapter 288, Section 9. The session law authorized the review and specifically directed the Auditor General to evaluate the performance of the State Land Department in enforcing the provisions of the above legislation and assess its economic impact.

The New Mexico-Arizona Enabling Act granted the State of Arizona more than 10 million acres of trust lands to support numerous beneficiaries, most notably public schools. The State Land Department (under the direction of a Commissioner appointed by the Governor) was created as a trustee to administer these lands in a manner that will produce the largest amount of revenue for its beneficiaries. Although the Enabling Act required that State lands be appraised before lease, State law did not require an appraisal; lessees of State mineral lands paid only a fixed royalty of 5 percent of the net value of the minerals produced.

However, in 1989, the U.S. Supreme Court ruled that the Arizona statutes were invalid. In an effort to implement the U.S. Supreme Court decision, the Legislature enacted new mineral leasing statutes in June 1989 that established a minimum royalty rate of 2 percent based on the gross value of all recovered minerals, and required royalties to be based on the appraised value of the minerals located on State lands. After the enactment of the new statute, the Department contracted for the appraisal of the two largest copper producing mines operating on State lands. These two mines accounted for approximately 98 percent of the royalties collected by the Department in fiscal year 1990-91.

**Revisions To Mineral Leasing Statutes Have Produced Significant Economic Impact To The State** (see pages 5 through 10)

The 1989 statutory change in royalty rates for mines producing on State lands generated an additional $12 million to the State over the past four years, approximately 93 percent more revenue than would have been realized under the old formula. However, the impact of the statutory change on the mining industry is less certain. Some in the industry view the new rate as an added cost that makes exploration or production on State land less attractive. However, industry representatives also indicate that other factors, including mineral prices and environmental liability, affect decisions about where to explore or mine.

**The Department Should Ensure That Future Appraisals Correctly Estimate The State's Interest In Its Mineral Lands** (see pages 11 through 18)

Under the requirements of A.R.S. §27-234, the Commissioner must appraise all State lands leased for the purpose of extracting minerals. In the case of the two largest copper producing mines, only a portion of each mine is located on State lands, approximately 44 percent of one and 7 percent of the second. As such, it was necessary for the Department to appraise the total value of each mine in order to determine the value of the State's interest in the mine. To appraise the total value required the Department to estimate the value of each mine's ore reserve and establish the cost of production, including an analysis of capital investment, capital costs and taxes.

Although Arizona realized significant additional revenues as a result of the 1989 revision, the methodological assumptions used by the Department to determine the State's interest in the two largest mineral producing mines were incorrect. A review by two mining economists (hired to assist us in our evaluation of the appraisals of the two mines) identified several departures from standard appraisal techniques that affect the value of the State's interest in these two mines. The deficiencies noted by our consultants included the incorrect calculation of the value of the ore reserves, unrealistic capital costs, inadequately defined taxes and subsidies, and the inappropriate deduction of royalty payments.

These deficiencies in the appraisals have a direct impact on the valuation of each mine and, therefore, the value of the State's interest in each mine. While a full reappraisal will be necessary to accurately determine the value of each mine and the State's interest, our consultants estimated that the appraisal had understated the amount of the State's interest in one mine by approximately $30.4 million, and overstated the State's interest in the second mine by an estimated $900,000. Although any estimate of the future impact these valuation changes will have on royalty collections is hampered by the limitations of the data used in the original appraisals, we estimate that additional royalties might have been due from both mines if the appraisals had been performed correctly.

Despite the problems identified with the appraisals, the Department may not be able to modify the contracts signed with the mines. The mistakes in the appraisal process appear to be mistakes which were accepted by the Department. Changing the contracts with the mines because of these mistakes would probably require the consent of the mines. Although the Department can likely do nothing about the problems with the existing mineral leases, it should develop guidelines to ensure that future appraisals correctly assess the State's interest in its mineral lands. The Department should incorporate these guidelines into all future appraisals.

**The Department Should Ensure That Future Adjustments To Its Sliding Scale Royalty Formula Are Appropriate** (see pages 19 through 22)

To determine the amount of royalties each mine should pay for the extraction of copper ore, the Department has developed a sliding scale royalty formula. Although the use of a sliding scale formula appears appropriate, future adjustments to the formula should be based on appropriate data. The Department's leases with the two largest copper mines call for an annual adjustment of the formula based on changes in production costs of the mines. However, according to our consultants, the production cost data used to adjust the formula includes inappropriate costs (i.e., interest costs and royalty payments) which could result in the mines paying less in royalties.

## Improvements Needed For Planning And Management Of The Mineral Leasing Program (see pages 23 through 27)

The Department should improve its overall planning and management of the mineral leasing program. Although the Department exceeded statutory deadlines in implementing the 1989 revisions to the mineral leasing statutes for the two largest producing mines, we found much of the delay appears justified. However, the Department's failure to appraise the remaining eight producing mines operating on State lands could result in lost interest revenue to the State. As such, the Department can and should strengthen planning and management for the remaining mineral leases, particularly the producing leases, and for future leases to limit delays in conducting appraisals and establishing royalty rates.

# TABLE OF CONTENTS

## ILLUSTRATIONS

# INTRODUCTION AND BACKGROUND

The Office of the Auditor General has conducted a review of the State land mineral leasing program as modified by the provisions of Session Laws 1989, Chapter 288, Section 9. The session law authorized the review and specifically directed the Auditor General to evaluate the performance of the State Land Department in enforcing the provisions of the above legislation and assess its economic impact.

## History And Purpose Of Trust Lands

In 1910, the New Mexico-Arizona Enabling Act became law, allowing the people of these territories to form state governments. The act included provisions that confirmed previous land grants and issued new grants encompassing almost ten million acres to the State of Arizona. The conditions attached to the granted lands require that (1) granted lands could not generally be sold or leased except to the highest bidder at a public auction following notice by advertisements; (2) the granted lands could not be sold or leased for less than the value set by a required appraisal; and (3) all proceeds from the lands would be used for the support of numerous beneficiaries. By ratification of the Arizona Constitution in 1911, the Arizona electorate accepted the land grants and conditions. State lands now encompass approximately 9.5 million acres for the benefit of numerous educational, health, and correctional institutions.

## Role Of The State Land Department

The Enabling Act imposed a fiduciary responsibility on Arizona regarding State lands. In 1915, the Arizona Legislature created the State Land Department to "...administer all laws relating to lands owned by, belonging to, and under the control of the state." Under the direction of a Commissioner, who is appointed by the Governor, the Department's primary function is to administer Arizona's trust lands in a manner that will produce the highest revenue yield for the numerous beneficiaries.

Funds from land transactions are deposited into either a permanent fund or an expendable fund as specified in the Enabling Act. Permanent fund revenues come from the sale of land or royalties from natural products of the land. These funds are not expendable for any purpose and are invested by the State Treasurer in interest-bearing securities. Expendable fund revenues include lease revenue from land leases and permits, interest from sales contracts, and interest earned on permanent fund investments, and are available to beneficiaries to use directly for their operations.

