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REVIEW OF ROYALTY AND
BONUS BIDDING

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AGO 668328 +

INTRODUCTION

The purpose of this report is to acquaint the reader with some general relationships between royalty and bonus bidding, and using probabilities based on national and Alaska statistics, compare the expected income to the State from these two types of bidding.

Using these same probabilities the expected income to the State was compared for bonus bidding with fixed royalties of $1/6$ and $1/3$. The reduction in bonus or "front money" was determined for $1/3$ royalty compared to $1/6$ royalty.

OPERATORS PROFITABILITY AND EQUALVALENT ROYALTY AND BONUS BIDS

To show a meaningful relationship between royalty and bonus bidding it is necessary to first examine this comparison from an operator's viewpoint.

Computer runs were made to determine the profitability to an operator for developing a given size field. These runs were originally set up for a field size of 100 million bbls. reserve. However, it was assumed for this general study that the income stream from this field size could be ratioed up or down by the reserve ratio of another size field e.g. a field having a billion bbl. reserve would have 10 times the income of a 100 million bbl. field. This also means that if the bonus bid for the 1 billion bbl. field was 10 times the 100 million bbl. field then the operators profit indicators would be identical. This concept was used in developing the relationships between royalty and bonus bidding throughout the study. The computer runs were made with various oil prices and with various bonus bids and royalty bids. A fixed $1/6$ royalty was assumed with each royalty bid. The rate of

return was selected as the profit indicator to be used to measure and equate the operators profitability for different bidding schemes. The results of this work are shown in Figure 1. In the upper graph in this figure the rate of return to the operator is plotted against his royalty bid for various oil prices. The lower graph shows the relationship between the operator's rate of return and his bonus bid for various oil prices.

Royalty bids were then equated to bonus bids that would yield the operator the same rate of return. Figure 2 shows this relationship for various oil prices. The dashed lines represent rates of return of 10% and 20%.

INCOME TO STATE FROM ROYALTY AND BONUS BIDS WITH KNOWN RESERVES

Using the same computer runs used to compute the operators profitability, the income to the State was determined for different royalty and bonus bids at various oil prices. Since there can be 4 to 10 years from the time a bonus payment is made until royalty income starts, if a discovery is made, the time value of money needs to be considered in any bid comparison. Therefore, the present worth income to the State has been used throughout this study, determined by using 10% per year present worth discount factors.

The results of this work are shown in Figure 3. The upper graph in this figure shows the present worth income to the State for any royalty bid and for 3 different oil prices. The lower graph shows how the State's present worth income would vary for different bonus bids, and for 3 different oil prices. As labeled, the graphs are for a field with a billion bbls. reserve,

however using the ration technique previously discussed these graphs could be used for larger or smaller fields. For example, in the lower graph with an \$8.50 per bbl. oil price it shows \$1500 million income from an \$800 million bonus bid. If a 100 million bbl. reserve field were being considered then an \$80 million bonus would read \$150 million for state income.

Relationships have now been shown that equate royalty and bonus bids to yield an operator the same rate of return. The present worth income to the State can now be calculated for whatever royalty or bonus bid that is to be considered. However the big unknowns are:

1. Will a field be discovered and
2. If it is discovered how big will it be.

PROBABILITIES OF DISCOVERY AND FIELD SIZE

Both Alaska and national statistics were examined to determine how successful operators have been in discovering oil fields and what the probabilities are for finding fields of different sizes.

The probability of discovering an oil field was considered for two different conditions:

1. Wildcat acreage, remote from proven production.
2. Drainage acreage, closely associated with or contiguous to proven production.

For wildcat acreage a 10% chance of discovery was used. This has been the historical discovery rate for both Alaska and the nation. To be considered

drainage acreage there must be a high chance of finding oil on the acreage. However until the acreage is drilled there is always some element of risk. For this study drainage acreage was assigned a 90% chance of discovery.

Since there have been only seven oil fields discovered in Alaska and one of them happens to be Prudhoe Bay, the Alaska statistics for determining the probabilities of finding oil fields of different sizes are probably optimistically weighted toward finding large fields.

The probabilities thus determined and used are shown in Table 1.

COMPARISON OF EXPECTED STATE INCOME FROM ROYALTY AND BONUS BIDS

Using the relationships developed for royalty and bonus bidding as shown in Figures 1 through 3 and the probabilities described in Table 1 it was possible to calculate the expected present worth income to the State for royalty and bonus bidding. This was done for wildcat acreage and drainage acreage with oil prices of \$8.50/bbl. and \$10.00/bbl. The results are shown in Figures 4 through 7.

For wildcat acreage, as shown in Figure 4 and 5, it makes little difference whether Alaska or national statistics or used for field size probabilities because the chance of discovery is the dominant factor. The bonus and royalty curves diverge rapidly as the bonus values increase. A check was made to see what royalty bids would be necessary to make the royalty curves equivalent to the bonus curves for wildcat acreage. It was found that even a 100% royalty bid would not yield the expected income to the State as a

bonus bid for bonuses as low as \$100 million.

For drainage acreage, as shown in Figures 6 and 7, it makes a considerable difference whether Alaska or national statistics are used. With the national statistics the royalty bid would not equal the bonus bid even with a 100% royalty, similar to wildcat acreage. However using Alaska statistics the royalty bid shows slightly more income in the bonus range of \$50 million to \$170 million for \$8.50/bbl. oil and \$35 million to \$285 million for \$10.00/bbl. oil. At the bonus level of \$500 million it would take a royalty bid of 83% for \$8.50/bbl. oil to yield the same income as the bonus and an 86% royalty bid for \$10.00/bbl. oil.

COMPARISON OF BONUS BIDDING WITH FIXED ROYALTIES OF 1/6 AND 1/3

Bonus Bids were compared for fixed royalties of 1/6 and 1/3 to determine how much the bonus would be reduced with the higher royalty. Figure 8 indicates the amount of reduction or loss in "front money" that would occur. For example, if an operator were willing to bid \$300 million with a 1/6 royalty he could only bid \$150 million with a 1/3 royalty if he wanted to obtain the same rate of return on the project. This would be a 50% reduction in the bonus or "front money".

Further comparisons were made to determine the differences in expected income to the State over the life of the project for the two royalties. Figure 9 is for wildcat acreage and there is very little difference between using Alaska or national statistics. Increasing the royalty from 1/6 to 1/3 would result in a reduction in income from approximately \$100 million to

\$200 million.

Figure 10 shows the same comparison for drainage acreage. The reduction in income using national statistics is about the same as for the wildcat acreage or approximately \$90 million to \$195 million. With Alaska statistics the reduction ranges from zero to approximately \$100 million.

