

EVALUATION OF
MINNESOTA MINERAL LEASING

June 24, 1982

PROGRAM EVALUATION DIVISION
Office of the Legislative Auditor
State of Minnesota



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PREFACE

In 1981, the Legislative Audit Commission directed the Program Evaluation Division to evaluate the state's mineral leasing policies.

This report concentrates on leasing procedures which affect the financial return to the state. Several policies used by various states are reviewed, and we conclude that continued use of a royalty system--a per ton charge for mining state owned minerals--is the best approach for the state to follow. We also examine Minnesota's copper/nickel royalty system, detailed in Department of Natural Resources rules. These procedures are sound. The report contains several recommendations which may further improve the return to the state.

We thank the staff of the Division of Minerals, Department of Natural Resources for their full cooperation during this study. This report was written by Jack Benjamin and Edward Burek (Project Manager).



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PROGRAM EVALUATION DIVISION

The Program Evaluation Division was established in 1975 to conduct studies at the direction of the Legislative Audit Commission (LAC). The division's general responsibility, as set forth in statute, is to determine the degree to which activities and programs entered into or funded by the state are accomplishing their goals and objectives and utilizing resources efficiently. A list of the division's studies appears at the end of this report.

Since 1979, the findings, conclusions, and recommendations in Program Evaluation Division reports are solely the product of the division's staff and not necessarily the position of the LAC. Upon completion, reports are sent to the LAC for review and are distributed to other interested legislators and legislative staff.

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TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	ix
INTRODUCTION	1
I. MINNESOTA'S MINERAL RESOURCES	3
A. Extent of Minnesota's Mineral Resources	
B. Mining Revenues	
C. Copper/Nickel Leasing in Minnesota	
II. ALTERNATIVE LEASING SYSTEMS	17
A. Bonus Bidding	
B. Profit Sharing	
C. Royalty Systems	
D. Combination Approaches	
E. Summary and Conclusions	
III. MINNESOTA COPPER/NICKEL LEASING PROCEDURES	29
A. The Public Lease Sale Process	
B. Copper/Nickel Rental Requirements	
C. Royalty Rates	
IV. FURTHER MINNESOTA COPPER/NICKEL LEASING ISSUES	47
A. Subleasing	
B. Negotiated Leases	
STUDIES OF THE PROGRAM EVALUATION DIVISION	53

LIST OF TABLES AND FIGURES

	<u>Page</u>
Table 1 Iron Ore Shipments from Minnesota	5
Table 2 Leases of State Owned Mineral Rights	7
Table 3 Distribution of Rent and Royalty Income from State Owned Mineral Rights	9
Table 4 Minnesota Taxes on Iron Ore	9
Table 5 Minnesota Taxes on Taconite	10
Table 6 Minnesota Copper/Nickel Lease Sales	14
Figure 1 Minnesota's Mineral Formations	4

EXECUTIVE SUMMARY

Interest in copper/nickel mining in Minnesota has increased in recent years, even though immediate economic conditions have dampened exploration activities. Exploration near Babbitt, Minnesota has been halted by Amax Exploration Company, but it appears that the Kennecott Company will continue the operation. If the deposit is mined, the Department of Natural Resources estimates that the state could eventually receive nearly \$250 million in royalties. Also, mining companies continue to show interest in obtaining new leases of other state owned copper/nickel mineral rights. In light of this, the Legislative Audit Commission asked the Program Evaluation Division to review the state's mineral leasing program, particularly as it relates to copper/nickel deposits. The program is administered by the Minnesota Department of Natural Resources (DNR).

We were asked to:

- describe Minnesota's mineral resources;
- evaluate different leasing approaches for ensuring a proper return for the state's mineral wealth; and
- analyze the advantages and disadvantages of Minnesota's copper/nickel leasing policies.

1. MINNESOTA'S MINERAL RESOURCES

Minnesota dominates domestic iron ore and manganese production, and has large, unmined copper/nickel and peat resources. The total value of Minnesota's mineral output for 1981 exceeded \$2 billion.

While no copper mines are currently producing in Minnesota, the Duluth Gabbro complex contains large deposits of low grade copper/nickel, and is the largest known nickel resource in the United States. Copper and nickel in the Duluth Gabbro complex are estimated by DNR to exceed \$80 billion in value. In addition, Minnesota's Greenstone formations may contain small, high grade copper/nickel deposits.

Most mineral rights are held by private parties. The state owns or manages about 10 million acres of mineral rights, mostly trust fund land and tax-forfeited lands.

2. ALTERNATIVE LEASING POLICIES

We analyzed four leasing policies to determine which system offers the best balance between maximizing state revenues, reducing administrative complexities, and minimizing production disincentives.

The approaches examined are bonus bidding (where the company offering the largest up-front payment receives the lease), profit sharing, royalty systems, and combination approaches, which combine two or more of the previous methods.

Minnesota uses a royalty system. There has been little competition for mining tracts, and leasing occurs before extensive exploration by the state or mining companies. At the time of leasing, companies do not know which tracts contain minable ore, and there is great uncertainty concerning the value of any find, or the eventual cost of mining.

- Under these circumstances, we find that continued use of royalty systems is the best option for Minnesota.

a. Bonus Bidding

With bonus bidding, the state would receive a share of mineral wealth through a single, non-refundable payment at the time of leasing. This approach requires companies to carefully determine the value of a mineral deposit, and to estimate their mining cost in order to determine the amount to offer the state for the right to mine the deposit. The company offering the largest amount is awarded the lease.

Successful bonus bidding requires accurate information at the time of leasing, and a high level of competition to ensure the state is offered an adequate share. These requirements conflict with conditions in Minnesota--poor information on the location and value of minable tracts, and low competition. If bonus bidding were used in Minnesota, the state would receive a poor share. Also, companies may decline to bid, resulting in fewer leases. This would eventually lead to lower output, employment, and revenues for the state and trust funds than other leasing options.

b. Profit Sharing

Under profit sharing, a portion of profits earned by mining state owned minerals would be paid to the state. This approach is rejected because profit sharing has proven very difficult to administer. Estimating the profit on state owned minerals is difficult because private owners may own mineral rights for part of the mine site, the company may be operating at many different locations, and the company has an incentive to shift company overhead expenses to sites with state owned minerals. A further disadvantage is that profit sharing, if it can be implemented, may take part of the profits necessary to attract capital to the project, discouraging development.

c. Royalty Systems

Royalty payments, received when ore is found and mined, may be a flat charge per ton or a percentage of ore value. Royalty systems are preferred because they encourage competition, share risk with the mining companies, and are easy to administer. The disadvantage of royalties is that they increase the cost of mining each ton

of ore, which can discourage mining of lower grades leading to reduced output and employment. This effect, called "high grading," can be reduced or eliminated by careful design of the royalty system--charging very low royalties on marginal ore.

d. Combination Systems

A few states have recently developed procedures which combine an up-front bonus bid payment with a royalty system. The intent may be to reduce the high grading effect of royalties, or to capture a better share for the state. We reject this approach because the same objectives can be better achieved by careful design of a royalty system.

3. MINNESOTA COPPER/NICKEL LEASING

Minnesota copper/nickel leases require rental payments, even when no ore is being mined. These payments are modest, flat charges per acre which increase over time. Royalties are required when ore is mined. These royalties, which increase over time and with ore value, are the sum of four components:

- a base rate;
- an extra royalty on ore value exceeding \$17 per ton;
- a bonanza royalty paid on very high grade ore; and
- an additional bid rate.

For underground mining, the base rate schedule requires a royalty of 2 percent of ore value on ore mined during the first 10 years of a lease. The royalty escalates each ten years by fractions of a percent, until a 3 percent royalty is required in years 41 through 50. (Royalty rates are 33 1/3 percent higher for open pit mining after the first 10 years.) In addition to this basic royalty, an extra royalty is calculated by doubling the basic royalty on all value exceeding \$17 per ton. The \$17 cutoff was adopted in 1966 and has not been indexed. A bonanza royalty may also be required. DNR is now amending its administrative rules to increase royalties on exceptionally rich deposits. The bonanza royalty will be paid on ore value exceeding a base of \$50 per ton. This \$50 base will be indexed to metal price increases. Finally, companies must offer a bid royalty. Generally, the company offering the highest bid royalty on a tract is awarded the lease. Winning bid rates have ranged from 0.07 percent to 7.17 percent of ore value.

Based on our review of Minnesota's copper/nickel royalty system, as detailed in DNR rules, and procedures used by other states, we conclude that the department has developed a sound design--clearly superior to most. However, we do have some reservations concerning the present Minnesota system, and we wish to focus critical thinking on these areas to encourage further improvement.

To earn an adequate return for the state, the royalty system should be designed to allow mining companies an acceptable but not excessive profit on all ore grades. High royalty rates on low grade ores can discourage mining, and the state will lose employment and receive no royalties unless the site is developed. On the other hand, if royalties are too low on high grade ores, the profit earned by the company may be far greater than necessary to permit mining the ores. The high return is retained by the company as excessive profits, rather than flowing to the state.

Most copper/nickel ores expected to be found in Minnesota are low or average grade. The state is adequately protected by the basic royalties when these grades are found. However, we believe the state will not receive an adequate share when a tract contains high grade ore. Assuming the new bonanza clause is adopted, the state will receive a large share from exceptional grade ores, although ores this rich are not expected. Our concern is not with exceptional ore grades, but with high ore grades--those not covered by the bonanza clause, and those with values less than a few hundred dollars per ton, where the bonanza clause will not have a significant effect. The basic royalties will not capture an adequate share of a high grade deposit, and given the level of competition for tracts and the data available at the time of leasing, the bid rate may be too low when high grade ore is found.

In spite of provisions which appear to escalate by ore value, these provisions generally will not reflect the profitability of mining higher grade ores. This places great reliance on the bid rate to capture an adequate share for the state. Companies must estimate any excess profit they could earn on a given deposit after payment of the required minimum royalties. The state relies on competition among companies to result in additional royalty bids which permit the state to capture this excess.

The bid royalty improves the state's share, and is a beneficial feature of Minnesota's leasing procedure. However, its effectiveness should not be overestimated. The same factors which prevent effective bonus bidding will also hamper accurate royalty bid rates. Because the state and mining companies do not conduct extensive exploration prior to leasing, the location of minable ore and the true value of minable tracts is not known. Also, competition for tracts has been limited. The majority of leased tracts received only one bid.

We conclude:

- The lack of detailed data and the low level of competition will reduce the effectiveness of the bid royalty in capturing the state's share of higher grade ores.

If Minnesota better escalated royalty rates by ore value, the need for accurate bid rates would be reduced. The escalating royalty rates would automatically produce a share for the state which reflects the high profitability of better ore grades.

Minnesota's system has little effective escalation by ore value. When adopted in 1966, the \$17 provision was viewed as a royalty for high grade ore, because only high grade ore would exceed the \$17 value. However, because this provision was not indexed, when copper mining occurs at some future time even the lowest grades of mined ore will be subject to the \$17 provision. Therefore:

- This provision does not provide effective escalation by ore value. Instead, when prices on these lower grade ores increase to greatly exceed \$17, the effect of this provision will be an approximate doubling of basic rates.

In contrast, the new bonanza clause will apply to ore exceeding \$50 in value, and this new clause is indexed to metal price increases. Thus:

- The combination of the \$17 clause and the new bonanza provision will result in an ever increasing range of ore values for which Minnesota's rate structure will have no effective escalation.

Minnesota is not effectively escalating rates by ore value, but rather is placing great reliance on a weak tool--the bid royalty.

An alternative to the current system is to establish several ore values at which the percentage royalty rates gradually increase, and to index this structure with inflation to maintain it over time. This suggestion should be viewed not as a rate decrease or increase, but as a rate realignment. The purpose is to develop rates which more closely reflect the profitability (or excess profit) of mining different ore grades. These rates would reduce reliance on the bid rate, and better complement the bid rate in capturing an adequate share for the state.

This report recommends that the Division of Minerals study the advantages, disadvantages, and administration of escalating percentage royalties by ore value. Pending lease sales should not be delayed while this option is examined.

4. FURTHER MINNESOTA COPPER/NICKEL LEASING ISSUES

The final chapter of the report discusses negotiated leasing and subleases. The Commissioner of Natural Resources is authorized to negotiate lease terms whenever it is impractical to hold a public lease sale for a given tract. A sublease is a legal agreement between the company holding the lease with the state, and a second company which takes over the mining and marketing of the ores. The second company pays the royalties required in the original lease, and also compensates the first company for services provided, and for the right to develop the unit.

a. Negotiated Leases

Under a negotiated lease, the mining company is required to pay the same basic rents and royalties required on competitive leases. In place of the competitive bid royalty, the company negotiates an additional royalty with the Division of Minerals, with final terms approved by the Executive Council. Of the 16 copper/ nickel leases still in effect, only one was negotiated.

We find:

- While available information does not permit objective comparison of likely state shares from negotiated and competitive leases, the negotiated lease process has adequate safeguards to protect the state's interest.
- Because of the poor state of information regarding ore location, and the combination of public and private ownership of mineral rights, there is no feasible way to avoid occasional use of negotiated leases.

b. Subleasing

DNR reviews copper/nickel subleases with regard to legal correctness and economic effects, and can reject any agreement which is not consistent with the state's best economic interest. The task of the division in reviewing subleases is to carefully weigh advantages against the risk of high grading. Under some circumstances, subleasing can provide greater output and royalties to the state, and may permit earlier mine development. Based on interviews, we conclude that department staff has a firm understanding of sublease issues. We find:

- The state is best served by continuing to permit subleasing based on the merits of each case.