The Department's Minerals Section, located within the Natural Resources Division, administers the mineral leasing program. In addition to mineral leases, the section administers prospecting permits, oil and gas leases, as well as mineral material leases and sales. The Minerals Section is also responsible for the geologic evaluation of all State land sales and the economic reevaluation of all mineral leases.

## Royalty Rates Under Previous Arizona Statutes

Section 28 of the Enabling Act specified that State lands could not be leased for less than their value as determined by an appraisal. Arizona passed its own statute (Arizona Revised Statutes §27-234) that required leases on State mineral lands to pay a royalty of 5 percent of the net value[1] of the minerals produced, but did not require those lands to be appraised before they were leased, or require those lands to be leased at their full appraised value.

In 1980, the Office of the Auditor General released a report on the State Land Department (Performance Audit Report No. 80-3). The report recommended adoption of a gross value royalty, as opposed to net, to increase State royalty revenue and eliminate the accountability problems associated with a net royalty system.

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(1) Net value is defined as gross value after processing, less the cost of transportation from place of production to place of processing, the costs of processing, and taxes on production.

## Court Proceedings

In 1981, a suit against the Department was filed in the Maricopa County Superior Court by individual taxpayers (Kadish) and an association of public school teachers (represented by the Center for Law in the Public Interest). The suit sought to invalidate Arizona's fixed 5 percent royalty rate. The plaintiffs contended that the State statute impermissibly resulted in the extraction of minerals without payment of the full value to the State. The plaintiffs claimed that such a limitation of income was contrary to the requirements of the Enabling Act and the Arizona Constitution. In 1985, the Superior Court ruled in favor of the Department.

Subsequently in 1987, on appeal by the plaintiffs, the Supreme Court of Arizona reversed the lower Court decision, declaring the State statute unconstitutional and void. Several mineral lessees then petitioned the U.S. Supreme Court to review the Arizona Supreme Court decision. The U.S. Supreme Court concluded, in a 1989 ruling, that lease of mineral lands granted to the State of Arizona under the Federal statutes must substantially conform to the mandatory requirements of the Enabling Act, and the Arizona Supreme Court was correct in declaring the Arizona statutes invalid.

## 1989 Mineral Leasing Statute

In an effort to implement the U.S. Supreme Court decision, the Legislature repealed A.R.S. §27-234 and enacted new mineral leasing statutes in June 1989 (Session Laws 1989, Chapter 288). The new statutes require an annual land rental as well as a royalty fee of at least 2 percent based on the gross value of all recovered minerals. The royalty rate for each mineral lease must be the appraised value of the State's interest in each mine, and expressed as a percentage of the gross value. In September 1989, the Department began to develop procedures for implementing the new law and contracted for the appraisal of the two largest copper mines operating on State lands. However, because only a portion of each of the two copper mines is located on State lands (approximately 44 percent of one and 7 percent of the second), it was necessary for the Department to appraise the total value of each mine in order to determine the value of the State's share or interest in the mine. These two mines accounted for approximately 98 percent of the royalties collected by the Department in fiscal year 1990-91.

## Audit Scope And Methodology

The scope of our audit is defined by Session Laws 1989, Chapter 288, Section 9:

> The auditor general shall review the status of mineral leasing on state trust lands. The review and report shall include: 1) the performance of the state land department in enforcing the provisions of this act, 2) the economic impact of this act.

To accomplish this directive, our audit contains findings in the following areas:

- the economic impact of the 1989 revisions to the mineral leasing statutes;
- the techniques used to appraise the State's share of two copper mines;
- the Department's use of a sliding scale formula to collect royalties from mineral leases; and
- planning and management of the mineral lease program.

To further assist us in our review of the appraisals of the two largest copper mines and the sliding scale royalty formula, we retained the mining economics consulting firm of Newcomb and Harris. Drs. Newcomb and Harris have over 24 years' experience in mineral appraisal, materials markets, and the evaluation of mineral resources and reserves. The consultants' assessments and recommendations are presented throughout Findings II and III.

This audit was conducted in accordance with government auditing standards.

The Auditor General and staff express appreciation to the Commissioner and staff of the State Land Department for their cooperation and assistance during our audit.

## FINDING I

## REVISIONS TO MINERAL LEASING STATUTES HAVE PRODUCED SIGNIFICANT ECONOMIC IMPACT TO THE STATE

The 1989 statutory change in royalty rates to mines producing on State land has generated an additional $12 million to the State. Over the past four years, the new royalty formula has generated approximately 93 percent more revenue than would have been realized under the old formula. However, the impact on the mining industry is less certain. Some in the industry view the new rate as an added cost that makes exploration or production on State land less attractive. Industry representatives also indicate that other factors affect decisions about where to explore or mine.

### Dollar Impact Of Royalty Rate Change

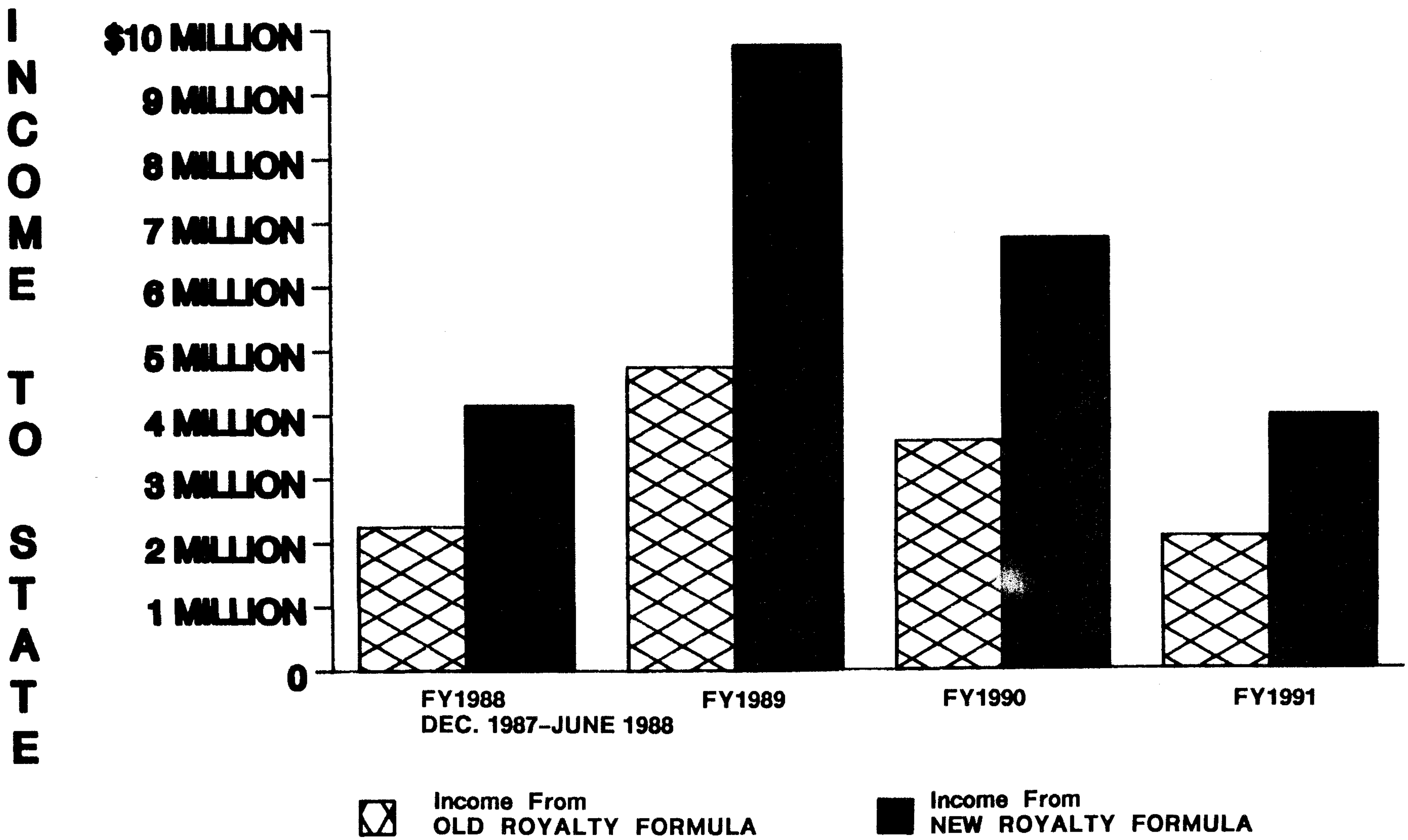
The new royalty rate has greatly impacted collection of revenues from the two major copper producers on State land. Although only two mines have been charged the new rate, payments to the State over the past four years have nearly doubled. Because the price of copper is now considered in the royalty formula, much of this increase is due to higher than average copper prices in recent years.