CONCLUSIONS

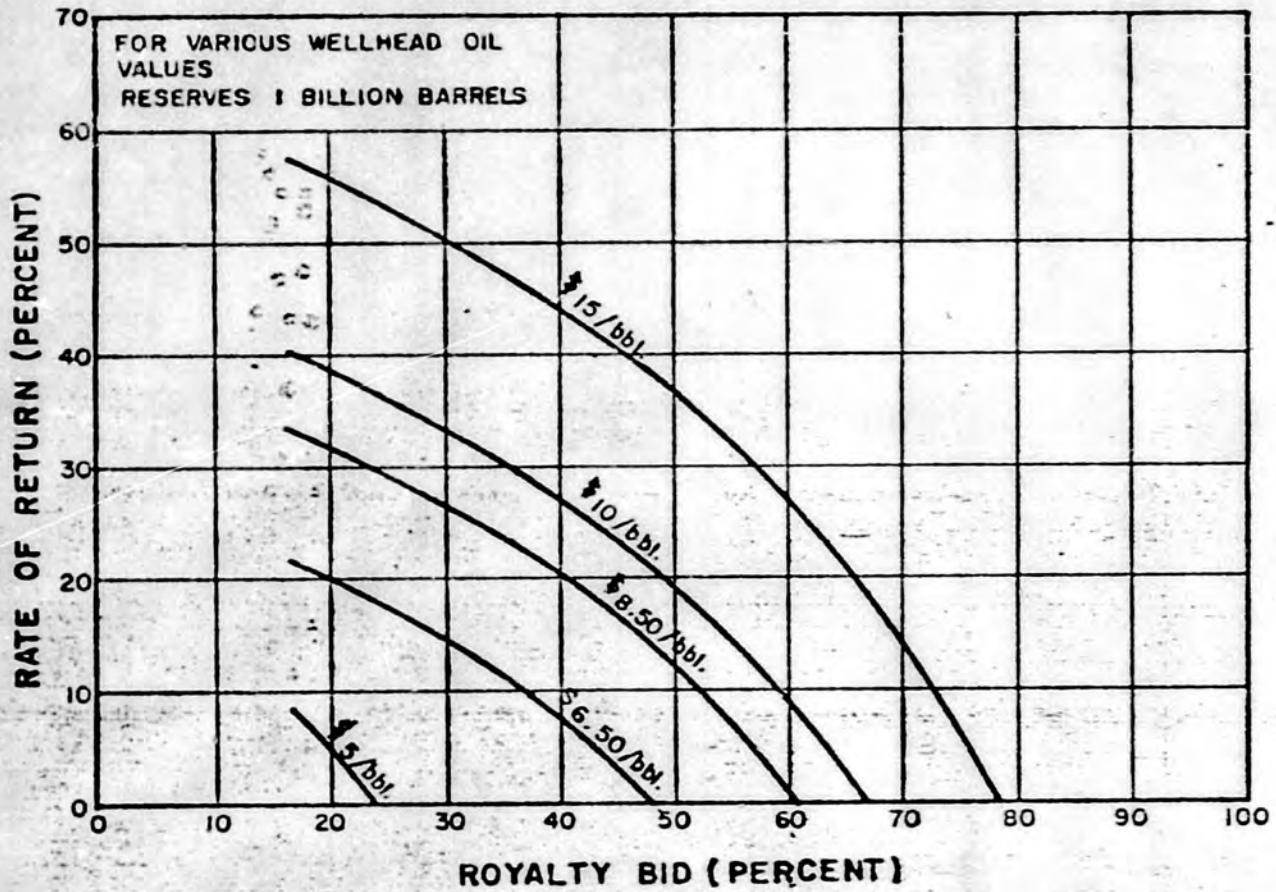
Using the relationships between royalty and bonus bidding developed in this study the following could be concluded:

1. The State should expect to realize more income from bonus bidding on wildcat acreage as compared to royalty bidding.
2. Since there have been only seven oil fields discovered in Alaska and one of them happens to be Prudhoe Bay, the Alaska statistics are probably optimistically weighted toward finding large fields.
3. For drainage acreage, the Alaska statistics would favor royalty bidding in some instances. However national statistics indicate that the State would realize more income from bonus bidding.
4. For wildcat acreage or drainage acreage the State should expect to realize more income from a bonus sale with a fixed $1/6$ royalty than with a fixed $1/3$ royalty.
5. By increasing the fixed royalty from $1/6$ to $1/3$ in a bonus sale, the reduction in bonus or "front money" could range from 42% to 100%.

