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DATE 02/15/85 STATE OF ALASKA
TIME 13:07:27.4 DEPT OF NATURAL RESOURCES

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STATE OF ALASKA
DEPT OF NATURAL RESOURCES

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Union Information / Grayling No. 1
3/10/82

ALASKA DEPARTMENT OF NATURAL RESOURCES

IN THE MATTER OF THE APPLICATION
FOR DISCOVERY ROYALTY BY THE UNION
OIL COMPANY OF CALIFORNIA AND
MARATHON OIL COMPANY (ADL 17594)

State of Alaska
Department of Natural Resources

OPINION IN SUPPORT OF DECISION

This decision concerns the application made by the Union Oil Company of California and Marathon Oil Company, co-lessees of state oil and gas lease ADL 17594, for discovery well certification of the Grayling No. 1-A well. On January 19, 1982, I issued a written decision confirming my November 13, 1981, determination which granted the application. This opinion contains my findings and conclusions which support the discovery royalty award to Union and Marathon.

In order to provide a context for the issues addressed by this decision, a chronological review of all pertinent events also will be presented. This review covers (1) the geologic evolution of Cook Inlet and the formation of the features which produced the hydrocarbons at issue, (2) antecedent federal laws and regulations concerning discovery royalties and geologic structures, (3) the laws and programs adopted by Alaska at statehood, (4) the leasing and development of Cook Inlet for oil and gas purposes, and (5) the sequence of discovery royalty applications and awards considered under the state discovery

royalty program. Finally, this decision will evaluate the Union-Marathon application and the issues pertaining to it.

I. INTRODUCTION.

On May 9, 1965, Union Oil Company of California and its partner, Marathon Oil Company ("Union-Marathon"), commenced a well, Trading Bay No. 1, in Cook Inlet on state lease ADL 18731. This well was plugged and abandoned the same day because the surface casing being set in the well parted. On May 10, Union commenced the Trading Bay No. 1-A well from the same location. At the time, the State of Alaska had an incentive program in the form of a discovery royalty to encourage oil and gas development in the state. A discovery royalty reduced the normal 12.5% royalty rate to 5% for ten years from the date of "discovery" for all production from the lease where a lessee had made the first discovery of commercial hydrocarbons on a new geologic structure. Sec. 18, Ch. 30, SLA 1964.*/ Union-Marathon's Trading Bay No. 1-A well encountered commercial quantities of oil in what became known as the Trading Bay Field. They were awarded a discovery

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*/ The applicable law at the time was AS 38.05.180(a). The relevant provisions of this law were first enacted as subsection 7, section 3, article VIII, chapter 169, SLA 1959, which was amended by section 18, chapter 30, SLA 1964. Legislative amendment in 1967 curtailed the discovery royalty program, which was abolished in 1969. 1967 Alaska Sess. L., ch. 91, § 2; 1969 Alaska Sess. L., ch. 65, § 1.

royalty for this lease by the Department of Natural Resources ("department") on August 27, 1965.

Union-Marathon, after further defining their Trading Bay discovery with two additional wells, moved their drilling barge approximately five miles south and commenced the Grayling No. 1 well on September 2, 1965. This well, too, was plugged and abandoned as a result of mechanical problems. The Grayling No. 1-A well was commenced immediately. Again, Union-Marathon found commercial quantities of hydrocarbons in what was to become known as the McArthur River Field. They filed an application for discovery royalty with the department on November 15, 1965, for state lease ADL 17594, which is adjacent to state lease ADL 18731.

It is at this point that the controversy giving rise to this decision began. Under the law, only one discovery royalty could be issued on any new geologic structure found to contain commercial hydrocarbons. 11 AAC 83.215(1) (repealed November 9, 1979).*/ The dispute has centered around whether the Trading Bay and McArthur River fields are separate geologic structures, which would permit discovery royalty certification of both the Trading Bay No. 1-A and Grayling No. 1-A wells, or are both part of a single dominant geologic structure, in which case approval of

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*/ Formerly 11 AAC 505.745(a).

Union-Marathon's application on the Grayling No. 1-A well would not be permissible.

On January 26, 1966, the department issued a decision denying the Union-Marathon discovery royalty application for the Grayling No. 1-A well on the ground that insufficient information existed to determine that the Trading Bay and McArthur features were not part of a single structure. Specifically, department geologists were concerned that shallow productive sands might continuously overlap the larger Hemlock reservoirs on both features, even though the Hemlock zones appeared to be separated by a major fault system and displaced by more than 3,000 feet.

Although the scant geologic data at the time prevented a definitive conclusion on the overlap questions, discovery royalty regulations required that information in support of an application be filed within 90 days after the well had been tested for commercial quantities (which had taken place from November 6-8, 1965). 11 AAC 83.210(c) (repealed November 9, 1979).*/ The denial was based on the information submitted within that 90-day time frame.

On February 14, 1966, Union-Marathon petitioned the department for reconsideration and interpretation of its decision

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*/ Formerly 11 AAC 505.744.

of January 26, 1966, denying the Grayling No. 1-A discovery royalty application. Their petition was made at least partially in response to encouragement from members of the department. Because of disagreement within the department over procedural and substantive questions relating to discovery royalties, no reply was given until October 31, 1968, at which point the commissioner granted Union-Marathon 60 days in which to submit more information. On December 30, 1968, Union-Marathon filed additional geologic information developed during the period since January 1966 and requested that the matter be set for hearing. On February 26, 1970, then natural resources commissioner Kelly established a hearing date of April 17, 1970, but notified Union-Marathon that only the information filed or developed within the original 90-day period would be considered. At the hearing, Union-Marathon submitted more new geologic information, and thereafter sent the commissioner a letter stating why he should consider the evidence acquired after the original 90-day period had expired. On October 7, 1970, Commissioner Kelly issued a decision denying Union-Marathon's application for the discovery royalty based on the evidence submitted within the 90-day period.

Union-Marathon then sought review in the superior court, which remanded the matter to the commissioner for a new decision, including a statement of the basis for the decision. On February 17, 1972, the commissioner reaffirmed his earlier

decision on the basis that insufficient information was submitted within the 90-day period to determine whether or not there were two separate structures. Union-Marathon again sought review in superior court. The court dismissed the appeal on grounds of lack of jurisdiction. Union-Marathon then appealed to the supreme court which reversed on the jurisdictional issue and remanded the case for further consideration. Union Oil Co. of Cal. v. State Dept. of Nat. Resources, 526 P.2d 1357 (Alaska 1974). On remand the superior court concluded that the commissioner of natural resources could not legally consider the after-acquired evidence and that the original decision was sustainable on the basis of the evidence submitted within the 90-day period. From that decision, entered July 31, 1975, Union-Marathon again appealed to the supreme court.

In its decision, dated February 10, 1978, the Alaska supreme court remanded certain questions relating to this application to the commissioner of natural resources for determination. Union Oil Co. of Cal. v. State, 574 P.2d 1266 (Alaska 1978). The threshold question was whether the 90-day limit of 11 AAC 505.744 (recodified as 11 AAC 83.210(c) (repealed November 9, 1979)) on submitting data regarding geologic structure was unreasonable as applied to Union and Marathon. If so, the commissioner was ordered to receive additional evidence regarding geologic structure and to rule on the application on the basis of all the data submitted.

In compliance with the supreme court's order, I first determined that the 90-day limitation, as applied to the applicants in this case, was unreasonable.*/ Thereafter, I received additional evidence concerning the issue of whether the Grayling 1-A well was the first discovery of oil or gas in a new geologic structure.

With the goal in mind of sustaining Commissioner Kelly's decision, several officials of the Alaska Department of Law (including then deputy attorney general Wilson L. Condon and then assistant attorneys general Susan A. Burke and Jeffrey B. Lowenfels) undertook an extensive effort to gather evidence which would challenge the validity of Union's and Marathon's claims. As part of this effort, they traveled extensively throughout the United States and conducted numerous interviews with federal officials employed by the United States Department of the Interior, including the United States Geologic Survey ("USGS"), who were intimately familiar with implementation of the federal discovery royalty program and the concept of a "known geologic structure of a producing oil and gas field" ("KGS"). Interviews were conducted with Interior official in Washington, D. C., and USGS officials in Langley, Virginia; Casper, Wyoming; Denver, Colorado; and Los Angeles, California. Among those federal officials interviewed was Emmett A. Finley, former chief of the Minerals Classification

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*/ See Part VI of this opinion.

Branch of USGS and author of USGS Circular 419, which purported to codify USGS practice in administering the KGS system. Interviews were also conducted within Alaska with state officials from the departments of Revenue and Natural Resources who were familiar with the state's discovery royalty program.

The Department of Law also compiled a glossary of all geologic terms relevant to the definition of the term "geologic structure" and prepared a comprehensive documentary history, in seven volumes, describing the development and administration of the discovery royalty provision of AS 38.05.180(a). Volume I (entitled "Summary of Documents") is a summary of their findings; it discusses certain federal oil and gas leasing practices (summarized in Section III of this opinion); describes the evolution of the Alaska Land Act and the Alaska oil and gas lease form (summarized in Section IV of this opinion); and traces the history of early oil and gas discoveries in the Cook Inlet region, the development of regulations governing discovery royalties, and the administration of those provisions with respect to applications for discovery awards on state leases in the Cook Inlet region (summarized in Section V of this opinion). Volume II describes the territorial and state administrative organization for the oil and gas from 1958 to 1970 (Appendix A), the evolution of the oil and gas lease form (Appendix B), and oil and gas development in the Cook Inlet region (Appendix C) and contains copies of the relevant affidavits (Appendix D). Volumes

III - VII are an extensive compilation of the correspondence and other documents which are summarized in Volume I.

Beginning March 13, 1980, I held a hearing to enable the applicants to submit additional evidence in support of their application. In preparation for that hearing, I had reviewed the following materials:

1. the Summary of Documents and appendices;

2. the documents referred to in the summary;

3. a videotape of a deposition of Emmett A. Finley and the exhibits submitted at that deposition;

4. the maps submitted in support of the applications for discovery certification of Union-Marathon's Trading Bay State No. 1-A well, Union-Marathon's Kustatan No. 1 and 1-A wells, Atlantic Richfield's West Foreland Unit No. 3 well, Texaco's Trading Bay No. 1 and 1-A wells, and the Grayling No. 1 and 1-A wells;

5. information submitted in support of the application for discovery well certification of Atlantic Richfield's Trading Bay State No. 1 well, including: the baroid mud log and dual induction laterolog submitted with the affidavit of

establishment of priority as to time and date on June 7, 1967; the materials submitted to the Oil and Gas Conservation Committee on September 27, 1967, to establish a separate geologic structure, including an evaluation of the mechanical logs (Exhibit 1), a structure contour map (Exhibit 2), a structural cross section -- $A\text{-}A^1$ (Exhibit 3), completion information drafted on an electric log (Enclosure 1), and a core analysis -- cores 1-10 (Enclosure 2); additional information supporting the application transmitted on December 30, 1968, including a structure contour map (Exhibit 1), an east-west cross section -- $A\text{-}A^1$ (Exhibit 2), and an east-west cross section -- $B\text{-}B^1$ (Exhibit 3); and exhibits presented at the hearing before the commissioner of natural resources on April 16, 1970, including a structural contour map of the Hemlock formation in the Trading Bay and North Trading Bay fields (Exhibit 1) and a structural contour map of the Hemlock formation showing producing trends in the Cook Inlet Basin (Exhibit 2);

6. all materials submitted by Union-Marathon through March 13, 1980, including the "blue box" and accompanying geologic reports; the light blue folders submitted at the April 17, 1970, hearing; and Volume III of the green folders, dated September 28, 1979, including the redrawn maps which were submitted later; and

7. all available information from Union-Marathon's Trading Bay State No. 2 and No. 3 wells which were drilled in the

late summer of 1965 and Union-Marathon's A-20 well drilled from their Monopod Platform on July 24, 1977.