<u>Revenue contribution of two copper producers</u> - While the 1989 statutory revisions and the resulting royalty rate change affect all mineral leases on State lands, two copper mines, the Asarco Mission Mine and the Magma San Manuel Mine generate most of the royalty revenue. For example, in fiscal year 1990-91, Asarco contributed approximately 72 percent and Magma more than 25 percent to the total royalties collected by the Department.

<u>Increase in royalty income</u> - Asarco's and Magma's royalty payments have increased almost 93 percent over the past four years as a result of the new royalty rate. Chart I (page 6) shows that from 1988 through 1991 royalties collected from these companies were significantly higher than

## CHART I

**A Comparison Of Total Income to the State Under the Old vs. New Royalty Formula**



they would have been under the old formula. For example, in fiscal year 1988-89, under the old royalty rate the two mines generated revenues of $4.7 million; under the new royalty rate, they generated revenues of $9.8 million, an increase of 106 percent. In total, over the past four years, the State has collected additional revenue of approximately $12 million from the two mines under the new royalty rate.

<u>Role of copper prices</u> - Because the new sliding scale formula takes copper prices into account in determining the mines' royalty rate, when copper prices increase, royalties increase. As Graph A (page 8) indicates, copper prices have fluctuated significantly in the past ten years, ranging from a low of 61 cents per pound in August 1986 to a high of $1.60 per pound in December 1988. Additionally, the price of copper per pound fell below $1 from August 1980 to October 1987. However, because prices have been higher over the past four years, the two mines' royalty payments have exceeded the minimum 2 percent of gross established by statute. Asarco contributed an average of 5.65 percent of gross from December 1987 through December 1990, while Magma contributed an average of 3.7 percent of gross from December 1987 through April 1991. Conversely, had copper prices been lower during that period, royalty payments from both mines would have been closer to the statutory minimum.

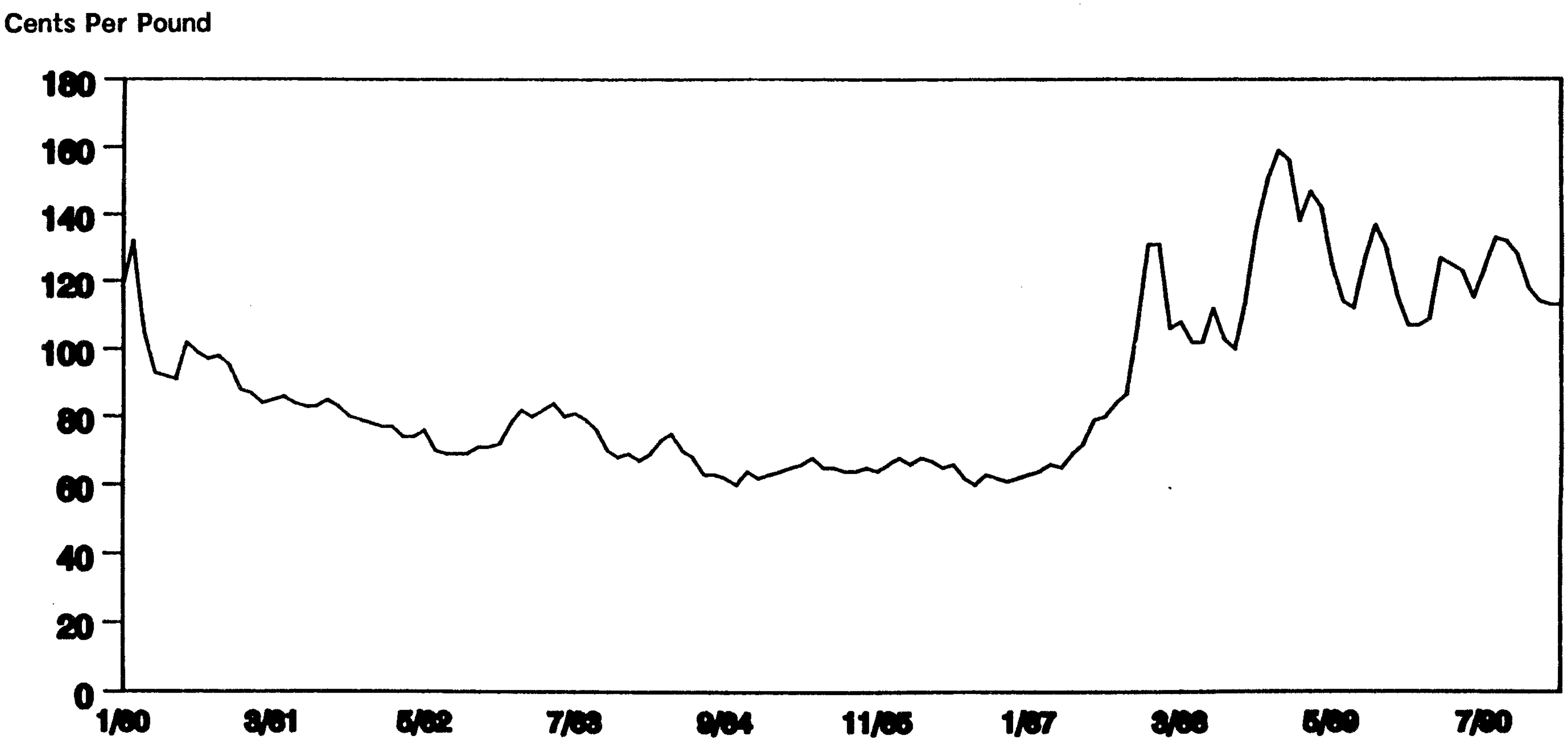
## Impact Of Royalty Rate On Mining Industry