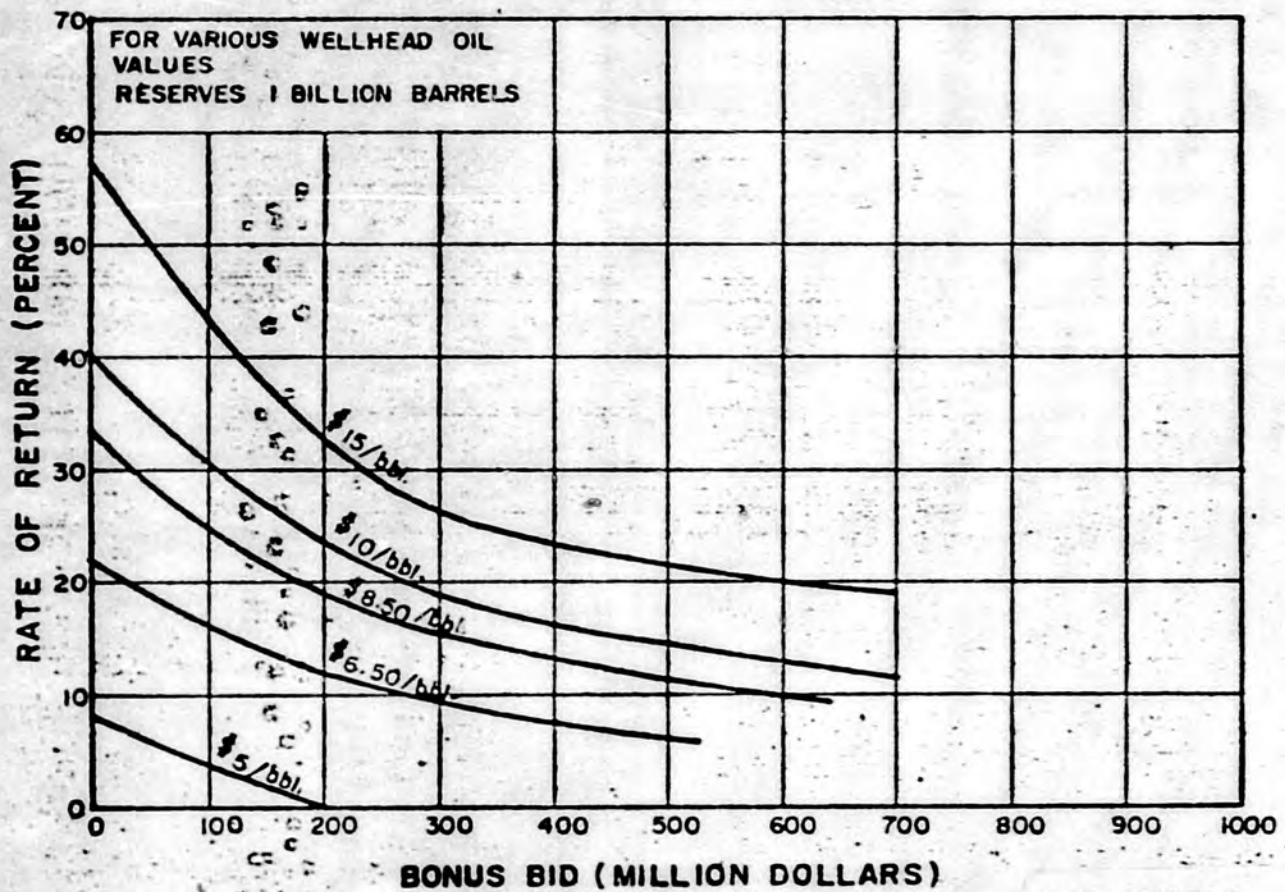
TABLE 1

<u>Possible Events</u>	<u>Wildcat Acreage Probability</u>		<u>Drainage Acreage Probability</u>	
	<u>Alaska</u>	<u>Nation</u>	<u>Alaska</u>	<u>Nation</u>
No discovery	90.0%	90.0%	10.0%	10.0%
10 million bbl. Field	5.0%	6.7%	45.0%	60.3%
50 " " "	1.58%	1.3%	14.22%	11.7%
100 " " "	2.05%	1.8%	18.45%	16.2%
500 " " "	.53%	.14%	4.77%	1.26%
1000 " " "	.61%	.059%	5.49%	.531%
5000 " " "	.09%	.0009%	.81%	.0081%
10,000 " " "	.14%	.0001%	1.26%	.0009%

