Application #1

96-99-NG

PHILLIPS ALASKA NATURAL GAS CORPORATION
HOUSTON TEXAS 77251 1967
BOX 1967

BELLAIRE TEXAS
6330 WEST LOOP SOUTH
PHILLIPS BUILDING

December 17, 1996

EIA - SURVEY CENTER
DEC 27 1996
DOE - WASH, DC

Office of Fuels Programs
Fossil Energy, U.S. Department of Energy
Docket Room 3E-056, FE50
Forrestal Building
1000 Independence Avenue, SW
Washington, D.C. 20585

Re: Phillips Alaska Natural Gas Corporation And Marathon Oil Company Application To Amend Authorization To Export Liquefied Natural Gas

Ladies and Gentlemen:

Pursuant to 10 C.F.R. §590.201, Phillips Alaska Natural Gas Corporation ("PANGC") and Marathon Oil Company ("Marathon") enclose for filing the original and fifteen (15) copies of their "Application to Amend Authorization to Export Liquefied Natural Gas." The applicants seek approval of the Office of Fossil Energy for a five-year extension of their existing authorization to export LNG

Also enclosed is a check for Fifty Dollars ($50 00) in payment of the filing fee pursuant to Section 590.207.

1996 DEC 31 A 8:54

REC'D DOE/FE

Very truly yours,

PHILLIPS ALASKA NATURAL GAS CORPORATION

Virgil Spurgeon

Virgil R. Spurgeon
Regulatory Affairs Agent
(713) 669-7993

VRS sw
Enclosure

UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

In the matter of	)	
	)	
PHILLIPS ALASKA NATURAL GAS	)	
CORPORATION	)	Docket No. 96-99-LNG
and	)	
MARATHON OIL COMPANY	)	

APPLICATION TO AMEND AUTHORIZATION TO EXPORT LIQUEFIED NATURAL GAS

December 17, 1996

UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

OFFICE OF FOSSIL ENERGY

1996 DEC 31 54

REC'D DOE/FE

In the Matter of	)	
	)	
PHILLIPS ALASKA NATURAL GAS CORPORATION	)	Docket No. 96-99 LNG
and	)	
MARATHON OIL COMPANY	)	

APPLICATION TO AMEND AUTHORIZATION
TO EXPORT LIQUEFIED NATURAL GAS

Phillips Alaska Natural Gas Corporation ("PANGC") and Marathon Oil Company ("Marathon") hereby request, pursuant to Section 3 of the Natural Gas Act, 15 U.S.C. §717b, and 10 C.F.R. Part 590, approval of a five-year extension of their existing authorization to export liquefied natural gas ("LNG"). The existing authorization was granted by the Economic Regulatory Administration ("ERA") of the Department of Energy ("DOE") on July 28, 1988, to Phillips 66 Natural Gas Company ("P66NGC"), predecessor in interest to PANGC, and Marathon for a 15-year period ending March 31, 2004, in DOE/ERA Opinion and Order No. 261. The authorization was subsequently amended by the Office of Fossil Energy ("FE") in DOE/FE Opinion and Order Nos. 261-A (June 18, 1991), 261-B (December 19, 1991), 261-C (July 15, 1992) and 261-D (March 2, 1995), collectively referred to herein as "Order No. 261".

In support hereof, Applicants submit the following:

I. GENERAL INFORMATION

The exact legal name of PANGC is Phillips Alaska Natural Gas Corporation. PANGC is a Delaware Corporation with principal offices in Bartlesville, Oklahoma. PANGC is a wholly-owned subsidiary of Phillips Petroleum Company ("Phillips"), a publicly traded Delaware Corporation. PANGC is authorized to do business in Alaska, Oklahoma, and Delaware.

The exact legal name of Marathon is Marathon Oil Company. Marathon is an Ohio corporation with principal offices in Houston, Texas. Marathon is a wholly-owned subsidiary of USX Corporation, a publicly traded Delaware corporation. Marathon is authorized to do business in all states in which it does business, including the State of Alaska. PANGC and Marathon are not affiliated with each other.