The mining industry representatives we interviewed perceive the new royalty rate as an increase in the cost of mining on State lands. Therefore, they are reluctant to invest in sites on State lands because they fear their profits will be eroded by the new rate. Delays by the Department have made assessing the impact of the rate increase difficult. Although factors such as mineral prices and environmental liability also contribute to the cost of mining, the mines are focusing on the impact of the new rate.

<u>Perceptions of the mining industry</u> - Companies mining on State lands are unhappy with the new royalty formula and say it has increased the cost of their operations on State lands. One industry spokesman called the

## GRAPH A

**Copper Prices for the Period From January 1980 to February 1991**




— SOURCE: METALS WEEK

new rate the "killing of the golden goose." The new 2 percent of gross method is perceived as an "unknown" by industry representatives because the unpredictable future price of copper plays such an important role in the new royalty formula. However, according to a Department official, the new royalty rate, once established, is very precise, whereas the old rate could be more easily manipulated by the mines.

According to several mining officials, the result of the new royalty rate may be a decrease in prospecting and exploration on State lands. These officials contend that, given a choice, a company would choose to mine on private or Federal lands rather than State lands because royalty rates on private lands are established prior to exploration and, therefore, are set before mining occurs. Consequently, the price of copper has no impact on the rates paid. Further, because mining on Federal lands does not require the payment of royalties, mining there costs less.

Finally, we spoke with four companies with production capabilities on State lands. Each company considers the new royalty rate an important factor in its decision to develop on these lands. While factors such as mineral prices also play a role, one company official said that in their market analysis they need to know that the mineral potential on State lands is enough to offset the higher royalty rate.

<u>Delays by the Department</u> - The mining industry's concerns about the new royalty rates have been affected by the Department's failure to complete timely appraisals of all mines operating on State lands. As explained in Finding IV (page 23), because of delays in mine appraisals by the Department, the impact of the new royalty rate is difficult to measure. Until more mines have been appraised, the total impact of the new royalty rate on all the mines affected cannot be determined.

<u>Other considerations in deciding where and when to mine</u> - While the royalty rate influences the mines' decision to develop State lands, other factors also have an impact. Mineral prices, environmental protection, liability cosiderations, and the general state of the economy all contribute to the potential prospecting and development equation. Mining industry officials cite the price of copper and other minerals as factors

that are as important as the royalty rate in determining whether to initiate development of mines on State lands. Further, according to a Department official, stricter environmental controls increase mining costs significantly. Because mines are financially liable for cleaning up all environmental damage caused by their activities, clean-up costs can substantially affect the potential profitability of a mine. Finally, mining industry officials mentioned several other important factors they consider before deciding to mine a particular mineral deposit. These factors include the general state of the economy, labor and facility operations costs, the demand for the mineral, the quality of the deposit, and the ease of extraction.

## FINDING II

## THE DEPARTMENT SHOULD ENSURE THAT FUTURE APPRAISALS CORRECTLY ESTIMATE THE STATE'S INTEREST IN ITS MINERAL LANDS

Although Arizona has realized significant additional revenue as a result of the 1989 mineral leasing revisions, the methodological assumptions used to appraise the State's interest in mines operating on State lands were incorrect. Our review revealed several departures from standard appraisal techniques that specifically affect the value of the State's interest. The Department should develop guidelines to ensure that assumptions made in future mineral appraisals do not incorrectly reduce royalty payments to the State.

### Appraisals Were Not Conducted According To Standard Appraisal Methodology

Appraisals of the two largest copper mines operating on State lands did not include the use of several standard appraisal techniques. According to A.R.S. §27-234, the Commissioner is required to conduct appraisals according to standard appraisal methodology to establish the value of the State's interest in all minerals recovered on State lands. With the aid of consultants, we identified several deficiencies in appraising the State's interest. These deficiencies impact the value of the State's interest and the amount of royalty collected by the Department.

Appraisal requirements - Under the new mineral leasing statutes enacted in 1989 (A.R.S. §27-234), the Commissioner must appraise all State lands leased for the purpose of extracting minerals. The appraisal is intended to establish the value of the minerals contained on these lands, and is then used to determine a royalty rate that will obtain the fair value of the minerals from the mining companies leasing the lands.

Appraisal of two mines - Although numerous mineral leases have been issued by the Department, the majority of the mineral royalty revenue collected by the Department is derived from only two leases.[1] These

(1) These two leases accounted for approximately 98 percent of the royalties collected by the Department in fiscal year 1990-91.

two leases include State lands that represent a portion of two large copper mines, the Asarco Mission Mine and the Magma San Manuel Mine.[1] The Department contracted with a mining engineer to appraise the value of the minerals contained on the State lands leased by these two mines. In conducting the appraisals, the Department's appraiser determined that since only a portion of each of the two mines is located on State lands, it was necessary to appraise the total value of each mine in order to establish the value of the minerals located on the State lands leased to the mines. In doing so, the appraiser established both a total value of each mine as well as the value of the State's interest in each mine (i.e., value of the minerals contained on the State lands when included as a portion of the total value of the mine.) To determine the total value of the mines, the Department's appraiser established the present value of each mine's expected cash flows (or income minus costs) over the expected life of the mine. To accomplish this, the appraiser estimated the value of each mine's ore reserve and established the cost of production, which included analysis of capital investment, capital costs and taxes. The State's interest in each mine was determined by estimating the value of the royalties the Department could collect from the minerals contained on State lands, using a fixed royalty rate of 5 percent of the net value of the minerals.

<u>Appraisal deficiencies</u> - Several deficiences limit the accuracy of the appraisals conducted on the two largest copper mines operating on State lands. We found the appraisal methods utilized by the Department's appraiser were insufficient to accurately determine the State's interest. Several deficiencies were noted by our consultants, including the following:

- <u>Ore Reserves Incorrectly Calculated</u> - The Department's appraiser incorrectly estimated the value of the ore reserves by (1) using a constant copper price with a fixed estimate of the size of the ore reserve, and (2) using constant production costs based solely on a one-year period. However, the value of the metals in the ore reserves does change with price and cost, both of which vary widely

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(1) The Asarco Mission Mine is an open pit mining operation, approximately 44 percent of which is located on State lands. The Magma San Manuel Mine is an underground mining operation, of which approximately 7 percent is located on State lands.

from year to year. In addition, it is unlikely that cost would remain constant if production were to increase. Furthermore, a one-year period does not provide sufficient history for evaluating the changes in price and cost. Since the value of the ore body is based on the results of simulations using a range of values, the assumption of constant prices and costs for such a limited period does not provide an accurate basis for valuing the ore body. Our consultants recommend that the Department review mine information (prices and cash flows, tonnages, outputs) periodically so deviations from appraisal estimates can be made an integral part of analysis, thereby increasing the accuracy and consistency in calculating the State's interest and mine value.

