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Report to the Congress; by Elmer B. Staats, Comptroller General.

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The Nation greatly relies on the Outer Continental Shelf (OCS) leasing program for meeting near-term domestic energy needs, particularly while new energy technologies and conservation actions are being developed. Decisions regarding where to lease and at what rate have a significant impact on the future production of OCS resources. The Department of the Interior's October 1977 sale of 135 oil and gas tracts on the OCS off the southern Alaskan coast, commonly known as the Lower Cook Inlet Sale CI, was reviewed and compared with previous sales of 1975 and 1976. Findings/Conclusions: Analysis of the data available for tract selection in Sale CI provides little assurance that the best tracts were selected for leasing. Industry nominations continue to be the predominant factor influencing the Department's tract selection. Much of the area considered for lease was inadequately examined, and tracts were included in the sale despite their apparent low promise of resources. The present program leases land on the basis of minimal geologic information, and the Department of the Interior has not made significant efforts to obtain additional geologic knowledge through stratigraphic drilling. Although the oil industry paid a significant amount of capital for leasing rights to Sale CI tracts, there is no assurance that energy resources will be found or that fair market value was achieved. Recommendations: The Secretary of the Interior should direct a geological exploration program with a systematic plan for appraising OCS oil and gas resources which would identify the level of stratigraphic drilling necessary to provide a minimal level of data. The Secretary should then encourage private industry to explore areas identified in the plan and share with the Department the information developed. If any data are still

needed, the Department should take the necessary actions to obtain it. The Geological Survey and Bureau of Land Management should be required to obtain the necessary information to make reliable tract values before lease. The Department should then offer for lease only those areas for which it has collected and analyzed sufficient information to identify where the resources are, their estimated value, and potential for development. (RRS)

6648

BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Lower Cook Inlet--Another Example Of More Data Needed For Appraising Outer Continental Shelf Oil And Gas Resources

The Chairman, House Ad Hoc Select Committee on the Outer Continental Shelf, requested GAO to review the Lower Cook Inlet oil and gas lease sale held October 27, 1977, in Anchorage, Alaska.

The Department of the Interior selected and evaluated Outer Continental Shelf oil and gas tracts for leasing without obtaining enough information to determine their potential resources.

Interior should direct an exploration program which has a systematic plan for appraising Outer Continental Shelf oil and gas resources including selected stratigraphic test drilling.

EMD-78-48

JUNE 8, 1978

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-118678

To the President of the Senate and the
Speaker of the House of Representatives

This report suggests how to improve the way the United States selects and evaluates Outer Continental Shelf lands for oil and natural gas exploration.

The review was initiated at the request of Congressman John M. Murphy, Chairman, Ad Hoc Select Committee on the Outer Continental Shelf, and performed under the authority of the Budget and Accounting Act, 1921 (31 U.S.C. 53).

We are sending copies of this report to the Secretary of the Interior; the Director, Office of Management and Budget; Congressman John M. Murphy, Chairman, Ad Hoc Select Committee on the Outer Continental Shelf; and the House and Senate committees and subcommittees having oversight responsibilities for the matters discussed in this report.

Elmer B. Staats
Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

LOWER COOK INLET--ANOTHER EXAMPLE OF MORE DATA NEEDED FOR APPRAISING OUTER CONTINENTAL SHELF OIL AND GAS RESOURCES

D I G E S T

The Nation is relying heavily on the Outer Continental Shelf lands as a way to increase U.S. domestic oil and natural gas production. Decisions on where to lease and at what rate will greatly affect whether the Nation can decrease its reliance on foreign energy supplies and have enough energy resources to meet near-term needs.

This report was requested by Congressman John M. Murphy, Chairman, Ad Hoc Select Committee on the Outer Continental Shelf. It is the third in a series which GAO has recently issued in response to congressional requests for reviews of OCS lease sales. (See p. 1.)

The Department of the Interior's policy of leasing Outer Continental Shelf lands that have not been properly evaluated (because of limited data) encourages industry to tie up capital in lands with minimum or no resource potential or buy lands for less than fair market value.

To prevent this, the leasing program should be designed to offer the best acreage after it has been adequately explored and evaluated for resources.

On October 27, 1977, 135 oil and gas tracts off the southern Alaskan coast, Lower Cook Inlet, were offered for lease to the highest industry bidders. Two types of bidding systems were used (1) cash bonus bid with a fixed royalty and (2) required bonus with a percentage royalty bid. The revenue received from the leased tracts was about $398.5 million.

SELECTING AND EVALUATING TRACTS

Interior selected the tracts for lease after reviewing limited data and before assessing the true resource development potential of the land. (See p. 9.)

Before actual sale, each tract is evaluated to determine the acceptability of industry bids and to make sure the Government receives a fair market value return for the lease of public resources. (See p. 17.)

As was the case with the two previous sales GAO reviewed the Lower Cook Inlet sale evaluations were made with limited and poor quality data and therefore were unreliable. (See p. 17.)

COMPETITION ON THE TRACTS

A competitive leasing program is based on the premise that competition will provide a fair market return. In its two previous reviews, GAO found that more than half of the tracts bid on got only one or two bids. For this sale about 60 percent of the tracts receiving bids got only one or two bids each. In cases such as this when competition is limited or does not exist, it becomes increasingly important to have reliable tract values to use as a basis for accepting or rejecting industry bids. (See p. 22.)

RECOMMENDATIONS TO THE SECRETARY OF THE INTERIOR

The Secretary of the Interior should direct a geological exploration program which has a systematic plan for appraising Outer Continental Shelf oil and gas resources, including selected stratigraphic test drilling. The plan should identify the level of stratigraphic drilling necessary to provide a minimal level of data on frontier shelf areas.

The Secretary should then encourage private industry to explore areas identified in the plan and confidentially share with

Interior the information developed. Exploration permits issued by the Department for private drilling should provide the opportunity for any bona fide potential bidders to "buy in" on the exploration by equally sharing the cost of the drilling.

If any data is still needed, Interior should take necessary actions, including public financing of stratigraphic drilling, to obtain it.

In addition, after the tracts have been selected, the process outlined above should be repeated to obtain more reliable data for prelease evaluation purposes if deemed necessary.

Interior's Geological Survey and Bureau of Land Management should be required to obtain the necessary information to make reliable tract values before lease. Then the Department should offer for lease only those areas for which it has collected and analyzed sufficient information to adequately identify where the resources are, their estimated value, and potential for development in the near future.

AGENCY COMMENTS

Interior supports GAO's concept of prelease exploration but it rejects GAO's specific recommendations for carrying out such a program. Interior said:

> "It is particularly important, in our view, that the development of a prelease exploration program be based upon careful study of the issues and the development of criteria."

GAO believes the issue has already been carefully studied and it is time for Interior to take action. (See ch. 5.)

RECOMMENDATION TO THE CONGRESS

More geological data is needed to reduce the risk associated with Outer Continental Shelf resources development.

Consequently, the Congress should favorably consider legislation which would not only allow but would also require the Secretary to take the actions recommended in this report.

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ABBREVIATIONS

GAO	General Accounting Office
MROV	mean range of values
OCS	Outer Continental Shelf

GLOSSARY

Electric log	An electrical survey of an uncased hole which reflects the resistivity of rock strata to electrical current and the spontaneous potential of the rock. From the resistivity curve, geologists can determine the nature of the rock strata surveyed.
Frontier areas	Geographic areas of the United States that have had little or no history of offshore oil and gas operations.
Geochemical	That branch of chemistry dealing with the chemical composition of the earth's crust and the chemical changes that occur in the crust.
Geological data	Any information necessary for a study of the crust of the earth. A petroleum geologist is primarily concerned with sedimentary rocks which produce the world's oil.
Geological structure	The physical results of folding, faulting, and displacement of rock layers due to movement of the earth's crust. Some structures may trap oil or gas.
Geophysical	Technical data which identifies the structure, composition, and development of subsurface rocks.
Interpretation	A geologist's conception of what geophysical stratigraphic and related exploration data means as to the possible entrapment of oil and gas.
Magnetometer	A device that measures the relative intensity of the earth's magnetic effect. It is especially useful where salt or igneous or metamorphic rock is responsible for the subsurface structure.
Paleontology	A branch of geology dealing with the life of past geological ages based upon the study of fossil remains of organisms.

Reservoir	A natural underground rock formation in which the pore space is sufficient to contain a liquid such as oil or water and gas.
Seismic	Geophysical data pertaining to the speed with which induced sound waves pass through different types of rock. The result is the detection and analysis by means of reflection or refraction techniques of elastic waves generated in the earth.
Stratigraphic test	A hole drilled to determine the nature of rock layers and their physical and chemical properties, specifically, the ability of the rocks to transmit and retain oil and gas.
Stratigraphic trap	A reservoir capable of holding oil or gas. It is formed by a change in the character of reservoir rock from a break in its continuity. For example, the loss of porosity and permeability in a tight sandstone updip forms a stratigraphic trap. Such a trap is much harder to locate than a structural trap because it is not readily revealed by geological or geographical surveys.
Structural trap	A reservoir capable of holding oil or gas, formed from crustal movements in the earth that fold or fracture rock strata in such manner that oil or gas accumulation in the strata are sealed off and cannot escape. The most common structural traps are fault traps, anticlines, and salt domes.
Wildcat well	An exploratory well being drilled in unproved territory; that is, in a reservoir from which there is no production in the general area.

CHAPTER 1

INTRODUCTION AND SCOPE

At the request of Congressman John M. Murphy, Chairman, Ad Hoc Select Committee on the Outer Continental Shelf, we reviewed the Department of the Interior's October 27, 1977, sale of 135 oil and gas tracts on the Outer Continental Shelf (OCS) off the southern Alaskan coast, more commonly known as the Lower Cook Inlet Sale CI. Pursuant to the request and agreements reached with his office, we reviewed the Lower Cook Inlet sale and compared it with our previous findings for Sale 35, on December 11, 1975, off southern California, and Sale 40, on August 17, 1976, in the mid-Atlantic. 1/

The main thrust of this request was to compare the tract selection, presale evaluation, and the postsale review of bids made by the Department for the three sales using a similar methodology as was used in our previous reports.