All correspondence and communications regarding this application, including service of pleadings and notices, should be directed to the following persons:

PANGC:

Mr. Virgil R. Spurgeon, Agent for
Phillips Alaska Natural Gas Corporation
P.O. Box 1967
Houston, Texas 77251-1967
Phone: (713) 669-7993

Mr. G. M. Schuppert
Vice President, Marketing
Phillips Alaska Natural Gas Corporation
1000B Plaza Office Building
Bartlesville, OK 74004
Phone: (918) 661-4118

Mr. Stephen R. Johnson, Attorney for
Phillips Alaska Natural Gas Corporation
1215 Adams Building
Bartlesville, OK 74004
Phone: (918) 661-8373

Marathon: Mr. Daniel W. Mowrey
Manager, International Natural Gas
P. O. Box 3128
Houston, Texas 77253-3128
Phone: (713) 296-3723

Ms. Lauren D. Boyd, Attorney for
Marathon Oil Company
P. O. Box 3128
Houston, Texas 77210-4813
Phone: (713) 296-2539

The Applicants hereby certify that the undersigned persons and those named above are the duly authorized representatives of the Applicants. There are no other proceedings related to this application pending at any other part of the DOE or any other government agency.

II. AUTHORIZATION REQUESTED

PANGC and Marathon request that FE amend the export authorization granted in Order No. 261 to approve the continued exportation of LNG for an additional five years commencing April 1, 2004 and extending through March 31, 2009.

III. BACKGROUND

In November 1969, Phillips and Marathon began exporting LNG manufactured from Alaskan natural gas to Japan. The exports originally commenced pursuant to the April 19, 1967, order of the

1227, 37 FPC 777 (1967). In that order, the FPC found that the export of LNG by Phillips and Marathon would not be inconsistent with the public interest and authorized the export of LNG by Applicants for a 15-year period ending May 31, 1984.

The original Liquified Natural Gas Sales Agreement dated March 6, 1967, among Phillips and Marathon as Sellers and Tokyo Electric Power Company Incorporated ("Tokyo Electric") and Tokyo Gas Co., Ltd. ("Tokyo Gas") as Buyers (herein collectively referred to as "Parties") provided that the term could be extended for an additional period of five years under certain circumstances. The Parties agreed to a five-year extension, and on May 10, 1982, Phillips and Marathon filed a joint application with the ERA to extend the initial export authorization granted by the FPC for an additional five years from May 31, 1984. In granting the authorization to continue the LNG export in Order No. 49, 1 ERA ¶70,116 (December 14, 1982), the ERA found the extension was not inconsistent with the public interest.[1]

The Parties entered into the Extension Agreement dated June 17, 1988, to continue the LNG sales for an additional 15 years through March 31, 2004. The Extension Agreement provided that LNG sales volumes would increase incrementally to coincide with the replacement of the existing LNG tankers with two new larger LNG tankers. Under the terms of the Extension Agreement, the LNG

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[1] In ERA Order No. 49-A, 1 ERA ¶70,128 (April 3, 1986), the authorization previously granted to Phillips Petroleum Company to export LNG was transferred to Phillips 66 Natural Gas Company effective as of January 1, 1986.

contract sales volumes would increase up to 57.5 trillion Btus per year with provisions to allow for sales of an additional 6% over the contract volumes. On April 11, 1988, P66NGC and Marathon filed a joint application with the ERA in Docket No. 88-22-LNG requesting approval of a 15-year extension and modification of their existing authorization. In granting the authorization to amend and continue the LNG export in Order No. 261, 1 ERA ¶70,130 (July 28, 1988), the ERA concluded inter alia, (1) that there is no domestic need for the gas involved in this export over the term of the extended authorization; (2) that the export arrangement is in accord with the DOE's international gas trade policy; (3) that the exports contribute favorably to the U.S. balance of payments; (4) that the pricing formula is reasonable and provides flexibility to respond to market conditions; and (5) that the extension is not inconsistent with the public interest.