Also in preparation for the hearing, I interviewed Tom Marshall, a petroleum geologist formerly employed by the state Oil and Gas Conservation Committee, regarding state administrative practices relating to discovery royalty applications and his understanding of Cook Inlet geology; William Van Alen, a petroleum geologist from the Alaska Oil and Gas Conservation Commission, on the structural history of the Trading Bay area; and William Van Dyke, a reservoir engineer employed by the division of minerals and energy management, regarding his interpretation of the well data in state files and Union-Marathon's interpretation of that data as depicted in their exhibits.

At the hearing testimony was given by Thomas Wilson, Jr., who worked as a geologist for Marathon Oil Company and had participated in joint Union-Marathon exploratory work in the Cook Inlet area since 1958 (he discussed the results of Marathon's exploratory and drilling work in the Trading Bay and McArthur River fields from 1959 through 1965); Richard A. Lyon, who worked as the Alaska District Exploration Manager for the Union Oil Company from 1963 through 1966 (he gave his perceptions of Alaska's discovery royalty program and its impact on Union's early exploration efforts in Alaska); Robert C. Warthen, who worked as a geologist for Union Oil Company (he presented a

compilation of all geologic information collected in the area by Union and Marathon to date, including updated geologic information not previously submitted to the state); Kenneth Zerda, a reservoir engineer for Union Oil Company (he compared the reservoir characteristics of the McArthur River and Trading Bay fields); Gerould H. Smith, a geochemist employed by Union (he compared the geochemical characteristics of the oil found at Trading Bay with the oil found at McArthur River); Ed Hall, a geologist from Union (he presented maps he had prepared based on examples of KGSs he had collected from several USGS offices); Charles M. Schwartz, a geologist in charge of Union's exploration and production activities in Alaska (he compared the physical characteristics of the two fields and hypothesized regarding the structural growth of these areas); and Joseph David "Red" Cerkel, Jr., a retired geologist who had served as chief of the Minerals Classification Branch of the USGS. Tom Cook, then director of the division of minerals and energy management; K. Daniel Hinkle, Marathon Oil Company's attorney; and Arden Page and John Sedwick, Union Oil Company's attorneys, also attended the hearing.

On April 23, 1981, I took testimony from William Van Alen, who gave a presentation on the geologic history of the Cook Inlet sedimentary basin and formation of the ancestral Trading Bay anticline (summarized in Part II of this opinion) and Thomas R. Marshall, who discussed the application of the Greater Trading Bay Structure concept to the award of discovery royalties by the

Oil and Gas Conservation Committee. Also present were Assistant Attorney General Michael E. Arruda, Mr. Page, and Mr. Sedwick.

As a result of the efforts of the Department of Law and Union-Marathon, examination of the issues in this case was extremely thorough. For the reasons set forth in my decision, however, I determined that this matter should be resolved in favor of the applicants.

More specifically, I determined that there is sufficient subsurface information to determine that the McArthur River feature, on which the Grayling 1-A well is located, is not overlapped by the previously certified Trading Bay feature and, furthermore, is a separate geologic structure within the meaning of then applicable 11 AAC 83.200 and 11 AAC 83.205(2) (repealed November 9, 1979).*/ On this basis, the application for discovery well certification of the Grayling 1-A well was granted.

II. GEOLOGIC EVOLUTION OF THE COOK INLET SEDIMENTARY BASIN AND THE TRADING BAY AND MCARTHUR GEOLOGIC FEATURES.

The Trading Bay and McArthur River geologic features which are the subject of this case are located within the Cook Inlet sedimentary basin, a major oil and gas province.

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*/ Formerly 11 AAC 505.74 and 11 AAC 505.741(b), respectively.

PAGES 13-22 ARE AVAILABLE FROM KEN BOYD, DNR/DO&G. THESE PAGES CONTAIN GEOLOGIC INFORMATION FROM THE EARLY JURASSIC PERIOD TO THE PLEISTOCENE PERIOD.

A SUMMARY OF THESE PAGES IS ON PAGE 23, WHICH FOLLOWS THIS PAGE.

II. Summary

In summary, the Cook Inlet Basin as we know it today began with the deposition of volcaniclastic materials (the Talkeetna formation) nearly 200 million years ago. Approximately 175 million years ago, sediments and organic matter were deposited in the Tuxedni Group, which became the source rock for most of the hydrocarbons in Cook Inlet. Over the succeeding 100 million years, additional coarse materials were deposited in the area which experienced the alternating uplift and subsidence, mountainous formation and folding conducive to generating the lateral and vertical compression and geothermal heat required for the formation of petroleum hydrocarbons in the Tuxedni source rock. At or slightly before the beginning of Tertiary time (65 million years ago) and thereafter, the area experienced (1) downwarping of the Cook Inlet trough exposing the westward and eastward ends of the Tuxedni source rock and forcing the migration of oil upwards; (2) the creation of the present day Alaska, Chugach and Kenai mountain ranges, creating a further depositional environment in Cook Inlet beginning with the Larimide revolution; (3) deposition of sedimentary materials constituting the West Foreland formation and the Kenai group, which became the reservoir rock formations receiving upward migrating oil from the exposed Tuxedni source rock; (4)general east-west folding of

on a new geologic structure. Neither the concept of a discovery royalty nor of using the term "geologic structure" for oil and gas regulatory purposes was without precedent. The term "KGS" had been used by the USGS since 1920 to determine whether land would be leased competitively or noncompetitively for oil and gas purposes. From 1937 to 1958, the term "geologic structure" was used for purposes of establishing reduced royalties on noncompetitive leases under regulations implementing the Alaska Oil Proviso of the Federal Mineral Leasing Act of 1920. */ Therefore, the use by federal officials of the term "geologic structure" and the federal discovery royalty provide some background for interpretation of the provisions of Alaska law contested in this case.

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*/ A discovery incentive program was initiated by the federal government in 1942 to encourage petroleum discoveries in the interest of national defense. This program, authorized by the so-called O'Mahoney Amendment to the Mineral Leasing Act on December 24, 1942, Pub. L. No. 832, Stat. 1080 (1942), placed a 12½ percent ceiling on royalty rates for discoveries of a "new oil or gas field or deposit." The amendment had the effect of reducing royalties on oil and gas production. The federal program was, in many ways, much easier to administer than the state's "new geologic structure" program because it was administered in a way that looked only to whether a discovery was made in a new "deposit." See Appendix 1. The concept of a separate field or deposit is much more easily defined than the concept of a separate geologic structure. The United States Department of the Interior never adopted specifications to administer this program until it was further amended in 1946. The six diagrams in Appendix 1 of this decision entitled "Possible Interpretations Under Act of December 24, 1942," clearly illustrate how the program was in fact administered.

CORRECTION

THE FOLLOWING DOCUMENT(S)
HAVE BEEN REFILMED TO
ASSURE LEGIBILITY OR PAGINATION

II. Summary

In summary, the Cook Inlet Basin as we know it today began with the deposition of volcaniclastic materials (the Talkeetna formation) nearly 200 million years ago. Approximately 175 million years ago, sediments and organic matter were deposited in the Tuxedni Group, which became the source rock for most of the hydrocarbons in Cook Inlet. Over the succeeding 100 million years, additional coarse materials were deposited in the area which experienced the alternating uplift and subsidence, mountainous formation and folding conducive to generating the lateral and vertical compression and geothermal heat required for the formation of petroleum hydrocarbons in the Tuxedni source rock. At or slightly before the beginning of Tertiary time (65 million years ago) and thereafter, the area experienced (1) downwarping of the Cook Inlet trough exposing the westward and eastward ends of the Tuxedni source rock and forcing the migration of oil upwards; (2) the creation of the present day Alaska, Chugach and Kenai mountain ranges, creating a further depositional environment in Cook Inlet beginning with the Larimide revolution; (3) deposition of sedimentary materials constituting the West Foreland formation and the Kenai group, which became the reservoir rock formations receiving upward migrating oil from the exposed Tuxedni source rock; (4)general east-west folding of

stratigraphic layers in the Cook Inlet Basin caused by mountain formation and the underthrusting of the North Pacific Oceanic Plate, initially establishing north-south anticlines which became entrapping mechanisms for hydrocarbons and, through further foldings, steepening the flanks of those anticlines (including Trading Bay) to the point that reverse faulting occurred; (5) the counterclockwise rotational movement of the Alaskan (North American) Continental Plate and subjacent thrusting of the North Pacific Oceanic Plate causing right-lateral strike-slip faulting along major regional faults (for example, the Castle Mountain fault) and similar movements along subordinate faults (for example, the Bruin Bay and Trading Bay faults). The last of these forces caused the upper portion of what was once a single Trading Bay anticline to migrate eastward approximately three and one-half miles. Therefore, through the composite action of folding, reverse faulting, normal faulting and strike-slip faulting occurring over the past 25 million years, the Trading Bay anticline has evolved from a simple fold into a complex structure with the Trading Bay field portion offset from the McArthur River Field portion.

III. ANTECEDENT FEDERAL LAWS AND REGULATIONS.

Alaska statutes and regulations adopted at statehood provided for a discovery royalty to be awarded to a lessee that was the first to encounter commercial quantities of oil and gas

on a new geologic structure. Neither the concept of a discovery royalty nor of using the term "geologic structure" for oil and gas regulatory purposes was without precedent. The term "KGS" had been used by the USGS since 1920 to determine whether land would be leased competitively or noncompetitively for oil and gas purposes. From 1937 to 1958, the term "geologic structure" was used for purposes of establishing reduced royalties on noncompetitive leases under regulations implementing the Alaska Oil Proviso of the Federal Mineral Leasing Act of 1920. */ Therefore, the use by federal officials of the term "geologic structure" and the federal discovery royalty provide some background for interpretation of the provisions of Alaska law contested in this case.

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A. Competitive-Noncompetitive Leasing Determinations.

In 1920 Congress passed the Federal Mineral Leasing Act, 41 Stat. 437 (1920), which was the organic statute governing oil and gas leasing in the United States. Under the act, land could be leased for oil and gas purposes either competitively or noncompetitively. The law required that land be leased competitively if it were located on a KGS. From then on, USGS geologists followed petroleum exploration activities in the United States, drawing and platting KGSs as new discoveries were made. Oil and gas rights to land not covered by a KGS could be obtained noncompetitively.

Although the USGS plotted hundreds of KGSs over the years after 1920, no regulations defining a KGS were adopted until 1970. In 1959, however, Emmett A. Finley authored a document entitled, "The Definition of Known Geologic Structures of Producing Oil and Gas Fields" (Circular 419).. This document was considered the principal reference in making KGS determinations.