RATE OF RETURN VS ROYALTY BID



RATE OF RETURN VS BONUS



ROYALTY BID VS BONUS BID

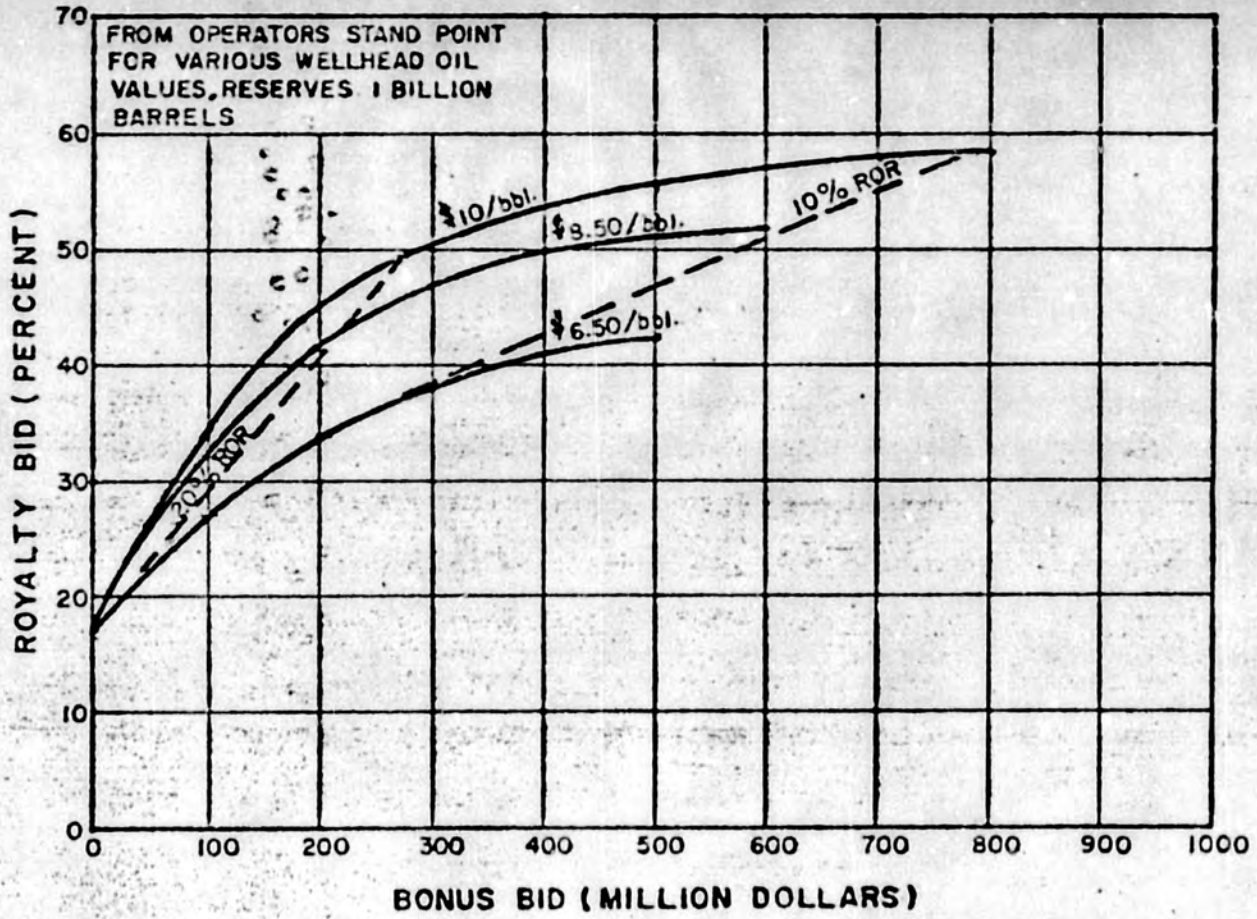
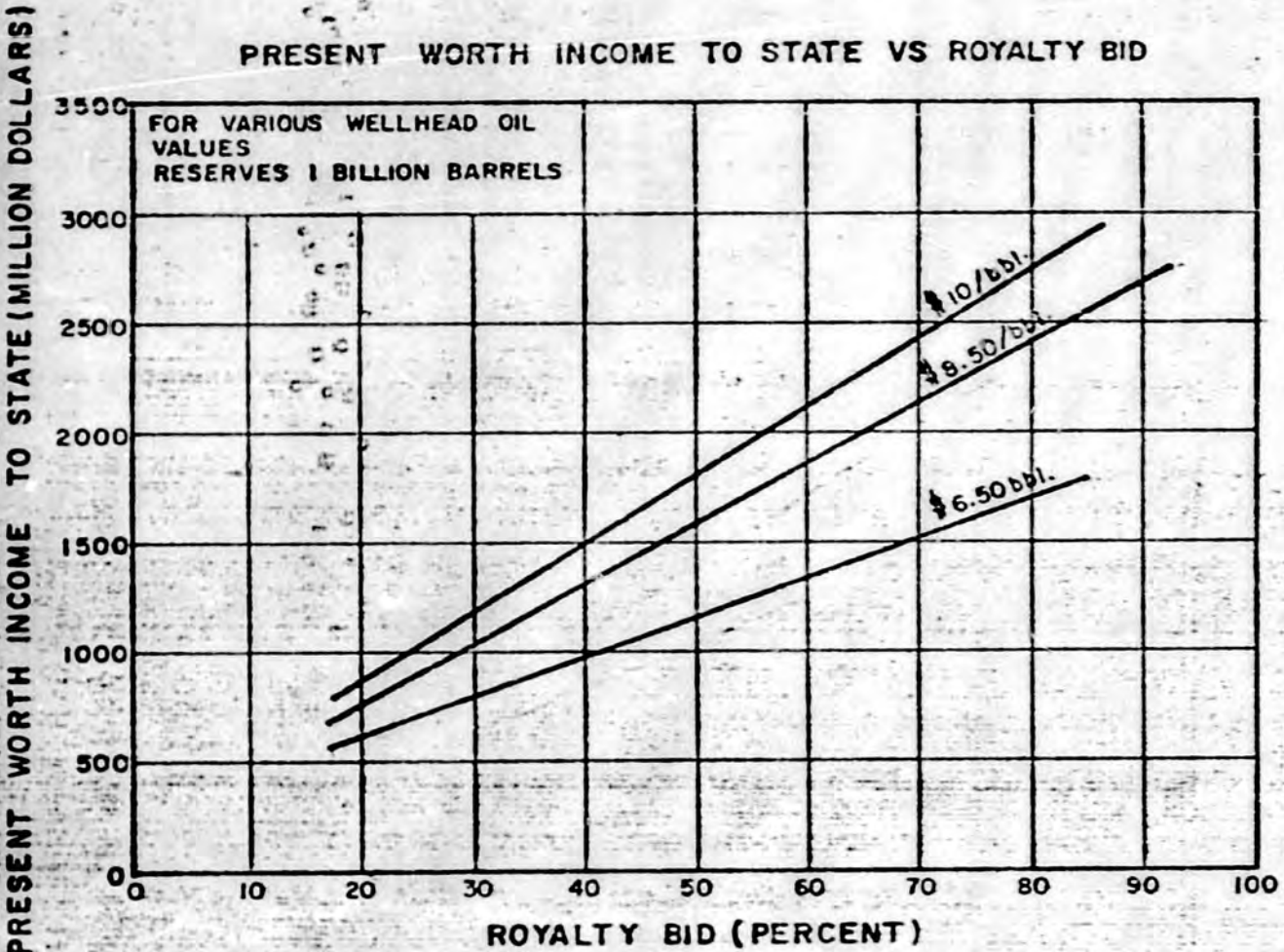
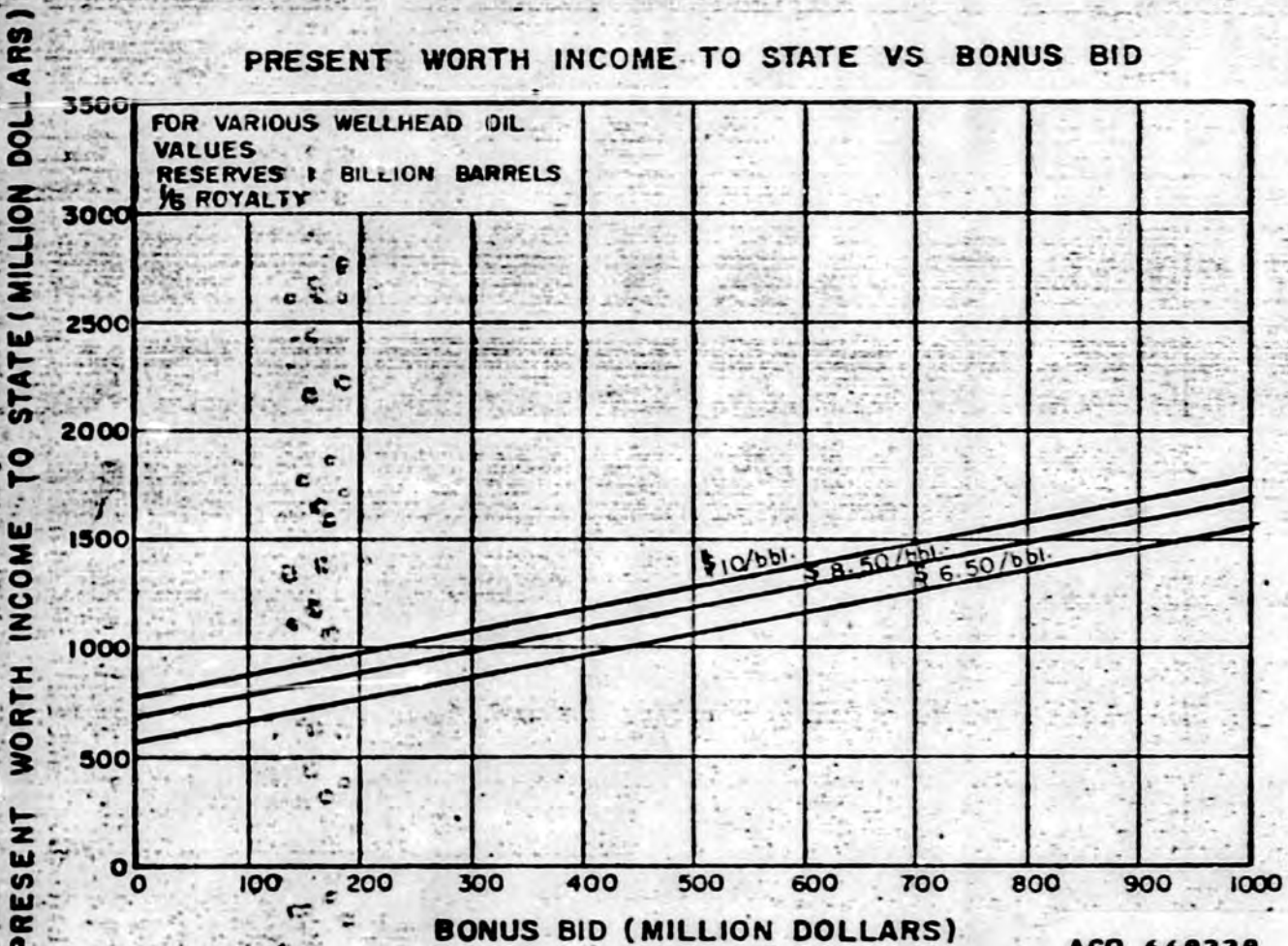