On October 31, 1991, the Parties signed a letter of intent which was later formalized in the Second Amendatory Agreement dated February 19, 1992, modifying the Extension Agreement to increase the contracted sales volume from 57.5 TBtus to 64.4 TBtus per year. On November 26, 1991, PANGC and Marathon filed an application with the FE requesting an amendment to their existing export authorization to permit the increase in annual exports of LNG to Japan. In granting the request in DOE/FE Opinion and Order No. 261-C, 1-FE ¶70,607 (June 19, 1992), the FE found the exporting of additional volumes of LNG was not inconsistent with the public interest.[2]

The Buyers and Sellers have continued discussions concerning the LNG purchase and sale to facilitate their planning for the conduct of their respective operations. Pursuant to such discussions, the Parties negotiated and executed the Letter Agreement dated May 17, 1993, attached as Appendix A and herein referred to as the "Letter Agreement", which contains the following terms of particular relevance to this application:

(1) Buyers elect to extend the Extension Agreement by an additional five (5) years commencing April 1, 2004, until and including March 31, 2009, under the same terms and provisions of the current agreement.

(2) The extension is subject to Sellers providing written acceptance of such extension to Buyers on or before March 31, 2001.

A copy of Applicants' written acceptance will be filed with the FE when available.

Historically, the natural gas used to manufacture LNG for export to Japan has been produced from the Cook Inlet Basin area of Alaska. Seventy percent of the annual wellhead requirement has been produced by Phillips from reserves which it owns or controls in the North Cook Inlet Unit, and 30% has been produced by Marathon

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[2] In FE/DOE No. 261-B (1 FE ¶70,506, December 19, 1991), the authorization previously granted to Phillips 66 Natural Gas Company to export LNG was transferred to PANGC effective as of December 19, 1991.

from reserves which it owns or controls principally in the Kenai Field. During the five year extension, for which authority is being requested herein, natural gas will be produced from gas fields owned or controlled by Applicants in the Cook Inlet area. The natural gas will be manufactured into LNG at the existing liquefaction plant which is indirectly owned by PANGC and Marathon near Kenai, Alaska.[3]

IV. EXTENSION OF THIS EXPORT PROJECT IS NOT INCONSISTENT WITH THE PUBLIC INTEREST.

The PANGC/Marathon Alaskan LNG export project has been a safe and reliable operation for all parties concerned for over 26 years. Applicants seek approval for the continuation of that export service using the existing facilities and the current method of operation for an additional five years through March 31, 2009.

Section 3 of the Natural Gas Act ("NGA"), in addressing natural gas imports and exports, provides in part, "The Commission shall issue such order upon application, unless, after opportunity for hearing, it finds that the proposed exportation or importation will not be consistent with the public interest." For the reasons stated herein, PANGC and Marathon believe that there continues to be no basis in fact or law for any conclusion other than that reached by the FPC in 1967, by ERA in 1982 and 1988 and by FE in 1992, that the export of Kenai liquefied natural gas to Japan by

[3] The Kenai LNG Plant is owned by Kenai LNG Corporation, which is 70% owned by PANGC and 30% owned by Marathon.

PANGC and Marathon from the Cook Inlet area is wholly consistent with the public interest.

For the past 26 years, the export project has improved both the economy of the State of Alaska and the balance of payments between the United States and Japan. The requested five-year extension of this export is not inconsistent with the public interest; rather, it would extend the current benefits now enjoyed by the Kenai Peninsula Borough, the State of Alaska, and the United States in general, for an additional five years.