- <u>State's Interest Incorrectly Calculated</u> - The Department's appraiser failed to adequately determine the value of the State's interest. The appraiser established the State's interest in each mine by estimating the value of the royalties the Department could collect from the minerals contained on State lands, using a fixed royalty rate of 5 percent of the net value of the minerals. Our consultants recommend valuing the State's interest as a net present value after the mines' costs, excluding royalties, are deducted.

- <u>Validity of Price-Cost Estimates Uncertain</u> - The Department's appraiser did not statistically test the appropriateness of either his pricing forecasts or cost estimates, nor did the appraisal contain the information necessary to conduct these tests. Since price and cost estimates are judgmental in forecasting, tests for consistency or significance must be performed. Our consultants recommend (1) including tests of price significance, such as a short run, five-year moving average, forecast model in appraisals, and (2) modifying the costing approach to explicitly identify key costs and link them to database simulations.

- <u>Misstatement of Capital Investment</u> - Capital investment was misstated in three significant ways. First, initial capital less depreciation was not included in calculating the total investment in either mine. Second, in valuing the Magma mine, the appraisal included the cost of refurbishing processing facilities that do not solely pertain to the State's interest. Third, the appraisals did not completely report or document net investment, depreciation, and depletion charges used in cash flow analysis. Without this explicit information, the appraisal cannot accurately determine the net value of the mines.

- <u>Cost of Capital Unrealistically High</u> - The cost of capital used in the appraisal is not related to the industry and the mines' financial experiences. The appraisal used a subjective discount rate[1] of 17 percent for both mines, which included a 7 percent profit margin. According to our consultants, it is very unlikely that

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(1) The discount rate is defined as the interest rate used to calculate the present value of a specific pattern of cash flows less the rate of inflation. At a minimum, without uncertainty or risk of default, the rate should be set at the risk-free interest rate less the expected rate of inflation.

the mines could sustain a real 17 percent cost of capital over a ten-year period as assumed by the appraisal. Our consultants estimate that the real discount rate is closer to 13.4 percent for Asarco and 14.4 for Magma.

- <u>Taxes and Subsidies Inadequately Defined</u> - The appraisal used effective tax rates(1) rather than code tax rates. The effective tax rate is unrealistic because it disguises information important to the lessor about revenue, royalty, and depletion. The effective tax rate, unlike the code tax rate, can vary annually, which makes it unauditable. To correct these deficiencies, our consultants recommend that tax options and deductions be incorporated into the cash flows by the use of an accounting program specifically developed for mining operations.

- <u>Inappropriate Deduction of Royalty Payments</u> - The initial appraisals inappropriately deducted royalty payments from the cash flows in determining the value of the mines. The purpose of the appraisal is to determine an appraised basis against which royalties will be assessed. Therefore, deducting royalty payments as a cost incorrectly reduces the value of the State's interest in the ore body.

<u>Impact on mine value, State interest, and cost of production</u> - The appraisal deficiencies noted above directly impact mine valuation, the State's interest, and the mine's cost of production. Our consultants attempted to measure the total impact of these appraisal deficiencies. However, their efforts were limited to using the same information used by the Department's appraiser. To accurately determine the mine's value and the State's interest, a full reappraisal must be performed.

In estimating the impact of the appraisal deficiencies for each mine, our consultants broke down costs shown in the appraisal and simulated cash flows under a correct model. Correction of the deficiencies is made progressively in three steps. As shown in Table 1 (page 15), the individual impact at each stage is estimated as well as the combined impact of the deficiencies on the value of the State's interest.

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(1) The effective tax rate is a weighted average that summarizes the net effect of various taxes and deductions so that it is an aggregate of those individual changes.

## TABLE 1

### Estimated Value Of The State's Interest In The Two Largest Copper Mines

| | Asarco (millions) | Magma (millions) |
|---|---|---|
| Department Appraised Value | $ 20.0 | $ 3.0 |
| Effect Of Appraisal Corrections on Appraised Value | | |
| **Step 1:** Incorporating estimates of the initial capital, defining taxes, and subsidies, and correcting the calculation of the State's interest. | 5.7 | (2.2) |
| **Step 2:** Adjusting the cost of capital from 17 percent to 13.32 percent and 14.40 percent, respectively. | 17.4 | .3 |
| **Step 3:** Restoring the deduction of royalty from revenues. | 7.3 | 1.0 |
| Estimated Appraised Value After Correction of Appraisal Deficiencies | 50.4 | 2.1 |
| **TOTAL DIFFERENCE** | $ 30.4 | $ (.9) |

Source: Office of the Auditor General, staff analysis of data obtained from our consultants' report.

As shown in Table 1, for Asarco, adjustments increase the corrected State's interest to $50.4 million, $30.4 million (or approximately 150 percent) more than the Department's appraised value. For Magma, adjustments reduce the corrected State's interest to $2.1 million, $.9 million (or 30 percent) less than the Departments appraised value.

These changes also affect the mines' cost of production. The net effect on Asarco's cost of production is an increase of one cent above the Department's value. The net effect on Magma's cost of production is a significant reduction of approximately 26 cents.

Impact on royalty receipts - The appraisal deficiencies can impact the amount of royalty collected by the State. While the net effect on current royalty payments cannot be determined accurately without a full reappraisal, changes in the appraisal values clearly have the potential to impact royalty receipts. The change in the appraised value at Asarco will impact the amount of royalty to be collected. As the royalty formula was developed to collect the State's appraised value, an estimated increase in the State's value at Asarco would mean additional royalty will have to be collected to ensure the State's interest is recovered. Furthermore, due to the decrease in Magma's cost of production, a critical element in the new royalty formula, the State could potentially collect more royalty under the new formula than it did under the old formula despite the reduction in the value of the State's interest.

## The Department Needs To Provide Clear Direction For Future Appraisals

The Department needs to more clearly define assumptions used in appraisals of State mineral lands. Although the Department may lack the ability to rectify the deficiencies of the appraisals on the Asarco and Magma mines, it can establish guidelines to be used in future appraisals.

Magma and Asarco appraisals stand - Despite the problems identified with the Magma and Asarco appraisals, the Department probably cannot modify the contracts signed with the mines. The lease is a separate document from the appraisal and is a contract between the State and the mines. According to our General Counsel and the Assistant Attorney General who represents the Department, the Department appears to have no legal basis for changing the contract even though the assumptions used by its appraiser do not conform to the statutory requirement for standard appraisal methodologies.