INTRODUCTION

Since 1900, Minnesota has been the nation's leading producer of iron ore. While there has been no recent copper mining in the state, extensive copper/nickel mineralization is known to exist. The value of the copper/nickel resource exceeds \$80 billion.¹ For several years Amax Exploration Inc., under contract from Kennecott, has been evaluating copper/nickel deposits near Babbitt, Minnesota. Amax recently announced it would terminate operations, but it is currently believed that Kennecott may take over and begin mining. The factor cited in Amax's decision was a large drop in world copper prices since early 1980. Mining companies continue to have serious interest in new leases of state owned copper/ nickel rights, and the Department of Natural Resources (DNR) intends to resume public sales of copper/nickel leases within the year.

In June 1981, the Legislative Audit Commission directed the Program Evaluation Division to study Minnesota's mineral leasing program, which is administered by DNR's Division of Minerals. We were asked to:

- describe Minnesota's mineral resources;
- evaluate different leasing approaches for ensuring a proper return for the state's mineral wealth; and
- analyze the advantages and disadvantages of Minnesota's leasing policies.

In response:

- We evaluated Minnesota's leasing policy but not the performance of DNR's Division of Minerals in administering this process.

This report is primarily a policy analysis, rather than a performance evaluation. The soundness of the overall approach should be assessed before trying to evaluate agency performance in implementing that approach. While we do not concentrate on agency performance, our impressions of management and staff are favorable.

- We focused on the rent and royalty provisions used when leasing copper/nickel.

Copper/nickel leasing is a current issue because DNR is revising its rules in preparation for a resumption of copper/nickel lease sales.

¹W.H. Listerud and D.G. Meineke, Mineral Resources of a Portion of the Duluth Complex and Adjacent Rocks in St. Louis and Lake Counties, Northeastern Minnesota, Minnesota Department of Natural Resources (1979), p. 48.

- We evaluated several alternative leasing models, and the specific procedures used in Minnesota.

We did not directly compare leasing procedures of different states. In any comparison it would be very difficult to account for variations in mineral resources, tax policy, state expenditures for exploration, and other factors necessary for an objective comparison of minerals management in different states.

This report assesses the adequacy of Minnesota's leasing system. Chapter I demonstrates the importance of Minnesota's mineral resources, in terms of the types, locations, quantities, and values of these minerals. Chapter II analyzes the advantages and disadvantages of four basic leasing systems--bonus bidding, profit sharing, royalty systems, and procedures which combine two or more of these approaches. Chapter III focuses on Minnesota's process for leasing copper/nickel, including rent and royalty payment requirements. Chapter IV discusses the practice of subleasing, and the implications of negotiated leases.

I. MINNESOTA'S MINERAL RESOURCES

Minnesota's mineral wealth includes significant resources of iron ore, copper, nickel, manganese, and peat. The state has smaller amounts of uranium, gold, silver, platinum, titanium, aluminum, cobalt, and graphite. The total value of Minnesota's minerals output for 1981 exceeded \$2 billion.¹ In that year the state's minerals industries employed 13,600 people.

A. EXTENT OF MINNESOTA'S MINERAL RESOURCES

Minnesota ranks first in the nation in the value of the nonfuel minerals produced. Figure 1 shows the location of the Mesabi and Cuyuna iron ranges, and the areas of copper/nickel mineralization identified as the Duluth Gabbro complex and Greenstone formations.² Minnesota dominates domestic iron ore and manganese production, and has large, unmined copper/nickel and peat resources.³ However, the state owns only a portion of all minerals occurring in Minnesota.

1. TONNAGE OF SIGNIFICANT MINERALS

Iron ore has dominated Minnesota's mining sector. In the 100 years since the first shipment of ore from the Soudan mine, Minnesota has produced more than 3.4 billion tons of iron ore. Of the state's iron ranges, the Mesabi is the only area still producing significant quantities of iron ore or taconite.⁴ Table 1 shows the tonnage of iron ore shipped from the state over the last five years. Present data indicate that there still is a 200 year reserve of iron ore in the state.

¹DNR, Division of Minerals, memorandum of June 8, 1982.

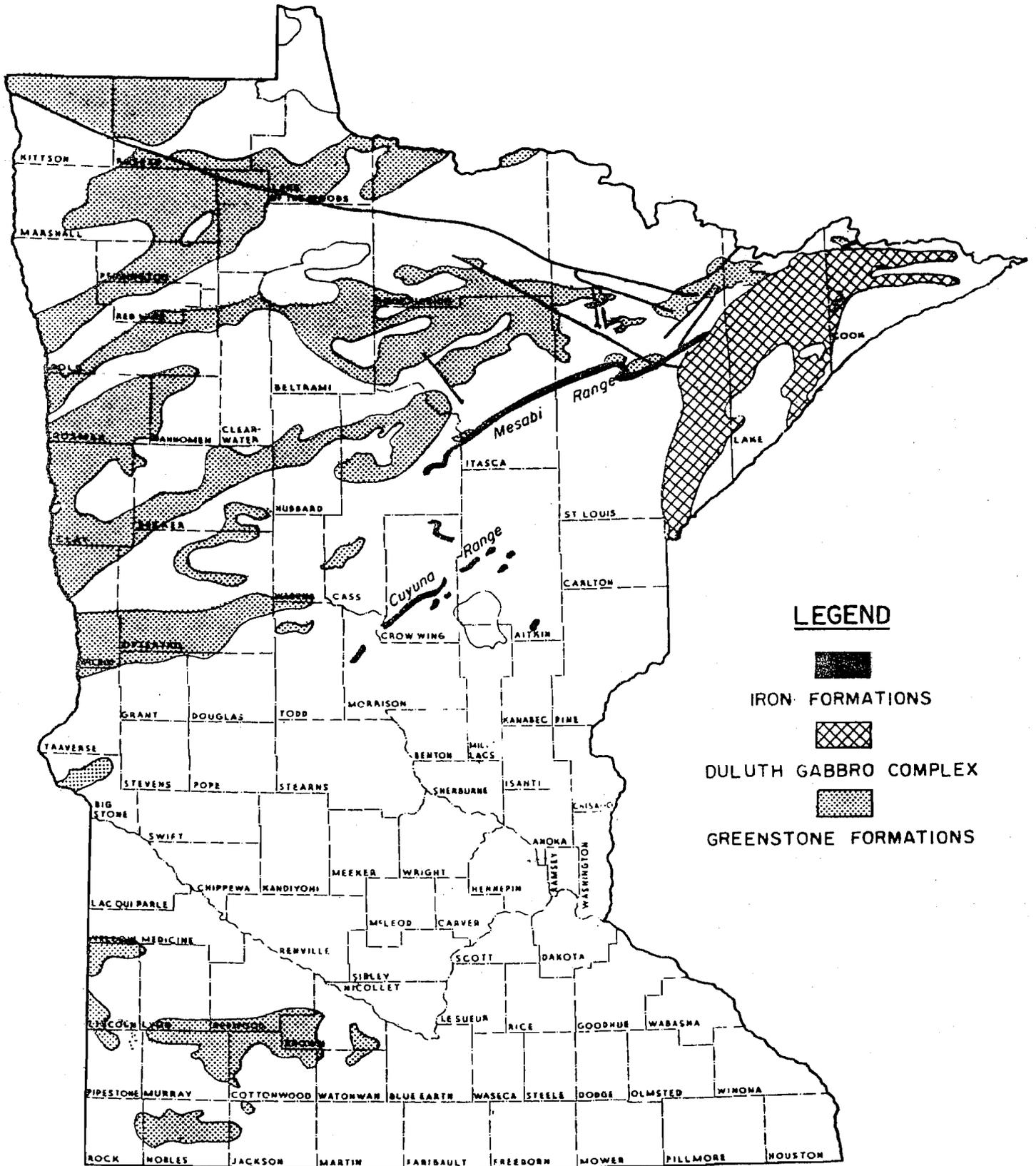
²Minnesota's copper and nickel resources typically occur together as sulfides disseminated irregularly in the rocks in two geological formations.

³U.S., Department of the Interior, Minerals in the Economy of Minnesota (1979), p.1.

⁴Taconite is a source of finely-disseminated, low grade iron ore requiring special processing.

FIGURE 1

MINNESOTA'S MINERAL FORMATIONS



LEGEND



IRON FORMATIONS



DULUTH GABBRO COMPLEX



GREENSTONE FORMATIONS

Source: DNR Division of Minerals

TABLE 1
IRON ORE SHIPMENTS FROM MINNESOTA^a

	<u>Mesabi Range</u>	<u>Cuyuna Range</u>	<u>Total</u>
1976	47,794,128	183,216	47,977,344
1977	30,887,109	159,250	31,046,359
1978	56,055,648	226,249	56,281,897
1979	59,798,836	162,056	59,960,892
1980	45,138,972	106,276	45,245,248

Source: William D. Trethewey, ed., Minnesota Mining Directory, Mineral Resources Research Center, University of Minnesota (1981), p. 223.

^aIn gross tons.

No copper mines are currently producing in Minnesota, although some prospecting for copper, nickel, and associated minerals continues on units leased in the late 1960s and early 1970s. It is known that extensive copper/nickel mineralization exists in the state. The Duluth Gabbro complex typically contains large deposits of low grade copper/nickel, with the higher grades of mineralization in this formation occurring along a thirty-mile band between Ely and Hoyt Lakes. This complex also contains the largest known nickel resource in the United States, as well as other metallic minerals. Minnesota's Greenstone formations are the counterpart to formations in Ontario which have provided much of Canada's mineral wealth, including copper, nickel, lead, zinc, gold, and silver. Canada's Greenstone formations typically contain high grade, relatively small deposits.

Using certain assumptions regarding the continuity of ore grades, future mineral prices, and other factors, a 1977 study by the Division of Minerals estimated the potential of the known deposit in the Duluth Gabbro complex:⁵

- Material containing mineable grades of copper/nickel exceeds 4.4 billion short tons.⁶

⁵W. H. Listerud and D. G. Meineke, Mineral Resources of a Portion of the Duluth Complex and Adjacent Rocks in St. Louis and Lake Counties, Northeastern Minnesota, Minnesota Department of Natural Resources (1977), p.48.

⁶A short ton contains 2,000 pounds, and a long ton contains 2,240 pounds.

- In 1977 prices, the value of the copper exceeds \$40 billion, and the value of the nickel exceeds \$42 billion.

These figures include mineral rights in the Duluth Gabbro held by all mineral owners, including the state. Reliable estimates of the amount and value of deposits in Minnesota's Greenstone formations do not exist, although mining company interest is shifting to these formations.

Minnesota's production of manganese exceeded 180,000 short tons in 1979, ranking the state first in the nation.⁸ State owned land on the Cuyuna range is considered to have a high potential for manganese. Finally, there are approximately seven million acres of peat in Minnesota, with the largest contiguous areas located in the northern half of the state.⁹ In addition to the typical horticultural uses of peat, there is growing interest in possible energy producing applications.

2. OWNERSHIP OF MINERALS IN MINNESOTA

The state owns or manages mineral rights on 10 million acres of land in Minnesota.¹⁰ This total includes:

- 18 percent of the Mesabi Range;
- 5 percent of the Cuyuna Range;
- 50 percent of the peatlands in the state; and
- approximately 25 percent of copper/nickel resources in the Duluth Gabbro complex and an undetermined proportion of copper/nickel resources in Greenstone formations.¹¹

Other owners of Minnesota's minerals include the federal government, local governments, mining companies, and other private parties. Private parties hold the bulk of mineral rights in Minnesota.

⁷The prices of copper and nickel used in these figures are, respectively, \$.70 and \$2.40 per pound. The respective 1981 average prices of copper and nickel were \$.75 and \$3.43 per pound. While copper prices fell sharply in 1980, the 1981 average remained above the 1977 level.

⁸U.S., Department of the Interior, The Mineral Industry of Minnesota in 1980 (January 16, 1981), p.2.

⁹Minnesota Department of Natural Resources, Biennial Report (1980-81), p. 38.

¹⁰Ibid.

¹¹Interview with Kathy Lewis, DNR Mineral Lease Specialist, March 17, 1982.

Only a small percentage of state owned mineral lands are currently leased. Table 2 shows the number of leases of state owned iron ore, taconite, and copper/nickel in effect on January 2, 1982. Most of these leases apply to minerals located in St. Louis and Itasca counties. Five companies hold iron ore leases, eight companies hold taconite leases, and two companies hold copper/nickel leases to state owned mineral rights.

TABLE 2
LEASES OF STATE OWNED MINERAL RIGHTS
January 2, 1982

	<u>Number of Leases</u>	<u>Acres</u>
Iron Ore	23	1,754
Taconite	126	10,817
Copper/Nickel	16	4,649

Source: Division of Minerals memorandum of January 27, 1982.

The state has acquired mineral rights in several ways, and also manages mineral rights for the trust funds and local jurisdictions:

- The state constitution established various trust funds, including a permanent school fund, composed of the proceeds from land which the United States government granted to the state. DNR manages minerals on these lands for the benefit of the trust funds.
- Upon statehood, the state assumed ownership of lands and mineral rights beneath navigable waters.
- On behalf of certain local taxing authorities, DNR manages lands acquired through liens against ditches constructed in the early part of this century. Revenue resulting from mining on these lands accrues to a consolidated conservation area fund and to the counties involved.
- On behalf of local taxing districts, DNR manages mineral rights on private lands which have been forfeited for failure to pay taxes or to properly register mineral rights.
- DNR manages mineral development on lands acquired as gifts or by purchase.