FIGURE 3

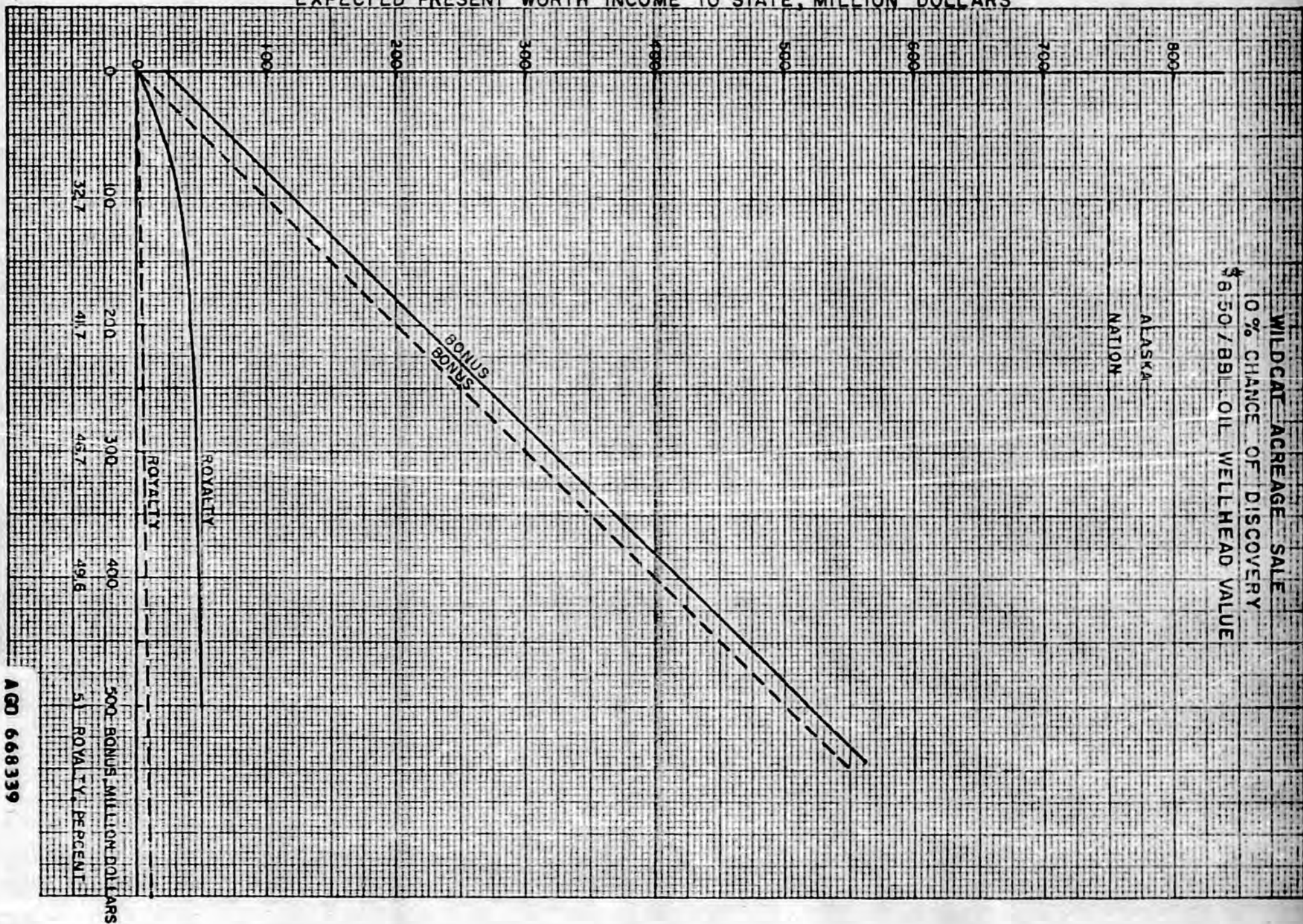
PRESENT WORTH INCOME TO STATE VS ROYALTY BID



PRESENT WORTH INCOME TO STATE VS BONUS BID



EXPECTED PRESENT WORTH INCOME TO STATE, MILLION DOLLARS

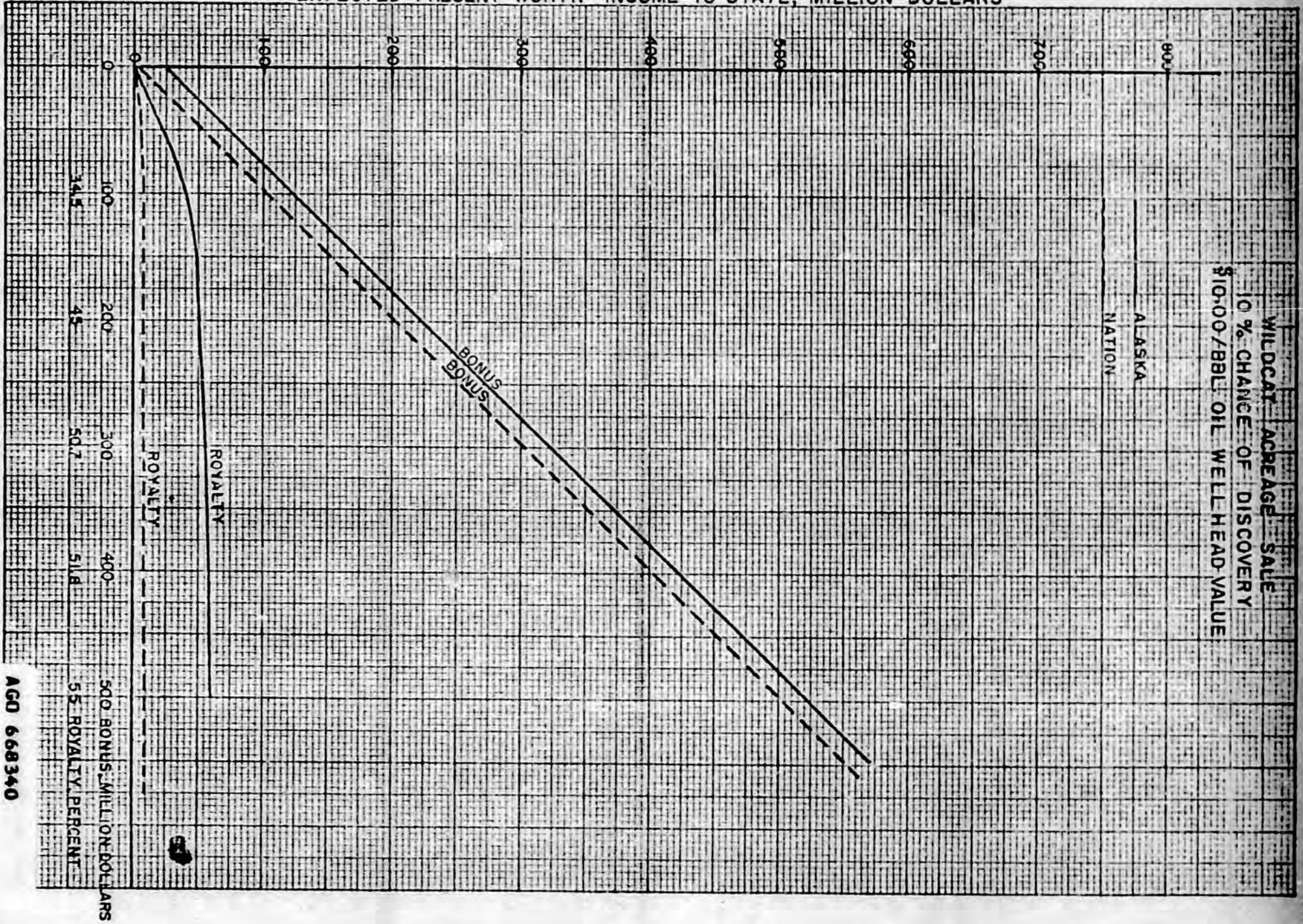


WILDCAT ACREAGE SALE
 10% CHANCE OF DISCOVERY
 \$8.50 / BBL OIL WELLHEAD VALUE

ALASKA
 NATION

AGD 668339

EXPECTED PRESENT WORTH INCOME TO STATE, MILLION DOLLARS



WILDCAT ACREAGE SALE
 10% CHANCE OF DISCOVERY
 \$10.00/BBU OIL WELL HEAD VALUE

ALASKA
 NATION

BONUS
 BONUS

ROYALTY
 ROYALTY

500 BONUS, MILLION DOLLARS
 5.5 ROYALTY, PERCENT