We reviewed the adequacy of the tract selection and presale evaluation procedures. In conducting the review, we

--interviewed officials at the Department's Geological Survey (Survey) headquarters in Reston, Virginia; its regional office in Anchorage, Alaska; the Bureau of Land Management (Bureau), Washington, D.C.; and its regional office in Anchorage, Alaska;

--reviewed pertinent records on the Lower Cook Inlet sale at the Department's headquarters and regional offices; and

--examined applicable regulations, policies, procedures, and practices pertaining to Federal leasing of the OCS.

ROLE OF THE DEPARTMENT OF THE INTERIOR

The Outer Continental Shelf Lands Act (43 U.S.C. 1331) provides for U.S. jurisdiction over OCS submerged lands--all

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1/"OCS Sale 35--Problems Selecting and Evaluating Lands to Lease," (EMD-77-19, March 7, 1977) and "OCS Sale 40--Inadequate Data Used to Select and Evaluate Lands to Lease," (EMD-77-51, June 28, 1977).

submerged lands seaward and outside State waters--with Federal jurisdiction of OCS lands generally beginning about 3 miles from the coastline of each State. The act authorizes the Department to lease such lands for certain purposes, including production of oil and gas, and to regulate OCS oil and gas operations to prevent waste and conserve natural resources. The act requires that oil and gas leases be issued only on a competitive bidding basis. Leases are awarded through sealed bids on the basis of the highest (1) cash bonus bid with a fixed royalty or (2) percentage royalty bid with a fixed cash bonus. Except for 46 tracts in the Lower Cook Inlet sale and 10 tracts in one other sale held in the Gulf of Mexico, all of the Department's leasing has been on the basis of cash bonus bids.

The Bureau executes the leases of OCS lands with the stated leasing and management goals of (1) providing orderly and timely resource development, (2) protecting the environment, and (3) receiving fair market value return for leased resources.

The Survey is responsible for valuing tracts before leasing on the basis of engineering and other technical evidence and economic analysis. Its valuation data is used as the basis for judging the acceptability of industry bids. The Survey is also responsible for assisting the Bureau in its leasing objectives by (1) providing technical and administrative assistance, (2) providing services for managing and disposing of OCS areas, and (3) supervising and regulating exploration, development, and production activities on tracts after they are leased.

Historically, Interior had determined when and where to lease OCS lands primarily on the basis of expressions of industry interest. However, in recent years Interior has developed a more formalized process for making these decisions--a published leasing schedule showing proposed sales over a period of years. Normally, in the preparation of this leasing schedule, Interior considers other factors in addition to industry interest. And as shown in this report and our earlier reports on OCS Sale 35 and Sale 40, industry interest is still a very important factor in the selection of individual tracts within a planned sale area.

ROLE OF THE DEPARTMENT OF ENERGY

The Department of Energy Organization Act (42 U.S.C. 7101) transferred from the Secretary of the Interior to the Secretary of Energy, among other things, the responsibility

for (1) fostering competition for Federal leases and (2) implementing alternative bidding systems authorized for the awarding of Federal leases. However, since the Department of Energy was just established on October 1, 1977, it did not participate in the scheduling or planning of any activities for lease Sale CI.

OCS LOWER COOK INLET SALE

The Department's OCS leasing program for frontier areas is part of the Federal effort to reduce dependency on foreign energy sources. The available geologic evidence indicates that the frontier OCS areas hold the most promise for making additional large discoveries of oil and natural gas.

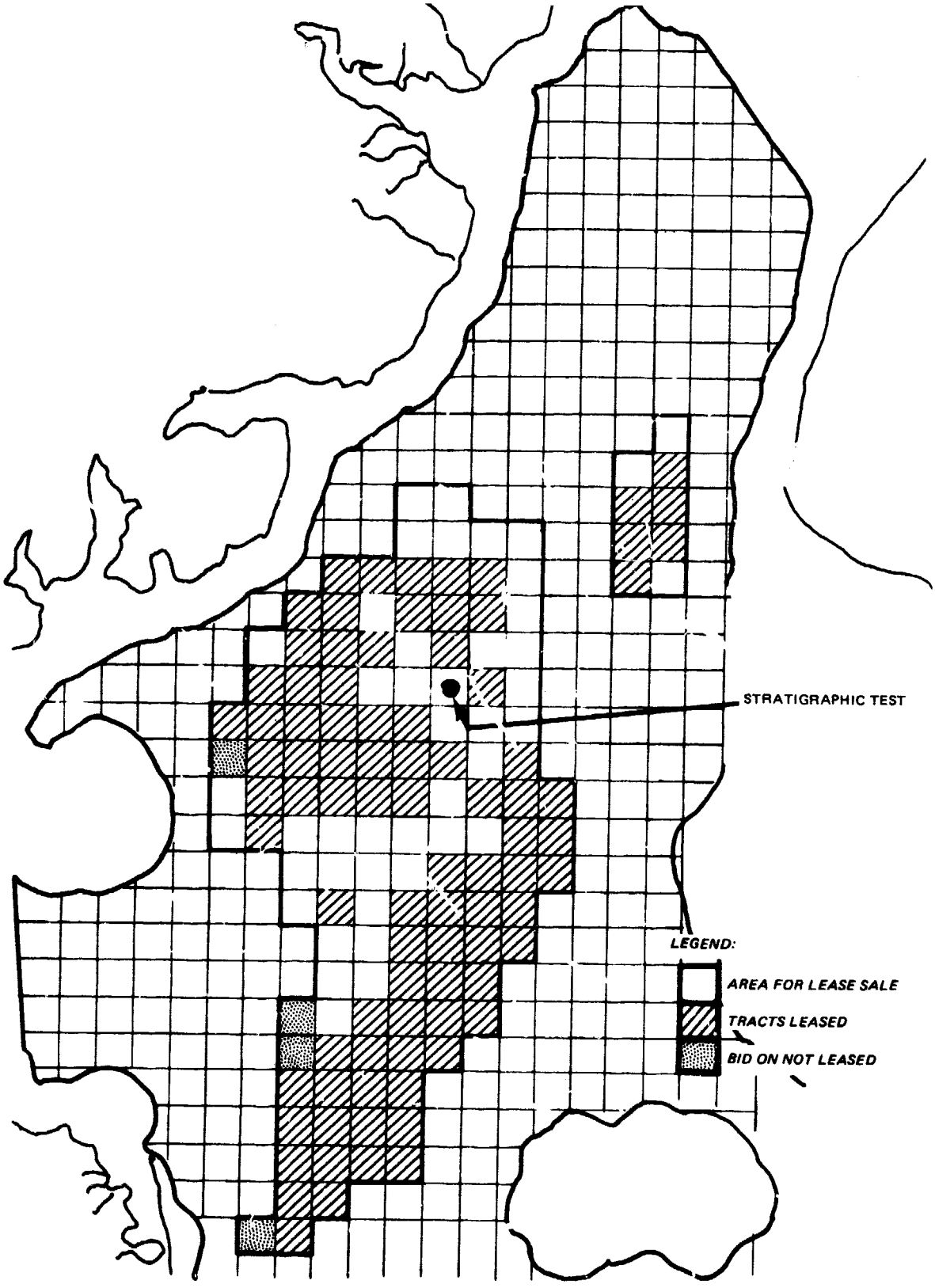
On September 22, 1975, the Department announced the call for nominations and comments on the proposed OCS lease Sale CI. The call area consisted of 450 tracts totaling 2.3 million acres, out of which 433 tracts were nominated by 16 companies.

From the 433 tracts nominated by industry, the former Secretary of the Interior selected 120 tracts and scheduled the sale for February 1977. However, the sale was delayed 8 months because the current Secretary of the Interior wanted more time to examine the studies, comments, and options that were available to his predecessor. In addition 15 more tracts were selected by him for inclusion in the sale held in October 1977.

Survey valued the 135 tracts offered in the sale at $79.5 million. Bids were received on 91 tracts. Of these tracts, 87 were subsequently leased for a total of $398.5 million. The high bids for the four tracts not leased totaled about $1.8 million. These were rejected because they did not meet the Department's fair market value criteria. The following table provides some general comparative information about Sales 35, 40, and CI.

	Sale 35		Sale 40		Sale CI	
	Number	Percent	Number	Percent	Number	Percent
Tracts in sale	231	100.0	154	100.0	135	100.0
Tracts valued at minimum	195	84.0	108	70.0	101	75.0
Tracts receiving bids	70	30.0	101	66.0	91	67.0
Tracts leased	56	24.0	93	60.0	87	64.0
Minimum value tracts leased	39	-	58	-	59	-
Average water depth of tracts leased (meters)	324	-	88	-	84	-

MAP OF TRACTS OFFERED AND LEASED COOK INLET OCS SALE



CHAPTER 2

PROGRAM OPERATION AND NATIONAL OBJECTIVES

Almost everyone now agrees that domestic and world supplies of oil and natural gas are limited. In fact, many experts forecast that these resources may be depleted within the next 30 to 40 years.

Likewise, almost everyone realizes that the consequences to this Nation of such a shortage are very grave. The United States already consumes more oil and natural gas than it produces and as demonstrated by the Arab oil embargo and the severe winter of 1976-1977, an inadequate supply of these fuels can seriously disrupt our economy.

There is little disagreement that the question of future energy supplies is one of the major problems facing the United States and the world today. To meet our problem, the administration has proposed a multifaceted approach. The Nation is attempting to "buy time" until new energy technologies are developed. To help in obtaining the needed research and development time, the President and leading policy and scientific bodies are encouraging prudent use of these resources. Conservation is believed to be the cheapest and best means of maintaining adequate near-term energy supplies. Additional use of coal, nuclear power, and renewable resources as sources of energy are being encouraged as an interim measure. More effort is needed to find and develop the Nation's remaining oil and natural gas resources.