Trust fund lands and tax-forfeited lands each total approximately 5 million acres, or virtually all of the 10 million acres of mineral rights which the state manages. Rent and royalty revenues from mining trust fund land are credited to the respective permanent trust fund. For rents and royalties from tax-forfeited mineral rights, state law provides that 20 percent accrues to the state's general fund and 80 percent to local districts. Of the local share, $\frac{3}{9}$ ¹² goes to the county, $\frac{2}{9}$ to the city, and $\frac{4}{9}$ to the school district.¹³ Minnesota laws reserving for the state the mineral rights on all land subsequently sold by the state were enacted in 1889, 1901, 1935, 1937, and 1939.¹³

B. MINING REVENUES

Mining of state owned minerals requires the payment of rents and royalties. Rents are a flat charge per acre leased.¹⁴ Royalties are a charge per ton of ore mined. Minnesota uses a schedule of minimum royalties and an additional royalty which companies offer in competitive sealed bids. Generally, the company offering the highest bid royalty is awarded a given lease.¹⁵ In addition, taxes are assessed on mineral lands and mineral-related income.

Table 3 summarizes rent and royalty income from state owned mineral rights for recent years. The bulk of revenues shown in Table 3 are from iron ore or taconite mining because there presently is no copper/nickel mining in Minnesota. The figures do include rents paid under the copper/nickel leases still in effect, averaging less than \$100,000 annually. The table shows that the trust funds have received most of the rent and royalty revenues in these years, while the state's general fund has received the smallest share.

Revenues from mining taxes exceed rents and royalties, and these tax revenues accrue to the state general fund and local governments. While taxes are assessed on all private parties engaged in mining, owning mineral rights, or operating taconite railroads, the state receives rents and royalties only from state owned or managed minerals. Trust fund lands and tax-forfeited lands compose nearly all the mineral rights managed by the state. Trust fund lands are managed for the benefit of the trust funds, while the general fund receives 20 percent of the return from tax-forfeited lands.

¹²Minn. Stat., Ch. 93, §335.

¹³DNR, Division of Minerals, memorandum of June 8, 1982.

¹⁴Copper/nickel regulations require higher rental fees in the later years of a lease.

¹⁵Chapter III is a detailed discussion of rent, royalty, and other mineral leasing provisions.

TABLE 3
DISTRIBUTION OF RENT AND ROYALTY INCOME
FROM STATE OWNED MINERAL RIGHTS

	1979	1980	1981 ^a
Trust Funds	\$1,503,454	\$2,880,801	\$2,052,862
Local Taxing Districts	750,799	850,341	420,342
General Revenue	187,700	212,585	105,086
Special Advance Royalty ^b	<u>277,333</u>	<u>277,333</u>	<u>358,932</u>
Total	\$2,719,286	\$4,221,060	\$2,937,222

Source: Detailed Biennial Budget Proposal, 1981-1983, for State Departments, Vol. 2, p. E-5354.

^aEstimated amounts.

^bThese revenues result from agreements by which certain taconite leases were extended, are recoverable against future shipments of ore, and are to be credited to the appropriate funds when those shipments occur.

Table 4 summarizes taxes collected on iron ore, excluding taconite, for recent years.

TABLE 4
MINNESOTA TAXES ON IRON ORE^a

	1977	1978	1979
Ad Valorem ^b	\$4,240,296	\$4,403,875	\$4,350,640
Occupation ^c	2,641,246	3,937,222	2,662,749
Royalty ^d	<u>747,716</u>	<u>893,955</u>	<u>807,314</u>
TOTAL	\$7,629,258	\$9,235,052	\$7,820,703

Source: Trethewey, Minnesota Mining Directory (1981), p. 242.

^aExcluding taconite.

^bBased on estimates of ore remaining to be mined; excludes county and local non-mineral real estate and personal property taxes.

^cSubstitute for the state income tax, assessed at 15.5 percent of the value of ore extracted.

^dTax of 15.5 percent assessed against royalty income.

Table 5 summarizes taxes collected on taconite, for recent years.

TABLE 5
MINNESOTA TAXES ON TACONITE

	<u>1977</u>	<u>1978</u>	<u>1979</u>
Sales and Use	\$ 5,284,151	\$ 8,647,477	\$ 10,902,884
Production ^a	48,757,124	69,221,559	88,483,670
Occupation ^b	3,190,408	19,226,372	23,856,757
Royalty ^c	2,626,141	3,279,861	4,775,352
Excise ^d	182,745	177,165	165,726
Railroad ^e	<u>3,160,898</u>	<u>3,267,247</u>	<u>3,634,407</u>
TOTAL	\$63,201,467	\$103,819,681	\$131,818,796

Source: Trethewey, Minnesota Mining Directory (1981), p. 243.

^aSubstitute for property taxes--for taconite, assessed at \$1.25 per gross ton of merchantable concentrate, plus amounts for higher grades, for tailings not meeting certain requirements, and for low levels of production; comparable provisions apply to semi-taconite.

^bSubstitute for the state income tax, assessed at 15 percent of the value of ore extracted.

^cTax of 15 percent assessed against royalty income.

^dSpecial school and village taxes.

^eTax on taconite railroads, assessed at 5 percent of gross earnings.

Tables 4 and 5 show that Minnesota mining taxes paid in 1979 exceeded \$139 million, greatly exceeding the rent and royalty income shown in Table 3. However, while this comparison reflects current conditions, it understates the future importance of taconite and copper/nickel royalty revenues. It is estimated that if the Amax-Kennecott copper/nickel site is developed, the state will receive approximately \$250 million in royalties. The royalties from this single project would exceed the combined total of all taconite and iron ore royalties received to date by the state. In part this is due to the size of the copper/nickel deposit, and the failure of the original iron ore/taconite royalty systems to keep pace with rising prices over time.¹⁶

Under current law, copper/nickel taxes will include a 1 percent occupation tax, a 1 percent royalty tax, a production tax of 2.5 cents per ton, and state income taxes. Occupation, royalty, income, sales, and taconite railroad taxes accrue to the state general fund; and, excise, ad valorem, and production taxes to local jurisdictions.¹⁷

C. COPPER/NICKEL LEASING IN MINNESOTA

Copper/nickel leasing is a topic of considerable current interest because of:

- the value of this resource;
- interest on the part of mining companies in new leases;
- current efforts of DNR to revise copper/nickel leasing regulations; and
- DNR's plans to resume public sales of copper/nickel leases within the year.

¹⁶ Royalty terms for iron ore and taconite were specified in statute, rather than rule. The 1941 taconite leasing law required a royalty of \$.05 per ton of crude ore, with no indexing. In 1957, the department was authorized to extend these taconite leases, and to negotiate new royalty terms. The department estimates that during the extension period the state will earn royalties exceeding \$500 million. These extensions and new royalty terms start becoming effective in 1991.

¹⁷ The occupation tax is deposited in the state treasury and distributed among elementary and secondary schools, the university, the iron range resources and rehabilitation board, and the state general fund.

For these reasons, the focus of our study is the leasing of state owned copper/nickel, which is one of the many responsibilities of the Division of Minerals. The purpose of the background material in this section is to provide information needed to understand better the remaining chapters of this report.

1. EFFECTS OF UNCERTAINTY ON LEASING AND DEVELOPMENT

The Division of Minerals does not conduct extensive mineral exploration, and copper/nickel tracts are leased before extensive exploration by mining companies.¹⁸ As a result, at the time of leasing:

- Companies bidding on tracts do not know which tracts contain minable ore, and there is great uncertainty regarding eventual mining costs.

It is difficult and expensive to improve the quality of information. Available exploration techniques can establish whether geological conditions are favorable for finding copper/nickel ore, but not whether a minable quantity or grade actually exists on a specific site. Test drillings are necessary to find and map a deposit. A mining company may spend millions of dollars studying the general potential of an area, and locating and developing a specific mine. Even then ore tonnage and ultimate profitability can only be estimated. Any estimate of profitability will depend on estimates of future metal prices and mining costs.

Given the inadequate information available at the time of leasing, companies cannot accurately determine what tracts to bid on and what bids to offer. Also, it is difficult for DNR to determine which areas to offer for lease, when to conduct lease sales, and which bids to accept or reject. The difficulties for both parties in identifying promising units is reflected in the following:

- Only in the December, 1966 sale did a majority of tracts offered receive any bids. In the 1973 sale, 2,164 units were offered, and 135 units (6 percent) received bids.
- On units which are leased, most are later surrendered because further exploration shows little mineral potential, or companies may fail to correctly evaluate a minable ore body.

The state has awarded 1,045 copper/nickel leases covering 425,513 acres. Currently there are 16 copper/nickel leases in effect, covering 4,649 acres.¹⁹ The leases still in effect represent:

¹⁸The federal Department of the Interior leases certain mineral rights only after extensive exploration by mining companies. We discuss this approach in Chapter III.

¹⁹These figures include four copper/nickel leases covering 1,000 acres, which resulted from negotiation. One of these leases, covering 200 acres, remains in effect.

- less than two percent of all copper/nickel leases ever issued;
- barely one percent of the total acreage ever leased; and
- less than one percent of the acreage offered at all sales.

In addition to difficulties identifying productive units, other factors may contribute to the fact that so few acres have been leased, and that so few leases remain in effect:

- To improve chances of winning some leases, companies may bid on more units than they intend to develop. As a result they may later find themselves unable to afford to explore or develop units they have leased.
- Current or projected minerals prices may not be high enough to make it profitable to develop a find.

Finally, uncertainty strongly influences the type of lease payment arrangement which is preferable. We take the position that:

- To reduce the risk to mining companies and to encourage bidding, the state should continue to use some form of leasing system which requires²⁰ payments only if ore is found, and only as ore is mined.

2. COMPETITION IN COPPER/NICKEL LEASE SALES

Strong competition encourages a mining company to offer high bids, to increase its chances of being awarded a given lease. However:

- There has been a low level of direct competition for specific units in most of the six previous sales of copper/nickel leases.

Table 6 summarizes the results of the six previous sales of copper/nickel leases. This table and other available information illustrate several points regarding competition. A comparison of the number of bids submitted with the number of leases awarded shows an average of only 1.5 bids per lease awarded. Additional information shows that there is little direct competition:

- The majority of tracts leased received only one bid.
- Only in the earliest sales did any units receive three or more bids. In the 1973 sale, competition occurred on only eight units; each received two bids.

²⁰We consider different leasing approaches in Chapter II.

TABLE 6
MINNESOTA COPPER/NICKEL LEASE SALES

<u>Date</u>	<u>Acres Offered</u>	<u>Bids Submitted</u>	<u>Leases Awarded</u>	<u>Acres Leased</u>	<u>Companies Bidding</u>
December, 1966	132,550	617	267	87,635	14
August, 1968	424,000	141	130	58,235	3
December, 1968	327,000	329	238	88,082	6
June, 1970	230,916 ^a	301	199	92,510	8
December, 1971	791,399 ^a	86	71	35,647	7
November, 1973	<u>237,258^a</u>	<u>143</u>	<u>136</u>	<u>62,404</u>	<u>5</u>
TOTAL	2,143,123	1,617	1,041 ^b	424,513 ^b	23 ^c

Source: Division of Minerals, memorandums of June 12, 1974 and January 17, 1982.

^aOf the total offered in each sale, represents only acreage newly offered--does not include acreage first offered at previous sales.

^bDoes not include four negotiated leases covering 1,000 acres.

^cTwenty-three different companies have submitted bids in these six lease sales.

- Few companies participated. For example, 14 companies bid at the first sale, 3 at the August 1968 sale, and 5 at the 1973 sale.

Minnesota's experience reflects the uncertainty affecting hardrock mining, and a low level of direct competition. In some ways these two factors are related. Lacking adequate information regarding the precise location of minable ore, a high level of competition is unlikely. The Division of Minerals may try to ensure the eventual identification and development of productive sites by offering a very large number of units at each sale. However, this may spread the bids of a small number of companies over a larger selection of mining units, thereby decreasing the possibility of direct competition for any given unit. In any case, the combination of uncertainty and a low level of direct competition requires leasing procedures which protect the state from underbidding.²¹

3. ECONOMIC RENT AND HIGH GRADING

Different leasing systems vary in their ability to reduce the undesirable effects of uncertainty and inadequate competition, as we discuss in Chapter II. There are two concepts which are important in that discussion. "Economic rent" is the excess of revenues over costs. The ability to capture economic rent is the principal criterion by which we evaluate different leasing systems. "High grading" is the practice of leaving lower grade ores unmined. This practice, which can be encouraged by some leasing policies, may reduce both royalties and mining employment.

a. Economic Rent

The degree to which a leasing policy extracts economic rent is an appropriate criterion for evaluation. It is the only measure by which the state and mining companies can receive appropriate returns, without discouraging mine development and employment. Economic rent is the excess of revenues over the costs of mining and processing, where costs include a profit sufficient to attract capital funds to the project. With adequate competition and precise information regarding ore location, quality, and ultimate production costs, the share represented by economic rent would be offered freely by mining companies for the right to mine a given tract. Economic rent represents the maximum amount any company could pay for the right to mine. Thus, where a leasing policy extracts economic rent, companies will not earn excessive returns on high quality deposits, and will not be discouraged from mining low grade deposits.

The goal of capturing the economic rent is consistent with the objectives of the Division of Minerals, which include:

²¹We discuss the effectiveness of Minnesota's royalty system in Chapter III.

- promoting mining activity to help provide a stable economy for the mining region and the state;
- providing an equitable, if not maximum, financial return to the state, local districts, and appropriate trust funds; and
- ensuring that mining meets environmental standards.