The Department's actions in accepting the contract limit its ability to modify it after the fact. Department staff raised questions about some of the appraiser's assumptions during their review. However, these questions were dismissed and the Department used the appraisal as the basis for contract negotiations with the mines. Thus, any mistakes in the appraisal process appear to have been accepted by the Department and do not appear to provide the basis for changing the contracts. Under these circumstances, any change in the contracts would probably require the consent of the mines.

<u>Guidelines for future appraisals</u> - Although the Department may not be able to address the problems with the existing mineral leases, it can develop guidelines to ensure that future appraisals correctly assess the State's interest in its mineral lands. Guidelines are needed to further define areas of standard appraisal methodologies that are open to interpretation.

A.R.S. §27-234 requires the Department to appraise mineral lands using standard methodology. The Department used a standard methodology, the income approach, in appraising the State's interest in the Asarco and Magma mines. However, it did not direct its appraiser in making assumptions in areas that are not clearly defined by standard appraisal methodology. As a result, the appraiser used assumptions that incorrectly reduced the State's interest by approximately $30 million in the Asarco mine and overstated its interest by an estimated $900,000 in the Magma mine (see pages 14 through 16).

To avoid future appraisal deficiencies, the Department should clarify how appraisers should use assumptions in appraising State mineral leases. The Department should identify ambiguous areas within standard appraisal methodologies, evaluate their potential impact on the State's interest in its mineral lands and specify how uncertainties should be resolved to ensure that appraisals correctly identify the State's interest. The Department should incorporate these guidelines into all future appraisal contracts.

## RECOMMENDATION

The Department should develop procedures to (1) ensure that standard appraisal techniques are applied to enhance the accuracy of the State's interest and mines' cost of production calculation and (2) provide clear guidance to appraisers in using assumptions in appraising State mineral lands.

## FINDING III

## THE DEPARTMENT SHOULD ENSURE THAT FUTURE ADJUSTMENTS TO ITS SLIDING SCALE ROYALTY FORMULA ARE APPROPRIATE

The Department's use of a sliding scale formula to establish royalty rates for State mineral leases appears appropriate; however, an appropriate break-even price should be used in the formula in all future lease agreements.

### Use And Appropriateness Of The Sliding Scale Formula

The Department developed a sliding scale formula to determine royalties for the two largest copper mines operating on State land. This method appears appropriate for establishing royalties due the State.

Development of the sliding scale formula - To determine the amount of royalties each mine should pay for the extraction of copper ore, the Department has developed a sliding scale royalty formula. The Department concluded that historically copper prices have ranged from well below the average cost of domestic production to highs that yield net profits over 100 percent for efficient producers. Because of the uncertainty established by the fluctuating price of copper, the Department decided that establishing a sliding scale royalty formula would be more equitable to the State and the mines than a fixed royalty rate.

In practice, the sliding scale formula provides the minimum statutory royalty of 2 percent of gross when copper prices result in revenues that are at or below the mines' production cost, defined by the Department as the "net present value break-even price". The maximum royalty, established by the Department at 8 percent of gross, is the cap of the sliding scale and is applied when copper prices reach or exceed the highest price experienced in the preceding 178 months. When copper prices are between the break-even price and the highest price, the royalty percentage rate is calculated by using the following formula:

Royalty rate = [(Copper index price - break-even price) x multiplier]+ minimum royalty

For example, with a break-even price of $0.80 per pound and a high price of $1.50 per pound, the formula would produce the royalty rates shown in Table 2.

## TABLE 2

### STATE LAND DEPARTMENT
### Sliding Scale Royalty Formula

Royalty rate = [(Copper index price - .80) x .0857[a]] + .02

| Copper Index Price | Royalty Rate |
|---|---|
| $0.80 | 2.00% |
| 0.90 | 2.86% |
| 1.00 | 3.71% |
| 1.10 | 4.57% |
| 1.20 | 5.43% |
| 1.30 | 6.29% |
| 1.40 | 7.14% |
| 1.50 | 8.00% |

(a) The multiplier is the factor necessary to determine the royalty rate when copper prices are between the break-even price and the highest price, and is calculated as follows:

$$\frac{\text{Maximum royalty rate - Minimum royalty rate}}{\text{Highest price - Break-even price}} = \frac{8\% - 2\%}{1.50 - .80} = \frac{.0600}{.700} = .0857$$

Source: Office of the Auditor General, staff analysis of data obtained from the State Land Department.

The calculated royalty rate is then applied each month to the gross value of the mineral concentrates the mine produces from the State lands to determine the monthly royalty due.

Sliding scale appears appropriate - According to our consultants, the Department's use of a sliding scale royalty appears to be an appropriate method of determining royalties. Other possible methods of determining royalties, specifically those that might appear similar to a fixed severance tax, have been criticized for distorting the efficiency of private industry decisions about the amount of time to mine or how much to mine and invest in a given deposit. This is because severance taxes, and the costs they create, affect the mine's level of production. Conversely, taxation based on a producer's net income is preferred by both economists and the mining industry because it does not so directly influence production levels and, therefore, has little or no impact on the mines efficiency and the time necessary to exhaust the deposit. As such, the Department's royalty rate formula, as a low minimum severance plus a progressive royalty levied on net income, is closer to an income tax and preferable to other methods that approximate a severance tax.

## Use Of Appropriate Break-Even Price In The Sliding Scale Formula

Although the sliding scale formula appears to be an appropriate method of determining royalties, future adjustments to the formula must be based on the appropriate break-even price. The Department's leases with the two largest copper mines calls for an annual modification of the formula. However, the data used for the modifications is inappropriate and can result in a reduction in royalties to the State.

Lease agreements - The current leases negotiated between the Department and the two largest copper mines include provisions that allow for annual adjustments of the sliding scale formula based on changes in production costs of the mines. This production cost data is derived from the mining companies' annual tax reports to the Arizona Department of Revenue.

Inappropriate adjustment of the formula - According to our consultants, the use of annual production cost data computed by the mining companies cannot be substituted for the net present value break-even price determined by the appraisal. As discussed in Finding II (pages 12 through 14), certain costs (i.e., interest costs and royalty payments) should be excluded when appraising the net present value of the mines. Production cost data derived from annual tax reports to the Arizona

Department of Revenue will include the types of costs that should be excluded from the appraisal. By using this data annually to adjust the mines break-even price, the Department will be including costs that are not representative of the mining companies' investment in the mine.

Annual adjustments to the sliding scale royalty formula based on production cost data could reduce the State's collection of royalties. Because the accounting methods often include capital charges not directly associated with the mines' activities, a break-even price based on these costs could be significantly higher than a break-even price derived from the net present value appraisal. Therefore, since the sliding scale formula (see page 20) uses the mines' net present value break-even price to determine the minimum royalty payment, any increase of this price would tend to result in the mines paying less in royalties.