AGD 668340

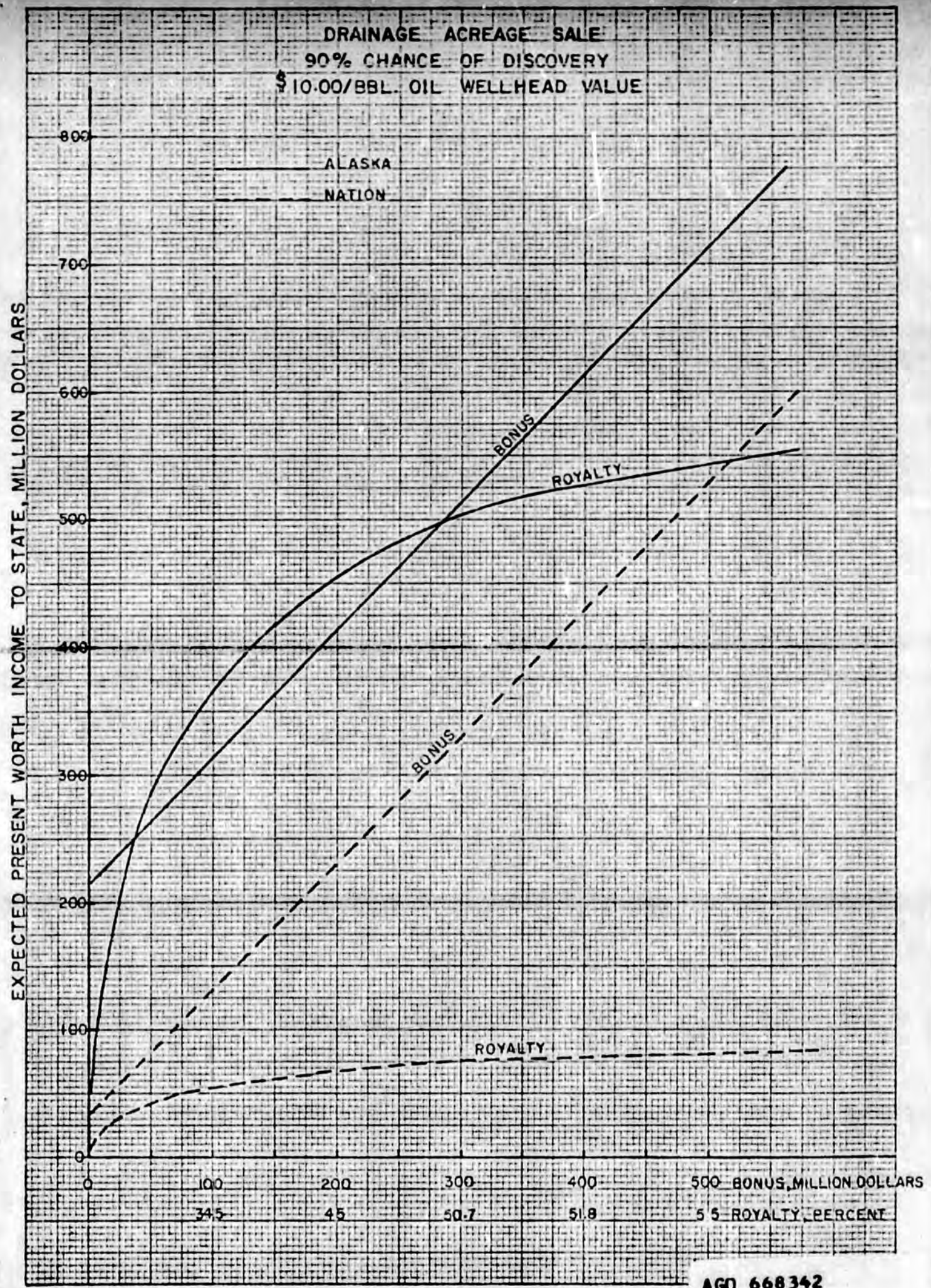
EXPECTED PRESENT WORTH INCOME TO STATE, MILLION DOLLARS



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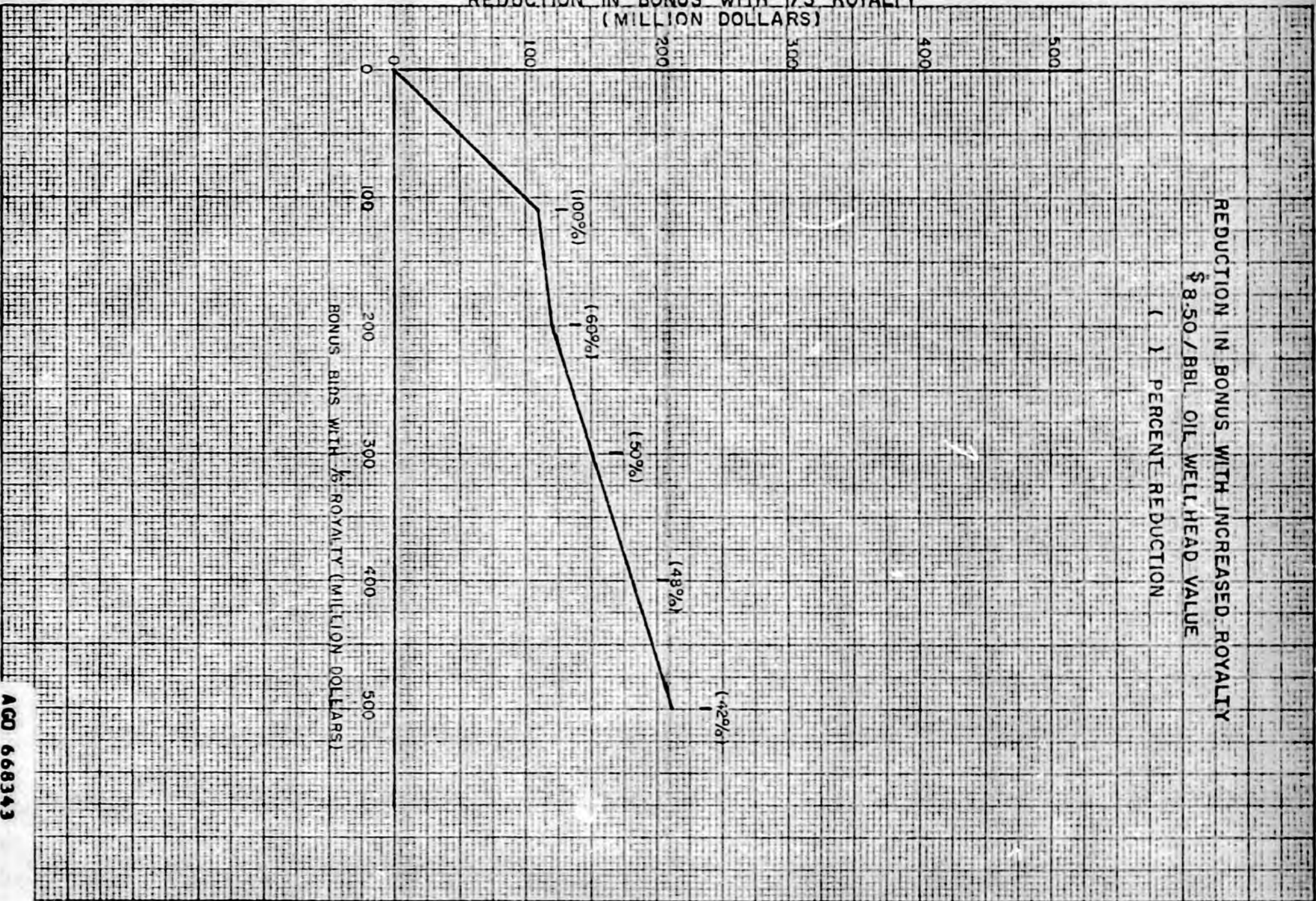
FIGURE 6

DRAINAGE ACREAGE SALE
90% CHANCE OF DISCOVERY
\$10.00/BBL. OIL WELLHEAD VALUE



K&S 10 x 10 to 1/2 inch 48 1323
7 x 10 inches MADE IN U.S.A.
KEUFFEL & ESSER CO.

REDUCTION IN BONUS WITH 1/3 ROYALTY
 (MILLION DOLLARS)



REDUCTION IN BONUS WITH INCREASED ROYALTY
 \$8.50/BBL OIL WELL HEAD VALUE
 () PERCENT REDUCTION

BONUS BIDS WITH 1/3 ROYALTY (MILLION DOLLARS)