A. CONTINUED EXPORT OF ALASKAN LNG BENEFITS ALASKA, THE AMERICAN PUBLIC AND JAPAN.

PANGC and Marathon requested that Resource Decisions ("RD"), an independent consulting firm, make a comprehensive economic analysis of the regional and national interest with respect to the proposed extension of the Kenai LNG export project. This report dated December 11, 1996, is attached as Appendix C. The RD report reviews in detail the benefits, both direct and indirect, derived by the local-regional economy as a result of the Kenai export project.

The State of Alaska continues to benefit significantly from the project. The operation of the liquefaction plant and natural gas production facilities provides substantial employment for workers and economic benefits for suppliers and businesses in the area. The State of Alaska and its citizens, as well as the federal government, also benefit from royalty payments on the natural gas used by the project as well as associated tax revenue. Local, State and Federal revenues from taxes and royalties associated with the export project totaled almost $44 million in 1995. The effects of this project create hundreds of jobs and generate millions of dollars a year in Alaskan personal income (Table 6-1, RD report).

This export also has provided a beneficial impact on the balance of payments between the United States and Japan and will continue to do so during the five-year extension proposed. Although small in comparison to the total U.S.-Japanese trade balance, this project provides a steady and continuous offset to the trade imbalance between the two countries.

While this source of LNG is not the largest source of imported energy consumed in Japan, it is one of the most secure and reliable energy sources available to that country. During the 26 years that this project has been in operation, there have been no major accidents or interruptions of service. This export has benefitted the Sellers, the Buyers, and the trade relations between the two countries, and will continue to do so.

B. THERE IS NO NATIONAL OR REGIONAL NEED FOR THE NATURAL GAS WHICH WILL BE EXPORTED.

The prospects for shipping LNG to the lower 48 states are remote, considering both the economics and the lack of need for this gas in the lower 48 states. The supply of gas in the lower 48 continues to be sufficient to meet demand. Even if economic conditions were such that LNG could be shipped to the lower 48 at market clearing prices, the constraints of building LNG receiving terminals on the West Coast would likely prevent such interstate sales over the period of the proposed extension. Currently, there are no LNG receiving facilities on the West Coast of the lower 48 states, and none are now anticipated. (RD report at 6-8) Movement of Kenai LNG to existing terminals on the East Coast or Gulf Coast is highly improbable due to the economic penalties imposed by the distance involved and the necessity of employing smaller U.S. registered LNG tankers to pass through the Panama Canal. No such appropriately sized LNG tankers currently exist. In addition, Canada has and will continue to have huge gas reserves available for export to the lower 48 states and will continue to be able to provide gas to the U.S. market at lower costs than those necessary for Alaskan LNG.

With respect to the regional need for natural gas, the Cook Inlet area continues to have an oversupply with resulting low prices. It is estimated that there will be ample gas reserves remaining to supply the local and regional need for gas well beyond the term of the export extension requested in this application. The RD study reports the results of various supply/demand analyses to determine their effect on the Alaska Railbelt Region. The estimates of natural gas supplies in the Cook Inlet area utilized in the RD study comes from four sources. One estimate of proven reserves was prepared by a private geophysical firm, Schlumberger GeoQuest Reservoir Technologies ("GeoQuest"), at the request of

Phillips/Marathon. This assessment, dated March 1996, is attached as Appendix D. The three other estimates referenced in the study are publicly available.[4]

Under the expected supply/demand scenario in the RD study, estimated Cook Inlet area remaining reserves will total in excess of 2.0 trillion cubic feet at the end of 2009 (RD Chapter 5.0, Railbelt Region Supply/Demand Balance). Even the most pessimistic low supply/high demand scenario examined in the RD study shows natural gas supplies remain adequate with reserves in excess of 1.2 trillion cubic feet at the end of 2009. It should be borne in mind that these are extremely conservative estimates. For example, the PGC estimates the most-likely possible and the most-likely speculative categories could add an additional 5.4 Tcf of reserves. Beyond those estimates, there are other potential sources of gas which might become available to Cook Inlet including North Slope gas, Susitna and Lower Cook Inlet Basin gas, and coalbed methane (RD report at 4-9). Further, the Alaska Railbelt Region has abundant oil, coal and hydroelectric energy resources.