Although the use of inappropriate cost adjustment data may reduce the State's royalty collections, the Department does not appear to have any option to modify the leases with the two mines. As noted in Finding I (see pages 15 through 16), the Department is bound by the lease agreements signed by the mines and has no basis to unilaterally change the terms of those leases. Therefore, any action to ensure that only correct data is used in annual adjustments to the sliding scale must be limited to future lease agreements.

**RECOMMENDATION**

In any future mineral lease agreements, the Department should not allow adjustments to the sliding scale formula based on annual production costs.

## FINDING IV

## IMPROVEMENTS NEEDED FOR PLANNING AND MANAGEMENT OF THE MINERAL LEASE PROGRAM

The Department should improve its overall planning and management of the mineral lease program. Although the Department exceeded statutory deadlines in implementing the 1989 revisions to the mineral leasing statutes for the two largest producing mines, much of the delay appears justified. However, the Department can and should improve its performance in implementing the statutes for the remaining leases.

### Implementation Impeded For Two Largest Mines

For the two largest copper mines operating on State lands, the Department has taken longer than had been allowed by statute to implement the new mandated royalty rate. While the statutory deadline for compliance may have been unrealistically short, other factors impeded completion of the lease appraisals and revision of the royalty rate.

**Statutory deadline too short** - The new legislation allowed the Department 180 days after June 8, 1989, to appraise mines and set royalty rates. However, to ensure that this legislation was adequate, the Department had to wait for a ruling by the Maricopa County Superior Court. On October 10, 1989, the Court ruled that the provisions of the new legislation corrected the defects in the old statute and conformed to the U.S. Supreme Court decision, and that leases then in effect were valid. Thus, following the court ruling, the Department had approximately 80 days remaining in which to comply with the mandated changes. It would appear that this delay in beginning the appraisal process was beyond the Department's control and that the statutory deadline may have been unrealistic.

**Other factors hamper implementation** - The time required to retain an appraiser, appraise the mines, and develop a new royalty rate formula slowed the Department's implementation of the new mineral lease law. For the two largest copper mines, instead of six months, it took approximately twenty months.

The Department's decision to contract for the appraisal of the two largest producing copper mines also caused delays. While the Department reports it began working on requests for proposals for the appraisals the day after the Superior Court ruling, the procurement process through the State's Purchasing Office took approximately three months to complete. Our review of the procurement process did not uncover any specific delays that appeared unreasonable.

In addition, the requests for proposals to conduct appraisals for the two largest copper mines indicated the contractor would have 120 days to complete the appraisals. While the initial appraisal reports were completed within the contract time frame, revisions were made after discussions among the appraiser, the Department and the mines. These revisions took an additional three months to complete. Therefore, it took approximately seven months from the time the contract was awarded until revisions were completed.

The development of an innovative sliding scale formula for calculating the new royalty rate required additional time. The Department's new sliding scale formula uses the mines' break-even price as a variable on the sliding scale. We conducted a survey of eight other states and found that none had developed a method similar to Arizona's. We also reviewed industry literature and found no comparable formula had been established that the Department could have utilized.

Once the formula was developed, its specific parameters were discussed with and accepted by the two mines. To complete the total negotiation process (i.e., from appraisal completion to agreement on the formula as well as other lease terms) took three months for one mine and nine months for the other.

## Improvements Needed For Planning And Management Of Lease Program

The Department should strengthen its planning and management procedures for the remaining mineral leases and for all future leases to limit delays in the appraisal of mines and establishment of royalty rates. At the present time, although there are a substantial number of mines that, under the law, must also be appraised, the Department has not established a plan or procedures for addressing these appraisals. Delays in the implementation of the new royalty rate could result in the loss of interest to the State in the future.

**Additional appraisals incomplete and untimely** - In addition to appraisals of the two largest producing copper mines, appraisals are required for nine other producing and eighty-nine nonproducing mines. Because of the anticipated cost to the mines to contract for these appraisals(1), the Department decided to conduct these appraisals using its own staff. However, the Department has not completed these appraisals in a timely manner.

To date, of the remaining nine producing mines, the Department has completed the appraisal of only one. The other eight producing mines have still not been appraised more than two years after the statutory deadline, although they accounted for nearly $91,000 of the royalties collected by the Department in fiscal year 1990-91. (According to the Department, some appraisal work has been completed on three of these eight mines.) The Department has also identified four nonproducing mines that could begin production in the near future. Although appraisals have not been completed on any of these mines, work has begun on only two of them.

The Department has also not completed appraisals on most of the nonproducing mines. To date, appraisals of only fourteen of the eighty-nine nonproducing mines have been completed. The Department's

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(1) A.R.S. §27-234.E provides that the costs of the appraisals should be charged to the mines.

goal is to complete all remaining appraisals by the end of 1992. The impact of such a significant change in priorities on the Department's other workload is unclear.

Areas for improved planning and management - There are several areas in which improvements in planning and management could facilitate the completion of the remaining mine appraisals. Priorities must be established to ensure the timely completion of the appraisals of producing mines. In addition, the Department's procedures for implementing the program should be improved.

The Department has failed to appropriately prioritize the completion of the unappraised mines. For example, initially two employees were assigned to complete the mineral abstracts for the appraisals of nonproducing mines while only one employee was assigned to complete the abstracts for the producing mines. However, only producing mines generate royalties. Further, because of the time the one employee needed to devote to the two largest producing copper mines, only one of the remaining nine producing mines has been appraised, while fourteen of the nonproducing mines have been appraised.

The Department also needs to review the adequacy of its appraisal fees for appraisals conducted by staff. The statute specifies that the cost for appraisals should be assessed to the mine owners. The Department originally estimated that a charge of $250 per appraisal would be adequate. This charge is based on 20 hours of staff time to complete the appraisal. However, the Department does not monitor the amount of time required to complete an appraisal to determine whether this charge is adequate.

Interest could be lost - Delays in the implementation of the new royalty rate could result in lost interest to the State. Because the Department has not appraised the remaining eight producing mines, the new royalty rate has not been applied to the minerals recovered from these State lands. Although the Department can collect any additional royalties, based on the new royalty rate, retroactively to December 1987 for leases then in effect, the State cannot earn interest for the beneficiaries until the royalties are collected. Further, there are no provisions in the statute for the Department to collect back interest from the mines.

## RECOMMENDATIONS

1. The Department should expedite the completion of appraisals for producing mines to minimize interest lost to the State either by placing a higher priority on staff time or contracting appraisals.

2. The Department should develop a procedure to review on an annual basis the adequacy of charges for staff appraisals.

FIFE SYMINGTON
GOVERNOR

Arizona
State Land Department
1616 WEST ADAMS
PHOENIX, ARIZONA 85007

M.J. HASSELL
STATE LAND COMMISSIONER

March 5, 1992

Douglas R. Norton
Auditor General
Office of the Auditor General
2700 North Central Avenue, Ste. 700
Phoenix, Arizona 85004

Dear Mr. Norton:

The following comments are offered concerning the Auditor General's report on the state Mineral Leasing Program.