REDUCTION IN STATE INCOME WITH INCREASED ROYALTY

WILDCAT ACREAGE

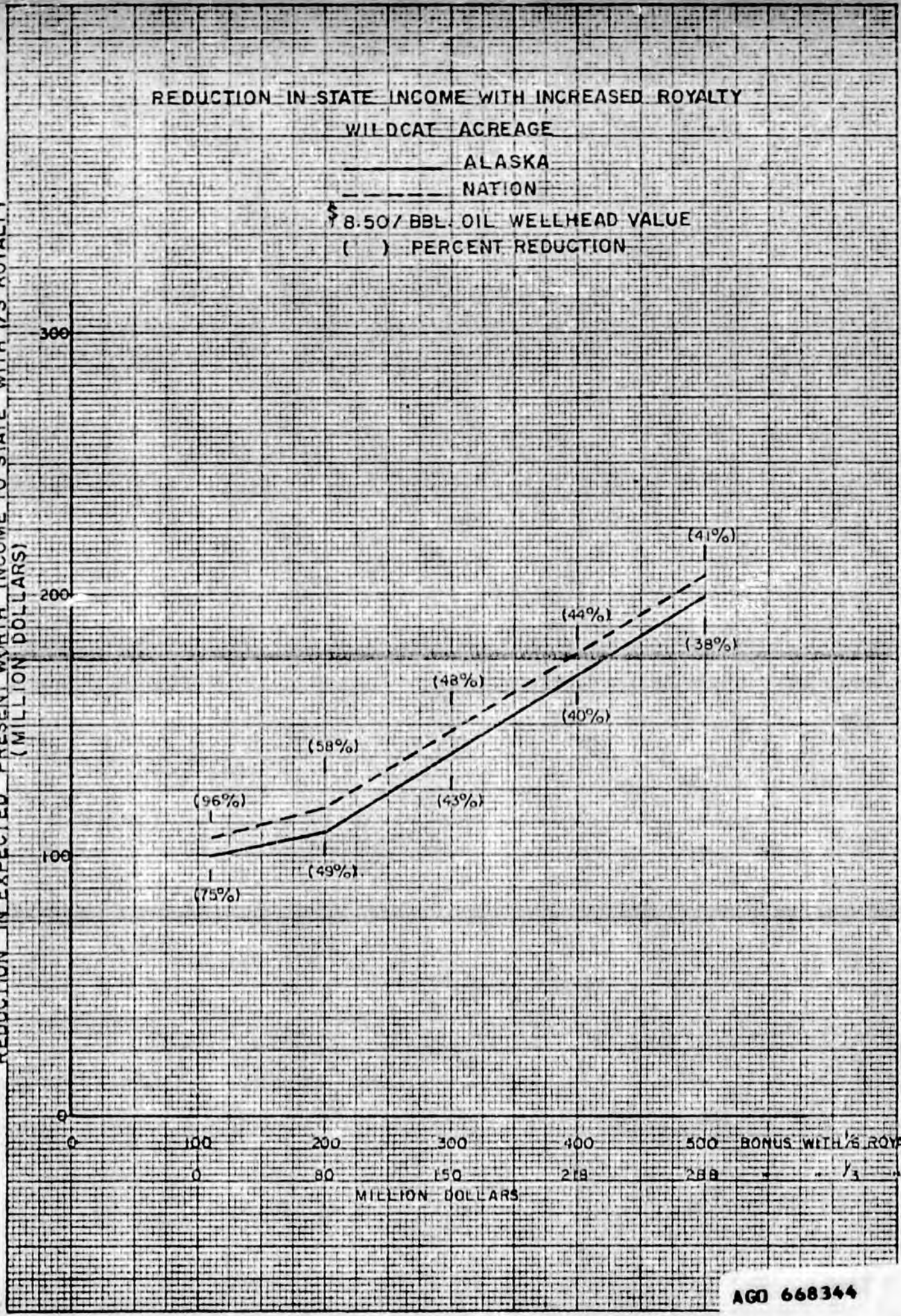
ALASKA

NATION

\$ 8.50 / BBL. OIL WELLHEAD VALUE

() PERCENT REDUCTION

REDUCTION IN EXPECTED PRESENT WORTH INCOME TO STATE WITH 1/3 ROYALTY (MILLION DOLLARS)



K&E 10 X 10 TO 1/2 INCH 46 1323
 7 X 10 INCHES
 MADE IN U.S.A.
 KEUFFEL & ESSER CO.

REDUCTION IN STATE INCOME WITH INCREASED ROYALTY

DRAINAGE ACREAGE

ALASKA

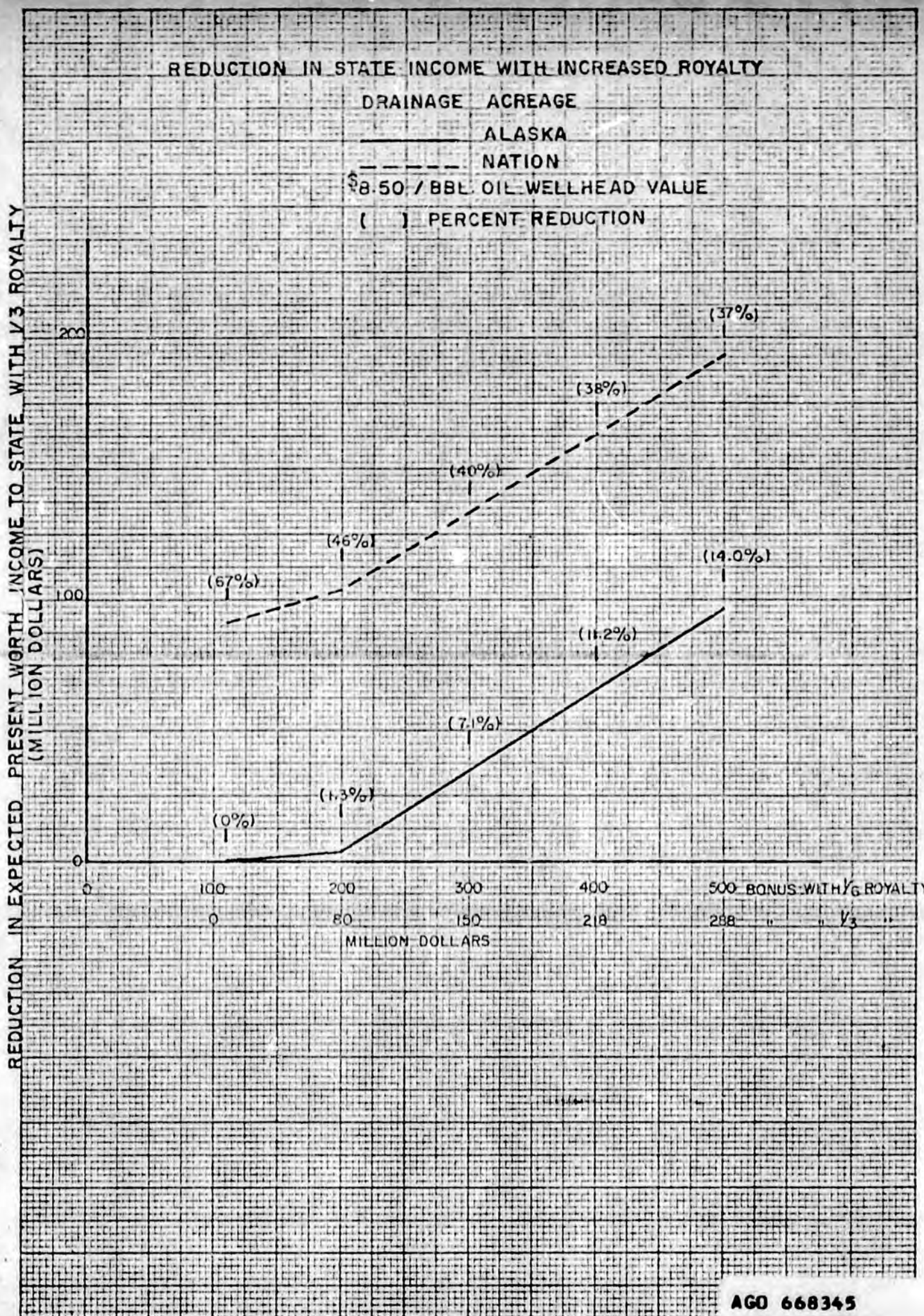
NATION

\$8.50 / BBL OIL WELLHEAD VALUE

() PERCENT REDUCTION

REDUCTION IN EXPECTED PRESENT WORTH INCOME TO STATE WITH 1/3 ROYALTY

(MILLION DOLLARS)



K&E 10 X 10 TO 1/2 INCH 46 1323
7 X 10 INCHES
MADE IN U.S.A.
KEUFFEL & ESSER CO.