

DECISION AND FINDINGS OF THE COMMISSIONER,
ALASKA DEPARTMENT OF NATURAL RESOURCES

FIRST CONTRACTION OF THE DUCK ISLAND UNIT
SECOND EXPANSION OF THE PRUDHOE BAY UNIT

MARCH 20, 1986

AGO 10163562

AGO 1363854

DUCK ISLAND UNIT CONTRACTION/PRUDHOE BAY UNIT EXPANSION

DECISION AND FINDINGS OF THE COMMISSIONER
OF THE DEPARTMENT OF NATURAL RESOURCES

SUMMARY OF DECISION: The contraction of the Duck Island Unit to exclude lands overlying the Lisburne reservoir, and the simultaneous expansion of the Prudhoe Bay Unit to include those lands, required by the conditions of the February 21, 1985 approval of the Third Expansion of the Duck Island Unit and Second Contraction of the Prudhoe Bay Unit, is determined to be in the best interests of the State of Alaska, and is hereby approved effective February 21, 1986.

I. INTRODUCTION AND BACKGROUND

On November 9, 1984, the Department of Natural Resources received an application to ~~expand the unit boundary of the Duck Island Unit and simultaneously to contract the unit boundary of the Prudhoe Bay Unit.~~ The purpose of that application was to amend the boundaries of the two units so that the Endicott reservoir would underlie a single unit, the Duck Island Unit. Lands overlying the Endicott reservoir which were then within the Prudhoe Bay Unit were excluded from that unit and included within the Duck Island Unit. ~~This application was approved by the Department of Natural Resources effective February 22, 1985 conditioned on the requirement that the working interest owners of the two units file a subsequent application within one year of the effective date of the approval, so as to make the boundary between the two units follow the trend of the Mikkelsen Bay Fault.~~ Such subsequent expansion/contraction would restrict the lands in the northwestern part of the Duck Island Unit to those overlying the Endicott reservoir, and restrict the lands in the eastern part of the Prudhoe Bay Unit to those overlying the Lisburne reservoir. The Decision and Findings of the Commissioner, dated February 21, 1985, required the following lands to be contracted out of the Duck Island Unit and recommitted to the Prudhoe Bay Unit:

T12N, R16E, U.M.: Section 21, SW/4 SW/4; Section 28, all; Section 33, all; and Section 34, NW/4 NW/4, S/2 NW/4, SW/4, SW/4 SE/4.

T11N, R16E, U.M.: Section 1, SW/4 SW/4; Section 2, SW/4 NW/4, SW/4, W/2 SE/4, SE/4 SE/4; Section 11, all; and Section 12, NW/4, NW/4 NE/4, S/2 NE/4, S/2.

On ~~November 21, 1985,~~ the Department of Natural Resources received an ~~application to expand the unit area of the Prudhoe Bay Unit and simultaneously to contract the unit area of the Duck Island Unit pursuant to the condition placed on the approval of the February 22, 1985 expansion/contraction.~~ The

application was filed with the Department by Sohio Alaska Petroleum Company ("Sohio"), predecessor in name to the present Standard Alaska Production Company, the Unit Operator of the Duck Island Unit and a Unit Operator of the Prudhoe Bay Unit, and ARCO Alaska Inc. ("ARCO"), a Unit Operator of the Prudhoe Bay Unit on behalf of all of the working interest owners of the two units.

Prior to filing the application with the Department, representatives from ARCO and Sohio met with Department staff and with the Alaska Oil and Gas Conservation Commission to discuss the terms of the required Duck Island Unit Contraction/Prudhoe Bay Unit Expansion. In the course of these meetings, the working interest owners presented evidence that the lands to be excluded from Duck Island Unit and recommitted to Prudhoe Bay Unit should be slightly different from those required in the February 21, 1985 decision. Specifically, they argued that based on new geotechnical data and interpretations of those data, the lands to be excluded from the Duck Island Unit and recommitted to the Prudhoe Bay Unit should be limited to:

T11N, R16E, U.M.: Section 2, SW/4 NW/4, SW/4, S/2 SE/4;
Section 11, all; and Section 12, S/2 NE/4, NW/4, S/2.

T12N, R16E, U.M.: Section 28, all; Section 33, all; and
Section 34, W/2 NW/4, SW/4, SW/4 SE/4.