Capturing economic rent would provide the highest revenues for the various funds, while allowing competitive returns for the mining industry. Broadly conceived, the goal of capturing economic rent may encourage mineral development and employment without subsidizing mining or disregarding environmental standards.

b. High Grading

"High grading" means mining only higher grade ores, and choosing not to mine lower grade ores. High grading may occur under several leasing systems, but is most easily illustrated with royalty systems. In this case, the required payments become a cost of producing each ton of ore--a cost which can be avoided only by leaving the ore unmined. It is in the interest of each mining company to establish a minimum grade of ore which is profitable to mine under a given lease, taking royalty or other payments into account as a cost of production. Having established such a cutoff grade, a company will choose not to mine ores which fall below that grade.

One effect of high grading is that companies reduce the scope of their operations, resulting in reduced output, employment, and mining revenue for the state. An important measure of the success of any leasing approach is the extent to which it avoids the adverse effects of high grading.

II. ALTERNATIVE LEASING SYSTEMS

This chapter analyzes four basic leasing systems, noting the advantages and disadvantages of each. Several states, including Minnesota, use royalty systems. The purpose of this chapter is to determine whether royalty systems are the best approach, or whether other systems offer a better balance between maximizing revenues, reducing administrative complexities, and minimizing production disincentives. The four approaches examined are:

- bonus bidding, where the company offering the largest up-front payment receives the lease;
- profit sharing, which requires the operator to pay a portion of mine site profits to the resource owner;
- royalty systems, which require the operator to pay a portion of the value of mined ore to the resource owner; and
- combination approaches, which combine two or more of the previous methods.

We conclude that the royalty approach is the best policy. However, unless a royalty system is carefully designed it can result in a poor share for the state, or it may discourage mining and mining employment. All approaches have problems because there is little direct competition for tracts, and because practical leasing procedures must deal with the uncertainties of mining.

A. BONUS BIDDING

Michigan and Utah combine bonus bidding with royalties in their copper leasing procedures, and the federal government uses this combination to lease offshore oil and gas deposits. This section focuses on bonus bidding, discussing the advantages and disadvantages of the approach. The effects of combining bonus bidding and royalties are discussed in a later section.

Where ore location, quantity, and production costs can be very accurately estimated, bonus bidding may be the best leasing system. However, because these key factors cannot be predicted with sufficient accuracy, bonus bidding is not a satisfactory leasing procedure. We do not recommend bonus bidding for use in Minnesota.

1. DESCRIPTION OF METHOD

Bonus bidding requires companies to estimate the economic rent at a site, and to offer the economic rent to the state through a competitive bidding process. The mining company with the winning

bid makes a single, up-front payment to the state. Each mining company would determine the amount to offer by estimating ore tonnage and quality, production costs, and future mineral prices. Estimated costs would include expected operating costs and a competitive return to capital. The companies would use discount factors to allow proper comparison of expected costs and revenues, which would occur at various times in the near and distant future. In this manner each company would determine the amount which it would be willing to offer in one advance payment, for the right to lease a given mining unit. The maximum amount which any company could pay the state, and still provide a competitive return to the firm's labor and capital, is the full economic rent.

Given highly accurate information and strong competition, the state would obtain the proper share without causing production disincentives. Since the bonus is a non-refundable payment occurring well before mining begins, it should not influence later production decisions. Hopefully, adequate competition for the right to mine the deposit would ensure the state receives its full share, and cause the lease to be awarded to the most efficient operator. The most efficient company can outbid less efficient companies due to its lower production costs.

A bonus bidding system would be relatively easy to administer. In addition to any mineral evaluations it provides, the state simply would offer the land, review the bids, and execute the leases. The state would accept the high bid, relying on competition to ensure that this bid is the state's full share. Furthermore, since the state obtains this share through a single up-front payment, there would be no monitoring activities needed to ensure proper payments, unlike other lease arrangements.

In summary, in situations where bonus bidding is practical, the approach has strong advantages:

- The state would automatically receive its full, proper share of the mineral wealth through the bonus bid.
- The state would receive its share without discouraging mining activity.
- The system is simple to administer.

2. DISADVANTAGES OF BONUS BIDDING

Despite apparent advantages, bonus bidding has not worked well in practice, and is not practical for use in Minnesota. The system is satisfactory only if mineral information and cost estimates are accurate, and if competition is high. However, in Minnesota productive tracts are not known prior to leasing. Given this uncertainty, companies cannot effectively estimate the economic rent, and the non-refundable, up-front payment required by bonus bidding exposes companies to great financial risk. To reduce these risks, companies would greatly reduce offers, bid on fewer tracts, or they

may simply decline to bid on Minnesota sites. Also, even if the exact location and value of ore were known, competition is not adequate for bonus bidding. The state would not receive its proper share unless there was enough competition for tracts to ensure the state was offered the full economic rent. With inadequate competition, some of the state's share would be retained by the companies as excess profits.

- For Minnesota's hardrock minerals other than taconite, there is great uncertainty regarding ore quality, location, and production costs. These factors, combined with the long time horizons necessary for ore production, make accurate estimates of revenues and costs nearly impossible to make early in a project.

Under these circumstances companies could not calculate economic rent, but could only make a gross estimate. In practice bonus bidding would resemble a lottery in which companies offer something, although much less than the economic rent, for the chance to lease a given unit.

- Bonus bidding exposes mining companies to great risk, which companies would try to minimize by reducing their offers to the state. As a result, payments to the state would fall well below the owner's full share.

Over 1,000 copper/nickel leases have been issued in Minnesota, but only 16 are now in effect. The rest were surrendered to the state. This suggests that the chance of actually finding a minable deposit after leasing a site is less than 2 percent.¹ Given the obvious risk, companies might calculate their bonus bid by using an "average" producing site as the standard, and offering 2 percent of that site's economic rent as the bid on all comparable units. In this manner, the company allows for the likelihood of not finding minable deposits on a given site, and reduces bids on all units accordingly. If this was the only effect the state would still earn an adequate return. While the state would earn far less than the full share on deposits ultimately mined, the bonus payments on unproductive sites would compensate. However, knowledgeable observers believe that companies would further reduce the amount of their bids, to minimize their financial risk. As a result, the return to the state would fall far short of the equivalent of economic rent.

- Competition is not adequate for bonus bidding, and use of bonus bidding may further discourage competition.

Low levels of competition might also encourage companies to offer lower bonus bids. In general, mining production is dominated by a few, very large firms. Competition for mine tracts does not

¹According to the Division of Minerals, the chances of finding a minable deposit are even less. They suggest (memorandum, June 8, 1982) that 5,000 to 10,000 "targets" must be evaluated to find one commercial deposit.

appear to be strong. Although Minnesota does not use a bonus bid system, Minnesota's experience in previous copper/nickel lease sales is representative--on most units there was only one bid and only a handful of companies participated. This is not a level of competition sufficient to make bonus bidding a workable alternative.

Bonus bidding may have the effect of further decreasing competition. Bonus bidding requires large up-front funds because the payment to the resource owner occurs before mining begins. Smaller companies may be unable to participate in bonus bidding, limiting competition to larger companies with sufficient up-front funding.

- Bonus bidding may both delay employment, and reduce the eventual level of output and employment.

Paying the bonus bid would reduce the funds available for early mine development, which may delay production and thereby delay mining employment. Also, because no company can afford the risk of making bid payments on too many tracts which later prove unproductive, they will bid on fewer units, or may decline to bid for Minnesota tracts. The likely short run effect would be fewer leases and reduced exploration. In the long run there would be fewer operating mines, less output, and less mine employment.

Bonus bidding is not a workable option for Minnesota. The fact that companies have surrendered more than 1,000 copper/nickel leases suggests the difficulty of finding minable sites, with available information. Given this uncertainty companies are likely to bid on fewer units, offer smaller bonuses, or decline to bid. A better leasing approach would share some risks between companies and mineral owners. We discuss examples below.

B. PROFIT SHARING

The City of Long Beach, California has used a profit sharing approach to lease oil rights. In addition, a recent General Accounting Office report has urged the federal government to adopt a profit sharing approach for leasing minerals on federal lands.² This approach offers the advantage of sharing risks between mineral owner and mine operator, but also causes production disincentives and has serious administrative problems. We do not recommend profit sharing for use in Minnesota.

²U. S., Comptroller General, Mining Law Reform and Balanced Resource Management, U. S. General Accounting Office (February 27, 1979), p. 39.

1. DESCRIPTION OF METHOD

There are two basic profit sharing approaches:

- The mineral owner may own some part of the mining company. In the case of Minnesota this would mean that the state, through purchase or expropriation, would share ownership of private mining companies.

We dismiss this version from further consideration because public ownership of any portion of a private company raises a host of economic, social, and political questions. The second alternative is:

- The mineral lease may require payment to the state of a specified portion of profits generated at the site.

In either case the company would share not only profits, but also the risks of hardrock mining. The company still could not be certain that ore quantity and quality, plus production costs and mineral prices, would enable an adequate profit. However, under profit sharing the company would not have to pay a fixed or up-front amount to the state, as bonus bidding requires. Payments would occur only if ore is found and some profit is earned by mining it. To this extent profit sharing may increase competition, encourage earlier development of a mine, and reduce some of the adverse effects of uncertainty for mining companies and the state.

2. DISADVANTAGES OF PROFIT SHARING

The disadvantages of profit sharing include:

- Most profit sharing systems fail to effectively capture economic rent, and discourage mining and employment by taking part of the profits necessary to attract adequate funding to a project.
- Profit sharing systems are very difficult to administer.

a. Simple Profit Sharing Systems

Simple profit sharing approaches fail to distinguish between profits necessary to provide a competitive return to capital, and "excess profits" or economic rent. The state owns the minerals and is entitled to be compensated for the value of that resource. However, the state does not own the mining company and is not entitled to a share of normal company profits. By requiring a share of profits, the state would be taking a part of the return which is needed to ensure adequate funding for the mining project. Reacting to these incentives, the company may reduce the scope of the project or resort to high grading, both of which would reduce output and employment.

Second, profit sharing would be difficult to administer. Obtaining and interpreting data would be a demanding task. As a resource owner the state would be concerned with sharing the profit only from those sites where the state owns the mineral rights. A given company may have mining operations at many sites, involving different mineral owners--private owners, the state, and the federal government. In this case, examination of company-wide records would be of little value, since they combine information from all operations. Instead, the state would need information only about operations using state owned resources; information which could prove very difficult to isolate.

Furthermore, administrators must deal with the incentives produced by the profit sharing approach. Since lease payments would be based on the apparent profitability of the site, companies would have an incentive to shift revenue producing entries to other sites or company affiliates, while assigning a disproportionate amount of company-wide overhead expenses to the site with state owned minerals.

b. "Excess Profit" Sharing Systems

The production disincentives of profit sharing systems can be reduced or eliminated by not requiring payments until the company has achieved a competitive return to capital at the given site. In this manner only "excess" profits (economic rent) would be shared. The state could require payment of a large portion of this excess profit, as much as 100 percent. This approach is similar to bonus bidding, except that with an excess profit system the economic rent is calculated using actual production data, and is paid as mining occurs. Excess profit systems should have little impact on production decisions because the state would not take profits necessary to ensure adequate funding for the project.

However, no one has developed workable procedures for identifying and sharing excess profits. It would be difficult to determine what constitutes a competitive return to capital and what profits really would be "excess." Second, this approach would have the same administrative and data problems which face simple profit sharing systems. In addition, interpreting operations data to calculate "excess" profits would be even more complex.

To elaborate, to determine when excess profits are being earned, it is necessary to first define competitive profits in order to determine when profits exceed this level. The appropriate measure of profit at the site would not be an excess of revenues over costs in any given year, but rather the return over the life of the mining project. Start-up expenditures would exceed revenues for many years, meaning that an adequate return to initial capital must come from revenues generated in later years. Thus, it would not be appropriate to review a single year's data and require payments whenever annual revenues significantly exceeded costs. Instead, detailed data covering many years must be gathered and carefully analyzed.

A final point regarding "excess" profits is that there must be some provision for the inevitable, unproductive ventures which occur. That is, there must be the allowance of some excess return on profitable ventures to enable companies to cover losses on unproductive exploration activities. Without this cushion, sometimes called a "dry hole fund," it is possible that companies could earn an adequate profit on existing mines, but could not afford the risk and expense of additional exploration. If this occurred industry production would decline as existing sites were exhausted. However, it would be difficult to determine the point at which a cushion for prudent exploration becomes too large, merely providing an excessively large profit or encouraging wasteful exploration activities.

3. EXAMPLES OF PROFIT SHARING

Attempts to implement profit sharing systems have not been satisfactory, regardless of how well the system was designed. The City of Long Beach, California used profit sharing in its 1965 lease of oil rights.³ The lessee established a subsidiary company to operate the site, which simplified the city's monitoring problems because site-specific operating data were more easily obtained. However, since payments to the city were based on profits, the parent company had every incentive to reduce the apparent profit of the subsidiary by shifting cost items from the parent company to the subsidiary, and shifting income from the subsidiary to the parent company.

Under these arrangements the resource owner should carefully monitor operations. Also, the original contract should specify in great detail how overhead and other company-wide costs are to be allocated to the subsidiary, how output is to be valued, what items are to be considered expenses, and other factors. Still, it is impossible to foresee all future developments. In the Long Beach case there were continual disagreements regarding these questions.

Minnesota had a brief experience with profit sharing. In a lease executed many years ago between a taconite company and private mineral owners, payments were to be based on profits of the operation. Disagreements quickly arose concerning expense items assigned to the site. Through court action, these disagreements were settled by replacing the profit sharing arrangement with a royalty system.

We conclude that profit sharing systems are not a good option for Minnesota. The advantages of sharing risks do not outweigh the design and administrative problems of these approaches.