**Finding I:** Revisions to Mineral Leasing Statutes that Produced Significant Economic Impact to the State.

The Department agrees with Finding I of the report which describes the impacts of the $12 million increase in revenue in a four year period to the Trust and the potential disincentive to the industry accruing from the statutory change.

We were somewhat disappointed that the report did not make a more comprehensive review of all of the 1989 changes in the mineral leasing statute. We believe that several of these changes, including the discretionary right to deny prospecting permits, the right to auction unleased mines and mineral properties, index pricing of gross mineral content, and the right to reappraise if new minerals are discovered or mine technology changes, will have major long term impacts on the program, and are significant components of the new mineral leasing statute that were not covered in the report.

**Finding II:** The Department Should Ensure that Future Appraisals Correctly Estimate the State's Interest in it's Mineral Lands.

The Department agrees with Finding II of the report and with the recommendation of Finding II which calls for the Department to develop procedures to ensure that standard appraisal techniques are used to enhance the accuracy of the State's interest and mines' cost of production calculations, and to provide clear guidance to appraisers in using assumptions in appraising state mineral lands.

There is apparently a fundamental disagreement between the State Land Department and the Auditor General about what should be appraised. A.R.S. 234-B, the new mineral leasing statute, identifies the State's interest as the value of the royalty income stream. It is not a percentage of the mine value or residual value of the ore body as the Auditor General's report suggests.

The Department's appraiser defined the State's interest as the net present value of the royalties received. We believe that this is an appropriate definition consistent with the statute. The appraisals of the State's interest in the two major copper mines on Trust lands used this definition and were completed using standard appraisal methology and rational assumptions.

A second requirement of the Department's appraisal contract was to appraise the total mine. However, it is not necessary to determine the value of the State's interest as the report suggests. The value of the entire mining operation was determined in order to assess the impacts any given royalty rate would have on the economics of the mine, to establish costs consistent with the economy of scale, and to determine the value of the mine to the lessee.

The Department did not mistakenly accept these values as the Auditor General's report suggests, but accepted the values as a viable factor to be used in negotiating royalty schedules for the mines as required by the statute. The mine appraisals provided valuable information used by the Department in negotiating the sliding scale royalty.

We believe that Finding II of the report misses the mark because it focuses on an analysis of the mine appraisals, and the net present value of the ore bodies. We recognized that the appraisals could have been improved in some areas, but they were sufficient for our purpose. Perhaps the best way to illustrate what we are trying to say is to use the analogy of a building.
If the owner could sell a building, it would be vital to know the value of the building. However, if the owner is precluded by law from selling the building and can only rent the building, his primary objective would be to determine a fair market rent.

In the case of the mines, the State is precluded by law from selling its mineral interest. The royalty, therefore, like a building rent, is the only way that the State can capture its interest. We believe that the $23.5 million in royalties we have received from the ASARCO and Magma mines during the past four years has already captured a major share of whatever appraised value is assigned to the State's interest in these two mines.

We have three additional concerns about the report's analysis of Finding II. We believe that the concept that the Trust is to receive no more or less revenue than it's share of the appraised value of the ore body using a royalty is flawed. The only way to ensure that this would happen is to make a cash sale. The net present value of the ore body is the value of the ore after recovery costs are deducted. A royalty that captured all of this value would eliminate the mine's profit and would remove the incentive for mining.

The Department hired, through the State procurement process, a professional mineral appraiser to make the appraisals of the ASARCO and Magma mines. We believe that it is inappropriate for the Auditor General's report to make statements about what is "incorrect" in the State appraiser's subjective opinion of value without including the appraiser's response to the questions you have asked him about what you perceive to be inadequacies in his report.

We believe that Table I in the report is of no value even though it is the basis for your conclusion. All it does is unilaterally accept the consultant's values. Another appraiser would almost certainly have a different value.

Further, the table is flawed because it attempts to add your consultant's values generated as a percentage of the total ore body with the Department appraiser's values generated from the net present value of the royalty income. It then compares the total with the appraiser's value. The result has no meaning because the adjustments are related only to the value of the ore body, not the value of the royalty income.

**Finding III:** The Department Should Ensure that Future Adjustments to it's Sliding Scale Royalty Formula are Appropriate.

The Department agrees with Finding III, however, we disagree with the recommendation that the Department should not allow adjustments to the sliding scale formula based on annual production costs.

Some form of adjustment is necessary if a sliding scale is used with the gross value of copper as the adjuster. The original equities of the scale will be lost if inflation occurs impacting either the production cost or copper price or both. The following illustration is derived from one of the mineral leases.

The royalty calculations beginning with calendar year 1992, the lower and upper CIP limits described in section 3.3c as $1.10 and $1.60 respectively shall each be adjusted either upward or downward by an amount equal to the difference between the new five year average production cost ("NFYAPC"), referring in this initial adjustment to the five year period 1987-1991 inclusive, and the last five year average production cost (LFYAPC), referring in this initial adjustment to the five year period 1986-1990 inclusive.

The formula for calculation of the lower CIP limit, where NLL equals the new lower limit, PLL equals the previous lower limit (in this initial adjustment $1.10 cents), shall therefore be:
NLL = PLL + (NFYAPC - LFYAPC)

As you can see the adjustment factor is an index. The base number is adjusted in both directions, upward and downward by this index. The base is not directly adjusted to last year's costs as suggested by the report. Numerous indices were considered. We believe the one chosen to be appropriate because it is based on factors specific to the mine rather than on indices only remotely related to mine costs.

<u>Finding IV: Improvements Needed for Planning and Management of the Mineral Lease Program.</u>

The Department agrees with Finding IV. To this end, the Department has prioritized the appraisal effort toward the small producing mines. The appraisal of non-producing mineral leases is also in process. Completion of all mineral lease appraisals is expected by December 31, 1992.

In summary, we believe that the Department has adopted an innovative sliding scale royalty, based on an index that reflects gross value copper prices and mining costs, that is fair to both the Trust and the mineral lessees and that is more advantageous to the Trust than other royalty schedules we have found in the market place.

The royalty schedules that the Department has applied to the Magma and ASARCO mineral leases have captured over $12 million in additional royalties, and total royalties of $23,251,021, from these two mines during the 1988-1991 period. These schedules will continue to produce a fair return to the Trust that is substantially greater than would have been received under the old fixed rate royalty based on net value of minerals produced. We also expect these royalty schedules to capture much more than the present appraised value of the State's interest in these two mines.

The report contains suggestions for changes that will improve the overall quality of the Department's minerals management program. We will implement these changes.

Thank you for the opportunity to comment on this report.

Sincerely,

M.J. Hassell

M.J. Hassell

MJH:dcd