The Department and the Alaska Oil and Gas Conservation Commission agreed that the data presented by the working interest owners indicated that the lands to be excluded from the Duck Island Unit and recommitted to the Prudhoe Bay Unit to conform to the areal extent of the Endicott and Lisburne reservoirs, respectively, were better reflected by the lands proposed by ARCO and Sohio. Based on this decision, the working interest owners of the two units filed the application for the Second Expansion of the Prudhoe Bay Unit and the simultaneous First Contraction of the Duck Island Unit on November 21, 1985.

The separate Duck Island and Prudhoe Bay Unit Agreements conform and modify individual oil and gas leases so that exploration and production activities can be conducted on a unit-wide basis rather than on a lease-by-lease basis. Approval of the expanded Prudhoe Bay Unit and contracted Duck Island Unit would extend joint, cooperative development of the respective unit areas in accordance with approved unit plans of development and operations to lands included within the expanded Prudhoe Bay Unit and contracted Duck Island Unit.

The Prudhoe Bay Unit was approved by the State on November 18, 1977, and was retroactively effective April 1, 1977. At the time of this application, the unit contained all or portions of 118 State of Alaska oil and gas leases, comprising approximately 243,847 acres. The Duck Island Unit, approved by the State on August 21, 1978, contained 16 State of Alaska leases totalling approximately 42,200 acres at the time of this application.

Public notice for the proposed expansion/contraction was published in the Anchorage Daily News and in the Tundra Times on December 2, 1985, and copies of the proposed unit application were provided to all affected parties as set out in 11 AAC 83.311, as well as to the Alaska Department of Fish and Game,

Mr. Al Ott
Regional Supervisor
Habitat Division
565 University Ave.
Fairbanks, AK 99701

Mr. C. V. Chatterton
Commissioner
Alaska Oil & Gas Conservation Commission
3001 Porcupine Drive
Anchorage, AK 99501

Mr. Bill Van Alen
Alaska Oil & Gas Conservation Commission
3001 Porcupine Drive
Anchorage, AK 99501

Mr. George Ahmaogak
Mayor
North Slope Borough
P.O. Box 69
Barrow, AK 99723

Mr. G. N. Nelson
President
Standard Alaska Production Co.
P.O. Box 196612
Anchorage, AK 99519-6612

Mr. Harold C. Heinze
President
ARCO Alaska, Inc.
P.O. Box 100360
Anchorage, AK 99510-0360

the Alaska Department of Environmental Conservation, and the Alaska Oil and Gas Conservation Commission. No comments were received by the Department on the proposed expansion/contraction.

II. DETERMINATION OF PROPER UNIT BOUNDARIES

In comments made in December 1984 to the Department of Natural Resources, the Alaska Oil and Gas Conservation Commission noted that the operators of the Prudhoe Bay Unit were concurrently petitioning the Commission to establish Field Rules for the Lisburne reservoir. The Public Hearing for the Lisburne Oil Pool Field Rules was held on November 29, 1984, and the Rules were subsequently adopted on January 10, 1985. As a result of the review of the testimony on the adoption of the Rules and a review of the geotechnical data from the Prudhoe Bay Unit Area, it became apparent that there existed a probability of the Lisburne reservoir extending to the northeast up to the Mikkelsen Bay Fault, which is postulated to be the southwest boundary of the Endicott reservoir. As a result of these findings, the Commission ordered the following Field Rule for the Lisburne Oil Pool:

Rule 11. UNITIZATION: To ensure the protection of correlative rights and to prevent waste, the Lisburne Oil Pool shall be administered in accordance with the Prudhoe Bay Unit Agreement.

To ensure that the Lisburne reservoir is contained within the confines of the Prudhoe Bay Unit to the maximum extent possible, the Commission requested that the Department of Natural Resources require modification of the application for the Duck Island Unit Expansion/Prudhoe Bay Unit Contraction to make the trace of the Mikkelsen Bay Fault the nominal boundary between the two units. They proposed that the boundary be stepped off from the fault to the southwest in 40-acre increments, thereby minimizing the inclusion of those lands within the Duck Island Unit Area which overlie the Lisburne reservoir. After consultation with both the Alaska Oil and Gas Conservation Commission and the Duck Island Unit and Prudhoe Bay Unit Operators, the Department of Natural Resources determined that the best interest of the State would be served by approving the earlier application for Duck Island Unit expansion/Prudhoe Bay Unit contraction as submitted, but conditioning the approval on the subsequent amendment of the unit boundaries to reflect the influence of the Mikkelsen Bay Fault in separating producing horizons between the two units. This was done on February 22, 1985, and the current application for expansion of the Prudhoe Bay Unit and simultaneous contraction of the Duck Island Unit was submitted in compliance with the condition placed on the earlier expansion/contraction.