³Walter Mead, "Pricing and Buyer Selection Alternatives," Economics of the Mineral Industry, ed. William A. Vogely and Hubert E. Risser (New York: American Institute of Mining, Metallurgical, and Petroleum Engineering, Inc., 1976), pp. 668-71.

C. ROYALTY SYSTEMS

Minnesota and many other states use royalty systems to lease state owned minerals. Although royalty systems have disadvantages, they generally offer advantages over bonus bidding, profit sharing, or other payment approaches. Continued use of a royalty system is the best approach for leasing Minnesota's state owned minerals.

1. DESCRIPTION OF METHOD

Under royalty systems, the lessor receives a payment on every ton of mined ore. There are three basic types of royalty systems:

- a flat charge per ton of ore regardless of grade;
- a fixed percentage of ore value, in which higher grade ore results in higher royalties per ton; or
- payments made more progressive, by charging a higher percentage royalty for high value ores.

The two main advantages of royalty systems are:

- administrative ease; and
- sharing risk between the state and mining companies.

Compared to profit sharing systems, royalty systems are easy to administer. The main tasks include identifying mining units, executing leases, and monitoring ore removed from the site and compliance with payment and environmental requirements. While these activities require staff and related expenses, the procedures are not complex and do not represent a great administrative burden.

Unlike bonus bidding, royalty systems share risk between the company and the state. No royalty payments are made if no minable ore is found. By sharing risk, royalty systems should not discourage bidding, thereby helping to encourage competition. Furthermore, because payments are due only when mining occurs, the mine operation is able to generate the funds necessary to make the payments. Thus, obtaining funds for royalty payments should not delay development, which may occur with bonus bidding.

2. DISADVANTAGES OF ROYALTY SYSTEMS

Bonus bidding and excess profit systems discussed earlier are clear attempts to calculate and obtain the economic rent for the resource owner. However, both approaches are impractical for use in Minnesota. The best approach which can be implemented is a royalty

system, but this is an indirect, rather blunt tool, which does not directly tap economic rent. Royalty systems take a share of total revenues generated by mining the site, rather than a direct share of profits or excess profits. Any time ore is mined, royalty payments will flow to the state whether or not there is any excess profit. As a result, the state may receive payments when these funds are needed to provide an acceptable profit, and cover payments to labor. This would cause a company to decrease production. In other cases, the royalties might be too low, permitting excessive returns to the mining company.

Thus, royalty systems have two disadvantages:

- Royalty systems may fail to collect the state's full share, or they may take part of the revenues needed to cover production costs.
- Royalty systems may cause high grading.

Royalties increase the cost of mining the ore. Since a royalty must be paid on each ton of mined ore, it becomes part of the cost of mining each ton. This added cost may influence the willingness of the company to mine low grade ore. Therefore, the goal in designing a successful royalty system is to capture an adequate share for the state, while minimizing the disincentives to mine low grade ores.

Actually, with simple systems it is possible to have excess returns to the mining company and to have high grading at the same site. This is most likely with royalty systems which require a flat charge per ton of ore extracted. If a lease required a payment of \$1 per ton of ore extracted, this may represent a low percentage of the value of high grade ore. If an excessive return could be earned on this ore, a higher royalty on high grade ore may be appropriate. However, the flat charge may represent a high percentage of the value of low grade ore. Since the charge must be paid if the low grade ore is mined, the charge may cause the lower grade ore to be left in the ground. The overall result is that the company may reduce the scale of the project, but still earn an excessive return on the ores mined.

A percentage royalty is an improvement over flat rate systems, although problems may still occur. A percentage royalty will automatically result in a lower charge on low grade ore, easing the high grading risk, and a higher charge on high grade ore. For example, Arizona requires a royalty of 5 percent of mineral value, with the lease awarded to the first company willing to meet this royalty requirement. With a 5 percent royalty, a company may estimate that a given mining unit offers a good likelihood of earning an exceptional profit. However, under this leasing arrangement the company would keep all of the "excess" profit. While the risk of high grading is reduced, the state would fail to capture its share of the mineral value.

Minnesota has taken steps to avoid the problem of Arizona's system. DNR's administrative rules establish a minimum royalty schedule which applies to all copper/nickel leases. In addition, by a competitive bidding process companies offer an additional "bid royalty," a royalty above the minimum which they are willing to pay for the right to mine a given tract. With some exceptions the Executive Council awards the lease to the company with the highest bid royalty on each given tract. In this manner Minnesota uses a royalty schedule, combined with competition, to try to extract the full economic rent. While in the next chapter we note some problems with the bid royalty, this is clearly a beneficial feature. This process should not discourage competition, or place an excessive burden on companies, because they are bidding on royalty rates to be paid as ore is produced, not on an up-front bonus payment due whether or not minable ore is found.

D. COMBINATION APPROACHES

Another approach, becoming more common, is the use of a combination of systems. By combining bonus bidding with royalty payments, or profit sharing with royalties, the resulting system has a combination of the advantages and disadvantages of each system considered separately. We conclude that none of these combinations has a clear advantage over a well-designed royalty system.

1. EFFECTS OF COMBINING SYSTEMS

We are unaware of any attempts to combine profit sharing with royalties. Combining profit sharing with lower minimum royalties would not effectively reduce the risk of high grading, since profit sharing tends to discourage development. A royalty system with low rates on low grade ore would better achieve this objective, without the distortions and administrative problems which profit sharing would entail.

There have been several attempts to combine bonus bidding with royalties. For example, Michigan and Utah combine royalties with a required, up-front payment. It is our understanding that this procedure is relatively new, and most existing mining in these states is subject to earlier royalty procedures. One objective may be to reduce the risk of high grading. However, we believe this new approach offers no clear advantage over a well-designed royalty system. If the up-front payment is very small, the procedure is primarily a royalty system with increased administrative complexity. Alternatively, the bonus may be significant, with comparably lower royalty payments. Placing greater reliance on the up-front payment would increase the risk to the company and may discourage companies from mining in that state, causing a greater loss of future employment than high grading alone could cause.

A second possible reason for combining bonus payments with royalties is to capture more of the economic rent. However, this may be better accomplished by a procedure such as Minnesota's, which combines a royalty schedule with a process encouraging companies to bid additional royalties in a competitive, sealed bid sale. Minnesota's approach may capture more of the economic rent for the state, while sharing more of the risk between the state and mining companies.

2. EXAMPLE OF COMBINED BONUS BIDDING, ROYALTY SYSTEM

The federal government has had some success combining bonus bidding with modest royalties to lease offshore oil and gas rights. However, conditions are more favorable in this type of operation than for mining hardrock minerals in Minnesota--the deposits have been studied extensively, less capital is required, production can start sooner, and the production period is shorter in length. These factors make it much easier for companies to estimate their own profits, because there is much greater assurance of a minable deposit, and costs and revenues must be predicted fewer years into the future.

Still there have been problems, apparently caused by the bonus bidding component. A recent report noted information problems affecting the federal offshore leasing program.⁴ We suspect some finds have been below expectations, and companies are either reducing their bonus bids on other sites, or are becoming reluctant to bid.

E. SUMMARY AND CONCLUSIONS

Bonus bidding would be a good system if competition and information on ores, prices, and costs were adequate. Through competition for the tract, companies would freely offer the owner's full share. However, weak competition and inadequate information make bonus bidding impractical for use in Minnesota. There is only a small chance of finding a minable deposit, and the state's proper share cannot be determined at the time leases are offered. Under these circumstances, companies might be reluctant to bid, and would greatly reduce their offers. This would cause a poor share for the state, and would discourage bidding, leading to fewer leases, and eventually less mining and employment.

Profit sharing systems are far from ideal. This approach is very difficult to administer. If it could be successfully implemented, it might adversely affect mining and employment by taking part of the profits necessary to attract funds to mining projects.

⁴U. S., Comptroller General, Mining Law Reform, p. 31.

A royalty system is the best approach for Minnesota to lease copper/nickel ore. However, it must be stressed that a royalty system is an indirect and imperfect way to obtain a share for the state. Royalties on each ton of ore capture part of the total revenue earned by mining, rather than any excess profits, and royalties increase the cost of mining the ore. This can cause two problems. The share received by the state may not approximate the economic rent, and royalties can cause high grading, decreasing output and employment. Therefore it is important to carefully design a royalty system to better capture a proper share for the mineral owner, while minimizing high grading risk. This risk can be reduced by use of a percentage royalty, or a set of percentage royalties which escalate with ore value, rather than a flat charge per ton. Minnesota uses a percentage royalty, combined with an additional bid royalty to better capture the state's share.

Royalty systems have been criticized for the possible effect of royalty payments on mine employment. However, this risk can be reduced by the design of the system. Also, most criticism of royalties fails to consider the effect of alternative policies--bonus bidding and profit sharing--on potential employment. These alternatives are either impractical to implement, or have a more severe effect on employment than royalty systems.

III. MINNESOTA COPPER/NICKEL LEASING PROCEDURES

This chapter discusses Minnesota's copper/nickel leasing procedures, concentrating on aspects which affect the state's share. The first section describes the public lease sale process, the second discusses rents, which are a flat charge per acre leased, and the third analyzes Minnesota's production royalties, which are based on the value of ore mined.

A. THE PUBLIC LEASE SALE PROCESS

In the process of leasing public lands in Minnesota, the Division of Minerals must first identify lands to offer. This requires identifying areas with mineral potential, clarifying ownership of the mineral rights, and determining which areas to exclude from the offering due to environmental hazards or other preferred uses of the land. Second, the division must publicize the sale and specify the lands available. Third, the division and the Executive Council review bids and award leases.

The first phase of the process, selecting mining units to be offered, includes the following steps:

- Mining companies identify general areas in which they have most interest.
- The Division of Minerals performs a preliminary analysis of mineral potential on areas of interest to mining companies, and other areas of interest to the division.
- The division determines whether the interest expressed by mining companies is sufficient to justify holding a public lease sale.

Given adequate interest by mining companies and favorable preliminary indications of mineral potential, the division:

- submits a list of potential areas to the Executive Council for review;
- sets tentative sale area boundaries; and
- submits maps of potential mining areas for review and comment to other DNR divisions; the Department of Energy, Planning, and Development; the Pollution Control Agency; the Historical Society; various counties; and other interested groups.

The division reviews the comments from these sources to determine conflicts, and may eliminate some areas from consideration. For remaining areas, the division establishes detailed ownership data, and produces mining unit books and maps describing these areas and specifying any special lease stipulations. Copper/nickel units contain 40 to 640 acres and can include areas from several trust funds.

Having established the units to be offered, the division provides public notice of the sale:

- The division publishes legal notice of intent to lease in mining region newspapers, Twin Cities newspapers, the DNR newsletter, Northern Miner, Skillings Mining Review, and the State Register.
- The division provides bidding materials to companies requesting information or otherwise known to be interested.

The final stage is the receiving and reviewing of bids, and the awarding of leases. Minnesota uses a sealed bid system, rather than oral bidding. Companies bid an additional royalty, above the minimum royalties required in rule. The process of receiving and considering bids, and awarding leases includes these steps:

- Bidders submit sealed bids, applications, and a \$50 certified check for each mining unit of interest. Bids must equal or exceed minimums established in statute or administrative rule, as we discuss below. The division returns checks to unsuccessful bidders.
- The division opens, announces, and records bids at a meeting of the Executive Council.
- Following the recording of bids, the Executive Council adjourns for at least 15 days before awarding permits or leases.

In the interim, the Division of Minerals evaluates bids with regard to the bidder's ability to comply with a lease, the bidder's prior experience in Minnesota, and other matters. The division also considers the concerns of various interests, including environmental groups.

- The division submits a written report and recommends action on lease awards to the Executive Council.
- The Executive Council awards or denies leases, or tables bids if more information is sought. It may reject any and all bids.

The successful copper/nickel bidders receive leases authorizing both exploration and mining. Leases are issued for a maximum of 50 years. The lease authorizes the mining and removal of the ore, and the construction of various structures required for mining. The

lease holder agrees to pay rents and royalties specified in rules, to provide monthly and annual reports, samples, and mining data, and to remove all equipment and structures within 180 days of the termination of the lease.

Since one goal of the Division of Minerals is to earn high returns for the treasury and trust funds, it is generally best to accept the highest bid on a tract. However, there are exceptions, and one purpose of the bid review process is to identify cases where bids, including high bids, should be rejected. It is appropriate to screen out bids whenever there is sufficient reason to question the willingness or the ability of a company to meet the requirements of the lease. A company with a poor record of complying with payment requirements or environmental standards may cause excessive monitoring costs, justifying rejection of its bid. A company submitting a high bid may be known to have difficulty funding or managing the development of a mine, also justifying rejection of the bid.

Finally, there is a role for bid review created by uncertainty regarding ore location, production costs, and future mineral prices. Companies must offer an additional royalty bid based on crude estimates of ore value and production costs. Under these circumstances, some bids may be overestimates.

Obviously, royalty bids were too high on the Minnesota copper/nickel tracts which later proved to have no minable ore. Overbidding is also possible on minable tracts. If the quality of the ore is overestimated, the royalty may be a burden for the company, leading to high grading or abandonment of the site. While overbidding may occur, this is very difficult to determine at the time of leasing because both the mining company and the Division of Minerals must base their estimates of proper royalties on highly uncertain data. Under these circumstances, we believe that rejecting a bid as an overestimate can be an appropriate action, but it should be a rare occurrence.

B. COPPER/NICKEL RENTAL REQUIREMENTS

DNR's administrative rules require rental payments throughout the lease period, even when no ore is being mined. These payments, approximately \$100,000 annually in recent years, are flat charges per acre which increase over time. The rent schedule is:

- for years 1 through 5, \$1 per acre per year;
- for years 6 through 10, \$5 per acre per year; and
- for years 11 through 50, \$25 per acre per year.