Because of this and because about one-third of all remaining domestic oil and gas resources are thought to be on the OCS, tremendous reliance has been placed on the OCS leasing program for meeting our near-term energy needs. To achieve the Department's stated leasing goals, particularly orderly and timely resource development, we believe it is important to have reliable geologic information about OCS resources. This would increase the Government's ability to select and evaluate tracts and make for better utilization of the limited capital that private industry has available for developing resources.

ADDITIONAL DATA WOULD INCREASE THE RELIABILITY OF TRACTS SELECTED AND EVALUATED

We believe the facts surrounding Sale CI show that tract selection and evaluation problems similar to those discussed in our two previous OCS sale reports again existed. For

Sale CI this has resulted in an (1) unreliable selection of tracts offered for lease and (2) unreliable estimates of their worth. Thus, the OCS leasing program does not assure that the best areas are being offered for development and the program encourages industry to tie up significant amounts of capital in lands that appear at least to the Government to have less development potential. In addition, the leasing of questionable lands encourages industry to expend additional capital exploring these leased lands.

Obtaining additional geological data with interpretations would help establish more reliable tract values. These values are used as the basis for accepting or rejecting industry bids. The combination of unreliable tract values with limited bidding competition (70 percent of the tracts bid on in Sale 35, 49 percent of the tracts bid on in Sale 40, and 60 percent of the tracts bid on in Sale CI got only 1 or 2 bids) reduces the chances of the public receiving fair market value return on all tracts for the resources sold. The following facts about Sale CI demonstrate these conclusions:

--Included in the final tract selection were 68 tracts (50 percent) identified by interpreted seismic data to contain no structure. These tracts were assigned (not evaluated by the Monte Carlo Simulation model) the minimum value, $25 per acre. The Department leased 34 of these 68 tracts for $58.3 million. 1/ The fact that Survey interpreted these tracts as containing no structure does not preclude the discovery of producible quantities of oil or natural gas. Stratigraphic traps--geologic features not as readily detectable by seismic surveys as structures--might possibly exist. However, most oil and gas development comes from structures, not stratigraphic traps, according to Survey. We believe this shows that tracts with a low resource potential, based on known geologic factors about resource potential at tract selection, were included in this sale. Including tracts of this type, we believe, increases the risk of investment, generates speculation, and reduces the potential for making an economic profit.

--All 135 tracts had a reliability rating of "D" on a decreasing scale from "A to E." The "D" rating

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1/Of this amount, seven tracts were leased under the royalty bidding system and had a minimum bonus required totaling about $1.0 million of the total.

was defined by Survey as fair to good knowledge of structure with questionable stratigraphic data on the sand conditions and depth. The knowledge of geologic risk is considered fair to poor. This "D" rating is identical to the "D" rating used in Sale 35 and equivalent to the "E" rating used in Sale 40.

--Survey's final evaluation of tracts was based primarily on seismic information and a stratigraphic test well drilled in the northern area of the sale. Survey's interpretations of the data showed that 101 tracts were estimated to contain either no resource or an insufficient amount of resource to make an economic profit. These tracts were valued at the minimum worth of $25 an acre.

--Competition was better in Sale CI than Sale 35, but less than Sale 40. In Sale CI, 60 percent of the tracts bid on received one or two bids each. In Sale 35, 70 percent received one or two bids, while for Sale 40, 49 percent of the tracts bid on received one or two bids each. In situations where there is little competition among bidders, it is important for Survey to have the best possible geological and geophysical information to protect the public interest. We do not believe that Survey had this kind of information in Sale CI.

CHAPTER 3

NEED FOR IMPROVEMENT IN SELECTING TRACTS FOR LEASE

TRACT SELECTION PROCEDURES

The OCS Tract Selection Agreement of August 19, 1971, specifies the procedures by which the Bureau and Survey jointly select specific tracts for leasing. Under this procedure, the Department gathers and reviews detailed geophysical, geological, engineering, economic, and resource information, and nominations on areas proposed for sale. Then the potential supply of hydrocarbons is estimated and the size of the sale (in acreage) is modified to maintain the most adequate rate of production possible to meet the demand for these resources.

The Bureau and Survey headquarters offices are responsible for implementing departmental objectives through specific guidance to their respective field offices for use in the actual tract selection process. This guidance must be consistent with the Department's leasing objectives and include such considerations as (1) recommended sale size, (2) tracts or areas for special consideration, and (3) information relative to administration or Department policy. According to the procedures, acreage is selected in sufficient amounts to attract industry interest and promote a fair market value return.

In the tract selection process, the Bureau and Survey field offices independently recommend tracts for inclusion in the sale. Before tract selection, the Bureau requests industry to nominate OCS lands on which it would like to bid if a sale is held. The number of nominations each tract receives is the dominant factor influencing the Bureau's tract selection. Survey recommends specific tracts based on technical information, including geological, geophysical, engineering, and paleontological information. Once the tentative selection lists are compiled, Survey and the Bureau meet to discuss tract selection differences and agree to a joint Bureau-Survey list. This list is forwarded to headquarters for review and a final list of tracts for the offer is determined. Before the offer, changes in the tract selection list are occasionally made by both headquarters and field offices.

LIMITED DATA AVAILABLE FOR TRACT SELECTION

In June 1975, 1/ we reported that although Survey and Bureau headquarters and field offices participate to some degree in various phases of tract selection, the Federal Government has relied primarily on industry interest in deciding where to lease. Determinations to lease specific tracts are based on industry nominations, geological inference, and speculation about whether oil and gas exist. We also reported, however, that neither Government nor industry had the geological data essential for adequately determining if geological characteristics necessary for petroleum accumulation exist in the wildcat tracts or OCS frontier areas.

Although OCS areas have potentially attractive geological structures, as identified by geophysical data and by extrapolation of geological trends, the geological characteristics and specific potentials for oil and gas are not known until holes have been drilled.

Therefore, information received from stratigraphic test drilling is valuable in identifying areas favorable for oil and gas accumulation, particularly in the undrilled areas of the OCS.

In a letter dated January 24, 1978, to the Chairman, Ad Hoc Select Committee on the Outer Continental Shelf, the Secretary of the Interior acknowledged the value of the information received from prelease deep stratigraphic test wells. However, to date, the Secretary has not formulated a systematic plan for appraising OCS resources which would include prelease deep stratigraphic test drilling.

In late September 1975, the Department issued a call for nominations and comments on specific tracts for Sale CI comprising an area of 2.3 million acres and consisting of 450 tracts. Sixteen petroleum companies responded by nominating 433 tracts.

In addition to the industry nominations, nine Federal and State government agencies, Alaskan communities, and

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1/Report of the General Accounting Office, "Outer Continental Shelf Oil and Gas Development--Improvements Needed in Determining Where to Lease and at What Dollar Value," (RED-75-359, June 30, 1975).

commercial fishing organizations also responded to the Bureau's invitations to pinpoint specific areas which they believe should not be leased because of environmental hazards or resource use conflicts. One respondent--a commercial fisheries organization--asked that all tracts be withdrawn from consideration. Other agencies and interested associations recommended deleting certain tracts or delaying the leasing of such lands until baseline studies are completed.

Survey had, at the time of the tentative tract selection, about 2,300 line miles of seismic data which fell within the call area with an average grid spacing of 4 miles by 4 miles. However, the actual grid spacing varied widely in the area of call. Survey told us that the seismic data was adequate to identify 17 small structures in the Sale CI area. Survey had previously stated that to identify and evaluate major structures, the seismic grid should be 2 miles by 2 miles, evenly spaced. For small structures, a smaller seismic grid is required. Consistent with Survey's criteria, we believe the seismic data for Sale CI, being 4 miles by 4 miles, was not adequate to identify and evaluate the structures.

In addition to this seismic information, some magnetic and geochemical data was also available. Magnetic data (magnetometer), obtained by low flying airplanes, measures the Earth's magnetic pull and can be used to interpret sea bedrock formations. Survey stated the magnetic data, when used by itself, does not provide detailed or reliable information because it is very interpretive. It is useful in confirming existing seismic interpretations.

Geochemical data (seabed samples) can be analyzed primarily to estimate the possible presence or absence of hydrocarbons on the sea floor. Survey stated that this information is subject to varying opinions.

Survey did not have any drilling data from nearby producing fields to aid in evaluating and extrapolating geologic trends for the 2.3 million acres under consideration. However, Survey did have data from 13 nonproducing onshore wells (10 on the east shore and 3 on the west shore) and 17 shallow (none deeper than 46 feet) corehole tests available to aid in the evaluation of the individual tracts. The 13 nonproducing onshore wells indicated the presence of hydrocarbons which were not economically producible. However, because the seabed conditions were very muddy, the corehole data were poor in quality and not helpful in any evaluations.

Nineteen companies jointly sought permission from Survey to conduct a deep stratigraphic test well in the Lower Cook Inlet area. This industry-financed test well was requested in order to provide them with drilling data about the rock porosity and permeability of the area. The data must be shared with Survey as required by a permit stipulation and the test well must be drilled off-structure.

On June 10, 1977, the one off-structure deep stratigraphic test was started in the northern section of the sale area. (See map p. 5.) This test well was completed on September 24, 1977. Prelease drilling information about the rock porosity and permeability can be correlated with seismic data. When these data are available, a better estimate of the potential for producible hydrocarbons and the more promising tracts can be made. However, results of this test well were not available at the time of the tentative tract selection process. 1/ The test data were later used by Survey to aid in valuing the individual tracts offered for lease. The stratigraphic test results affected, to at least some extent, 50 percent of the input parameters used in estimating the resource value of the sale tracts. This significant impact underscores the importances of having and using these data in the tract selection process.

Based upon seismic data, industry nominations, and State input, the Bureau and Survey field staff independently prepared a list of tracts to be included in the sale. In a January 1976 report to headquarters, the field staff jointly recommended a tentative tract selection of 128 first-priority tracts (highest resource potential and few environmental concerns) and 12 second-priority tracts (high resource potential, with some undesirable or potentially undesirable environmental concerns). Also forwarded with the field submission for Washington office consideration were an additional 26 third-priority tracts recommended by Survey based on geological potential but not agreed to by the Bureau on environmental grounds. These additional tracts recommended by the Survey brought the list of tentative tracts to 166.