III. GEOLOGICAL CONSIDERATIONS.

At the time of the earlier expansion of the Duck Island Unit and contraction of the Prudhoe Bay Unit, the applicants presented extensive geological,

geophysical, and engineering data to the Department to justify that expansion/contraction. The information was presented to the Department in a series of technical working sessions between the applicants and Division of Oil and Gas personnel. Data presented included well logs and core data, seismic interpretations, reservoir stratigraphy, structure, and other characteristics, and engineering and production estimates.

In late 1985, the applicants again met with Department staff and the Alaska Oil and Gas Conservation Commission to present similar technical data and interpretations of those data. As a result, the lands to be excluded from the Duck Island Unit and recommitted to the Prudhoe Bay Unit were slightly changed.

IV. DISCUSSION OF CRITERIA AND CONTRIBUTING FACTORS

According to 11 AAC 83.303, the State will approve a proposed unit agreement for State oil and gas leases if such an agreement is found to be necessary to protect the public interest considering the provisions of AS 38.05.180(p) and the regulations governing unitization (11 AAC 83.301 -- 11 AAC 83.395). Such an agreement must promote the conservation of all natural resources, including all or part of an oil or gas pool, field, or like area, promote the prevention of economic and physical waste, and provide for the protection of all parties of interest, including the State. In evaluating these criteria, the State must take into consideration several factors including environmental and economic costs and benefits of unitization, prior exploration activities in the proposed unit area, the applicant's plans for development of the unit area, and the geological and engineering characteristics of the potential hydrocarbon accumulation or reservoirs proposed for unitization. These decision criteria and contributing factors are considered below.

Criteria for Decision:

A. The Conservation of All Natural Resources. Unitized development and operation of hydrocarbon reservoirs is a well accepted means of hydrocarbon conservation. Unitization acts to permit the entire oil or gas field (or a very substantial portion of it) to be operated as a single entity, regardless of the surface boundary lines or the diverse ownership of separate tracts within the field. By unitization of the separate tracts that overlie a hydrocarbon reservoir, the development operations necessary to produce the resource most efficiently can be carried out by a single operator acting to exploit the field in a considered and integrated manner.

The objective of the proposed expansion of the Prudhoe Bay Unit and simultaneous contraction of the Duck Island Unit is to restrict the areal boundaries of each unit to conform to the subsurface location of the respective producing areas in each unit. Thus the Prudhoe Bay Unit is expanded to encompass acreage overlying the Lisburne reservoir, and the Duck Island Unit is contracted so that its northwestern unit area more properly represents the surface acreage overlying the Endicott reservoir. This alleviates as much as possible problems that might arise in allocation of

hydrocarbons across lease or unit boundaries. As such, it meets the criterion of conservation of all natural resources. The separate unit agreements provide for the conservation of both surface and subsurface resources through the applicable plans of Development and Operations as well as through the unitized operation of their respective reservoirs.

B. The Prevention of Economic and Physical Waste. The benefits of unitization are particularly important when the fields to be developed contain economically marginal reservoirs. In such areas, added reserves are often obtained by virtue of the efficiencies of unitized operations. Capital savings as a result of minimal duplication of facilities and integrated reservoir management allow less profitable areas of a reservoir to be developed and produced. The current uncertainty regarding the magnitude of the return on the investment necessary to develop a field adds to the reluctance of individual lessees to enter into a costly development project by themselves.

Both the Lisburne and the Endicott reservoirs are considered to be somewhat marginally economic hydrocarbon accumulations. The benefits attributable to unitization are a significant impetus to the development of these reservoirs as a whole; without unitization the probability of production from these reservoirs underlying the Prudhoe Bay and Dusk Island Units would be significantly diminished.

Considering the above, the expansion of the Prudhoe Bay Unit to contain the productive portion of the Lisburne reservoir, and the restriction of the Duck Island Unit to contain only the Endicott reservoir, contribute to the prevention of economic and physical waste. A single operator will produce and develop the Endicott reservoir, and the Duck Island Unit Agreement sets forth a comprehensive Plan of Development governing that production. The Prudhoe Bay Unit co-Unit Operators will produce and develop the Lisburne reservoir under the auspices of the Prudhoe Bay Unit Agreement, which also provides for a comprehensive Plan of Development. Divisions of interest allocating hydrocarbon production and development and operational costs are included as a part of the Unit Agreements as Exhibit C to each Agreement.