However, mining companies can avoid these rental charges. When a certain level of production occurs, the rule fixes the maximum rent at \$5 per acre per year. In all cases a company may credit the rent it pays in a given calendar year against royalties due in the same calendar year. Thus at a certain level of production the company can completely avoid payment of rent.

The Division of Minerals has cited several reasons for this rental procedure:

- to provide some minimal income from mineral leases for the various funds;
- to encourage mining companies to conduct prompt but thorough studies of the mineral potential of leased tracts; and
- to encourage prompt development of minable tracts.

The intended incentives of these rental requirements are clear. The escalation in the schedule of rental payments over time and crediting rents against royalties are intended to increase incentives for prompt mine development. If detailed exploration shows that tracts have insufficient minable ore, companies can surrender leases to the state, thereby relieving any further obligation to make rental payments. For sites which prove to have minable ore, rental costs can be reduced or eliminated by prompt development.

There is some indication that companies are sensitive to these incentives. The fact that only 16 copper/nickel leases are in effect, although the division executed more than 1,000 of these leases, is consistent with companies promptly evaluating tracts and surrendering leases where there is inadequate mineralization.

On the other hand, it is difficult to determine if these rental requirements can influence the timing of mining. No lease sites are in production because of mineral price levels and the quality of ores found to date in Minnesota. Thus, there is no experience to suggest the effects of this rental provision. However, it is unlikely that rental payments can affect production because of their low level relative to other costs. While a limited DNR survey suggests that Minnesota's rental rates are high compared to most copper producing states, they are low in absolute terms. More important factors influencing development of mines are the level of technology, which determines the feasibility and cost of mining a tract, and ore grades and mineral prices, which determine revenues.

We believe that the appropriate level and role of rental payments should be examined further, after careful clarification of the goals of the mineral lease program. This need is discussed further in the following sections of this chapter.

C. ROYALTY RATES

Minnesota uses royalty systems for leasing iron ore, taconite, and copper/nickel. Since there presently is interest in renewed copper/nickel leasing, and more flexibility to formulate policies, this section deals only with copper/nickel royalty rates.

1. DESCRIPTION OF RATES

The Minnesota royalty system is complex. Royalties on copper/nickel increase over time, increase with ore value, and vary with the method of mining used. The royalty payments are the sum of four components:

- a base rate;
- an extra royalty on ore value exceeding \$17 per ton;
- a bonanza royalty paid on very high grade ore; and
- an additional bid rate.

a. Base Rate Royalty

The base rate schedule specified in administrative rule establishes the minimum royalty rates permissible on state leases. For underground mining, the following rates apply for ore values less than \$17:

- years 1-10, 2 percent of gross value of ore
- years 11-20, 2 1/4 percent of gross value of ore
- years 21-30, 2 1/2 percent of gross value of ore
- years 31-40, 2 3/4 percent of gross value of ore
- years 41-50, 3 percent of gross value of ore.

After the tenth year, for open pit mining the base rate is 33 1/3 percent higher than the above rates.

b. Extra Royalty

For ore value exceeding \$17, an extra royalty is calculated by doubling the above minimum royalty rates. For example, \$20 ore mined in the first ten years of a lease would require a royalty of 2 percent on the first \$17 of value, and a royalty of 4 percent on the remaining \$3 of value. The total basic and extra royalty on this ore would be 46 cents per ton. At the present time, ore worth \$17 has a mineral content which is average for Minnesota.

c. Bonanza Royalty

DNR is amending its administrative rules on copper/nickel mining to include a "bonanza clause," increasing royalties due on rich deposits. The bonanza royalty will be paid on ore value exceeding a base of \$50 per ton. This \$50 base will be indexed to metal price increases. The purpose of the bonanza clause is to capture a portion of the large profits that would be earned on exceptional ores.

The bonanza royalty¹ is equal to the square of all value above the base (currently \$50), times .0004. For example, on ore worth \$55 the bonanza would be applied against the \$5 value exceeding \$50. The bonanza royalty would be calculated by first multiplying \$5 times \$5, yielding \$25. Then \$25 would be multiplied by .0004 to find the amount payable, which in this case is one cent. On ore worth \$100, \$50 of value would exceed the base. The calculation of the bonanza royalty would be \$50 times \$50 times .0004, yielding \$1 as the bonanza royalty.

While the bonanza clause is very modest for the lower ore values covered by this provision, the calculation causes a progressively higher percentage of the ore value to flow to the state. At extremely high ore values, this effect can be prohibitive. For example, on ore valued at about \$2,600 per ton (at today's prices) the special royalty would equal the value of the ore. In other words, all the revenues earned by mining the ore would be required to pay the special royalty, leaving no revenues to cover taxes, labor and capital costs, or pay the basic royalty. In response to this potential problem, however remote, the division changed the proposed bonanza to require a review of any specific case where the bonanza royalty equals or exceeds 20 percent of the ore value. At current prices, this first occurs for ore valued at about \$600, generating a bonanza royalty of \$120. Under these circumstances, the company can seek a lid on the bonanza royalty. However, the division is not bound to agree to any proposed ceiling on the bonanza royalty.

¹The simplified presentation in the text ignores indexing terms. The actual formula is:

$$\text{Bonanza Royalty} = .0004 \left(\frac{VB}{VC} \right) \left[VC - 50 \left(\frac{VC}{VB} \right) \right] \times \left[VC - 50 \left(\frac{VC}{VB} \right) \right]$$

VB = base value of the metals and mineral products recovered in the mill concentrate; and

VC = current value of the metals and mineral products recovered in the mill concentrate.

The general conclusions stated later regarding the bonanza clause apply to the actual formula.

d. Bid Royalty

In addition to the basic royalty rates, the extra royalty, and bonanza royalties specified in rule, companies must offer a bid royalty. Generally, the company offering the highest bid rate on a tract is awarded the lease. The bid rate is a percentage of the value of minerals contained in the ore, after milling. This rate remains unchanged over the life of the lease--it does not change over time, or with ore grades mined. On Minnesota copper/nickel leases, winning bid rates have ranged from 0.07 percent to 7.17 percent of ore value.

2. DISCUSSION OF MINNESOTA COPPER/NICKEL ROYALTY RATES

Minnesota's copper/nickel leasing system is clearly superior to most. However, we do have some reservations concerning the design of the Minnesota system, and we wish to focus critical thinking on these areas to encourage further improvement. Given the enormous potential value of the copper/nickel resource in this state, any improvement in procedures should yield a substantial dollar return.

a. Overview

We have two key concerns relating to the combined effects of the four royalty components:

- Under the present system, the state may not receive an adequate share from ores of above average grade.
- Provisions to encourage prompt development may not be successful, and may lead to high grading when mining does occur.

Minnesota does not have an effective system of escalating rates by ore value to automatically provide the state with royalty payments reflecting the profitability of mining various ore grades. While the extra royalty on ore value exceeding \$17 and the new bonanza royalty appear to escalate percentage royalty rates by ore value, for reasons discussed below this escalation will be ineffective. Rather than relying on escalating rates to better capture economic rent, the Minnesota system places heavy reliance on the bid rate, which may not be an adequate tool.

- The extra royalty on ore value exceeding \$17 has not been indexed, causing a doubling over time of the basic rates rather than maintenance of a special royalty payable on high grade ore.

When this provision was adopted in 1966, it was viewed as an additional royalty assessed against high grade ores. Currently, an average ore grade would be subject to this provision. Given further inflation, when copper/ nickel mining does occur in the future, any mined ore will be subject to this provision. The result is a loss of

effective escalation by ore value. The provision causes a gradual increase in effective royalty rates over time, leading to a near doubling of the basic rates.

The new bonanza clause is designed to protect the state's interest if exceptional grade ore is found. The new bonanza does not require payments on ore values less than \$50, and in contrast to the \$17 provision, this new clause is indexed. It is expected that few deposits warranting bonanza payments will be found in Minnesota, and bonanza payments are modest for the lower value ores covered by the provision. This leaves a wide gap in ore values for which there is little effective escalation in royalty rates. Therefore:

- The \$17 provision and the new bonanza do not combine to provide effective escalation by ore value on the range of ore grades most likely to be found in Minnesota.

Given this fact, the bid rate is the primary tool to supplement the basic rates in capturing economic rent on ore of above average grade. However, we argue later that bidding will be conservative, and the quality of information available at the time of leasing is not adequate to permit accurate bidding.

- This will probably result in bid rates which are too low when it is later discovered that a tract contains high quality ore. Thus, the bid rate may not be adequate to ensure a sufficient return to the state.

Also, the bid rate is added to the other royalty components, increasing the total royalty rate payable on all ore grades. Even if the bid rate were adequate to reflect the general profitability of the operation, it adds to the royalty burden on the lower grade ores at the site, increasing high grading risk.

An unusual feature of the Minnesota royalty system is that royalty rates increase over time. This increase, required in DNR rules, is in addition to the effect of the \$17 provision mentioned earlier. To fully evaluate the benefit of this feature, it is first necessary to more precisely define program goals, and to then determine whether this provision is consistent with program objectives, and whether these objectives can be achieved. The present goal statement of the division--earning a high return for the state and trust funds while encouraging mining and a strong regional economy--is not specific. A wide range of policies is consistent with this general goal. The division could withhold some promising sites from current lease offerings in an attempt to prolong the total period of mine activity. Alternatively, the division could simply offer promising sites, allowing mining company production decisions to determine the timing and duration of employment. Finally, the division can try to encourage early development and employment.

Encouraging early development and employment is the apparent intent of this provision. Since the state charges lower royalty rates in the early years of a lease, this implies a willingness to trade royalty income for earlier development. Assuming this procedure

reflects intended goals, the crucial question is whether the state can influence the timing of mining through this royalty design. It may be the case that metal prices and technology would not permit companies to profitably mine many Minnesota sites during the early years of leases. This is suggested by Minnesota's copper/nickel leasing to date. Under this circumstance, the state's royalty design cannot cause earlier mining, and there is the risk that the higher base rates in later years, combined with the gradual effect of the \$17 provision, may further delay development or lead to high grading.

The sections which follow further develop these arguments and note specific advantages and disadvantages of each of the four royalty components--the base rate, the extra royalty, the bid rate, and the bonanza.

b. Base Rate Schedule

Given a goal of capturing economic rent, technically the state should not require royalty payments on ore deposits or ore grades which are marginally profitable. Charging royalties in these cases could discourage development of some tracts, and cause high grading on others. Although this suggests that Minnesota's base rate schedule should be modified to eliminate royalties on the marginal grade of ore, we do not recommend this change. It is impossible at the time of leasing to know what ore will be the marginal or "cutoff" grade. The cutoff grade will be determined by future metal prices and cost conditions at the site, and by the technological improvements in mining which may occur after leasing. Under these circumstances the state is best served by maintaining modest royalties on all lower ore grades.

The base royalty rates for open pit mining are 33 1/3 percent higher than rates for underground mining after the first ten years of a lease. Underground mining is more costly, but once mined the ore has the same value as a comparable grade mined by open pit methods. Thus, profits on comparable ore may be higher if mined by open pit methods, and higher royalty rates are reasonable.

Escalation of the rate structure over time is the controversial aspect of the base rate schedule. This procedure, combined with the escalating rental structure discussed earlier, may encourage early development, employment, and output, and may avoid placing a burden on the company before higher output levels and greater efficiencies can be achieved. On the other hand, the system may be unable to hasten development, while higher royalties in later years may lead to high grading.

We recommend:

- The division should work with the Legislature to clarify goals relating to employment and development.
- Based on these goals, the division should decide whether to continue encouraging early development, or whether it should adopt neutral policies regarding the timing of employment.

- If escalation of rates over time is retained, the division should carefully justify the procedure. If necessary, the degree of escalation should be modified.

The division should begin by precisely stating the goals of the program and then analyzing this policy for consistency with those goals. If escalation over time is to be retained, the justification for the procedure should be carefully developed, including study of possible disadvantages. An effort should be made to determine the degree of appropriate escalation, and the likely effect of these procedures on production decisions.

It may be argued that lower royalty rates earlier in the lease are justified because the revenue is received sooner. This assumes, however, that this system is capable of causing earlier production. If not, the escalation has little effect, and a structure which holds rates constant over time may be more appropriate.

Another argument for escalating rates over time is to counteract the effect of technological change on profits. Technological improvements lower production costs, and it is sometimes argued that this leads to steadily increasing profitability over time. Under certain circumstances, it may be in the interest of mining companies to delay production, because while current development of a given site may be profitable, the return might be greater if development is delayed. If part of the intent of the Minnesota rate structure is to counteract this effect, the division should justify this policy. First, the division should demonstrate why it believes this situation is relevant for Minnesota copper/nickel. Second, the division should state why it is appropriate to counteract this effect. It may be better to simply develop royalty rates which more closely reflect the profitability of the ore when eventually mined, rather than trying to hasten production.

c. Extra Royalty on Above Average Ore

When Minnesota's copper/nickel rules were adopted in 1966, the \$17 provision was viewed as an extra royalty on high grade ore, since only high grade ore would exceed the \$17 value. Because this provision was not indexed, and because inflation has greatly exceeded expectations held in 1966, this provision no longer provides effective escalation reflecting the profitability of mining higher grade ores. At the present time, average grade ore would be subject to the higher royalty. Given inflation, when copper mining occurs at some future time, even the lowest grades of mined ore will be subject to the \$17 provision. Thus, this provision will not provide effective, consistent escalation by ore value. Instead:

- Eventually, when these lower grade ores greatly exceed \$17 in price, the effect of not indexing this provision will be an approximate doubling of basic rates required on all mined ores.