On February 11, 1976, the Bureau Director submitted the joint Bureau-Survey tract selection to the Assistant Secretary, Land and Water Resources. This memorandum recommended

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1/The tentative tract selection is that part of the OCS lease sale process when the Bureau and Survey provide lists of specific tracts for possible inclusion in the actual sale.

that 152 tracts be included in Sale CI. The tract selection included all first- and second-priority tracts and 12 of the tracts recommended by Survey only. The remaining 14 tracts were not selected in order to protect critical biological habitats, prevent a potential drainage of State resources, and provide a buffer zone for commercial fishing.

On January 18, 1977, Interior announced that 32 of the 152 tracts would be eliminated from the sale due to environmental sensitivity and low resource potential. Thus, the sale was to consist of 120 tracts and be held in late February 1977. In early February 1977, the current Secretary postponed the sale because he wanted more time to examine the studies, comments, and options available to his predecessor.

The sale as announced by the new Secretary on September 15, 1977, consisted of 135 tracts totaling 768,580 acres. The Secretary included 15 more tracts because of a reassessment of environmental concerns; it was determined that measures were available to protect the resources in this area of relatively low water circulation--null zone. 1/

TRACT SELECTION INFLUENCED BY INDUSTRY

As seen in the following table, only 12 of these 135 tracts received less than 10 nominations. We believe this is an indication of the Department's reliance on industry nominations for selecting tracts.

Number of nominations received per tract	Number of tracts selected for Sale CI
7	2
8	3
9	7
10	17
11	18
12	22
13	24
14	24
15	12
16	6
Total	135

1/A null zone is a Survey hydrologic term. For Sale CI, the null zone is an area where the water currents are not as great as in other areas.

EVALUATION OF SALE TRACTS FOR RESOURCE POTENTIAL

Seismic surveys measure the speed of shock waves through various rock formations, providing information about the depth of various rock layers and the location and existence of structures which may contain hydrocarbons. Based on these data, "horizon maps" of each tract are made which detail the geology of the tract and any structures on it.

For each of the 135 tracts included in the sale, three or four horizon maps were prepared from interpreted seismic data. Each map considers the geology of the tract at a different depth. These maps, when completed, provide information about the presence of a structure--a highly favorable factor associated with oil and gas resources. Structures act as a trapping mechanism and could contain oil or gas as in a reservoir. The fact that a tract does not have a structure on it, however, does not preclude the eventual discovery of producible quantities of oil or natural gas. Stratigraphic traps, 1/ not as readily detectable as structures by seismic surveys, might possibly exist and contain oil or gas. Survey told us, however, that most production is from structures, not stratigraphic traps.

Survey told us that seismic data provides reliable information about the presence or lack of structure. The seismic data interpreted by Survey and the subsequent preparation of the horizon maps indicated that 17 structures were present in the sale area. These structures were considered by Survey as being small in size with less potential for the discovery of producible hydrocarbons than those in the Upper Cook Inlet.

A Survey official stated that, for oil or gas discoveries to be economically developed in the Lower Cook Inlet area the reservoirs have to be four to five times the size as those in the Gulf of Mexico. This is because of expected higher drilling, platform, transportation, and other related costs for the Lower Cook Inlet.

1/A reservoir capable of holding oil or gas. It is formed by a change in the character of reservoir rock from a break in its continuity. For example, the loss of porosity and permeability in a tight sandstone updip forms a stratigraphic trap. Such a trap is much harder to locate than a structure trap because it is not readily revealed by geological or geographical surveys.

There were 67 of the 135 tracts included in the sale identified as containing some portion of the 17 interpreted structures. The remaining 68 tracts contained no structure and were assigned the minimum value.

An analysis of the bidding for the 68 tracts containing no structure generally indicates that industry drew conclusions similar to Survey about the resource potential of these tracts. Generally, the bidding interest was low. For example, of the 68 tracts thought by Survey to be without structure included in Sale CI, 34 (50 percent) received bids. Thirty-two received one or two bids each and none received more than four bids. The following table shows the bid pattern for these 34 tracts.

Number of bids	Number of tracts	Percent of total tracts
1	25	73.5
2	7	20.5
3	1	3.0
4	1	3.0
Total	34	100.0

In addition, many of the bids were close to Survey's presale value. There were 46 total bids for these 34 tracts, 10 were royalty and 36 were cash bonus. Of these 36 cash bonus bids, 24 (52 percent) were from $25 to $50 an acre. The following table shows the bid ranges for the 36 cash bonus bids (royalty bids excluded).

	Bid Ranges				
	$25-50	$51-60	$61-100	$101-110	Over $110
Total bids within range	24	1	1	-	10

In addition to the 68 tracts assigned the minimum value, 33 of the 67 tracts identified as containing some portion of a structure were subsequently valued at minimum after being evaluated on the Monte Carlo Simulation model. This brought the total minimum value tracts to 101. Including tracts in a sale with no or low potential for development increases the risk of investment and reduces the potential for making economic discoveries.

CONCLUSIONS

We believe that limited data existed at the time tracts were selected for inclusion in OCS Sale CI. The 2,300 line miles of seismic data available to select tracts with an average grid spacing of 4 miles by 4 miles did not adequately cover all the 450 tracts in the call area (2.3 million acres). Our review of this seismic coverage available to Survey showed that about 20 percent of the tracts had inadequate (no or limited) seismic coverage. Of these, 65 percent were not offered for sale because Survey had no information by which to judge resource potential. As a result, Survey did not know if some of these tracts were better than others actually offered. Survey had no drilling information, and there were no nearby producing wells to aid in evaluating geologic trends and conditions.

CHAPTER 4

RELIABILITY OF TRACT VALUATIONS

HINDERED BY LIMITED AND POOR QUALITY DATA

Before a sale, each tract offered for lease is evaluated. This estimated value is a primary factor in determining the acceptability of industry bids and in assuring that the Government receives a fair market value return when it leases public resources.

In our June 30, 1975, report to the Congress, we stated that the effectiveness of the Department's OCS evaluation program was being hampered by inadequate data and analysis. Because of poor or missing geological data, the Department was conservatively estimating tract dollar values in undeveloped areas. Our March 7, 1977, report on Sale 35 demonstrated that there wasn't enough data to properly evaluate the resource potential of tracts in that sale. Our analysis of Sale 40 again showed that the Department continued to make tract evaluation decisions without sufficient data. And, our analysis of Sale CI also found this same problem with the Department's evaluation process. Tract value estimates for Sale CI cannot reasonably assure that the public received a fair market value return for each lease offering, particularly since inadequate competition existed for about 60 percent of the tracts.

TRACT EVALUATION PROCEDURES

Before each OCS lease sale, Survey calculates the presale values of tracts offered for lease and the Bureau audits and reviews Survey's evaluation procedure. During the evaluation process, Survey is responsible for providing the specific geological, geophysical, and engineering inputs obtained through in-house analysis of industry data submitted to the Department and through the purchase of seismic data. The Department provides certain economic inputs, such as estimates of oil and gas prices, discount rates, and tax considerations. This information is obtained through review of industry publications, Department guidelines, and independent research.

Survey's field office also furnishes the Bureau reliability categories for each tract, which indicates the adequacy of available geological, geophysical, paleontological, and engineering data, as well as other factors that will be used in the resource evaluation. It then gathers the data

on all tracts and uses a statistical technique--the Monte Carlo Method of simulation 1/--to develop a range of values, mean range of values (MROV), and discounted MROV, normally calculated using a discounted cash flow 2/ for each sale tract.

The simulation method is useful in analyzing problems where there are many uncertainties and data is often poor and based on subjective judgments. It can consider an unlimited number of variables to arrive at the MROV. Some variables considered in the evaluation are porosity, gas-oil ratios, recovery factors, production rates, rate of return on investment, and over 20 other geologic, engineering, and economic parameters and variables.

At least one week before the sale, a Bureau evaluation team reviews Survey's presale tract evaluation review package, which consists of the tract values, reserves estimates, and all pertinent data used in the evaluation process. On the day before the sale, the review team submits to the responsible Survey and Bureau officials a report indicating the results of its review and discussing any area of possible concern regarding selected evaluation inputs.

Immediately after the sale, Survey and the Bureau jointly recommend to the Secretary whether specific bids on the tracts should be accepted or rejected for lease. The primary emphasis in this decision is to receive fair market value. Factors considered in making this determination include Survey's reliability category rating and the high bid as a percent of the MROV, discounted MROV, and the average evaluation. The final acceptance or rejection decision is made by the Secretary.

Survey's presale valuation for the 135 tracts included in Sale CI totaled $79.5 million. A minimum value of $25 3/

1/Monte Carlo is a computerized mathematical model that predicts, in monetary value, the possible future development of a Shelf tract using geotechnical, engineering, and economic data.

2/Discounted cash flow, simply stated, is the present value of future revenues and outlays.

3/The minimum bonus offer the Department will consider for lease acceptance. This includes those royalty tracts with a royalty minimum ranging from 12.5 percent to 16.6 percent.

an acre was placed on 101 (75 percent) of these tracts. These tracts were valued at minimum because Survey believed, based on interpretations, that the tracts contained no resource or an uneconomical amount of resource. Seismic data were available for all the tracts included in the sale. In addition, there was one deep stratigraphic test well (off-structure), 13 nonproducing onshore wells (10 on the east shore and 3 on the west shore), and 17 shallow (none deeper than 46 feet) corehole tests available to help evaluate the individual tracts.

INSUFFICIENT DATA FOR ESTIMATING TRACT VALUES

The Monte Carlo simulation model incorporates over 30 geotechnical, engineering, and economic variables in deriving specific tract values. Deriving these variables requires many judgments and involves many uncertainties which must be weighed and evaluated on the basis of individual experience, knowledge, and choice. The quality and quantity of data from which these judgments are based affects the reliability of the final value assigned to any tract.