B. Discovery Royalties.

The 1920 Federal Mineral Leasing Act also contained a section known as the "Alaska Oil Proviso." This section authorized the secretary of the United States Department of the

Interior to establish special lowered royalty rates on leases issued in the State of Alaska in order to encourage oil and gas development in this frontier area. Although regulations implementing the Alaska Oil Proviso were amended several times (which usually changed the lowered royalty formula), by 1950 they provided for payment of a 5% royalty (compared to the normal 12.5%) for ten years following the date of discovery by any lessee that made the first discovery of oil or gas in commercial quantities in a new geologic structure. The Alaska Oil Proviso was virtually identical to a provision of the discovery royalty statute enacted by the Alaska legislature in 1959 except that the Proviso applied to noncompetitive land only. The Alaska Oil Proviso was repealed in 1958.

In summary, at the time of statehood, the term "known geologic structure" had been used by the USGS since 1920 to determine whether land would be leased competitively or noncompetitively. During the same period, the term "geologic structure" had been used for purposes of awarding discovery royalties under the Alaska proviso, but on noncompetitive leases only.

IV. DEVELOPMENT OF A STATE DISCOVERY ROYALTY PROVISION.

Because the territorial government had no land to manage, territorial land officials had little experience with

land management, including oil and gas leasing. With the approach of statehood, these officials began the massive preparation necessary for the transition from territorial status and the problems which statehood would bring, including problems associated with the receipt of immediate title to 45 million acres of tide and submerged land and the selection of 103,350,000 acres of upland.

In order to assume their new responsibilities, territorial officials began developing programs for the selection, management, and disposal of state land and its resources. Special attention was given to the leasing and management of land containing oil and gas resources because of its potential for generating revenue for the cash-poor state. The major concern was development of a well-conceived leasing program which would avoid land speculation in areas of oil and gas potential.

During the two years before statehood, there was continued activity by territorial officials debating the provisions to be included in the Statehood and Alaska Land acts. Much of the discussion centered on the extent to which the state would competitively lease land with oil and gas potential. Although the territorial land board retreated from its initial proposal to competitively lease all sedimentary basins, their final proposal required competitive leasing on a broader scale than the federal act had. There also was considerable discussion regarding

adoption of a discovery royalty program by the state. The oil industry advocated its adoption on the ground that the federal royalty program had attracted the industry to Alaska in the first place.

The Alaska Land Act passed in 1959. Unlike the federal act which limited competitive oil and gas leasing to land containing a KGS, the state act required competitive leasing on land known or believed to contain oil or gas. The state act also contained a discovery royalty provision virtually identical to the terms of the Alaska Oil Proviso. Under this provision a lease holder that drilled and made the first discovery of oil or gas in commercial quantities in a geologic structure could be rewarded by paying a discovery royalty of only five percent of the value of oil and gas extracted for the first ten years, after which the normal rate of 12½ percent was applicable. The new state oil and gas leasing form also contained a provision which repeated verbatim the discovery royalty provision included in the state act.

V. IMPLEMENTATION OF THE STATE'S DISCOVERY ROYALTY PROGRAM IN THE COOK INLET REGION.

A. Early Leasing Activity.

Although Alaska received a large entitlement of land at statehood, this was a nonliquid asset. The state was cash poor

and unable to adequately operate the government and provide essential public services. To obtain the revenue needed to run the new state, state officials quickly began implementing programs which would generate cash from the land. High on their list of activities was oil and gas leasing, as evidenced by the quick succession of legislation (the Alaska Land Act was signed on May 2, 1959), regulations (effective September 15, 1959), and lease sales (the first was conducted in December of 1959).

From 1959 through 1966 the state conducted 17 competitive oil and gas lease sales. All major oil discoveries and most major natural gas discoveries in Cook Inlet were made on leases sold at the seventh and ninth lease sales (held on December 19, 1961 and in July of 1962, respectively). Virtually all subsequent discovery royalty determinations involved leases sold in these two sales.

Most land opened by the state for oil and gas exploration, development, and production activities in the upper Cook Inlet area was leased by a small number of oil companies in combination. Pan American Petroleum Corporation and its partners (the Pan American group) leased by far the greatest amount of acreage in the seventh and ninth competitive lease sales. The SRS group (consisting of the Shell Oil Company, the Richfield Oil Company, and the Standard Oil Company of California) acquired the second largest amount of acreage. Union Oil Company of

California and Marathon Oil Company, as partners, acquired four leases in these sales and a fifth by assignment. Union also acquired an interest in two other leases in partnership with Mobil. Texaco and Superior together obtained three leases. Atlantic Refining Company obtained eight leases.

B. Initial Exploratory Efforts Affecting Land in the Seventh and Ninth Competitive Oil and Gas Lease Sales.

Given the large amount of land leased by the Pan Am group and the SRS group in the seventh and ninth competitive oil and gas lease sales and the close proximity of these leases to one another, it was likely that these two groups would compete for discovery royalty awards if oil or gas were found in the area. During the summer of 1962, even before the ninth lease sale was held, four wells (two by the Pan Am group and two by the SRS group) were commenced to test the potential of the leases in this area.

On May 15, 1962, the Pan American group spudded its Middle Ground Shoal State No. 1 well from a drilling barge on lease ADL 17595 in the area now known as the Middle Ground Shoal Field. This well blew out one week later while it was being drilled at a depth of 1,132 feet. It was brought under control on the same day. While being drilled at a depth of 5,216 feet,

the well blew out again upon encountering a high pressure gas zone. The well remained out of control for 45 days, and a large gas flow erupted through the inlet floor 700 feet from the well. During this period Pan Am pumped into the well 25,265 barrels of mud and lost circulation material, 16,480 sacks of cement, 975 sacks of Cal Seal, and a large quantity of diesel gel cement, topped off by burlap sacks, parachutes, gravel, sand, and sawdust. Finally, on July 25, 1962, the well was controlled. It was then plugged and abandoned.

On May 30, 1962, Shell, as operator for the SRS group, spudded a well, State No. 1, on lease ADL 17582. This well was drilled roughly halfway between what is now known as the Middle Ground Shoal Field and Cook Inlet Gas Field. The well was drilled to a depth of 14,401 feet and completed on September 14, 1962. Although shows of oil were found in various tests of the well, no commercial discovery was made.

On May 31, 1962, Pan Am, on behalf of the Pan Am group, spudded a second well, Cook Inlet State No. 1, on lease ADL 17589 in the area now known as the Cook Inlet Gas Field. While it was being drilled at a depth of 12,237 feet, this well also blew out. Because of the high volume and pressure of escaping hydrocarbons, the drilling barge had to move off the well and the escaping gas and oil had to be ignited. A relief well was spudded about 1,500 feet to the northeast one week later. The initial well continued

to blow ignited for almost fourteen months before it was finally controlled by pumping salt water down the relief well.

On April 19, 1962, at an onshore location on a federal lease adjacent to lease ADL 17599, the Standard Oil Company of California, as operator for the SRS group, spudded a well. The well was tested on December 1, 1962. On December 4, Standard announced that it had discovered what became known as the Beluga River Gas Field.

C. Development of the Discovery Royalty Regulations.

The drilling of the four wells described above led representatives of the Pan Am group and the SRS group to ask the department about the policies and procedures for making discovery royalty awards. The state, as lessor, and the oil companies, as lessees, were all faced with the same problem: neither the statute authorizing discovery royalty awards, the regulations adopted to implement the statute, nor the state lease form defined what was meant by the terms "first discovery," "commercial quantities," or "geologic structure."

The need to define the terms "first discovery" and "commercial quantities" was brought to a head by the advent of Pan Am's two blowouts. This situation made plain that the state had implemented a discovery royalty program without adequately

considering the practical problems which materialize after a program is put into practice. After four wells had been drilled, the department began to attempt to untangle the confusion which the lack of specifics in the regulations had created. There followed extensive exchanges of memoranda, position papers, and other communications among members of the department, oil companies, and the Western Oil and Gas Association as they attempted to work out acceptable solutions. Concurrently, Pan American applied for discovery royalty awards for leases covered by the two wells that had blown out the previous summer, and SRS applied for a discovery royalty for the gas discovery in their Beluga River well (Appendix 4 summarizes all state discovery royalty applications in Cook Inlet). While the department did not want to make hasty discovery royalty awards, state officials were also concerned that drilling races would result from the department's failure to answer essential questions on discovery royalty awards where there was mixed ownership of leases over a potential structure.

Further confusion occurred within the department because of differing views on the problems caused by the absence of detailed discovery royalty regulations. While aware of the problems relating to the definitions of "first discovery," "commercial quantities," and "geologic structure," the commissioner's office was also concerned about whether a discovery royalty award applied to all production from within the lease, all production from only a particular pool or interval, or all production from within the exterior boundaries of the discovery structure on the lease.

On January 15, 1963, the department issued a decision granting Pan Am's application for the Middle Ground Shoals well on state lease ADL 17595 (for the structure only). (A map prepared by the Union Oil Company which accompanied the testimony of E.A. Hall and illustrates federal and state discovery royalty awards generally is attached to this opinion as Appendix 2.) The award was contested by SRS. Concurrently, the Western Oil and Gas Association was urging the department to define discovery royalty terms by regulations in a manner which would clear up any misunderstandings.

Subsequently, department officials conducted hearings on proposed discovery royalty regulations. These hearings were characterized by acrimony and disagreement between oil companies and other organizations. Although most of the discussion concerned the meaning of the term "first discovery" (because of Pan Am's two blowout wells), there was also some discussion of the definition of "geologic structure," although a factual dispute involving this term had not yet arisen.

A hearing was held in June of 1963 to consider new department draft regulations put out at the end of May. After the hearing some revisions were made. The final regulations were filed in July and became effective in August. Those regulations read as follows:

505.73 Royalty.

The royalty rate on production under competitive leases will be fixed in the lease form for each lease offer and shall not be less than 12 1/2 percent in amount or value of the production removed or sold from the leased lands, except as provided in Section 505.74.

505.74 Discovery Lease.

Any operator who by time and date first encounters sufficient evidence of oil and/or gas in a particular geologic structure covered by any State oil and gas lease to cause said operator diligently to continue in good faith testing, reworking, drilling or other operations on said lease, whether in the same hole or other holes, in an effort to establish production of oil and/or gas in the same structure shall be qualified for a discovery well certification under the terms of said state lease should he complete a well and establish production in commercial quantities in the same zone in which oil and/or gas was first encountered.

505.741 Definitions.

With regard to regulations 505.74 through 505.748 and applicable provisions in State leases, the following terms shall have the meanings indicated.

(a) "Discovery" shall be the first acceptable evidence in a drilling well of the existence of oil and/or gas which can be produced in commercial quantities after well completion.

(b) "Geologic Structure" shall be any structural and/or stratigraphic entrapping mechanism containing one or more intervals, zones, strata, formations, or fault blocks which has the necessary physical characteristics to accumulate and prevent the escape of oil and/or gas. It is intended that the meaning shall be similar to that as used by the United States Geological Survey in the administration of the Federal Mineral Leasing Act of February 25, 1920 (41 Stat. 437) as amended.

(c) "Completed Well" shall be a well which is cased, controlled and in which all underground work in connection therewith has been finished and such well is capable of producing oil and/or gas.

(d) "Commercial Quantities" shall be those amounts of oil and/or gas which after well completion would appear to a reasonable and prudent operator to be sufficient to recover ordinary costs of drilling, completing and producing an additional well on the same geologic structure at an offset location with a reasonable profit to the operator, if a market were available.

(e) "Committee" shall be the Alaska Oil and Gas Conservation Committee composed of the Director of Mines and Minerals (Chairman), the State Petroleum Geologist, the State Petroleum Engineer and the Deputy Commissioner of the Department of Natural Resources or his designee.