Applicants submit that there is no evidence of a domestic need, either national or regional, for the volume of natural gas

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[4] *Historical And Projected Oil And Gas Consumption* published 1996 by the Alaska Department of Natural Resources; *Potential Supply Of Natural Gas In The United States* published by the Potential Gas Committee, July, 1995; a combination of an onshore resource estimate, titled *Analysis of Historic Oil and Gas Lease Sales and Exploration Data For Alaska*, Report of Investigation 95-11, by Alaska Dept. Of Natural Resources, Division of Geological and Geophysical Surveys and an estimate of offshore resources, titled *Endowments of Undiscovered Conventionally Recoverable and Economically Recoverable Oil and Gas in the Alaska Federal Offshore*, OCS Report MMS 96-0033, by the Minerals Management Service (1996)

for which Applicants are requesting export authority herein. Therefore, the proposed export extension is not inconsistent with the public interest.

C. THE PRICE TO BE CHARGED FOR THE LNG DELIVERED TO JAPAN IS CONSISTENT WITH THE PUBLIC INTEREST.

In DOE/FE Order No. 261-D, Docket No. 94-81-LNG (October 11, 1994), the FE approved certain changes to the LNG pricing formula designed to keep the price competitive with other LNG prices and with world energy prices. The price to be charged for LNG delivered during the five-year continuation of this proposed authorization is determined by Article VIII of the Extension Agreement as previously amended and will be the same method approved in Order No. 261-D. Therefore, as concluded in Order 261-D, the price is not inconsistent with the public interest.

D. DISCONTINUATION OF THE PROJECT WOULD BE CONTRARY TO THE PUBLIC INTEREST.

The foregoing discussion as well as the attached Resource Decisions analysis demonstrate that failure to allow this export project to continue would adversely impact the regional and national interests.

If authorization to extend the export of LNG is denied, there would be no foreseeable demand for this quantity of gas either locally or in the lower forty-eight states. Therefore, the facilities associated with the Alaskan LNG project would be prematurely shut down. The idling of productive assets would impose unnecessary hardships on the beneficiaries, both direct and indirect, of the project. The impact on the local and state economies would be significant. Hundreds of jobs generating millions of dollars of personal income would be lost, as well as millions of dollars in local and state revenue from taxes and royalties.

In addition, discontinuation of the project would exacerbate the trade deficit between the United States and Japan by more than a billion dollars during the five-year extension time period.

V. ENVIRONMENTAL IMPACT

The existing LNG manufacturing and storage facilities will be utilized during the five-year extension of export operations. These facilities have operated safely without major disruption of supply or accident from start-up in 1969. Therefore, Applicants request that the FE find that approval of this application is not a major Federal action significantly affecting the quality of the human environment within the meaning of National Environmental Policy Act of 1969, 42 U.S.C. §4321 et.seq., and that neither an environmental impact statement nor an environmental assessment is required.

VI. APPENDICES

Attached hereto and incorporated by reference herein are the following appendices:

Appendix A:	Letter Agreement
Appendix B:	Opinions of Legal Counsel
Appendix C:	Resource Decisions "Economic Analysis of Regional and Local Interest Relating To Kenai LNG Export to Japan"
Appendix D:	GeoQuest "Proven Reserves Assessment Cook Inlet Alaska"

VII. CONCLUSION

For the foregoing reasons, PANGC and Marathon respectfully request that FE amend Order No. 261 to authorize the continued export of LNG for an additional five years pursuant to the conditions set forth in this application.