There are no universally agreed upon standards to determine the quantity and quality of data needed to make a reliable tract evaluation. Survey personnel, however, stated that three questions must be answered in order to determine the presence of producible hydrocarbons: (1) Does a structure or stratigraphic trap exist (2) what is the porosity and permeability of the rock (3) are hydrocarbons present?

The existence of structures or stratigraphic traps is usually interpreted from seismic tests, while rock porosity and permeability is interpreted from electric logs and deep stratigraphic tests. The presence of commercially producible hydrocarbons can only be actually determined through drilling wells.

If sufficient information exists for identifying the structure and determining the rock porosity and the potential for hydrocarbons, the risk associated with exploring a tract would be reduced. Conversely, as the ability to answer any one or more of these conditions decreases, the risk associated with successfully exploring a tract increases. As a result, the estimated value of a tract increases or decreases as the quantity and quality of the data increases.

Survey assigns a reliability rating to each tract to reflect the extent and adequacy of available technical data used to evaluate the tract. The ratings for Sale CI were the same as Sale 35, which differed from those used for

Sale 40. The different ratings used in Sale 40 were the result of Survey's eastern regional office wanting a new rating category for the Atlantic area.

Five categories were established for Sale CI and Sale 35 ranging from "A to E;" whereas a scale of "A to G" was used in Sale 40. As the reliability category changes from A to E or A to G, the risk factor increases because the technical data used is more limited. Regardless of the number of categories used, it is critical to understand that there are no specific guidelines, criteria, or parameters as to how a tract should be rated. The rating is subjective, based on the definition of each category and the experience of the technical staff making the rating.

All tracts in Sale CI were assigned a "D" reliability rating. Ninety-one percent of the tracts in Sale 35 were also rated as "D." The reliability rating of "E" assigned to all tracts in Sale 40 comes closest to the "D" category used in Sales 35 and CI. The "D" rating used in Sale CI and Sale 35 is defined as a fair to good knowledge of structure, with questionable stratigraphic data on gross sand conditions and depth. The knowledge of geologic risk is considered fair to poor. The "E" reliability rating used in Sale 40 was defined as sufficient seismic control to identify structure, but with no current production and insufficient well control to establish stratigraphic trends and conditions.

Our review of Sale CI showed that the Department had less geologic information to evaluate these tracts than they did for the tracts in OCS Sale 35, but more than they had for OCS Sale 40. The table below briefly summarizes the geologic data available to the Department for the tract evaluations for these three sales.

	Sale 35 (note a)	Sale 40	Sale CI
Number of acres offered	1,260,000	877,000	769,000
Line miles of seismic data for each 1,000 acres	11.1	8.0	14.3
Coreholes	239	0	17
Deep stratigraphic test	21	1	1
Onshore fields studied and characteristics extrapolated	414	0	b/13

a/There were four prospect areas in Sale 35. The 239 coreholes and 20 deep stratigraphic tests were primarily from one prospect area. Eight tracts leased from this prospect area accounted for 53 percent of the total Sale 35 revenue.

b/In addition to the 10 wells on the eastern shore and 3 on the western shore, producing wells in the Upper Cook Inlet were also considered when evaluating the Lower Cook Inlet area.

Under the present leasing program, it is not unusual that limited geologic knowledge exists about frontier OCS areas. We believe, however, that since it is critical to develop domestic energy resources, a systematic approach is needed to evaluate these OCS areas and help manage them in a manner consistent with national energy policies.

The preceding table shows that the Department relied primarily on seismic data to value the tracts in Sale CI. Survey stated that it had adequate seismic coverage in the sale area to suggest that there is a good possibility that commercial quantities of hydrocarbons are present in the Lower Cook Inlet. In addition, the Lower Cook Inlet is part of the same geologic basin as the Upper Cook Inlet, where production is currently taking place.

One Survey regional official stated that much of the seismic data obtained were difficult to interpret because of their poor quality. As a result, Survey acquired interpretations from two commercial companies. One company made interpretations from some of Survey's seismic data, and the second sold Survey some seismic data with corresponding interpretations. These outside interpretations indicated that the structures in the area were larger than what Survey interpreted, thus more tracts would contain structures or portions of structures. However, Survey officials believed that these interpretations had no more validity than their own nor did the interpretations help to resolve the uncertainty regarding the resource potential. Consequently, Survey assigned the minimum value to 50 percent of the tracts included in the sale.

IMPACT OF DEEP STRATIGRAPHIC TEST ON EVALUATION

In addition to the seismic data available for tract evaluation, Survey had data from one deep off-structure stratigraphic test well located on tract 46 (block 489) in the northern section of the sale area. (See map p. 5.) The test was financed by 19 companies, and the results were shared with Survey as required by the permit stipulations. The stratigraphic test was drilled to acquire geologic information and was intentionally located off-structure to reduce the possibility of penetrating significant quantities of hydrocarbons. The information obtained indicated that the porosity of the rocks--a factor needed for hydrocarbons to be present--was poor and not favorable for the entrapment of hydrocarbons. Survey told us that the stratigraphic test was relied on significantly in evaluating the sale tracts--50 percent of the parameters used to estimate the resources were influenced to at least some extent.

A Survey regional official told us that it would have been beneficial to have a second deep stratigraphic test well in the southern section of the sale area. The knowledge obtained from this additional well would have provided Survey with the ability to better correlate seismic with stratigraphic data. The second test could have better assessed the extent to which the conditions, identified in the test areas, existed throughout the sale area. Both we and Survey officials we talked with believe this information would have reduced the risk, better assessed the probable range of the fair market value estimates, and better focused industry capital to tracts with the best potential for resource development. An additional stratigraphic test well, however, was not drilled. The exploration program we have recommended in other reports, and continue to recommend, would provide the impetus for Interior to take the necessary action, including public financing of stratigraphic drilling, to obtain needed data not obtained through industry efforts. The Department currently lacks such a program to foster such action even though Interior officials believe this action is permissible under existing authority. The one stratigraphic test well by itself was inadequate to increase the reliability rating of Survey's tract evaluations because there were no other stratigraphic test wells in the area with which to correlate the data.

COMPETITION IN THE LOWER COOK INLET SALE

The competition in Sale CI was better than in Sale 35, but less than in Sale 40. However, as shown by the following table, there was still a significant proportion of tracts receiving either one or two bids.

Total Tracts Receiving Bids

Number bids on each tract	Sale #35 Number of tracts	Sale #35 Percent	Sale #40 Number of tracts	Sale #40 Percent	Sale CI Number of tracts	Sale CI Percent
1	40	57.1	28	27.7	34	37.3
2	9	12.9	21	20.8	21	23.1
3	4	5.7	7	6.9	11	12.1
4	6	8.6	5	5.0	8	8.8
5	4	5.7	4	4.0	7	7.7
6	3	4.3	5	5.0	6	6.6
7	-	-	8	7.9	4	4.4
8	3	4.3	15	14.8	-	-
9	-	-	7	6.9	-	-
10	1	1.4	1	1.0	-	-
Total	70	100.0	101	100.0	91	100.0

About 60 percent of the tracts in Sale CI receiving bids got only one or two bids. For Sale 35 and Sale 40 respectively, about 70 percent and 49 percent of the tracts bid on got one or two bids.

Other facts regarding the relative competitiveness of these sales are:

--A larger percentage of tracts in Sale CI were bid on than in either Sale 35 or Sale 40 (67 percent of the tracts were bid on in Sale CI, 66 percent for Sale 40, and 30 percent for Sale 35). (See table on p. 4.)

--The average number of bids for each tract in Sale CI was greater than Sale 35 but less than Sale 40 (an average of 2.6 bids per tract for Sale CI, 4.1 bids per tract for Sale 40, and 2.4 bids per tract for Sale 35).

The high percentage of one and two bid tracts in Sale CI is, to us, the primary indicator of inadequate sale competition. As stated in our Sale 35 and Sale 40 reports, a competitive leasing program is based on the premise that competition will provide a fair market value return. When competitive conditions do not exist, however, it becomes increasingly important to have reliable tract values to use as the basis for accepting or rejecting bids. When large percentages of the total tracts in a sale receive one or two bids per tract and are minimally valued based on poor information, there can be no assurance that the public received a fair market value return for the potential resources leased.

We also analyzed the distribution of bids for one and two bid tracts in Sale CI. We found that 52 of the 55 tracts receiving one or two bids were leased. Fifty of these leased tracts were minimally valued by Survey at $25 per acre under the cash bonus bidding system or $25 per acre fixed bonus with less than a 16-2/3 percent royalty rate under the royalty bidding system. The remaining five tracts were valued above the minimums. Of these five, two were leased and three were not leased due to bid insufficiency.

The following table shows that many of the leased tracts receiving one or two bids under the cash bonus system (royalty bid tracts are excluded) were valued by industry close to Survey's minimum. Thirty-two of the 54 industry bids (about 59 percent) were under $61 an acre (23 of the 54 one or two bids were under $41 per acre). The average high bid for all 38 tracts leased under the cash bonus system receiving one or two bids was $489 per acre. The average

high bid for the other 19 tracts leased (tracts with three or more bids) was about 5 times greater--$2,426 per acre. We believe these statistics indicate that speculation was a strong motivating force in bidding on many of these tracts. We continue to believe that greater competition on the OCS is needed.

Frequency Distribution of Bids for Tracts Receiving One or Two Bids and Dollar per Acre Bid

Dollar on acre bid range	Tracts receiving one bid Accepted	Tracts receiving one bid Rejected	Tracts receiving two bids Accepted	Tracts receiving two bids Rejected	Total number of bids in each acre range
$ 25- 50	16	1	2	9	28
51- 60	1	-	(a)	b/3	4
61-100	1	-	1	-	2
101-150		1	1	1	3
over 150	8	-	8	1	17
Total of all one and two bid tracts accepted	26		12		
Total of all one and two bids					54

a/Excludes one tract for failure to obtain an acceptable bid.

b/Includes one tract rejected for failure to obtain an acceptable bid.