C. The Protection of All Parties of Interest, Including the State. As stated above, the principal aim of unitization is the protection of all parties having an economic interest in a common resource. Unitization acts to protect the various interests of all of the affected parties by eliminating the competition of divergent interests in producing a common reservoir, while retaining separate allocations for the equitable division of costs and benefits based on original ownership of the resource. By committing their interests to the Unit Agreement, all parties are assured an allocation of costs and benefits commensurate with the value of each respective interest.

The proposed expansion of the Prudhoe Bay Unit and simultaneous contraction of the Duck Island unit protects the State's economic interest by maximizing the physical recovery of the hydrocarbons in the Endicott and Lisburne reservoirs, and thereby maximizes the revenue attributable to the production from those reservoirs. At the same time, through State approval of the Plans of

Development and Operations that are integral parts of the Prudhoe Bay and Duck Island Unit Agreements, any impacts to the region's cultural, biological, and environmental resources may be mitigated and minimized. The Prudhoe Bay and Duck Island Unit Agreements contain equitable provisions for reporting and maintaining records, provide for State approval of operating procedures, and provide acceptable procedures for royalty settlement, in-kind oil taking, and emergency storage of oil. The Prudhoe Bay and Duck Island Unit Agreements have also been amended to contain provisions for settlement of cleaning, dehydration, and transportation charges for royalty hydrocarbons derived from the Endicott and Lisburne reservoirs, thereby reducing the chance of any further controversy or litigation attributable to that cause for the reservoir.

The State's interest is protected by the consideration and approval rights over the allocation formulas for production and costs for the Endicott and Lisburne reservoirs, and Plans of Development and Operations for the Prudhoe Bay and Duck Island Units as a whole. The interests of the various leaseholders are protected by their commitment to agreements preserving correlative rights and maximizing economic recovery from the reservoirs. The interests of all affected parties are, therefore, protected by the proposed expansion of the Prudhoe Bay Unit and simultaneous contraction of the Duck Island Unit.

In reviewing the above criteria, the following factors were considered:

1. The Environmental Costs and Benefits of Unitized Development. As discussed in the consideration of Criteria A and B above, the environmental consequences of lease-by-lease drilling and exploitation of a reservoir are generally undesirable. Such a program leads to development of an area based on individual interests rather than on an integrated basis, and contributes to significant duplication of surface activities and impacts.

The leases involved in this expansion/contraction are adjacent to an environmentally sensitive marine area known as the "Boulder Patch." In addition, the Unit Areas include substantial portions of the Sag River Delta. Although numerous leasing and permitting restrictions exist to protect the environment and habitat of the area, unitized development as part of the Prudhoe Bay and Duck Island Units will further contribute to the maintenance of the environmental integrity of the area. The benefits of unitized development of the area are many; no environmental costs of unitization relative to lease-by-lease development are apparent.

2. The Geological and Engineering Characteristics of the Reservoir Proposed for Unitization. At this time, the principal objective of the development of the Duck Island Unit is production from the Endicott reservoir, underlying the Lisburne Group below approximately 10,440 feet below sea level. The trapping mechanism is postulated to consist of a combination of various faulting elements to the north and west, an oil-water contact to the south, and truncation to the east.

The Lisburne reservoir underlies the eastern portion of the Prudhoe Bay Unit at an approximate depth of 10,000 feet below sea level, being upthrown from the Endicott reservoir on the southwest by the Mikkelsen Bay Fault. The trapping mechanisms for the Lisburne reservoir are thought to be both structural and stratigraphic in nature.

This contraction of the Duck Island Unit and expansion of the Prudhoe Bay Unit will place separation of the two units approximately at the location of the Mikkelsen Bay Fault at the depth of the Endicott reservoir. Since the Lisburne reservoir is postulated to be bounded by the Mikkelsen Bay Fault to the northeast, the use of this fault as the boundary between the two units will act to place each of the two reservoirs within separate units to the extent physically possible.

3. Prior Exploration Activities in the Area. Considerable exploration activities have been pursued in the area adjacent to the Mikkelsen Bay Fault. Sohio has drilled three wells, Sag Delta Wells Nos. 1, 2, and 3 in the immediate vicinity of the fault, and numerous other wells have been drilled in the area by Sohio and Exxon.