Respectfully submitted,

PHILLIPS ALASKA NATURAL GAS CORPORATION

By Virgil R Spurgeon
Mr. Virgil R. Spurgeon
Regulatory Affairs Agent
P. O. Box 1967
Houston, Texas 77251-1967
Phone: (713) 669-7993

MARATHON OIL COMPANY

By Daniel W. Mowrey
Mr. Daniel W. Mowrey
Manager, International Natural Gas
P.O. Box 3128
Houston, TX 77253-3128
Phone: (713) 296-3723

December 17, 1996

VERIFICATION

STATE OF TEXAS)
) SS:
COUNTY OF HARRIS)

BEFORE ME, the undersigned authority, on this day personally appeared Virgil R. Spurgeon, who, having been by me first duly sworn, on oath says that he is Regulatory Affairs Agent for Phillips Alaska Natural Gas Corporation and is duly authorized to make this Verification; that he has read the foregoing instrument and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

Virgil R Spurgeon
Virgil R. Spurgeon

Subscribed and sworn to before me, a notary public, this 17th day of December, 1996

Bonnie J. Anderson
Notary Public

My Commission expires:

9-8-2000

BONNIE J ANDERSON
MY COMMISSION EXPIRES
September 8, 2000

VERIFICATION

STATE OF TEXAS)
) SS:
COUNTY OF HARRIS)

BEFORE ME, the undersigned authority, on this day personally appeared Daniel W. Mowrey, who, having been by me first duly sworn, on oath says that he is Manager, International Natural Gas of Marathon Oil Company and duly authorized to make this Verification; that he has read the foregoing instrument and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

Daniel W. Mowrey
Daniel W. Mowrey

Subscribed and sworn to before me, a notary public, this 17th day of December, 1996.

Judy Trujillo
Notary Public

JUDY TRUJILLO NOTARY PUBLIC STATE OF TEXAS EXPIRES 9-16-2000

My Commission expires:

9-16-2000

APPENDIX A

LETTER AGREEMENT

May 17, 1993

Mr. K. Nemoto
General Manager
LNG Project Office
The Tokyo Electric Power Company, Incorporated
1-3, Uchisaiwai-cho, 1-chome,
Chiyoda-ku, Tokyo 100
Japan

Mr. A. Ohnuma
General Manager
Gas Resources Department
Tokyo Gas Co., Ltd.
5-20, Kaigan, 1-chome,
Minato-ku, Tokyo 105
Japan

Dear Sirs,

In our recent discussion in Japan, Buyers and Sellers discussed a course of action which will allow Sellers more flexibility in aggregating natural gas supplies. Such additional flexibility will place Sellers in a better position to expand future LNG deliveries to Buyers.

Accordingly, as requested by Sellers in order to facilitate their long term planning including exploration and production, Buyers elect to increase the annual quantity of Alaskan LNG to be delivered during the 10-year period commencing with contract year 1994 by six percent (6%) above the ACQ, provided Sellers submit written acceptance of such increase to Buyers on or before October 1, 1993. If Sellers provide written acceptance of their election to supply the additional six percent (6%) of Alaskan LNG by October 1, 1993, then Buyers and Sellers shall meet as soon as possible thereafter to discuss any revisions that may be needed to amend the Liquefied Natural Gas Sale and Purchase Extension Agreement dated June 17, 1988 (hereinafter referred to as Extension Agreement), if necessary, to reflect this increased volume. It is understood that after the commencement of delivery of the additional six percent (6%), Buyers may reduce LNG purchases by up to 7.6 trillion Btus in any contract year subject to the limitations contained in Section 5.2c of the Extension Agreement. However, if after discussion with Buyers, Sellers furnish written notice to Buyers in accordance with the provisions contained in the Second Amendatory Agreement dated February 19, 1992 electing to reduce the ACQ to 57.5 trillion Btus beginning in contract year 1997, then Buyers are under no obligation to purchase and receive the additional six percent (6%) contemplated in this letter from contract year 1997 through contract year 2003.