Thirty of the 87 tracts leased were under a royalty bidding system with a fixed cash bonus, of which 14 tracts (about 47 percent) had received one or two bids. Twenty-two bids were submitted for these 14 tracts, of which 15 bids were less than a 33-1/3 percent royalty rate. The average high royalty rate accepted for these 14 tracts leased was 33.6 percent. The average high royalty rate accepted for all the other tracts leased (16 tracts leased with three or more bids) was 45.76 percent.

A total of 240 bids were received on the 91 tracts for which bids were received. Twenty-seven companies placed 142 bids on 61 cash bonus tracts, and 29 companies placed 98 bids on 30 royalty tracts. As depicted below, a comparable number of cash bonus and royalty tracts received bids. Of the cash

bonus tracts offered, 68.5 percent received bids, while 65.2 percent of the royalty tracts offered received bids. However, the average number of bids received per tract under each bidding system varied. The average number of bids per tract for the cash bonus tracts bid on was 2.3 and the average number of bids per royalty bid tracts was 3.3.

The cash bonus system requires a large capital outlay, which makes it difficult for smaller firms to acquire tracts. Also, smaller firms are less diversified against the risks of not finding oil or gas than are major firms. The larger average number of bids per tract received on the royalty tracts may indicate that more firms were willing to bid a minimum capital outlay and pay for the resources later if economical discoveries are made. However, the participation by smaller companies for royalty tracts in this sale was not significant enough to measure what effect, if any, the royalty bidding system had on stimulating competition.

RELEVANCE OF DATA TO SALE RESULTS

In our Sale 35 and Sale 40 reports, we presented information which compared Survey's presale values for minimum valued tracts with the average accepted bid on those tracts. That information demonstrated the discrepancies between the Department's presale tract values and the bid amounts received. The analysis showed a large range between the Department's and industry's evaluation.

There were 59 minimum value tracts leased in Sale CI. Forty-three of these tracts were leased under the cash bonus system and 16 were leased under the royalty bidding system. Industry, however, when evaluating these same tracts, frequently drew different conclusions about their value. The average accepted bid per acre for the 43 minimally valued cash bonus tracts was about $478 (about 1,900 percent greater than Survey's value). The average accepted royalty rate for the 16 minimally valued royalty bid tracts was about a 34-percent royalty rate accepted (about 160 percent above Survey's values). In Sale 40 there were 58 minimum value tracts leased. The average accepted bid per acre for these 58 tracts was about $484 (about 2,000 percent greater than Survey's values). While not conclusive, it could be interpreted from the averages that industry either had, or thought it had, information which indicated the tracts to be potentially more valuable than did Survey. Or possibly, some companies believed that because the Lower Cook Inlet was a new area they needed to establish a presence in the area. This latter statement was a reason given by industry for the significant participation in Sale 40.

The results of the uncertainty of the potential value of tracts may cause industry to tie up capital in lands with minimum or no resource potential or buy very good lands for less than fair market value. Until these tracts are further explored and potential resources are developed, no one knows whether the capital sunk into these tracts was excessive or, conversely, will provide a sizeable return for the investment.

CONCLUSIONS

Our review of the Sale CI indicates, as it did for Sale 35 and Sale 40, that the Department had limited data with which to value tracts. We believe this for the following reasons:

--There was less overall information for Sale CI than Sale 35 but more than Sale 40. There was only one deep stratigraphic test off-structure for Sale CI.

--The reliability rating of the tracts in Sale CI was "D," which is the same as the Sale 35 "D" rating and basically equivalent to the "E" rating in Sale 40. The ratings show that, at best, only one of the three parameters necessary for resource evaluation could be identified (structures) by seismic data.

--The competition in Sale CI was better than in Sale 35 but less than Sale 40. There were still a significant number of tracts (60 percent) getting one or two bids each in Sale CI, as compared with 70 percent for Sale 35 and 49 percent for Sale 40. In these kinds of noncompetitive situations, where bidding is not heavy, it is important for Survey to have the best possible geological and geophysical information to protect the public interest.

--The differences in values assigned by Survey and by industry to the minimum value tracts leased differed by an average of more than 1,900 percent for the tracts offered under the bonus bid system.

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS, AND AGENCY COMMENTS

CONCLUSIONS

The Nation's and the world's remaining supplies of oil and natural gas are limited. Some experts estimated that economical resources of oil and gas may only last for another 30 to 40 years, even if growth in their usage is decreased. The Nation greatly relies on the OCS leasing program for meeting our near-term domestic energy needs, particularly while new energy technologies and conservation actions are under development. Decisions regarding where to lease and at what rate will have a significant impact on the future production of OCS resources.

We believe that the operation of the present leasing program is not the best way to develop OCS resources. T present program leases lands on the basis of minimal geologic information. The resource potential of OCS areas offered for lease are based on many assumptions. Even though additional geologic knowledge received from stratigraphic test drilling would be beneficial in identifying and evaluating potential, the Department has not made significant effort to obtain such data.

Our analysis of the data available for tract selection in Sale CI gives little assurance that the best tracts were selected for leasing. Industry nominations continue to be the predominant factor influencing the Department's tract selection. Much of the area that was considered for lease was inadequately examined and tracts were included in the sale despite their apparent low promise of resources. We believe this policy encourages speculation in bidding, can result in tying up limited industry capital in lands with no or minimal resources, and bring into question the public's ability to receive a fair market value return on leased lands.

The oil industry paid a significant amount of capital for leasing rights to Sale CI tracts. This fact in itself, however, is no assurance that energy resources will be found or that fair market value was received. The attainment by industry of more geologic knowledge shared with the Government before that sale might have reduced industry's willingness to bid for those tracts, but a better allocation

of industry capital would have been achieved. In addition, the public would have been better assured of receiving a fair market value return for those leased lands.

We believe, as we previously stated in our Sale 35 and Sale 40 reports, that the Department of the Interior should schedule lease offerings in geographical areas and adequate acreage amounts to meet our near-term domestic energy needs. Before scheduling lease sales, however, the Department should conduct a systematic program to identify the amounts of potential resources available for production on the OCS. Such information would provide

--the Nation with a better knowledge of the total OCS resource potential for the purposes of formulating broad energy policy;

--Interior with a basis for setting priorities on the areas for leasing purposes;

--a better basis than now exists for evaluating resource development potential and potential environmental impacts (both within and between geologic areas) if used in conjunction with the results of available environmental information involving the same geologic areas; and

--more reliable valuing of tracts to assure that the public receives a fair market value return for the lease offerings.

RECOMMENDATIONS TO THE SECRETARY OF THE INTERIOR

The Secretary of Interior should take the following actions.

--Direct a geological exploration program which would provide for the development and implementation of a systematic plan for appraising Outer Continental Shelf oil and gas resources, including selected stratigraphic test drilling. The plan should identify the level of stratigraphic drilling necessary to provide a minimal level of data coverage for major OCS areas.

--After the plan has been developed, encourage private industry to conduct the drilling identified in the plan subject to the developed information being

shared with Interior on a confidential basis. Exploration permits issued by the Department for private drilling should provide the opportunity for any bona fide potential bidder to "buy-in" on the exploration by paying a pro-rata cost of the drilling.

After the extent of industry participation is known, if any data gaps still exist, take the necessary actions, including public financing of stratigraphic drilling, to obtain the needed data.

--In addition, after obtaining and evaluating the above information, take the necessary steps to encourage industry to obtain further information after the tract selection process is completed. These additional activities should focus on the specific tracts selected and help develop reasonably sound information for presale evaluation purposes. The results again should be shared with Interior on a confidential basis. Exploration permits issued by the Department for private drilling should provide the opportunity for any bona fide potential bidder to "buy-in" on the exploration by paying a pro-rata cost of the drilling.

After the extent of industry participation has been reviewed and evaluated by Interior, if any significant data gaps exist, take the necessary actions, including publicly financed stratigraphic drilling, to obtain data.

--Offer for lease sale only those areas for which the Department has collected and analyzed sufficient information to adequately identify where the resources are, their estimated value, and their potential for development in the near future.

--Evaluate the questions of whether it is in the national interest for prelease drilling to be either on-structure or off-structure.

These recommendations are essentially the same as the ones stated in our Sale 35 and Sale 40 reports and our March 7, 1977, letter to the Secretary of the Interior.

RECOMMENDATION TO THE CONGRESS

Selecting high resource development potential tracts for sale and valuing them reliably to help assure that the public receives a fair market value return can only be accomplished effectively if sufficient geotechnical data exists at the time decisions are made.

In April 1975, we testified before the Senate Committees on Interior and Insular Affairs and Commerce regarding the need for improved policies and procedures for the rational exploration and development of OCS fossil fuel resources. At that time, we endorsed the overall thrust of the legislation designed to improve the Government's ability to deal with OCS exploration and development problems.

In March 1977, we again testified before the House Ad Hoc Select Committee on the Outer Continental Shelf and the Senate Committee on Energy and Natural Resources. We discussed at those hearings deficiencies in the OCS leasing program, particularly in tract selection and evaluation. We commented that the recommendations in our report were generally in line with the thrust of provisions in bills S. 9 and H.R. 1614. At that time S.9 contained a mandatory directive to the Secretary to contract on behalf of the Federal Government for exploratory drilling. That directive was deleted during the course of markup by the Senate Committee in May/June 1977, but a comparable provision was reinstated in the July Senate floor debate. This provision has been deleted from H.R. 1614.

The deficiencies discussed in this report, and our previous reports, are currently being considered by the 95th Congress in bills S. 9 and H.R. 1614, which would amend the OCS Lands Act of 1953. Currently, both bills have passed their respective Houses of Congress and have been presented to the Joint House/Senate Conference Committee.

We believe our review of OCS Sale CI provides additional support for the passage of legislation which would not only allow, but would require, the Secretary to take the actions recommended in this report.

AGENCY COMMENTS

In commenting on this report, the Department (see app. IV) stated that it and the administration have recommended to the Congress that the OCS Lands Act amendments provide the Secretary the authority to develop and implement a program of prelease exploration which he determines to be appropriate. They further state that, although this is consistent with our recommendations to the Congress, our report includes more specific recommendations to the Secretary. The Department does not believe that the data and analysis contained in this report or its predecessors on OCS lease sales 35 and 40 lead to such specific positions. The Department would favor instead a general recommendation that it develop a prelease exploration program.