- In the short run, the \$17 provision will add to the escalation of rates over time. Because of inflation, a higher percentage of the value of any ore will be subject to this royalty the longer mining is delayed. Therefore, the escalation over time implied by the base rate schedule understates the true escalation.

The impact of this provision on the state and the mining companies is fairly clear. Since basic royalty rates and receipts will increase, companies may try to reduce bid rate offers in future sales by an offsetting amount. This should be possible on many tracts, but will be difficult on tracts which would receive very low bid rates even without the effect of the \$17 provision. Thus, there are risks:

- The higher basic rates may increase the possibility of high grading.
- Companies may be less willing to bid on units thought to contain low grade deposits.

We observe that an intervenor at the original rules hearing in 1966 recommended indexing this extra royalty provision, a suggestion which was not incorporated in the final rules. The division remains reluctant to index this provision, suggesting the division believes that higher base rates than those implied in the rules are appropriate.

We recommend:

- The division should reach clear decisions concerning the appropriate level of basic rates. Effective rates should be clearly stated to ease review and company planning.

d. Bonanza Clause

In response to a request by the Executive Council the department recently has taken steps to amend its administrative rules to include a new bonanza provision. This clause defines bonanza grade ore as having a value of \$50 or greater, in present dollars. The \$50 base will be indexed.

It is important to understand the purpose of the new bonanza clause to recognize when the state's interests will be protected and when they may not:

- The new bonanza clause is designed to capture an adequate share of exceptional grade ore--a true bonanza mine.

If excess profit systems were practical, such systems would cause excess profit to flow automatically to the state, regardless of the situation or reason for the high return. However, when a royalty system is used, different situations which result in excess profits may require different treatment under the royalty system. It follows that:

- Other provisions may be needed to protect the state's interests if high quality ore of less than bonanza grade is mined, or if a shortage of copper or nickel occurs, greatly increasing mining company profits.

Given its purpose, the new bonanza clause will have little or no impact on higher grade ores more likely to be found in the state. The bonanza clause will require significant royalties only on ore of truly exceptional quality, exceeding a value of several hundred dollars per ton. A higher royalty on higher grade ores, both those not covered by the bonanza and the lower valued ores covered by the clause, may be necessary to provide an adequate share for the state. Few deposits with ore worth \$50 per ton, the lowest value requiring a bonanza payment, are expected in the state, although it is possible in the Greenstone formations. In any case, the bonanza royalty on \$55 ore is only one cent, \$100 ore requires a \$1 bonanza royalty, while \$250 ore requires a \$16 payment. While ore of these values will be very attractive to mining companies, the state would receive insignificant returns from the bonanza royalty.

The state also lacks a provision to capture an adequate share if increasing demand causes a worldwide shortage of copper or nickel. Under this circumstance, companies could earn large profits even on lower grade ores. The proposed bonanza does not address this situation because of its high base, and its index. The base must be indexed if the clause is not to slowly erode, as happened with the 1966 bonanza. However, since the proposed new bonanza clause contains a metals price index, if an increase in price is due to a shortage of the metal, the bonanza clause may never be activated because the index will increase the threshold base value.

e. Additional Bid Rate

Minnesota requires a company wishing to lease a given unit to specify a percentage royalty above the scheduled minimums, which it is willing to pay. The companies offer these additional royalties, which in past sales have ranged from 0.07 percent to 7.17 percent, either in a sealed bid at competitive lease sales, or during the process of negotiating a lease with the division. These percentages are in addition to the other royalties.

We previously noted that Minnesota escalates its basic minimum percentage royalties over time but does not adequately escalate royalties by value on the range of ores most likely to be found in Minnesota. Given the high base of the new bonanza royalty, and the failure to index the \$17 provision, there is an ever widening gap in the range of ore values for which Minnesota's rate structure provides no effective escalation. Given a schedule of flat royalty rates for each ten year period, the bid rate is the principal tool used by the state to capture additional economic rent. Companies must estimate any excess profit they could earn on a given deposit after payment of these required minimum royalties. The state relies on competition among companies to result in additional royalty bids which permit the state to capture this excess.

- While the bid royalty is a beneficial feature of the Minnesota leasing procedure, its ability to capture effectively the state's share should not be overestimated. It may be particularly weak in capturing an adequate share when it is later found that a tract contains high grade ore.

We believe the state will not receive an adequate share when a tract contains high grade ore. The state is adequately protected by the basic royalties when lower grade ore is found, and by the bonanza clause on truly exceptional ores. However, the basic royalties will not capture an adequate share of a more typical high grade deposit, and given the level of competition for tracts and the data available at the time of leasing, the bid rate may be too low when high grade ore is found.

For royalty bidding to be highly effective, there must be adequate information on ore quality and location, and estimates of future prices and costs, to calculate a correct bid. Second, there must be enough competition for tracts to ensure that the state is offered its full share. However:

- The inadequate information on Minnesota mining tracts does not permit companies to bid additional royalties accurately. This factor will hamper the ability of the royalty bid to capture effectively the state's share of higher grade ore.

The enormous percentage of leases issued through earlier sales which have now been surrendered to the state illustrates that mineral potential, and therefore appropriate bid royalties, cannot be estimated effectively at the time of leasing. In addition, there is a low level of competition for tracts.

The Division of Minerals uses a sealed bidding system. Under the circumstances, this is clearly the best bidding method. Sealed bidding encourages higher offers because bidding companies do not know whether there is competition for a tract, or what other offers have been submitted. However, the benefits of sealed bidding can not fully substitute for accurate information concerning mineralization on mining tracts, and can not fully reverse the effects of low competition. As noted in Chapter I, Minnesota's experience with over 1,000 copper/nickel leases shows the following:

- The majority of leased tracts received only one bid.
- Few companies participate in lease sales, and there is little direct competition. A few units in the earlier sales received several bids. In the 1973 sale, competition occurred on eight units, each of which received two bids.

Given the data problems, and the level of competition, companies will probably be conservative in their bidding even though sealed bidding is used:

- Because companies cannot estimate bid royalties accurately, they will seek to avoid a situation where they cannot profitably mine because the bid royalty offered was too high compared to the ore grades eventually found at the site.
- Companies have a reasonable assurance that there will be little competition for any given tract.
- The expected loss to a company if it is outbid on a tract is not significant. The odds are high that the tract will later prove to have no minable ore.

We conclude:

- The lack of detailed data and the level of competition will reduce the effectiveness of the bid royalty in capturing the state's share of higher grade ores.

3. ROYALTY DESIGN ALTERNATIVES

The underlying problem affecting the state's royalty policy is the inadequate information available at the time of leasing. Two alternatives are available to improve the state's ability to receive an adequate share. The information problem can be directly addressed:

- The Division of Minerals or mining companies could conduct extensive exploration, identifying and evaluating deposits prior to leasing.

This would improve mineralization information available at the time of leasing, permitting more accurate bids, and perhaps encouraging more competition for promising tracts.

The second alternative circumvents the information problem:

- The royalty system can be made more responsive to ore grades eventually found, automatically bringing in a share more appropriately matched to the profitability of the site.

While both approaches are feasible, we feel that modifying the royalty system to automatically increase the share when higher grade ore is found is the better alternative. The section below discusses this option, while the next section discusses procedures for improving the quality of information.

a. Escalating Percentage Royalties

An alternative to the current system is to establish several ore values at which the percentage royalty rates gradually increase. This should be viewed not as a rate decrease or increase, but as a rate realignment. Depending on the design and level of rates, this would increase royalty rates on high grade ore while possibly decreasing rates on low grade ore. The purpose is to develop rates which

more closely reflect the profitability (or excess profit) of mining different ore grades. These rates would not replace the bid rate, but could better complement the bid rate in capturing economic rent. This system would reduce reliance on the bid rate, and the need for accurate bid rates. Thus, the approach has three advantages:

- Lower percentage royalties on low grade ore can reduce the risk of high grading.
- Escalating royalties can automatically capture more of the economic rent, particularly on higher grade deposits. This better protects the state from underbidding.
- The importance of the bid rate, and the need for accurate bid rates to capture economic rent, is reduced.

A schedule of escalating royalties must be indexed to maintain the schedule's structure in the face of inflation. If the range of ore values subject to each royalty level is stated in dollar terms without adjustment for inflation, eventually even the lowest grade ores may be subject to royalty rates originally intended for the highest grades. Depending on the degree of escalation in the original schedule, this effect could seriously discourage mining.

An approach using escalating percentage royalties also has disadvantages, one of them caused by indexing:

- Administration of the system will be somewhat more complex, since proper royalty rates will depend directly on ore value.
- Royalty rates may be too low if metal prices rise relative to other prices.

This second problem can be caused by the price index used. If increases in metals prices are similar to increases in prices of other goods and services, the profitability of mining should not be greatly affected. However, if a metals price index is used, the state will not be well protected if metal prices rise substantially relative to other prices. In this circumstance mining profitability should increase, but the use of a metals price index would change the royalty rate schedule in a way which would needlessly decrease the state's share.

We recommend:

- The Division of Minerals should investigate the advantages, disadvantages, and administration of escalating percentage royalties by ore value.

We are not recommending immediate implementation of an escalating royalty structure. We do recommend, however, that the option should be carefully studied. For the present, continuation of the current royalty structure is appropriate, and pending lease sales should not be delayed while this option is studied.

The Division of Minerals should conduct a study of escalating percentage royalty rates by ore values. The study should include:

- the proper levels and degree of escalation in rates;
- the choice of an index;
- the expected effects of the escalating structure and the index on company production decisions; and
- the expected effects of the escalating structure and the index on the administration of the state's copper/nickel leasing program.

When this study is conducted, earlier recommendations concerning escalating rates over time and the \$17 clause need to be incorporated into this more general rate review. In any new design, the proper degree of escalation by ore value will depend upon the degree of escalation over time which is retained. Attention should be paid to simplifying the system and providing consistent design. Currently, the new bonanza clause is indexed, while other provisions are not.

Also, the proper rate levels and degree of both types of escalation must be based on a careful clarification of program goals. In this Program Evaluation Division report we have concentrated on procedures to capture economic rent with minimal trade-off against employment. Depending on the specific program goals, the Legislature and the department may wish to capture a larger share for the state and trust funds. While this will require a larger trade-off against mine development and employment, the same basic royalty design features are appropriate. The issue is simply the level of rates, and the degree of escalation. Since a royalty increases the cost of mining each ton, it is important to minimize the production and employment disincentives, regardless of financial return objectives for the state and trust funds. Low royalties on low grade ore, with higher royalties on higher grade ore will reduce high grading effects.

We noted earlier that the decision not to index the \$17 clause is gradually increasing the effective basic rates. This clause is inconsistent with an indexed set of escalating percentage royalty rates. Clear decisions should be made regarding the level of basic rates and those rates should be accurately stated. Within the context of this larger review, it is possible that the \$17 provision may be retained in an indexed form, or replaced by several escalating steps.

We also noted that a metals price index will not adequately protect the state's interest if metal prices increase relative to other prices. While a shortage of copper/nickel is not expected, other price indices should be investigated, or thought should be given to a separate provision to handle this possibility. The same index should be used for both the bonanza clause and other percentage royalty rates which increase with ore value. Care should be taken to ensure that the bonanza clause effectively complements any new rate structure.

If possible, DNR's study should investigate royalty policy in conjunction with tax policy and other key factors. Tax policies at the federal, state, and local levels directly influence the profitability of mining and appropriate royalty rates. In particular, state royalty policies should be consistent with and influenced by the design of Minnesota's copper/nickel tax policies.

b. Improving Ore Information

An alternative to escalating percentage royalties is to maintain a system similar to the present one, while improving the quality of information available at the time of leasing. Better information on specific units would permit more informed royalty bidding and perhaps encourage more competition. This could be attempted in two ways:

- The state could become a major producer of exploration data, made public before lease sales; or
- Prior to leasing, companies could be required to complete extensive evaluation of tracts, with results to be shared with the state before leases are executed. Royalties would be determined through negotiation, and based on the information produced.

We consider these options below.

(1) Exploration by the State

The Division of Minerals has a mineral potential evaluation unit, and limited test drilling capability. However, the division does not have its own large-scale exploration program, instead relying heavily on mining companies to provide drill core samples and other exploration data for much of the information the division uses to evaluate mineral potential. Reliance on other sources for data limits the amount and use of the information which is available to the division and other state and local government units.

While ore information could be improved if the state began an intensive drilling and exploration program, this alternative is not preferred. Clearly identifying units with minable ore could cost millions of dollars annually. Since exploration activities by the state would provide a service of value to mining companies, this expense could be viewed as an investment, resulting in higher royalty payments. As payment for this service, and because uncertainty would be reduced, companies should be willing to offer higher royalty bids.

However, this alternative has risks:

- Increased bid royalties may not fully cover state exploration expenses.

The reasons are:

- Exploration expenses can be recovered only by leasing tracts and receiving royalties. Where exploration shows little or no minable ore in an area, exploration costs would not be recovered.
- Companies use different exploration techniques, and may prefer their own procedures or interpretations to those of the state, reducing their bids accordingly.
- If competition remains inadequate, companies may have little reason to offer bids, even on promising units, which are high enough to compensate for the state's exploration costs.

In conclusion, state financed exploration would be a heavy burden, especially given the state's current financial situation. While higher royalty bids should result, the increase may not exceed the exploration expenditures. Also, although an exploration program operated by the division would be funded by a general appropriation, we noted in Chapter I that the majority of mineral leasing revenues go to the trust funds. Therefore, the effect of the program would be to transfer revenues to the trust funds. If the return on this expenditure is small, the loss to the general fund would exceed the gain to the trust funds.