4. The Applicant's Plans for Development of the Unit Areas. In the several technical meetings held between the applicants and the State, the applicants indicated that development of the Endicott reservoir was being pursued with the intention to commence production in 1988. Initial development plans call for between 40 and 60 directional wells to be drilled from two gravel islands constructed immediately offshore. Hydrocarbon reinjection for reservoir pressure support will be implemented from the onset to maximize total recovery of hydrocarbons. Producing wells will tie into a centralized production facility, which will process the hydrocarbons to meet pipeline specifications. The conditioned liquid hydrocarbons will then be transported by pipeline and introduced into the Trans Alaska Pipeline System (TAPS) at Pump Station No. 1. A portion of the associated gas will be conditioned, compressed, and processed through a natural gas liquids recovery facility; the remainder of the associated gas will be reinjected into the gas cap or sold.

Meetings with the Prudhoe Bay Unit working interest owners have indicated their interest in commencing development of the Lisburne reservoir in 1986 with the possibility of a late 1986 - early 1987 startup. Interference and drainage testing is scheduled for 1986, with delivery of the Production Center for the project scheduled for the 1986 sealift.

5. Economic Costs and Benefits to the State. It is to the State's advantage to encourage early development of the Endicott and Lisburne reservoirs as the commencement of production from the reservoirs will begin at approximately the time that the State will be beginning to feel the effects of the decline of production from the Sadlerochit reservoir within Prudhoe Bay Unit. As a result of the development and production of the Endicott and Lisburne

reservoirs, the State's long-term royalty and tax revenues are enhanced and private development capital is available for alternative oil and gas activities elsewhere in the State. Also, by having a single operator, Sohio for the Endicott reservoir, and ARCO for the Lisburne reservoir, rather than numerous lessees, the administrative burden to the State is significantly reduced.

V. DECISION AND FINDINGS

Considering the facts discussed in this document and the administrative record, I hereby find as follows:

1. Based on the available geologic and engineering data submitted to the State, on comments on the application provided by other State agencies, and on the several technical presentations made to the State by the applicants, the contraction of the Duck Island Unit to exclude portions of ADLs 34634 and 34636, and the expansion of the Prudhoe Bay Unit to include those portions of ADLs 34634 and 34636 are proper and justified. The following lands are therefore to be excluded from the Duck Island Unit and recommitted to the Prudhoe Bay Unit:

T11N, R16E, U.M.: Section 2, SW/4 NW/4, SW/4, S/2 SE/4;
Section 11, all; and Section 12, S/2 NE/4, NW/4, S/2.

T12N, R16E, U.M.: Section 28, all; Section 33, all; and
Section 34, W/2 NW/4, SW/4, SW/4 SE/4.

2. Approval of this contraction of the Duck Island Unit and expansion of the Prudhoe Bay Unit is necessary and advisable to protect the public interest. Lessees' ratification of the appropriate Unit Agreement will insure a fair and equitable return to the State from any production of hydrocarbons from the final approved unit areas.
3. Diligent exploration and delineation of the reservoirs underlying the Duck Island and Prudhoe Bay Unit Areas will continue to be conducted by the respective Unit Operators under the Plans of Development and Operations for the two units as approved by the State.
4. The economic benefits to the State in contracting the Duck Island Unit Area and expanding the Prudhoe Bay Unit outweigh the economic costs to the State to do so.
5. Contraction of the Duck Island Unit Area and expansion of the Prudhoe Bay Unit will provide for the increased conservation of all natural resources including hydrocarbons, gravel, sand, water, wetland, and other valuable habitat.

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6. Contraction of the Duck Island Unit Area and expansion of the Prudhoe Bay Unit will reduce the amount of surface lands and fish and wildlife habitat that would otherwise be used if the area were to be explored and developed on a lease-by-lease basis. This reduction in the impact on the environment is in the public interest.
7. Contraction of the Duck Island Unit Area and expansion of the Prudhoe Bay Unit will not limit or diminish access to public or navigable waters beyond any limitations already contained in the oil and gas leases within the two Unit Areas.
8. At this time, the action is consistent with the Alaska Coastal Management Program.
9. This expansion of the Prudhoe Bay Unit Area and simultaneous contraction of the Duck Island Unit Area will be effective as of 12:01 a.m. February 22, 1986.