The principal thrust of our recommendations is that the Department both develop and implement a prelease exploration program. We have been as specific as we can in our recommendations in terms of basic elements and principles which should be embodied in such a program. We continue to believe that the evidence is clear that the Department has yet to develop a systematic exploration program including public financing of stratigraphic test drilling. The program we recommend would provide minimum drilling data in areas where efforts to encourage industry to undertake such drilling are not successful. These actions are permissible under existing authority. Consequently, we believe the recommendations that we continue to make to the Secretary of the Interior are appropriate.

We disagree with the Department's statement that the report's conclusions are not fully supported by the data and analysis contained in the report. In this regard, our specific comments on the principal points made by the Department follow.

Tract selection and evaluation

The Department stated that the data on hand at the time tracts were selected and at the time tracts were evaluated was neither insufficient nor inadequate. They further stated that throughout the report, we compare the data base with hypothetical, undefined standards.

The evaluation process, according to the Department, must remain a technical judgment carried out by the Department using established evaluation techniques to arrive at a reasonable evaluation of oil and gas properties. These techniques are designed to handle uncertainties, reduce subjective judgments, and determine the most probable value of a tract.

In our report, we state that "There are no universally agreed upon standards to determine the quantity and quality of data needed to make reliable tract evaluation." We are aware that the determination of sufficient and adequate data to select and evaluate tracts are technical judgments of the the Department. In performing our review of the Department's OCS lease sale program, we used the Survey's own stated criteria for selecting and evaluating tracts.

Survey personnel stated that three questions must be answered in order to determine the presence of commercially producible hydrocarbons: (1) Does a structure or stratigraphic trap exist, (2) what is the porosity and permeability of the rock, and (3) are hydrocarbons present? We believe that, with the information available to the Department, they could only have reliably answered question (1) and this could only have been accomplished after the tracts had been selected.

The Department's response stated that a 4 mile by 4 mile seismic grid would be considered most adequate for tract selection by anyone involved in marine exploration. However, Survey officials had previously told us that to identify and evaluate major structures the seismic grid should be 2 miles by 2 miles, evenly spaced. And, for small structures, a smaller seismic grid is required. When a 4 mile by 4 mile seismic grid does not cover all the tracts in an area subject to a proposed OCS lease sale, we believe this kind of coverage is inadequate. Consistent with Survey's criteria, we believe the seismic data for Sale CI, being 4 miles by 4 miles, was not adequate to identify and evaluate the structures contained in all the tracts.

Our review of the seismic coverage available to Survey showed, at the time of the tentative tract selection, that about 20 percent of the tracts had inadequate (no or limited) seismic coverage. As a result, Survey did not know if some of these tracts were better than others actually offered. Survey had no drilling information, and there were no nearby producing wells to aid in evaluating geologic trends and conditions.

In order to answer the second question, Survey must have knowledge of the porosity and permeability of the rock for the entire sale area. However, only one deep off-structure stratigraphic test well was drilled in the northern section of the sale area. The results of this one deep stratigraphic test indicated that the porosity and permeability of the rock in the test area was poor and not favorable to the entrapment of producible hydrocarbons. There were no other stratigraphic tests conducted in the sale area and the one stratigraphic test was relied on significantly in evaluating the sale tracts--50 percent of the parameters used to estimate the resources were influenced to at least some extent. Additional tests could have given Survey a better understanding of conditions throughout the sale area.

We believe that a second stratigraphic test in the sale area would have reduced this risk, assessed the probable range of the fair market value estimates better, and focused industry capital on tracts with the best potential for resource development. The exploration program we have recommended in other reports, and continue to recommend, would provide the impetus for Interior to take the necessary action, including public financing of stratigraphic drilling, to obtain needed data not obtained through industry efforts.

Structural flank tracts

The Department stated that structural flank tracts 1/ and high nomination tracts with apparent low resource potential are often included to give recognition to the fact that highly qualified professionals can disagree on the hydrocarbon potential of a tract and this disagreement can occur no matter how much data are available.

We agree that tracts evaluated to contain some portion of an identified structure should be included in an OCS lease sale. A distinction should be made, however, between such tracts and those "high nomination tracts." The fact that tracts are highly nominated does not necessarily insure the possibility that commercially producible hydrocarbons are present. Some companies nominate many tracts for inclusion in an OCS lease sale to camouflage their true interest in specific tracts. Consequently, we believe OCS

1/Structural flank tracts are those tracts which contain the bottom or beginning of the structure. This bottom or beginning of the structure is considered the least probable portion of a structure to contain producible hydrocarbons.

lease sales should not include tracts based solely on industry nominations. Tracts should be included in an OCS lease sale where industry interest is apparent and there is evidence of resource potential. Only by an analysis of geological and geophysical data can the resource potential of each tract be assessed.

In addition to the above comments on our draft report, the Department had several additional specific comments. (See pp. 39 thru 43.) We considered each comment carefully in preparing our final report and made revisions as appropriate.

APPENDIX I

NINETY-FIFTH CONGRESS

JOHN M. MURPHY, N.Y., CHAIRMAN

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U.S. House of Representatives
Ad Hoc Select Committee on
Outer Continental Shelf
Washington, D.C. 20515

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CHARLES A. BEDELL
MERCHANT MARINE AND FISHERIES

December 1, 1977

The Honorable Elmer B. Staats
Controller General of
the United States
Washington, D.C.

Dear Mr. Staats:

I should like to request that the General Accounting Office study and report to me on the Department of Interior Cook Inlet oil and gas lease sale held on October 27, 1977 in Anchorage, Alaska. I expect that this report would be prepared using a similar methodology as your report EMD-77-19, dealing with OCS Sale No. 25, offshore Southern California, and EMD-77-51, dealing with OCS Sale No. 40, offshore mid-Atlantic; and in such a format that the information and conclusions of the reports may be compared.

As you may know, on October 25, 1977, the House Rules Committee voted to defer until next session consideration of a rule for H.R. 1614, the Outer Continental Shelf Lands Act Amendments of 1977. This delay provides the opportunity to develop an analysis of the competitive aspects, the reliability of tract evaluations, the use of royalty and bonus bidding from a comparative standpoint, and other facets of the recent Cook Inlet sale. Because of its previous experience on the two referenced studies, I feel that the GAO is best qualified to conduct such a study. However, due to the short timeframe involved, i.e., a due date of late January, it is expected that the report would be somewhat briefer than the two previous efforts. I feel that the above-mentioned analysis would provide additional information related to the need for OCS reform, particularly since the Cook Inlet sale involved a substantial increase in the use of royalty bidding on the part of the Interior Department.

The Honorable Elmer B. Staats
December 1, 1977
Page Two

I would appreciate it if Mr. Canfield or a member of his staff would contact Martin H. Belsky, Chief Counsel of the OCS Committee, at the earliest possible date regarding this request.

With kind personal regards, I remain,

Sincerely,

JOHN M. MURPHY
Chairman

JMM:mbg

APPENDIX II

SURVEY DEFINITIONS OF EVALUATION RELIABILITY CATEGORIES USED IN SALE 35 AND SALE CI

A. Has drainage and has excellent control, good data, with little (relative) uncertainty with regard to exploratory value.

B. Good knowledge and good well or geophysical control, may have some production data; part of evaluation has some doubt, especially if the exploratory portion is large.

C. Good knowledge of structure configuration and size; well control may be interpolated into tract to predict sand conditions, depth, and hydrocarbon potential; good knowledge of geologic risk.

D. Fair to good knowledge of structure configuration and size. Poor to no well control. Stratigraphic data may or may not be adequate to predict gross sand conditions and depth; fair to poor knowledge of geologic risk.

E. Poor to very poor well control, useful geophysical data sparse to nonexistent, stratigraphic data poor. Poor knowledge of geologic risk.

SURVEY DEFINITIONS OF

EVALUATION RELIABILITY CATEGORIES

USED IN SALE 40

A. Actual drainage is taking place or would be taking place when production facilities are established. Production data and/or test data available on offsetting wells. Good idea of reserves. Seismic data may be available, but not necessarily required.

B. Possible drainage and/or development. Less well control than rating A. Structure may be confirmed by seismic data to some extent. Some idea of reserves.

C. No drainage involved. On trend with known production. Sufficient well control to establish stratigraphic trends and conditions. Sufficient evidence from either subsurface control or seismic to identify structure.

D. No production on trend. Sufficient well control to establish stratigraphic trends and conditions. Sufficient seismic control to identify structure.

E. No production or trend. Insufficient well control to establish stratigraphic trends and conditions. Sufficient seismic control to identify structure.

F. Stratigraphic and structural information poor, but some idea of structure should be known.

G. Insufficient stratigraphic and structural information. Very little opinion of actual value.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APR 12 1978

Mr. Monte Canfield, Jr.
Director
Energy and Minerals Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Canfield:

Members of my staff met with Harry Wolfe on March 20, 1978, to give him our oral comments on the draft of the report entitled "Outer Continental Shelf Sale CI--Need to Improve Selecting and Evaluating Lands to Lease." We offer the following written comments.

As you know, the Department of the Interior and the Administration have recommended to the Congress that the OCS Lands Act Amendments provide the Secretary the authority to develop and implement a program of pre-lease exploration which he determines to be appropriate. Although this is consistent with the GAO's recommendation to the Congress, your report includes more specific recommendations to the Secretary. We do not believe that the data and analysis contained in this report and its predecessors on OCS lease sales #35 and #40 result in reaching such specific conclusions.

It is particularly important, in our view, that the development of a pre-lease exploration program be based upon careful study of the issues and the development of criteria.

The Department of the Interior recommends that the specific approach to pre-lease exploration be deleted from this report and that it be replaced by a recommendation for development of a program. Specific comments are enclosed.

Sincerely,

Larry [illegible]
Assistant Secretary--Policy,
Budget and Administration

Enclosure

Comments on GAO Outer Continental Shelf Sale CI
Need to Improve Selecting and Evaluating Lands to Lease

General Comments

As was the case with previous GAO reports, the Cook Inlet report represents an idealized and oversimplistic analysis.