(2) Exploration by Mining Companies

The state could permit mining companies to thoroughly explore tracts prior to leasing. Mining companies would be required to share the exploration information with the state before lease terms are developed. For reasons discussed below, competitive leasing could not be used--all leases would have to be negotiated. While the state could negotiate from a knowledgeable position given its access to the exploration data, the bid rate would depend solely on the bargaining ability of the two parties. Given that our present procedures are sound and that further improvements are possible within the context of the present system, it is unnecessary to totally reject competitive bidding.

For leasing hardrock minerals in Minnesota, the U.S. Department of the Interior requires companies to evaluate specific sites under prospecting permits, and then to negotiate the terms of the lease with the federal agency. The government cannot make public the information generated under the prospecting permit, and then conduct a competitive sale. Companies will explore only if they are assured they can mine ores found. If the information were made public and a competitive sale conducted, many bidders could outbid the first company because of the valuable and costly information which they received free. Under these conditions, no company would be willing to explore the tracts.

A competitive sale is possible only if the exploring company is fully compensated for its exploration expenses. Unless the state directly reimburses the exploring company, a procedure must be developed to permit the company to subtract exploration expenditures from its bid. This would be very difficult to do under a royalty system without either subsidizing the company, or discouraging exploration.

IV. FURTHER MINNESOTA COPPER/NICKEL LEASING ISSUES

This chapter discusses subleasing and negotiated leases. A sublease is a legal agreement between the company holding the state lease and a second company, allowing the second company to mine and market the ores subject to the payment requirements of the original lease. The final section considers negotiated leases, which are substituted for competitive bidding whenever it is impractical to have a public sale.

A. SUBLEASING

A sublease is a legal agreement between the company (Company A) which executed the lease with the state, and a second company (Company B), which takes over some portion of the mining and marketing of the ores. Company B pays Company A for the right to develop the unit, and for any services which Company A may already have provided. This payment is often called an override royalty and generally takes the form of a royalty rather than some other form of payment.

DNR's administrative rules authorize the division to review copper/nickel subleases both with regard to legal correctness and economic effects. Copper/nickel subleases require the commissioner's approval, and the commissioner can reject any agreement which is not consistent with the state's best economic interest.

The present practice of the Division of Minerals is for staff to evaluate the economic effects of each copper/nickel sublease or assignment proposed by mining companies. The division accepts or rejects these proposals based on the merits of each case. The state is best served by a continuation of this policy.

1. EFFECTS OF SUBLEASING

There are two areas of concern regarding subleasing:

- The existence of a sublease with override royalties may suggest that there is a surplus or excessive profits which the state has failed to capture.
- Subleasing may result in high grading, which can decrease employment and decrease the royalties to the state.

a. The Sublease "Surplus"

It may be assumed that in the absence of a sublease Company A would market any minable ore from the site. The company would have certain costs, including royalties to the state, but there

would be no override royalty involved. Under a sublease Company B would mine the ores. Company B would have production costs, including royalty payments to the state, but also would have the additional cost of the override royalty paid to Company A. If Company B can operate profitably under this arrangement, it appears that the override royalty is a surplus which would flow to Company A and not to the state. There is the impression that the state has been shortchanged, and that this might have been prevented if the state's lease with Company A had set royalty rates high enough to capture this apparent surplus.

However, this account is not satisfactory. Company A has provided some services which are of value to Company B. Examples include prospecting work to locate and assess the value of the mineral deposit, developing legal agreements with mineral owners, and construction which improves access or enables the processing of ore. Company A will try to recover the costs of producing these items, either through developing the unit itself or through the override royalty from the sublease. This compensation is necessary to maintain the profitability of Company A, and does not represent a surplus which the state can capture.

In the absence of subleasing, Company B would have to locate, evaluate, and develop its own site. For various reasons Company B may prefer to sublease a unit where some of these steps have already occurred, and to compensate the original lessee accordingly through the override royalty. In either case, the override payment from Company B to Company A is a payment for items of value, and does not represent a surplus which the state should be receiving.

We conclude:

- The existence of override royalties does not, by itself, indicate that the state's royalty terms are too low.
- Any attempt by the state to capture the amount represented by override royalties could discourage mining in Minnesota.

b. High Grading

High grading is possible whenever a sublease payment takes the form of a royalty. The comments regarding royalty systems are also relevant here. With any royalty system high grading can occur because collecting the owner's share imposes a cost on the mining of each ton of ore, which may discourage mining the lowest grades. The override royalty resulting from subleasing has the same effect, because the compensation to Company A for items of value imposes a production cost on Company B.

The extent to which high grading will occur depends on the production decisions which Company B makes, and on the structure of the override royalty. If the override royalty allows lower payments for lower grade ores with increasing payments for higher grades,

Company B may choose to mine more of the lower grade ores, minimizing high grading. Where override royalties do encourage high grading, the reduced scope of the operation would decrease output, employment, and royalties paid to the state. The state would lose the royalties on ore remaining unmined as a result of the override royalty. While these risks clearly exist, it is not possible to measure the effects of a given override royalty with certainty.

2. ADVANTAGES OF SUBLEASING

In many cases the state may receive advantages from proposed subleases which outweigh disadvantages. Two factors which may prove advantageous are:

- opportunities related to different competitive strengths which different firms may have; and
- opportunities related to the effects of risk on the financing of mining activities.

We find:

- Subleasing may prove beneficial to the state by enabling a better match between the conditions of a specific mine site and the strengths of a particular mining company.

Mismatches can occur because of the poor quality of information available at the time of the original leasing. Companies cannot determine actual conditions at a given site until after they have signed a lease and completed considerable prospecting work and preliminary development. Even where a company locates minable ore, the characteristics of the find may make it difficult and expensive for this company to develop the mine. Because different companies have different capabilities, related to different experience or technological advantages, a company which executed a lease may not be the company best able to develop a specific mine. Subleasing may permit a second company to operate the site more efficiently and at a lower cost, providing greater output, employment, and royalty income. The possible high grading effect of the sublease royalty would be offset by the advantages which a more efficient operator could offer.

A second advantage is:

- Subleasing may permit earlier mine development, earlier employment, and earlier receipt of the state's royalties.

In the face of mining uncertainty, companies may be very conservative in financing mining activities. Extensive use of debt or equity financing increases the financial risk of making large expenditures at sites which later prove unprofitable. Companies may prefer heavy use of retained earnings and other internal funds. In this case, companies may choose to delay development of a new mine until they

have generated sufficient funds from other ongoing operations. In this manner, a self-imposed shortage of capital may reduce the amount of mining activity which the industry will finance at any one time.

One implication for the state is that companies may postpone development of some promising sites, even though current conditions may otherwise encourage development. To the extent that development is delayed, the employment and royalty benefits would also be postponed. Under these circumstances the state could benefit from subleases, or from joint venture arrangements between companies which share risk and capital costs. Even if high grading occurs, it may still be in the interest of the state to permit sublease agreements, if the result would be earlier employment and royalty income.

3. SUBLEASING AND THE ROLE OF THE DIVISION OF MINERALS

We believe that the Division of Minerals should continue to consider each proposed sublease by careful weighing of advantages and disadvantages, without reference to any rigid set of rules. In view of the complexities of subleasing, we believe the state is best served by capable staff working with sufficient flexibility. More specifically, we find:

- The subleasing research which the division has conducted is of high quality and provides a useful starting point for analyzing specific subleases submitted by mining companies.
- The division should conduct further study, as needed, to analyze specific subleasing proposals.

Current staff of the division have an impressive understanding of subleasing issues, and are fully capable of conducting the necessary additional research. At the present time the division has experienced staff, quite familiar with the capabilities of mining companies operating in Minnesota. To its credit, the management of the division appears willing to combine the work of its research staff with the experience and judgement of others to make informed decisions.

We have only one minor reservation. We note that the division has no explicit authority in statute or rule to request certain information from mining companies which may be valuable in the division's study of potential sublease agreements. However, the division does have considerable leverage, since no copper/nickel sublease can take effect without the approval of the commissioner. Approval could be withheld if companies do not provide information necessary to enable the division to make an informed judgement on proposed subleases.

- If future sublease reviews show that the current mechanism is not satisfactory, DNR should seek changes in its authority, as needed.

B. NEGOTIATED LEASES

Minnesota law and DNR rules authorize the commissioner to negotiate lease terms whenever it is impractical to hold a public lease sale on a given tract. Under a negotiated lease, the mining company is required to pay the basic rents and royalties specified in rule. In place of the competitive bid royalty, the company negotiates an additional royalty with the Division of Minerals. Final terms must be approved by the Executive Council. The division has negotiated leases on units which could not be mined, except in conjunction with the development plans of a company holding the rights to adjacent units. Negotiated leases are a small percentage of all leases now in effect--of 24 iron ore leases, five were negotiated; of 129 taconite leases, 10 were negotiated; and of 16 copper/nickel leases, one has been negotiated.

It has been suggested that the state may receive a better share from competitive leases awarded through public sales, and that negotiated leases should be further curtailed.

Regarding these issues we conclude:

- While available information does not permit objective comparison of likely state shares from negotiated and competitive leases, the negotiated lease process has adequate safeguards to protect the state's interest.
- There is no feasible way to avoid occasional use of negotiated leases.

We have not attempted to compare state shares resulting from negotiated leases and competitive sales. There are too few cases of negotiated leases, and there is no clear basis for objective comparison. Comparing royalty rates on competitive and negotiated leases is not satisfactory. Higher royalty rates are not necessarily better royalty rates, particularly if units with higher royalty rates are not developed. The state is best served when royalties match the mining conditions of a specific unit. Since the division uses negotiated leases for small or isolated deposits which could not be economically mined on their own, this suggests that royalty rates might be slightly lower on negotiated leases. This is appropriate, and would not indicate poor performance by the Division of Minerals.

In any case, we conclude that the negotiated lease process has safeguards to protect the state's interest:

- Rents and basic royalties are identical to those required for competitive sales.
- Companies must offer an additional royalty, similar to the competitive bid royalty.

- Additional royalties and other matters are negotiated by Division of Minerals staff experienced in mineral evaluation, economics, and leasing.
- When there is agreement, the division prepares a report and recommendation to the Executive Council, which may approve or disapprove the proposed lease.

There is no practical way to avoid occasional use of negotiated leases. Two factors cause a need for negotiated leases--inadequate information regarding ore location, and the combination of private and public ownership of mineral rights.

Because the precise location of minable ore is not known prior to lease sales, a company may lease a tract and find a deposit near an edge of the leased unit, and partially on adjacent land. In order to form a minable deposit it may be necessary to negotiate a lease for the adjacent land. Without this opportunity, development may not occur, causing lost employment and royalty income. In other cases, a small but separate deposit may be located near a leased unit, and may not be economical to mine separately. By negotiating with the company leasing the adjacent tract, the small deposit may be developed, again increasing employment and royalty income. Some of these situations could be avoided if better information on ore location were available prior to public lease sales so that tract boundaries could be drawn to include the deposits. However, this would require an enormous increase in exploration expenditures by the state for little return, particularly when the negotiation process provides a satisfactory remedy.

In some cases a company may locate ore on private or federal lands. The company may wish to lease adjacent state lands, if the exploration data indicate that the ore body extends onto these adjacent lands. If the state owned land is impractical to mine by itself, then a negotiated lease would be an appropriate way for the state and the company to benefit.

We conclude that negotiated leases serve a valuable purpose and are impractical to eliminate. Although competitive lease sales offer certain assurances of a proper return, existing safeguards in the negotiating process seem sufficient to protect the interests of the state and various funds.

STUDIES OF THE PROGRAM EVALUATION DIVISION

Final reports and staff papers from the following studies can be obtained from the Program Evaluation Division, 122 Veterans Service Building, Saint Paul, Minnesota 55155, 612/296-8315.

1977

1. Regulation and Control of Human Service Facilities
2. Minnesota Housing Finance Agency
3. Federal Aids Coordination

1978

4. Unemployment Compensation
5. State Board of Investment: Investment Performance
6. Department of Revenue: Assessment/Sales Ratio Studies
7. Department of Personnel

1979

8. State-sponsored Chemical Dependency Programs
9. Minnesota's Agricultural Commodities Promotion Councils
10. Liquor Control
11. Department of Public Service
12. Department of Economic Security, Preliminary Report
13. Nursing Home Rates
14. Department of Personnel, Follow-up Study

1980

15. Board of Electricity
16. Twin Cities Metropolitan Transit Commission
17. Information Services Bureau
18. Department of Economic Security
19. Statewide Bicycle Registration Program
20. State Arts Board: Individual Artists Grants Program

1981

21. Department of Human Rights
22. Hospital Regulation
23. Department of Public Welfare's Regulation of Residential Facilities for the Mentally Ill
24. State Designer Selection Board
25. Corporate Income Tax Processing
26. Computer Support for Tax Processing

27. State-sponsored Chemical Dependency Programs, Follow-up Study
28. Construction Cost Overrun at the Minnesota Correctional Facility - Oak Park Heights
29. Individual Income Tax Processing and Auditing
30. State Office Space Management and Leasing

1982

31. Procurement Set-Asides
32. State Timber Sales
33. Department of Education Information System
34. State Purchasing
35. Fire Safety in Residential Facilities for Disabled Persons
36. State Mineral Leasing

In Progress

37. Post-Secondary Vocational Education
38. Direct Property Tax Relief Programs
39. Community Services for the Mentally Retarded
40. State Land Acquisition and Disposal