505.742 Establishment of Priority as to Time and Date.
To establish priority as to time and date of discovery, an operator must furnish the Committee with a sworn statement substantiating evidence, acceptable to the Committee, that oil and/or gas has been encountered in sufficient showing to cause a reasonable and prudent operator to conduct further operations in an effort to complete a well in the discovery zone so that such well can be tested for potential oil and/or gas production in commercial quantities. Such statement must include the time and date of first discovery, the exact location of the well concerned, the precise interval of discovery and the Alaska Division of Lands lease number on which said well is located. Such statement should be furnished to the Committee as soon as possible, but not later than thirty (30) days after the date claimed for the discovery.

505.743 Establishment of Commercial Quantities.
To establish and prove oil and/or gas in commercial quantities, operator must: (a) Conduct a potential test of the discovery

zone within one year after completion of a discovery well. (b) Notify the Committee or its designated representative five days in advance of such scheduled potential test and furnish transportation (if requested) for a designated representative of the Committee to witness such test. The Committee may at its option or at the option of its designated representative waive the witnessing of the test and require sworn evidence to establish results of said test. Any such sworn evidence shall be delivered to the Committee or its designated representative within thirty (30) days after such test.

505.744 Establishment of Geologic Structure.

To establish the geologic structure from which the oil and/or gas can be produced, the operator must furnish pertinent data to the Committee which will enable it to determine the geologic structure from which the oil and/or gas is being produced. This may include but is not limited to, geophysical data, total depth, casing records, perforation data, electric logs, drilling and mud logs, core analyses, sample cuttings and sample logs, and the operator's interpretation thereof, together with any other records and interpretations the operator deems pertinent. This data must be supplied within ninety (90) days after the date of the potential test as required in Section 505.743. All such data submitted shall be held confidential for a period of 24 months unless written authorization from the operator for the release of same is secured.

505.745 Certification After Compliance and Application.

After compliance with Sections 505.742 through 505.744 inclusive, the operator may apply to the Director for discovery well certification. Within ten (10) days of receipt of such request the Director will publish notice of such application allowing thirty (30) days for any interested party to object to or protest the application. If no protest or objection is received by the Director, the Director will, within seventy (70) days after the receipt of an application, either certify the well as in (a) or

deny the application as in (c) of this section. If any protest or objection is made it must be submitted in writing to the Director within the specified thirty (30) day period. After receipt of said protest or objection the Director will advertise and hold an open public hearing in accordance with the Alaska Land Act (AS 38.05) and in accordance with the Alaska Administrative Procedures Act (AS 44.62.300 - AS 44.62.630). Within thirty (30) days after such hearing the Director will do one of the following.
(a) Certify the well in question a first discovery well which has established oil and/or gas in commercial quantities in (name geologic structure) as of (time) on (date), and specify the date of commencement of the 10 year 5 per cent discovery royalty term which date shall be the first of the next succeeding month from the established date of initial discovery. After discovery well certification, no other well, regardless of when drilled, shall be eligible for consideration for certification as to the same geologic structure.
(b) Continue the hearing at a later specified date.
(c) Deny the application for discovery well certification.

505.746 Cancellation.
At any time after discovery well certification should any information supplied to the Committee be later proven false or erroneous and such information would affect the decision of the Director to the extent that the original application for certification would have been denied on such basis, the certification shall be immediately revoked. Such action also may be taken when it is determined that error was caused by failure to disclose full and complete knowledge available to the operator at the time of application for certification. After such certification is revoked royalty payment of 7 1/2 per cent on production theretofore shall be immediately due and payable and 12 1/2 per cent royalty on all subsequent production shall be paid. Should the royalty due not be paid on demand, the State shall take legal steps to cancel the lease involved.

505.747 Termination.
In the event of the termination of a discovery lease for any cause, the 5 per cent discovery royalty terminates and will not be allowed or reinstated on the same geologic structure.

505.748 Five Per Cent Discovery Royalty.
A "First Discovery Well Certification" shall secure the 5 per cent royalty rights for the holder of the State lease on which such well is located on all production from all zones, strata, formations and structures under and within the exterior boundaries of said lease. If at any time before or after discovery well certification, the State lease on which such well is located is subject to or made a part of any development unit, pooling or consolidation contract, the 5 per cent discovery royalty rate shall apply only to the production allocated to said lease under such agreement.

In 1973 the state's discovery royalty regulations were recodified. 11 AAC 84.152 -- 11 AAC 84.168 were the discovery royalty provisions applicable to competitive leases and 11 AAC 84.407 -- 11 AAC 84.422 were the discovery royalty provisions applicable to noncompetitive leases. In 1974 these two sets of regulations were combined into one set of discovery royalty provisions generally applicable to all oil and gas leases, 11 AAC 83.200 -- 11 AAC 83.230. These regulations were repealed on November 9, 1979.

D. The Dispute Between Pan Am and Shell Over the Middle Ground Shoal Discovery Royalty Award.

In May of 1963 the SRS group spudded a well in the Middle Ground Shoal area immediately to the south of the lease on which Pan Am had drilled the gas blowout the previous year and for which Pan Am and its partners had been awarded a discovery royalty in January. The first day the new regulations on discovery royalties were in effect, SRS filed an affidavit of first discovery based on encountering oil sands in various intervals in the area. Their application was denied by the department in December of 1963.

SRS requested reconsideration by the department and concurrently filed a document claiming that Pan Am's discovery award was not valid because the well was a blowout and, therefore, ought to be revoked. Several documents were filed on both sides.

The department issued a decision in May of 1965 upholding the original discovery royalty award to Pan Am and denying Shell's petition. This matter was then appealed to the courts. In 1969 the Alaska supreme court upheld the department's decision. Pan American Petroleum Corp. v. Shell Oil Co., 455 P.2d 12 (Alaska 1969).

E. Discovery Royalty Awards for North Cook Inlet, Beluga River, and Falls Creek.

1. North Cook Inlet award.

On November 12, 1962, the date Pan American had applied for discovery award for the Middle Ground Shoal No. 1, Pan Am also applied for a discovery award on ADL 17589 on the basis of the Cook Inlet No. 1 blowout. The department decided not to act on this application until after the discovery royalty regulations went into effect.

In August of 1963 (after the new regulations became effective), Pan Am was informed that a potential test to verify the existence of commercial quantities would be required. No testing was possible until the summer of 1964.

In the interim Shell protested any award of discovery benefits to Pan Am for the Cook Inlet No. 1 well and spudded a well on the lease immediately to the north of the lease where Pan Am had drilled the Cook Inlet No. 1 and No. 1-A wells.

In June and July of 1964, the Cook Inlet No. 1-A well was tested by Pan Am. In December of 1964, Pan Am was granted a discovery royalty for lease ADL 17589 based on the discovery made in the Cook Inlet No. 1 well and the potential test of the Cook Inlet No. 1-A well.

2. Beluga River and Falls Creek awards.

The SRS group had requested a discovery royalty in December of 1962 in conjunction with its Beluga discovery. Action on this request was initially delayed because the commissioner of natural resources believed that the Beluga discovery might be on the same structure as Pan Am's North Cook Inlet blowout. The SRS group contended, however, that it had an automatic right to an award because the state had recognized the Beluga discovery for the purpose of reclassifying adjoining state upland acreage from noncompetitive to competitive. There was an exchange of information between the department and the SRS group over this application at the same time as the deliberations on the adoption of the discovery royalty regulations were occurring.

In May of 1963 the SRS group applied for a discovery royalty for lease ADL 00590 on the basis of the gas discovery made in the Falls Creek Unit Number 1 well in April of 1961. When the department decided to defer action on both the Falls Creek and Beluga River applications until after the discovery royalty regulations were adopted, The SRS group objected that it was being treated unfairly.

In September and October of 1963, the SRS group reapplied for Beluga discovery certification. It was awarded on the same day that the SRS application for the Middle Ground Shoal oil discovery was denied.

In December of 1963 an application was submitted for the Falls Creek lease. It was processed under the new regulations, and a discovery royalty award was made on February 18, 1964.

F. Application for and Award of Discovery Royalty Certifications in the Trading Bay, McArthur River, and Nicolai Creek Areas.*/

1. Introduction.

In 1965, for the first time, offshore wildcat wells were drilled along the west shore of Cook Inlet on leases issued during the seventh and ninth competitive lease sales. Mobil and Union drilled the Granite Point No. 1 well on lease ADL 18761 from April 5, 1965, to August 5, 1965. The well resulted in discovery of the Granite Point oil field. The companies applied for a discovery royalty for the lease, which was awarded on September 14, 1965.

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*/ A map depicting the top of the Hemlock gelogic formation and illustrating applications for discovery royalty awards in the Trading Bay and McArthur River areas is attached to this opinion as Appendix 3. Appendix 2 should be referenced to locate the Nicolai Creek area for which a discovery royalty award was also sought.

During this same drilling season Union (on behalf of itself and its co-lessee, Marathon) drilled four wells in the Trading Bay-McArthur River area. These wells and others which followed encountered oil in almost every instance in reservoirs contained in the Hemlock formation, which also contained the major oil reservoirs in the Middle Ground Shoal and Swanson River fields.

A number of exploratory wells were drilled in the Trading Bay-McArthur River area during the 1966 drilling season. Filings for five of these wells were made with the state, which initiated the discovery royalty certification process.

2. Application for and award of a discovery royalty certification for the Union Trading Bay No. 1-A well.

On May 9, 1965, Union, on behalf of itself and Marathon, spudded the first well on lease ADL 18731. The well (Trading Bay No. 1) was drilled to a depth of 747 feet. The casing parted at a depth of 126 feet while it was being set in the well, and the well was plugged and abandoned. On May 23, 1965, Union spudded another well from the same location, Trading Bay No. 1-A. In drilling this well Union discovered oil in the Trading Bay field. The well was completed at a depth of 6,832 feet on June 25, 1965.

Union and Marathon applied for a discovery royalty for lease ADL 18731 based on this discovery. The department found that Union and Marathon had adequately established a discovery date of May 23, 1965, and that the potential test conducted on June 17, 1965, had established that the Trading Bay No. 1-A well was capable of producing commercial quantities. The department also found that the Trading Bay feature was a separate structure. The application for this discovery award was processed and certified on August 27, 1965.

3. Application for a discovery royalty certification of the Grayling No. 1-A well.

Union and Marathon drilled two more wells from locations on lease ADL 18731 after the Trading Bay No. 1-A discovery. In the late summer of 1965 the drilling barge which had been used to drill these wells was moved to lease ADL 17594 immediately to the south, also a Union-Marathon lease. Union commenced the Grayling No. 1 well here on September 2, 1965. As a result of mechanical problems encountered in the early stages of drilling, the well had to be plugged and abandoned at a depth of 817 feet.

Grayling No. 1-A was commenced immediately and tested for commercial quantities from November 6 to November 8, 1965. An application for discovery royalty certification was submitted on November 15 and amended on November 19. Oil and gas sands

were encountered intermittently in this well from depths of 3,305 feet to 9,770 feet, including a 400-foot pay interval from 9,370 to 9,770 feet in the Hemlock zone.