For these reasons I hereby approve the First Contraction of the Duck Island Unit and Second Expansion of the Prudhoe Bay Unit.

James E. Brown, Deputy Director
 In James E. Brown, Director
 Division of Oil and Gas

March 20, 1986
 Date

For: Esther C. Wunnicke, Commissioner
 Alaska Department of Natural Resources

Attest: *Madeline S. McIntyre*
 Title: Unit Manager
 Date: 3-20-86

Attest: *Betty L. Harriman*
 Title: Secretary
 Date: 3/20/86

Attachment: Delegation of Authority from Commissioner, Department of Natural Resources, to Director, Division of Oil and Gas, February 22, 1984.

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ATTACHMENT II
 FIRST REVISION OF THE PARTICIPATING AREA FOR THE
 ENDICOTT RESERVOIR, DUCK ISLAND UNIT
 AS REQUIRED BY FEBRUARY 22, 1986

<u>Tract</u>	<u>ADL #</u>	<u>Legal Description</u>
1	47502	T11N, R17E, U.M.; Secs. 5, 6, 7, and 8
2	47503	T11N, R17E, U.M.; Secs. 3, 4, 9, and 10
3	47504	T11N, R17E, U.M.; Secs. 13 and 14
4	47505	T11N, R17E, U.M.; Secs. 15 and 16
5	47506	T11N, R17E, U.M.; Sec. 17
12	34634	T12N, R16E, U.M.; Sec. 27, NW/4, E/2, E/2 SW/4, and NW/4 SW/4; Sec. 34, NE/4 NW/4, NE/4, N/2 SE/4, and SE/4 SE/4.
13	34633	T12N, R16E, U.M.; Secs. 25, 26, 35, and 36
14	34636	T12N, R16E, U.M.; Secs. 1, NW/4, NE/4, SE/4, N/2 SW/4, SE/4 SW/4; Sec. 2, N/2 NW/4, SE/4 NW/4, NE/4, NE/4 SE/4; Sec. 12, NE/4 NE/4.
15	312828	See Below
16	312834	See Below

Tract 15: That portion of those lands in the S/2 S/2 NE/4 of Block 653 lying north of the south boundary of Sections 22, 23, and 24, T12N, R16E, U.M., AK. (being identical with line 6-7 on Block 653) and those lands in the S/2 SW/4 NE/4 of Block 653 lying north of the south boundary of Section 24, T12N, R16E, U.M., AK. and east of the west boundary of Section 30, T12N, R17E, U.M., AK. and those lands in the SW/4 SE/4 NE/4 of Block 653 and those lands in the SE/4 of Block 653 lying east of the west boundary of Sections 30 and 31, T12N, R17E, U.M., AK. and those lands in the SW/4 SW/4 of Block 654 and those lands in the SW/4 NW/4 SW/4 of Block 654 and those lands in the SW/4 SE/4 SW/4 of Block 654 and those lands in Block 697 lying in T12N, R17E, U.M., AK. being the northeast portion of Block 697 and those lands in the NW/4 of Block 698 lying north of the south boundary of Sections 31, 32, and 33, T12N, R17E, U.M., AK. and those lands in NW/4 NW/4 NE/4 of Block 698 lying north of the south boundary of Sections 33 and 34, T12N, R17R, U.M., AK. which are within the offshore three-mile arc lines and which are all listed as state area on the "Supplemental Official O.C.S. Block Diagram" approved 10/19/79 and 12/9/79, respectively.

Tract 16: That portion of those lands in the S/2 and S/2 N/2 of Block 698 lying east of the west boundary of Sections 2 and 11, T11N, R17E, U.M., AK. (Being identical with line 4-5 of Block 698) and lying north of the south boundary of Section 11, T11N, R17E, U.M., AK. (being identical with line 5-6 in Block 698) and the SW/4 NW/4 of Block 699 and those lands in the SW/4 of Block 699 lying north of the south boundary of Sections 11 and 12, T11N, R17E, U.M., AK. and those lands in the SW/4 NW/4 SE/4 of Block 699 and those lands in the SW/4 SE/4 of Block 699 lying north of the south boundary of Section 12, T11N, R17E, U.M., AK. and east of the west boundary of Sections 7 and 18, T11N, R18E, U.M., AK. which are within the offshore three-mile arc lines and which are all listed as state area on the "Supplemental Official O.C.S. Block Diagram" approved 10/4/79 and 12/9/79, respectively.