The report uses general and value-laden terms such as "unreliable selection of tracts", "unreliable estimates of work", "reliable tract values", "reliable data", "limited data", etc., without discussing or defining the terms.

Data on hand at the time tracts were selected and at the time tracts were evaluated were neither insufficient nor inadequate. Throughout the report the data base is compared with a hypothetical, undefined standard. However, on page 27 the report states that "There are no universally agreed upon standards in existence to determine the quantity and quality of data needed to make a reliable tract evaluation." This is and must remain a technical judgment based on each individual area.

The evaluation process is carried out using established evaluation techniques to arrive at a reasonable evaluation of oil and gas properties. These techniques are designed to handle uncertainties, reduce subjective judgments, and determine the most probable value of a tract.

Specific Comments

Digest, Pages i, ii, iii

The report states "The Department of Interior's policy of leasing OCS lands that have not been properly evaluated (because of limited data) encourages industry to speculate in lands believed to contain no or minimal resources and does not guarantee that the public receives the fair market value for these leased resources."

It is not the policy of the Department to lease OCS lands that have not been properly evaluated, and the evaluation process is designed to ensure that a fair value is received for the leased rights. The report does not, nor attempt to, make the case that the public receives less than fair value for the leased rights.

The reports states that "Interior selected tracts for lease after reviewing limited data and before assessing the true resource development potential of the land." Further, it states "Sale CI evaluations were unreliable--made with limited and poor quality data." Data on hand at the time tracts were evaluated were sufficient and adequate to make an evaluation. At the time of tract selection geophysical data were adequate to make an estimate as to where the structures were located in the nominated area.

During the evaluation process, the Survey had sufficient geophysical data covering the Lower Cook Inlet area to make an evaluation of the tracts selected for lease. The amount of geological and geophysical data necessary for tract evaluation varies from tract to tract depending upon technical parameters such as (1) structure placement on the tract, (2) the complexity of the structure and (3) variation of the structure with depth. There appears to be no technical basis for the conclusion that the Geological Survey had limited data and the assessment of the resource potential of the CI sale was unreliable.

Page 8, First Paragraph

GAO states that current programs encourage industry to speculate and tie up significant amounts of capital in lands with less potential.

Structural flank tracts and high nomination tracts with apparent low resource potential are often included to give recognition to the fact that highly qualified professionals can disagree on the hydrocarbon potential of a tract and this disagreement can occur no matter how much data are available.

Page 15, First Paragraph

"As a result of the seismic grid being 4 by 4 miles at tract selection for sale Cook Inlet, we believe the seismic data was not adequate and couldnot reliably identify which tracts contained the outer portions of the structures."

Both statements reveal the lack of understanding of the program. A 4- by 4-mile seismic grid would be considered most adequate for tract selection by anyone involved in marine exploration.

Page 18, Last Paragraph and Page 19, First Paragraph

The discussion of the 15 tracts which were supposedly added because of additional seismic data is incorrect. These tracts were added because of a reassessment of environmental concerns; it was determined that measures were available to protect the resources in this area of relatively low water circulation. The definition of null zone is wrong-- the null zone is merely an area of low water circulation and has nothing to do with hydrocarbon potential.

Page 23, First Paragraph

The report states "Including tracts in a sale with no or low potential for development increases the risk of investment, generates speculation, and reduces the potential for making economic discoveries."

We do not believe that the present tract selection and evaluation process encourages industry to speculate, but rather opportunity is afforded to lease and explore lands which industry must also evaluate for resource potential. Speculation is a "way of life" in the search for oil and gas where assumptions on petroleum occurrences are based on many uncertainties inherent in petroleum exploration. In this sense, speculation is a useful, not an immoral process for the efficient exploration and discovery of hydrocarbons.

Page 25, First Paragraph

"The Bureau provides...." should be replaced by "The Department provides...."

Page 26, Last Paragraph

"A minimum value of $25...."

The Survey placed a value of $25/acre on 105 tracts (not 101), 11 of which were royalty bid tracts.

Page 30, Deep stratigraphic test, sale #35

Although some deep stratigraphic tests were drilled under State permits, only one deep stratigraphic test was drilled under a Federal permit.

Page 31, Second Paragraph

"...seismic data obtained was difficult to interpret because of its poor quality."

Seismic data were poor in Cook Inlet because of certain geologic conditions which result in weak reflections from subsurface rock boundaries.

"To help alleviate some of this difficulty...."

This statement is not correct. The additional interpretation was not done in order to improve the data, but rather to conduct an independent analysis of the data used in evaluation which is a proper procedure used by the Geological Survey to provide a regional interpretation. This pemits the Geological Survey to focus on specific tracts to be included in the sale.

Page 31, Last Paragraph

"In addition to the seismic data...."

As part of the seismic data package purchased from Geophysical Corporation of Alaska, an interpretation was included. This single purchase includes perhaps 15% of the total data used.

Page 34, Last Paragraph

"Fifty of these leased...."

There is incorrect information throughout the paragraph. The following is correct information:

APPENDIX IV

In the CI Sale, there were 55 tracts that received 1 or 2 bids. Fifty-two of which were leased, the remaining 3 were rejected. Forty-seven tracts out of the 55 were valued by the Geological Survey at the minimum which is $25/acre and 16.6% royalty rate for bonus tracts and $25/acre and 12.5% royalty rate for royalty bid tracts. One other royalty tract was valued at another minimum prescribed by the Department which is $50/acre and 12.5% royalty rate. The remaining 7 tracts were valued by the Survey above the minimum of $25/acre and 16.6% royalty rate and $25/acre and 12.5% royalty rate; on 3 of which high bids were rejected.

Page 37, Last Paragraph

"There were 59 minimum value tracts in CI Sale."

Our figures give 57 minimum tracts in which 43 were bonus tracts and 14 were royalty tracts.

Next to the last line--there were 14 minimally valued royalty bid tracts, instead of 16.

Page 38, Conclusions

The report gives the erroneous impression that the GAO analyses of sales 35 and 40 are an accepted standard.

Page 39, Third Bullet

"The competition in Sale CI"

In examining the bidding behavior in Sale CI, our reviewers find that the competition for tracts having positive Geological Survey pre-sale values averaged about four bids per tract for tracts offered for cash bonus bidding and five bids per tract for tracts offered for royalty bidding which means that competition existed on these tracts. This also means that the industry as well as the Geological Survey believes that these tracts have good potential for oil and gas.

Page 45, Recommendations to the Congress

The Survey has had the necessary geotechnical data at each decision point in the OCS lease sale process. If sufficient data are not available, that decision is delayed.

PRINCIPAL OFFICIALS

RESPONSIBLE FOR ADMINISTERING

ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DEPARTMENT OF THE INTERIOR		
SECRETARY OF THE INTERIOR:		
Cecil D. Andrus	Jan. 1977	Present
Thomas S. Kleppe	Oct. 1975	Jan. 1977
Kent Frizzell (acting)	July 1975	Oct. 1975
Stanley K. Hathaway	June 1975	July 1975
Kent Frizzell (acting)	May 1975	June 1975
Rogers C. B. Morton	Jan. 1971	May 1975
ASSISTANT SECRETARY OF THE INTERIOR--ENERGY AND MINERALS:		
Joan M. Davenport	Apr. 1977	Present
William D. Bettenberg (acting)	Jan. 1977	Apr. 1977
William G. Fischer (acting)	Jan. 1976	Jan. 1977
Jack W. Carlson	Aug. 1974	Jan. 1976
King Mallory (acting)	May 1974	July 1974
Stephen A. Wakefield	Mar. 1973	Apr. 1974
John B. Rigg (note a)	Jan. 1973	Mar. 1973
Hollis M. Dole	Mar. 1969	Jan. 1973
ASSISTANT SECRETARY OF THE INTERIOR--LAND AND WATER RESOURCES:		
Guy R. Martin	Apr. 1977	Present
Christopher G. Farrand (acting)	Jan. 1977	Apr. 1977
Jack O. Horton	Mar. 1973	Jan. 1977
ASSISTANT SECRETARY OF THE INTERIOR--PUBLIC LAND MANAGEMENT (note b)		
Harrison B. Leosch	Apr. 1969	Jan. 1973

---

a/Deputy Assistant Secretary in charge.

b/Became Office of Assistant Secretary--Land and Water Resources--in March 1973 reorganization.

	Tenure of office	
	From	To
ASSISTANT SECRETARY OF THE INTERIOR--POLICY, BUDGET, AND ADMINISTRATION: (note c)		
(Vacant)		
Deputy--Larry Meierotto (principal)	Jan. 1977	Present
ASSISTANT SECRETARY OF THE INTERIOR--PROGRAM DEVELOPMENT AND BUDGET:		
Heather L. Ross (acting)	Jan. 1977	Present
Ronald G. Coleman	May 1976	Jan. 1977
Stanley D. Doremus (acting)	Feb. 1976	May 1976
Ryston C. Hughes	Feb. 1974	Feb. 1976
Laurence E. Lynn	Apr. 1973	Feb. 1974
ASSISTANT SECRETARY OF THE INTERIOR--PROGRAM POLICY: (note d)		
John W. Larson	Apr. 1969	Apr. 1973
DIRECTOR, GEOLOGICAL SURVEY:		
H. William Menard	Mar. 1978	Present
William A. Radlinski (acting)	Jan. 1978	Mar. 1978
Vincent E. McKelvey	Dec. 1971	Jan. 1978
William A. Radlinski (acting)	May 1971	Dec. 1971
DIRECTOR, BUREAU OF LAND MANAGEMENT:		
Frank Gregg	Feb. 1978	Present
George L. Turcott (acting)	July 1977	Feb. 1978
Curt Berklund	July 1973	July 1977
Burton W. Silcock	June 1971	July 1973

c/Became Office of Assistant Secretary--Policy, Budget, and Administration--in January 1977 reorganization.

d/Became Office of Assistant Secretary--Program Development and Budget--in April 1973 reorganization.

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