The department found that the date of discovery for the Grayling No. 1-A well was October 24, 1965, and that commercial quantities had been encountered within the Hemlock zone. However, for the first time since the discovery royalty program was commenced, there was a serious question as to whether the discovery had been made on a new geologic structure. The decision issued on January 26, 1966, concluded:

> Insufficient subsurface information exists to determine that the McArthur River feature on which the Grayling No. 1-A well is located is not overlapped by the previously certified Trading Bay geologic feature. Thus, the well does not satisfy the requirement for being a discovery well on a geologic structure previously uncertified, and the application on the Grayling No. 1-A well is hereby denied.

On February 10, 1966, a meeting took place in Anchorage between Union-Marathon officials and department officials to discuss the decision denying Union-Marathon's request for discovery certification. In one meeting Tom Marshall of the division of mines and minerals told Union-Marathon officials that he was concerned about the possibility that shallow productive sands continuously overlaid both the Trading Bay structure and the Grayling structure. Marshall also told one of the oil

company representatives that his view of the McArthur River application relied heavily on the "dominant structure concept" referred to in USGS Circular 419. Another meeting was held with Erle Mathis, chief of the minerals section of the division of lands, who encouraged Union and Marathon to request time to submit additional evidence.

On February 14, 1966, Union filed a document with the division of lands entitled, "Petition for Reconsideration and Interpretation of Decision of the Director of the Division of Lands Dated January 26, 1966, in the Matter of Discovery Well Certification Grayling No. 1-A well -- ADL 17594." In this petition Union requested that applicable regulations be interpreted to permit Union to submit additional and supporting information at a later time or to allow reconsideration by the director of his decision on the basis of additional supporting information then available, including evidence satisfying the criteria used for the determination of geologic structures by the USGS in administering the Mineral Leasing Act of February 25, 1920.

Erle Mathis prepared a proposed decision responding to Union's petition. He conferred with Tom Marshall about it before sending it to the commissioner. The proposed decision denied Union's request for reconsideration on the ground that the state's oil and gas leasing regulations would not permit it. However, the proposed decision permitted Union to submit any

additional supporting information and authorized an award of discovery royalty if that information established that Grayling No. 1-A was on a separate geologic structure. This proposed decision was never issued.

Beginning on February 16, 1966, Tom Marshall provided Jim Williams, director of the division of mines and minerals and chairman of the Oil and Gas Conservation Committee, with a series of reports regarding his February 11 meeting with Union-Marathon. In these reports Marshall stated that the discussion was limited to the state's interpretation of the definition of geologic structure and that USGS Circular 419 was the principal basis used for determining geologic structure. He outlined a number of problems regarding the definition of geologic structure, including the complicating effects of stratigraphically controlled production, dominant structure, trends of folding, the interpretation and accuracy of seismic records, and the absence of subsurface data.

In his reports Marshall reiterated that the main problem with the Grayling application was the occurrence of undefined stratigraphic traps in the shallow horizons. He felt that it would be a mistake to award a discovery royalty for the Grayling well before the extent and continuity of those traps were known. He mentioned the other problem of determining how much vertical displacement along faults is required to separate geologic structures, and wondered what development of the field

would provide sufficient subsurface information to resolve this problem.

Marshall also said that the procedures used by the USGS in determining KGSs were discussed and that the point was made that the state regulations did not allow the state to make a tentative determination regarding geologic structure, unlike federal regulations which allowed federal officials to delineate an undefined KGS. He noted that state officials were without the benefit of surface geology available to persons working in uncovered upland areas. He explained that the USGS makes its final KGS determination after an evaluation of all controlling factors, but that like information was not available to the state with respect to the Trading Bay and McArthur River areas at this time.

On March 2, 1966, the commissioner of natural resources responded to Earl Mathis' suggested reply to Union-Marathon's petition for reconsideration. In his response the commissioner concluded that there were two separate geologic structures present, but expressed concern about the problem of one lease covering a portion of two separate structures -- an entirely different issue than that being dealt with by Marshall, Williams, and Mathis. He felt that the time limit imposed by the regulations could be circumvented if the petition were accepted by the commissioner rather than the division of lands, thus enabling

a study of the problem to be made. He also indicated that the attorney general had been requested to review the question of whether a five percent royalty would apply to the entire lease if a discovery well were drilled in a new structure where the area of the lease also covered a second structure that had been previously certified as a discovery on a different lease. It is apparent from this opinion request that the commissioner was concerned with lease boundaries (the legal interpretation of the words "all production from the lease") rather than a question involving the boundaries of a geologic structure.

On August 26, 1966, an opinion was issued by the attorney general's office which resolved the question of lease boundaries. The conclusion was that all production from the lease should enjoy the benefits of discovery royalty even though it were derived from a structure which was previously the subject of a discovery royalty on another lease. However, the principal questions of whether or not Trading Bay and McArthur River were separate structures was not addressed by this opinion.

There was no further active consideration of the Union-Marathon application until 1968.

4. Discovery royalty certification of the Nicolai Creek State No. 1 well.

Because the term of the leases issued in the seventh and ninth competitive sales was five years, there were a large number of wells drilled and several discovery well certification applications filed in the 1966 drilling season.

The first discovery royalty request in the 1966 drilling season came for a well drilled by Texaco -- Nicolai Creek State No. 1. Texaco had spudded this well in the fall of 1965. On May 23, 1966, Texaco submitted evidence in support of an April 28, 1966, priority date. In early May the well was tested and found to be capable of producing commercial quantities of gas. Texaco applied for discovery well certification on June 13, 1966, which was approved on August 19, 1966.

5. Discovery affidavit for the SAS Foreland Channel State No. 1 well.

On June 10, 1966, Shell (on behalf of itself, Standard Oil of California, and Atlantic Richfield) filed an affidavit of first discovery for the SAS Foreland Channel State No. 1 well. No potential tests were conducted on this well, and no discovery certification application was filed.

6. Discovery affidavit for the Pan Am North Redoubt Well No. 1.

Pan Am drilled the North Redoubt Well No. 1 for the Pan Am group in the spring and summer of 1966. According to the affidavit filed on June 23, 1966, the depth in that well corresponded very closely to the Hemlock discovery in Union's Grayling No. 1-A well. Although geologic structure boundary information and evidence of commercial quantities were submitted in early September, Pan Am did not actually apply for discovery royalty certification.

7. Application for discovery royalty certification of the Kustatan No. 1-A well.

Meanwhile, Union had been drilling the Kustatan No. 1 well on Union-Marathon's lease ADL 18729, immediately to the south of their Grayling lease. This well was drilled to 11,600 feet during April, May, and June 1966. Union filed affidavits to establish priority of time and date of discovery for this well. During the period August 5 to 7, 1966, a commercial quantities test was witnessed by the state. On September 6, 1966, Union formally applied for discovery certification. One week later Union withdrew the application pending submission of additional information, which was submitted on October 7, 1966. Union withdrew this application in December 1966 before any action on it had been taken by the department.

8. Application for discovery royalty certification of the West Foreland Unit No. 3 well.

Atlantic Richfield drilled the West Foreland Unit No. 3 well on lease ADL 18777 into the upper left arm of the McArthur River Hemlock reservoir. On August 3, 1966, an affidavit of first discovery was filed in support of a July 25, 1966, discovery date with the Oil and Gas Conservation Committee. A commercial quantities test was conducted on August 16, 1966.

On September 28, 1966, Atlantic Richfield submitted its geologic structure boundary evidence to the Conservation Committee. In an explanatory letter which accompanied this evidence, Atlantic Richfield explained why it believed the Hemlock reservoir, in what it labeled the "Foreland Field," was separate from the Hemlock reservoir encountered by Union in Grayling No. 1-A. The explanation claimed that a barren syncline separated the Hemlock field encountered by the Grayling 1-A well from that encountered by the West Foreland Unit No. 3 well and that the hydrocarbon accumulation in the McArthur River structure was not in communication with that of West Foreland No. 3.

On September 30, 1966, Atlantic Richfield formally applied to the division of lands for certification of discovery royalty of the West Foreland Unit No. 3 well. On the basis of this submission, there was further discussion within the

department on the definition of geologic structure and whether the concept of dominant structure, originally advanced by Tom Marshall from USGS Circular 419, was the best interpretive approach to solving this issue.

On December 9, 1966, a decision was issued by the director of the division of lands denying Atlantic Richfield's request for discovery royalty certification on the ground that the well was on the Greater Trading Bay structure for which a discovery royalty had been previously awarded. He made this decision notwithstanding the fact that the earlier denial of Union-Marathon's application was on the basis that there was insufficient evidence to determine whether the Trading Bay and McArthur River features were separate structures. On December 30 Atlantic Richfield filed a petition for reconsideration of the director's decision. There was discussion within the department on whether and when to consider the petition for reconsideration (Atlantic Richfield was in favor of delay until further information from drill reports from subsequent operations became available). Like the Union-Marathon request for reconsideration, there is no indication in the record that any thought was given to the matter until a year later.

9. Application for discovery royalty certification of Texaco's Trading Bay State No. 1 well.

In the late summer of 1966 Texaco, on behalf of itself and Superior Oil Company, commenced the Trading Bay State No. 1 well on lease ADL 17597. On September 27, 1966, the well was tested for commercial quantities. This test also served as the basis for an affidavit of first discovery. The well was drilled through the oil bearing zones in both the Kenai and Hemlock formations.

On March 7, 1967, denial of Texaco's application was issued by the director of the division of lands on the grounds that the well was not capable of producing oil in commercial quantities and that it was located on the Greater Trading Bay structure on which discovery certification was previously granted.

10. Application for discovery royalty certification of Atlantic Richfield's Trading Bay State No. 1 well.

Another discovery was claimed in the McArthur River-Trading Bay area in the summer of 1967. This claim was made by Atlantic Richfield for the Trading Bay State No. 1 well on lease ADL 34531. According to the affidavit of first discovery, evidence of first discovery was encountered in the well on June 7, 1967. The well was drilled into the Hemlock accumulation north of the McArthur River Hemlock reservoir on the downthrown side of the Trading Bay fault. Atlantic Richfield named this

accumulation the Ivan Bering Field. A commercial quantities test was conducted on June 25, 1967. Application for discovery royalty certification was filed on September 27, 1967. The application was then considered by state officials.

The decision of the Oil and Gas Conservation Committee issued to the division of lands recommended that certification be denied on the ground that drilling the Trading Bay State No. 1 well had not resulted in the first discovery on a new geologic structure. The relevant portion of the committee's decision stated:

> Section 505.744 - Establishment of Geologic Structure: It is the opinion of the Oil and Gas Conservation Committee that the Ivan Bering Field discovered by the Trading Bay State #1 well is controlled by a fault or faults associated with the Greater Trading Bay Structure. Inasmuch as a discovery royalty was previously awarded to the Trading Bay Structure, the Committee does not consider that the Trading Bay State #1 well is the first discovery on the dominant geological structure.

On December 7, 1967, the decision denying Atlantic Richfield's application for discovery royalty certification of the Ivan Bering field was issued. By letter dated December 21, 1967, Atlantic Richfield requested reconsideration of the decision rejecting their application and permission to submit additional data. This petition was supplemented on December 28, 1967.

11. Application for discovery royalty certification for Redoubt Shoal No. 2.

There was one more discovery well certification application considered by the state for a well drilled in the Trading Bay vicinity. In the summer of 1968, Pan American drilled Redoubt Shoal Unit No. 2 well on lease ADL 29690. This well was drilled into a Hemlock accumulation 4 1/2 miles south of the McArthur River Hemlock reservoir. An affidavit to establish priority of discovery was filed in early October 1968. The formal application for discovery certification was filed on November 12. The committee concluded that commercial quantities had been encountered but that the Redoubt Shoal feature was a downfaulted nose subsidiary to the Trading Bay dominant geologic structure which had been previously awarded a discovery royalty. Pan American filed a notice of appeal to the superior court on February 19, 1969, but the appeal never proceeded to a disposition on the merits.

12. Reconsideration of the Grayling No. 1-A, West Foreland Unit No. 3, and Atlantic Richfield Trading Bay State No. 1 applications for discovery royalty certification.

Atlantic Richfield's application for reconsideration of the denial of discovery royalty certification for the discovery

in the Ivan Bering field prompted Pedro Denton, chief of the minerals section of the division of lands, to change his mind about how much time should be given to discovery certification applicants to prove the boundaries of geologic structures. On January 29, 1968, he wrote to then Commissioner Thomas E. Kelly that the cutoff period established by the regulations provided a reasonable time period, that holding discovery royalty applications in abeyance would cause serious financial administrative problems, and that no evidence gathered after the time limit should be accepted. He was concerned that if the period were unlimited, some companies would continue to demand refunds or credit many years after the ten year term from first encounter had expired, with severe adverse effects on state fiscal planning.

On October 31, 1968, the commissioner sent out three decisions with respect to these three long-standing discovery royalty applications, Union-Marathon's Grayling 1-A (ADL 17594), ARCO's West Foreland No. 3 (ADL 18777) and ARCO's Trading Bay State No. 1 (ADL 35431). Each of these decisions provided as follows:

1. On the basis of the information available at this time, the Director's decision was proper.

2. Adequate time has been allowed the applicant to submit supporting information as requested in their petition for reconsideration.

3. That applicant's request for an opportunity to submit supporting information is reasonable.

> Therefore, the applicant is granted 60 days from receipt of this decision in which to supply supporting information or to schedule a hearing at a time mutually agreeable to the state and the applicant. If no supporting information or hearing is scheduled within the time allowed, the Director's decision will be affirmed.

Atlantic Richfield filed a letter, three exhibits, two enclosures, and a copy of the notice describing the well tests ending July 1, 1967, with Commissioner Kelly in response to these decisions on December 26, 1968. The letter suggested a meeting with state officials to discuss and develop technical data supporting the application. The technical data submitted with this letter included Exhibit 1, an evaluation of mechanical logs; Exhibit 2, a structure contour map; Exhibit 3, a structural cross section A-A[1]; Enclosure 1, well completion information drafted on an electric log; and Enclosure 2, a core analysis -- cores 1-10. They all pertained to lease ADL 34531 and the Ivan Bering field and purported to show that the field was on a separate structure from both the Trading Bay and McArthur River fields. Atlantic Richfield filed nothing with respect to lease ADL 18777 and the West Foreland Unit No. 3 well. These letters were followed up on January 26, 1968, with a legal brief from Theodore F. Stevens and Russell H. Holland, representing Atlantic Richfield. The brief was almost word-for-word the same as the one filed a year earlier in support of Atlantic Richfield's discovery royalty application for the West Foreland Unit No. 3 well.

On December 30, 1968, Union supplemented their application for certification of the Grayling No. 1-A well by filing a blue box which was labeled, "Appendix Geologic Reports and Exhibits." In the box were maps and exhibits and a narrative interpretation explaining the maps and exhibits. Union requested that the matter be set for a hearing at the earliest possible time.

On January 9, 1969, Pedro Denton forwarded to the commissioner his arguments on why the 90-day time limit on geologic structure information ought to be strictly enforced.

On February 7, 1969, Atlantic Richfield was notified that the decision of December 9, 1966, denying discovery certification of the Foreland field was affirmed because no additional information had been submitted.

On June 5, 1969, the Oil and Gas Conservation Committee informed the director of lands that they had reviewed the documents and exhibits submitted to the division of lands on December 30, 1968, and found that this additional information did not warrant a change in the committee's original decision dated January 1, 1966. This letter was signed by Tom Marshall and O. K. Gilbreth, Jr. The results of the review were never forwarded to Union-Marathon.

No further action was taken on either Union's or ARCO's application until February 26, 1970. At that time the commissioner sent out decisions to both Atlantic Richfield and Union-Marathon establishing hearing dates of April 16, 1970, and April 17, 1970, for the pending certification applications. In this notice Commissioner Kelly notified both sets of applicants that his review would be limited to information which was filed within the original 90-day period.

The Atlantic Richfield hearing was conducted on April 16, 1970. At the hearing additional information was presented to show that the Ivan Bering field was one of several entrapping mechanisms on separate structures, each of which should be entitled to discovery royalty certification.

The Union-Marathon hearing was conducted on the next day. At this hearing Union and Marathon introduced a light blue folder full of new exhibits corresponding with Volumes 1 and 2 of the exhibits later submitted on September 28, 1969.

On June 8, 1970, Union-Marathon sent Commissioner Kelly a letter stating the legal reasons why he should look at the after-acquired evidence. Pedro Denton then sent the commissioner a copy of his January 7, 1969, notes which argued that after-acquired evidence should be disregarded.

In August of 1970 the Conservation Committee sent Commissioner Kelly a memorandum which concluded that the original Union-Marathon decision was correct. Pedro Denton then drafted a decision to send to Union-Marathon which contained a lengthy justification for disregarding the after-acquired evidence. The commissioner did not sign Pedro Denton's proposed decision. Rather, he signed a final decision prepared by the Attorney General's office. This decision, again denying Union-Marathon's application for discovery certification, was sent on October 7, 1970.

On November 5, 1970, the chief of minerals forwarded to the commissioner for signature a proposed decision denying Atlantic Richfield's discovery royalty application for ADL 35431. The commissioner signed the decision on December 3, 1970, and the decision was sent to Atlantic Richfield.

13. Judicial review of the decisions denying discovery royalty for Union's Grayling No. 1-A well and Atlantic Richfield's Trading Bay State No. 1 well.

Both Union-Marathon and Atlantic Richfield appealed to the courts. Union and Marathon sought review of the commissioner's October 7, 1970, decision in the superior court, which remanded the matter to the commissioner for a new decision including a statement of the basis for the decision. The

commissioner issued a decision on February 17, 1972, denying discovery well certification on the grounds that insufficient information had been submitted within the 90-day period prescribed by the regulations to determine whether the Grayling well was on a separate geologic structure and that evidence submitted after the 90-day period could not be considered. The companies again sought review in the superior court which dismissed the appeal on the ground that the court lacked jurisdiction. Union-Marathon then lodged their first appeal with the supreme court, which reversed and remanded the matter for further consideration. Union Oil Co. of Cal. v. State Dept. of Nat. Resources, 526 P.2d 1357 (Alaska 1974).

On remand, the superior court affirmed the administrative decision and concluded that the commissioner could not legally consider the after-acquired evidence offered by the applicants, that the commissioner had not granted them the right to submit after-acquired data, and that the director's decision denying discovery royalty certification was clearly sustained by the evidence. Union-Marathon appealed to the supreme court for the second time. The court concluded that the commissioner could legally consider after-acquired evidence and remanded the matter to the commissioner for a determination of the reasonableness of the 90-day limit and to receive additional data and rule upon the basis of all data submitted if, under the circumstances, the limit were found to be unreasonable,. Union Oil Co. of

Cal. v. State Dept. of Nat. Resources, 574 P.2d 1266 (Alaska 1978).

The Atlantic Richfield case was stayed in the superior court by stipulation pending resolution of the Union-Marathon application. Atlantic Richfield Co. v. State Dept. of Nat Resources, No. 3AN-70-3789 Civ.

VI. THE 90-DAY LIMITATION.

In its 1978 decision the supreme court addressed the question of whether the commissioner has the power to consider new evidence of geologic structure which is supplied after the 90-day deadline established by 11 AAC 505.744 (recodified as 11 AAC 83.210(c) (repealed November 9, 1979). The court concluded that the unreasonableness of the 90-day limitation could not be answered on the basis of the record before it. Therefore, it ordered that Union-Marathon be given the opportunity on remand to demonstrate that the 90-day limitation, as applied to them in this case, was unreasonable.

In its decision the supreme court discussed some of the factors which are pertinent to a determination of whether the 90-day requirement should be waived in this case. 574 P.2d at 1272-74. These factors included the advantages of finality, the

desire for stability, the importance of administrative freedom to reformulate policy, the extent of party reliance upon the first decision, the degree of care or haste in making the first decision, and the general equities of each problem, among others.

I determined this issue without affording Union-Marathon the opportunity to demonstrate that the 90-day limitation, as applied to them was unreasonable. My consideration of the factors raised by the supreme court led to my conclusion that I should waive the 90 day limitation and consider data submitted after that period where that data contains evidence of facts in existence at the time the original decision was made. I reached that conclusion for the following reasons.

1. Prompt adjudication of discovery royalty applications was of some importance given the incentive nature of the discovery royalty program. Early decisions on awards would tend to maximize the incentive from the standpoint of applicants and other lessees. Delays in processing applications would have diluted the incentive were they to become a consistent pattern. However, most of the applications were relatively routine. Therefore, permitting occasional delays for the submission of additional evidence on unusually difficult applications would not have significantly dampened the incentive. Moreover, the state experienced no trend in false submissions requiring expeditious denial as an enforcement mechanism.

2. Agencies often request additional specified information if the information in the original submittal is not sufficient to provide grounds for a firm decision. In this case, the applicable regulations plainly did not guarantee conclusive determinations in every instance because the evidence in support of a geologic structure determination was largely left to the discretion of the applicant. For example, 11 AAC 83.210(c) (repealed November 9, 1979)*/ states that this evidence may include the "operator's interpretation" of geophysical and other specified data in addition to the data itself. Other than a definition of the term "geologic structure," there are no set criteria establishing the guidelines for the state's decision. 11 AAC 83.200 - 11 AAC 83.230 (repealed November 9, 1979).**/ The exercise of some latitude in the handling of each application is therefore implicit in the content of these regulations. Under the circumstances, an extension of time to submit additional evidence would not be considered unusual as a matter of agency practice. Moreover, the supreme court strongly suggested that there would be no prejudice to the public interest in considering data obtained after the 90-day period where the data (in this case subsurface geology) would not change over time. See 574 P.2d at 1273.

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*/ Formerly 11 AAC 505.744.

**/ Formerly 11 AAC 505.74 -- 11 AAC 505.741.

3. During the early years of the discovery royalty program in Cook Inlet, the government had little or no information other than the data submitted by the applicant. In the case of the Grayling No. 1-A application, Union-Marathon submitted during the 90-day peiod unusually complete information which included a cross-sectional interpretation of the data. It was this cross section which led Tom Marshall to postulate a possible overlap in the shallow Middle Kenai sands extending into the Trading Bay feature. See Section V.F.3 above. This was only an hypothesis; later-acquired evidence proved it to be incorrect. Nevertheless, Marshall's hypothesis led the department to deny the discovery royalty application on the ground that insufficient subsurface information existed to determine that the McArthur River feature was not overlapped by the previously certified Trading Bay geologic structure.

It is only logical to permit the submission of additional evidence when (1) the applicant submitted unusually detailed information originally, (2) the information generated possible doubt about the validity of the application but could not be proved, (3) the government could only deny the application based on insufficient (rather than contrary) evidence with the 90-day period, and (4) the regulatory requirements governing submission of evidence were vague and judgmental. In order to establish procedural finality, the government could have set a cutoff date for any further evidence. However, while

Union-Marathon appealed the initial denial of January 26, 1966, on February 4, 1966, the Department took no action at all for 2½ years, at which time it granted Union 60 days to submit more information. On December 30, 1968, Union submitted additional information and requested a hearing.

The department did not hold a hearing until April 17, 1970, almost five years after the 90-day period had elapsed. Half a year after the hearing, on October 7, 1970, the commissioner summarily affirmed the original decision. His decision was appealed to the superior court, which remanded the matter to the commissioner for a new decision, including the basis for the decision. On February 17, 1972, the commissioner denied certification on exactly the same grounds as the original 1966 decision, namely that insufficient information was submitted during the 90-day period to determine whether Grayling No. 1-A was on a separate structure.

In summary, although the state's decision not to consider evidence beyond the 90-day period may initially have been reasonable, by virtue of its subsequent behavior it has waived any opportunity to confine additional evidence to a limited period. Further, the discovery royalty program was repealed in 1969, so there is a limited potentially adverse precedent to consider.

Therefore, it is appropriate to consider all geologic evidence submitted by Union-Marathon in conjunction with this case to determine whether they are entitled to a discovery royalty on the grounds that the McArthur River feature is a separate geologic structure from the previously certified Trading Bay geologic structure.

VII. GEOLOGIC STRUCTURE.

A. Applicable Law.

At the time that Union-Marathon applied for discovery well certification of their Grayling No. 1-A well, the holder of a state oil and gas lease that drilled and made the first discovery of oil or gas in commercial quantities in a geologic structure could be rewarded by paying a discovery royalty of only five percent for the first ten years, after which the normal rate (12 1/2 percent of the value of the oil and gas produced) was applicable. AS 38.05.180(a). The pertinent portion of AS 38.05.180(a) provided:

> . . . the holder of a lease who drills and makes the first discovery of oil or gas in commercial quantities in a geologic structure shall pay a royalty on all production under the lease of five per cent for 10 years following the date of discovery and thereafter the royalty rate shall be not less than 12 1/2 per cent.

(Emphasis supplied.)

The regulations contained at 11 AAC 83.230 (repealed November 9, 1979) (formerly 11 AAC 505.74--11 AAC 505.748) specified the procedures for proving the three elements required by AS 38.05.130(a) for discovery well certification: date of discovery, commercial quantities, and geologic structure. 11 AAC 83.210(c) (repealed November 9, 1979) (formerly 11 AAC 505.744) specified the procedure for establishing geologic structure, the only criterion at issue here. The relevant portion provided:

> To establish the geologic structure from which the oil or gas can be produced, the operator must furnish pertinent data to the committee which will enable it to determine the geologic structure from which the oil or gas is being produced. This may include, but is not limited to, geophysical data, total depth, casing records, perforation data, electric logs, drilling and mud logs, core analyses, sample cuttings and sample logs and the operator's interpretation thereof, together with any other records and interpretations the operator deems pertinent. This data must be supplied within 90 days after the date of the potential test as required in (b) of this section.

Additional guidance was provided by 11 AAC 83.205(2) (repealed November 9, 1979) (formerly 11 AAC 505.741(b)), which defined the term "geologic structure" as:

> any structural and/or stratigraphic entrapping mechanism containing one or more intervals, zones, strata, formations, or fault blocks which has the necessary physical characteristics to accumulate and prevent the escape of oil and/or gas. It is intended that the meaning shall be similar to that

used by the United States Geological Survey in the administration of the Federal Mineral Leasing Act of February 25, 1920 (41 Stat. 437) as amended.

The discovery royalty system was curtailed and finally abolished by legislative amendments in 1967 and 1969. 1967 Alaska Sess. L., ch. 97, §2; 1969 Alaska Sess. L., ch. 65, §1.

B. Historic Background.

In 1959 Alaska was a cash-poor state. At this time, exploitation of the state's oil and gas resources was thought to be the best avenue for remedying this situation. The cash would come from bonuses from lease sales and from royalties from leases producing hydrocarbons in commercial quantities. An active leasing program and aggressive exploration activities by lessees were therefore desired goals. Against this background the state's discovery royalty program (which made its first appearance as section 3(7), article VIII, chapter 169, SLA 1959) was adopted to provide a substantial incentive to oil companies to come to Alaska (which was, at the time of statehood, a frontier area from the standpoint of its oil and gas potential) and conduct exploratory drilling operations for and produce oil and gas on state leased land.

The discovery royalty program was plainly successful. It is obvious from the attention devoted to including the dis-

covery royalty program in the 1959 Alaska Land Act, the active participation of oil companies in the drafting of the discovery royalty regulations, and the disputes among the companies over controversial awards that discovery royalty provided an incentive for oil companies to come to Alaska. It is also evident that the discovery royalty program generated drilling races between competing companies on neighboring leases. Undoubtedly, Cook Inlet would have been explored and developed by the oil companies even without the discovery royalty program. However, the state's discovery royalty program definitely accelerated exploration and development activities on state oil and gas leases, thus helping to satisfy the state's objective of obtaining cash as quickly as possible after statehood to fund the state government and finance the provision of essential public services.

C. Decision Criteria.

In considering the issue of geologic structure, there were several approaches suggested in the course of the hearings which I did not consider a valid basis for determining the issue.

First, I did not use the predeposition approach advanced by Mr. William Van Alen. Under this approach Mr. Van Alen constructed a paleostructure map depicting the greater Trading Bay feature at the time hydrocarbons were deposited in the reservoir rock. This paleostructure map was constructed

using all available well data by (1) restoring all fault blocks to the positions they occupied before faulting took place, (2) undoing the effects of compression acting on the structure, and (3) restoring the location of sediments to their original position. The result was that Mr. Van Alen demonstrated the existence of an ancestral Trading Bay anticline dating back approximately 60 million years. The Trading Bay and McArthur River features which exist today evolved from a once undistorted anticline similar in general appearance to that at Middle Ground Shoal. Were I to adopt Mr. Van Alen's approach, I would deny the Union-Marathon application on the ground that both the Trading Bay No. 1-A and Grayling No. 1-A wells penetrated features the origin of which was a single anticline.

I have accepted the accuracy of Mr. Van Alen's paleostructure map as well as his outstanding analysis of the general development of Cook Inlet geology notwithstanding some contrary interpretations submitted by Union-Marathon. However, I do not believe that the existence of an ancestral Trading Bay anticline is pertinent to this decision. Given the incentive nature of the discovery royalty program, it is my belief that the determination should be made on the basis of the geology as it existed at the time of the alleged discovery, regardless of whether that geology was substantially different at an earlier period in time. Otherwise, the program might not have accomplished its purpose of encouraging the discovery of new geologic structures.

Second, I did not employ the K6S concept used by the USGS in the administration of the Federal Mineral Leasing Act of February 25, 1920, 41 Stat. 437, as amended, as described further in USGS Circular 419. That the KGS concept is not dispositive of the issue is demonstrated by the conflicting testimony of Emmett Finley and Joseph David "Red" Cerkel, both formerly serving as chief of the Minerals Classification Branch of the USGS, the agency responsible for making KGS determinations.

Based upon well completion reports from the original Trading Bay No. 1-A well, Mr. Finley drew the KGS boundary around the 7000 foot contour (essentially describing the Trading Bay feature). When shown the well completion reports from the other Trading Bay wells and the Grayling No. 1-A well, Mr. Finley stated that USGS practice would have been to extend the KGS boundary to encompass both areas. Thus, his opinion was that only one KGS would have been drawn around the Trading Bay and McArthur River features by the USGS. Mr. Finley adhered to this conclusion even after reviewing Union's after-acquired evidence graphically displaying the best current geologic understanding of the Trading Bay and McArthur River fields.

However, based on the information available at the time of Union-Marathon's discovery royalty application for the Grayling No. 1-A well, Mr. Cerkle testified that he would have placed an undefined KGS around each feature. When presented with

the updated information, he testified that it was sufficient to completely define the areas and warranted their formal promulgation as two separate defined KGSs.

Further, Mr. Ed Hall, a witness appearing on behalf of Union-Marathon, systematically reviewed USGS KGS determinations in various oil and gas provinces around the United States and demonstrated conclusively that USGS practice varied substantially from area to area. He proved that either Mr. Finley's or Mr. Cerkle's approach might have been used in this case. Moreover, the KGS concept was used by the USGS to make determinations as to whether lands would be leased competitively or noncompetitively, not for discovery royalty awards. The competitive determination is considerably less crucial than a decision as to whether a lessee is to receive a discovery royalty award, and substantial flexibility in applying the KGS for its original intended purpose is acceptable, since the principal effect is on prospective rather than existing lessees. This may explain why the UGS did not feel compelled to issue Circular 419 until 1959 despite the use of the KGS concept in thousands of competitive/noncompetitive determinations since 1920, and the observation in Circular 419 that no phrase in the 1920 Mineral Leasing Act "has resulted in more speculation as to its precise meaning than the phrase 'known geologic structure of a producing oil and gas field.'" In essence, the KGS concept was far less precise than the task it was expected to accomplish in circumstances such as presented by

this case. It worked adequately in obvious cases and not well at all in closer ones. Therefore, while the authors of Alaska's discovery royalty statute and regulations may have intended to follow federal practice, the KGS concept did not provide sufficiently specific criteria to properly found a decision.*/

A third approach which did not present a sufficient basis for determination of this case was the "dominant structure" concept used by the department during the early 1960s on a number of discovery royalty applications. This concept, developed by Thomas Marshall, was used as the basis for rejecting discovery royalty applications filed by Atlantic Richfield for certification of its West Foreland Unit No. 3 and Trading Bay State No. 1 wells, by Texaco for its Trading Bay State No. 1 well, by Amoco for the Redoubt Shoals well, and by Union-Marathon for the Grayling No. 1-A well. All of these applications except the Grayling application were rejected on the basis that the geologic structure on which each well was located was part of the previously certified Greater Trading Bay geologic structure. The Grayling application was rejected on the basis that insufficient

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*/ In addition, none of the regulations implementing the Alaska Oil Proviso, the federal counterpart to Alaska's discovery royalty program, ever used the term "known geologic structure of a producing oil and gas field." Rather, like Alaska's discovery royalty provision, the term "geologic structure" was used. There is, therefore, no express application of the Circular 419 KGS methodology contained in either federal or state law governing discovery royalties.

subsurface information existed to determine whether or not the McArthur River feature was overlapped by the Greater Trading Bay structure.

Mr. Marshall testified that this approach was designed to treat essentially intact anticlinal areas as dominant structures for purposes of aggregating discovery royalty applications. It was devised in response to the inherent ambiguity of the discovery royalty statute. The statute provided for the award of a discovery royalty to the first well drilled on a new "geologic structure" which, from the standpoint of geology, could be as large as Cook Inlet or as small as a microfold. Two competing objectives needed to be reconciled in the context of the inherent ambiguity of the statute: (1) the provision of a sufficiently strong incentive to encourage the oil industry to venture expeditiously into a frontier oil and gas province, and (2) the need to avoid a discovery royalty approach which would result in the award of a discovery royalty for every new accumulation of oil that was found.

Generally, the department did an excellent job in the award of discovery royalties; a review of all discovery royalty awards for Cook Inlet shows that only one was made for each major anticline in the Cook Inlet area. Any other approach would have resulted in too few or too many awards to have successfully meshed the competing objectives mentioned above. However, all of

the other anticlines in Cook Inlet are relatively intact and undisturbed; the Trading Bay/McArthur River features constitute a geologic exception to the pattern of reservoirs discovered in Cook Inlet. The "dominant structure" concept is simply overly general to provide a conclusive answer to a situation where a once single anticline was subsequently severely compressed, distorted, and offset into two distinct features. As a result, the "dominant structure" concept does not provide a sufficient basis to deny a discovery royalty award solely on a finding that a well is located on the same essentially intact anticlinal area as a previously certified discovery well.

Consequently, in order to determine whether the Grayling No. 1-A well was drilled on the same "geologic structure" as the Trading Bay No. 1-A well, there must be an inquiry based on a common sense analysis of the purposes of the discovery royalty program. I have determined that this inquiry must have two parts:

Predrilling Expectation: Did the lessee's opportunity to drill the Grayling No. 1-A well on the McArthur River prospect, based on the information available at the time the decision was made, constitute a proposition of sufficient risk with respect to the possible discovery of a new reservoir such that the state would wish to encourage it by providing a discovery royalty incentive?

Post-drilling Verification: Did the geologic evidence generated after the Grayling No. 1-A well was drilled tend to confirm the lessee's initial belief that the McArthur River feature was relatively distinct from the Trading Bay feature, and that a decision to drill constituted a risk which should be rewarded by granting the discovery royalty incentive?

The Predrilling Expectation inquiry is necessary because the discovery royalty incentive operates at the time a lessee is faced with a decision to commence a well on a new prospect. If the geologic information then available indicated a magnitude of difference in the characteristics of the Trading Bay and McArthur River features, the potential award of a discovery royalty could substantially influence the outcome of the decision on whether and when to drill the well, which was the purpose of the discovery royalty program.

The Post-drilling Verification inquiry is required to demonstrate that the Predrilling Expectation, as contained in the lessee's geologic interpretation of the area, was not seriously in error as a result of substandard evaluation efforts and that a distinct structure has been discovered.

The Predrilling Expectation factor is important; reliance solely on geologic information acquired long after a well has been drilled to adjudicate an application would render

the discovery royalty concept a mere sporting proposition. The Post-drilling Verification factor is equally necessary; inadequate geophysical evaluation at the time of a decision to drill a well could make a gamble out of what would be a virtual certainty for a prudent lessee, and the incentive would be promoting inefficiency. Therefore, both inquiries must be satisfied to justify the discovery royalty award.

D. Analysis

1. Predrilling Expectation. The decision by Union-Marathon to drill the Grayling No. 1-A well was accompanied by sufficient risk with respect to discovery of a new major reservoir, given the information available at the time, as to justify the provision of an incentive by the state, for the following reasons:

a. Union-Marathon's recognition of the existence of two separate features in the Trading Bay area resulted from data provided by their 1959 offshore seismic survey of Cook Inlet. The results of offshore gas exploder seismic surveys conducted in 1960-1961 in preparation for a 1961 state lease sale further defined these two structures. At this time, the companies assigned separate code names to both prospects. Although evidence indicated that Union-Marathon was aware of the discovery royalty implications inherent in the designation of two struc-

tures rather than one collective Trading Bay structure, it is apparent that the companies considered these separate features with differing characteristics. Mr. Richard Lyon testified that the seismic data on the Trading Bay feature consistently showed a sharply defined and attractive potential entrapping mechanism. The data for McArthur River, however, was less consistent. While indicating the presence of an anticline which might be a considerable reservoir, the anticline was shallow and less well defined with a substantial possibility that insufficient closure existed to contain any hydrocarbons which might have been produced. As a result, Union-Marathon bid ten times the bonus money to acquire the tract overlying the Trading Bay feature as it did for the tract covering the McArthur River feature.

b. Seismic work done in 1963 and 1964 further defined these two prospects and was used to locate sites for test wells. Predrilling interpretations of this seismic data showed the existence of two features separated by faulting and a syncline at both the shallow and deep horizons. In 1964 separate AFEs (authorizations for expenditure) were prepared for management approval of the test wells to be drilled on each geologic prospect. Mr. Lyon testified that the presence of a discovery royalty provided him with additional support within his company in the competition to obtain AFEs for both wells.

c. In 1965 three wells (including the Trading Bay No. 1-A discovery well) were drilled to locate the accumulation limits of the Trading Bay structure and to define the boundaries of the Trading Bay structural trap. While the Trading Bay discovery did confirm that the Hemlock was a producing zone within at least part of the collective Trading Bay area as it was elsewhere in Cook Inlet, the evidence of substantial faulting between Trading Bay and McArthur River (and therefore the likelihood of noncommunication between any productive zones) was, if anything, reinforced. Moreover, doubts regarding closure of the McArthur River anticline were in no way diminished.

d. While it may have been logistically convenient for Union-Marathon to move its drilling barge south from Trading Bay to drill the Grayling No. 1-A well, Tom Marshall testified that this action definitely represented a stepping out by Union-Marathon into an area of very considerably uncertainty. It must be remembered that the seismic data and even well data at this point were very scarce and relatively unreliable. Moreover, all of the wells in this area were offshore, and there was no surface geology which could be used to assist in confirming seismic data interpretations. Most important, although it is difficult to appreciate now that platforms are a routine part of the landscape, Cook Inlet was a frontier area during the years shortly after statehood. With the presence of ice, severe tides, and highly adverse weather conditions, there was no assurance

that the area would be successfully developed even if hydrocarbons were present. It was viewed, therefore, much as the Beaufort Sea or the Chukchi Sea are looked at now as potential oil and gas provinces.

e. While the Hemlock zone which produced oil at Trading Bay was considered prospective, Union-Marathon were more attracted by structures at shallower horizons. Thus, the prime target with respect to potential reservoir rock was different at McArthur River than at Trading Bay, increasing the risk factor.

f. In summary, the McArthur River prospect was very much the type that the state would have wanted to have explored. The area was definitely doubtful despite a discovery at Trading Bay, but the potential returns were large given the size of the prospect. Seismic data existing at the time before the drilling of the area indicated two separate prospects of considerably different characteristics and risk, and would have been so viewed by any competent lessee. Under these circumstances, the application of an incentive to obtain early and expeditious drilling of the McArthur River prospect was plainly in the state's interest.*/

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*/ Whether the discovery royalty program actually caused or influenced Union-Marathon's decision to drill the Grayling 1-A well is irrelevant. To deny an award based on the fact that the particular lessee would have drilled the well anyway for its own reasons would be unjustly punitive. The question is whether there was sufficient risk or doubt regarding success that the state would have wanted to encourage an affirmative decision to drill.

2. Post-Drilling Verification. The after-acquired evidence submitted by Union-Marathon demonstrates that the situation occurring at the Pre-Drilling Expectation stage was as perceived, and that the risk involved at the time justified the application of the discovery royalty incentive. In fact, the after-acquired evidence substantiates that the separateness and differing characteristics of the respective reservoirs was somewhat greater than believed in 1965. This conclusion is warranted by the following factors:

a. Evidence presented by the applicant demonstrates that there is no overlap in any gas or oil formation between the Trading Bay and McArthur River features.

b. The extensive number of wells drilled in the intervening area between the Trading Bay and McArthur River features establishes that there is no communication between hydrocarbon accumulations in either of the features.

c. Although both the Trading Bay and McArthur River features possess oil bearing sands in the Hemlock formation, there are both gas (above D zone) and oil (West Foreland) producing horizons in the McArthur River feature which are not present in the Trading Bay feature.

d. The geochemistry for McArthur River hydrocarbons differs significantly for parafins, aromatics, and napthenes from that discovered at Trading Bay.*/

e. The area between the Trading Bay and McArthur River features is transected by a massive strike slip fault. The area within the Trading Bay feature which at the time of the ancestral anticline was opposite the McArthur river featureis now 3 1/2 miles to the east. Moreover, there is a very large displacement of the Hemlock zone to the extent that it is 3,500 feet deeper in McArthur River than in the Trading Bay feature.

It is the last factor which is most persuasive. When looking at the oil and gas fields discovered in Cook Inlet, they are nearly all readily discernable and intact anticlines with primarily a single defined reservoir within each. One discovery royalty was awarded for each of these anticlines. While nearly all of these anticlines contain some local faulting, no discovery royalty was awarded before or after the Grayling 1-A well on the

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*/ While the applicant claimed that this resulted from different geologic origins of Trading Bay and McArthur River, it is my opinion that the McGoon and Claypool report (referenced in Exhibit 1 to Mr. Van Alen's testimony) is more likely correct. It is their belief that variations in geochemistry resulted from differing bacterial deterioration rates of accumulated hydrocarbons during the post-deposition stage rather than from a totally different geologic origin in the context of source rock. However, this does not affect my conclusion that the once existing Trading Bay ancestral anticline developed into two very distinct structures.

basis that local faulting created separate structures (in fact, most applications initially filed on this basis were later withdrawn). The greater Trading Bay/McArthur River area, however, is the one heavily distorted and displaced anticline in Cook Inlet, the only one in which major oil accumulations are divided by a large regional fault (in fact, the only regional fault present in Cook Inlet), and substantially offset in vertical distance as well.

In the context of Cook Inlet geology, the pattern of discovery royalty awards, the purpose of the discovery royalty system, and the potential risk of drilling on the McArthur River feature (which appeared very different from the Trading Bay feature before drilling and was confirmed to be very different after drilling) justifies the conclusion that (1) both the Predrilling Expectation and Post-drilling Verification analyses confirm the propriety of applying a discovery royalty from the standpoint of the purpose of the program, (2) McArthur River is, therefore, a separate geologic structure from the structure at Trading Bay within the meaning of the discovery royalty statutes and regulations, and (3) Union-Marathon is, therefore, entitled to a discovery royalty award for all production from lease ADL 17594.

Dated August 10th, 1982, in Juneau, Alaska.

Geoffrey Haynes
Deputy Commissioner
Department of Natural Resources

APPENDIX 1

4/1/96

Received after the bill was reported out.

Copies to Larry and H. Fin.

STATE OF ALASKA
1996 LEGISLATIVE SESSION

FISCAL NOTE

BILL NO: CSSB 112 (RES)

Revision Date:
Dept. Affected: Revenue
Title: Discovery Royalty Credit
BRU: Revenue Operations
Component: Oil and Gas Audit
Sponsor: (S) Resources
Requestor: (S) Rules
COMPONENT SERIAL NO. 115

Expenditures/Revenues: (Thousands of Dollars)

OPERATING EXPENDITURES	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	•	•	•	•	•	•
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )	••••••••••••••••••• See Analysis •••••••••••••••••••					

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other						
TOTAL	•	•	•	•	•	•

Estimate of any current year (FY96) cost $

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: (Attach a separate page if necessary)

This bill would grant a royalty rate of 5 percent to all oil and gas produced from the lease from which a discovery was made for a period of ten years following the date of discovery.

The revenue impact would depend on the size of the discovery and the timing of the development of the discovered oil and gas accumulation.

See attached analysis for potential revenue loss.

Prepared by: Chuck Logsdon
Phone: 277-5627
Division: Oil and Gas Audit
Date: March 28, 1996
Approved by Commissioner: [illegible]
Date: March 28, 1996
Agency: Department of Revenue

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