As further requested by Sellers, Buyers elect to extend the Extension Agreement by an additional five (5) years commencing April 1, 2004 until and including March 31, 2009 under the same terms and provisions of the current agreement, provided Sellers submit written acceptance of such extension to Buyers on or before March 31, 2001. If Sellers fail to submit the written acceptance of such extension to Buyers on or before March 31, 2001, Section 14.1 of the Extension Agreement shall be reactivated. In order to facilitate the Buyers' planning process regarding such extension, Sellers will periodically update Buyers commencing April 1, 1998 on situation of activities necessary to extend the contract.

If the foregoing is acceptable to Buyers, please so indicate by signing in the space provided below and returning a fully executed copy of this letter to Sellers.

We look forward to increasing our commitment to our valued customers.

Sincerely yours,

PHILLIPS ALASKA NATURAL GAS CORPORATION

G. M. Schuppert, Jr.

G. M. Schuppert, Jr., Vice President
Marketing

MARATHON OIL COMPANY

F. R. Adamchak

F. R. Adamchak, Manager
International Natural Gas

ACCEPTED AND SIGNED as of this 17th day of May, 1993

THE TOKYO ELECTRIC POWER COMPANY, INCORPORATED

K. Nemoto

K. Nemoto, General Manager
LNG Project Office

TOKYO GAS CO., LTD.

A. Ohnuma, General Manager
Gas Resources Department

APPENDIX B

OPINIONS OF LEGAL COUNSEL REGARDING
CORPORATE AUTHORITY TO EXPORT LNG

PHILLIPS ALASKA NATURAL GAS CORPORATION

BARTLESVILLE, OKLAHOMA 74004

December 16, 1996

Office of Fuels Programs
Fossil Energy, U S Department of Energy
Docket Room 3F-056, FE50
Forrestal Building
1000 Independence Avenue, SW
Washington, D C 20585

Re Phillips Alaska Natural Gas Corporation / Marathon Oil Company Application for LNG Export Authorization, Opinion of Counsel Regarding Corporate Powers

Ladies and Gentlemen

In accordance with the requirements of 10 C.F R §590 202(c), I have examined the Certificate of Incorporation and Bylaws of Phillips Alaska Natural Gas Corporation, a Delaware Corporation, the Delaware corporation law and other authorities as necessary, and have concluded that the proposed exportation of natural gas by Phillip Alaska Natural Gas Corporation, one of the applicants, is within the corporate powers of Phillips Alaska Natural Gas Corporation Further, Phillips Alaska Natural Gas Corporation is authorized to do business in Alaska and to engage in foreign commerce Phillips Alaska Natural Gas Corporation is a wholly-owned subsidiary of Phillips Petroleum Company, a Delaware corporation, which has similar corporate powers and authority

Very truly yours,

Stephen R Johnson

Attorney for
Phillips Alaska Natural Gas Corporation
1215 Adams Building
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(918) 661-8373

SRJ mn

Lauren D Boyd
Attorney
Worldwide Exploration & Production

Marathon Oil Company

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Houston, Texas
Telephone 713/296-2539
Fax 713/296-2581

December 10, 1996

Office of Fuels Programs, Fossil Energy
U S Department of Energy
Docket Room 3F-056, FE-50
Forrestal Building
1000 Independence Avenue, SW
Washington, D C. 20585

RE Application of Phillips Alaska Natural Gas Corporation and Marathon Oil Company to Amend Authorization to Export Liquefied Natural Gas

Dear Sir/Madam

This opinion of counsel is furnished in accordance with the requirements of 10 C F R § 590 202(c) in connection with the above-referenced Application

As counsel for Marathon Oil Company, I have examined Marathon's Articles of Incorporation and Code of Regulations, and other relevant documents and am of the opinion that the proposed exportation and sale of liquefied natural gas is within the corporate powers of Marathon Oil Company.

Respectfully submitted,

By Lauren D. Boyd
Lauren D Boyd

Attorney for
MARATHON OIL COMPANY

LDB/imd
JJX/71782

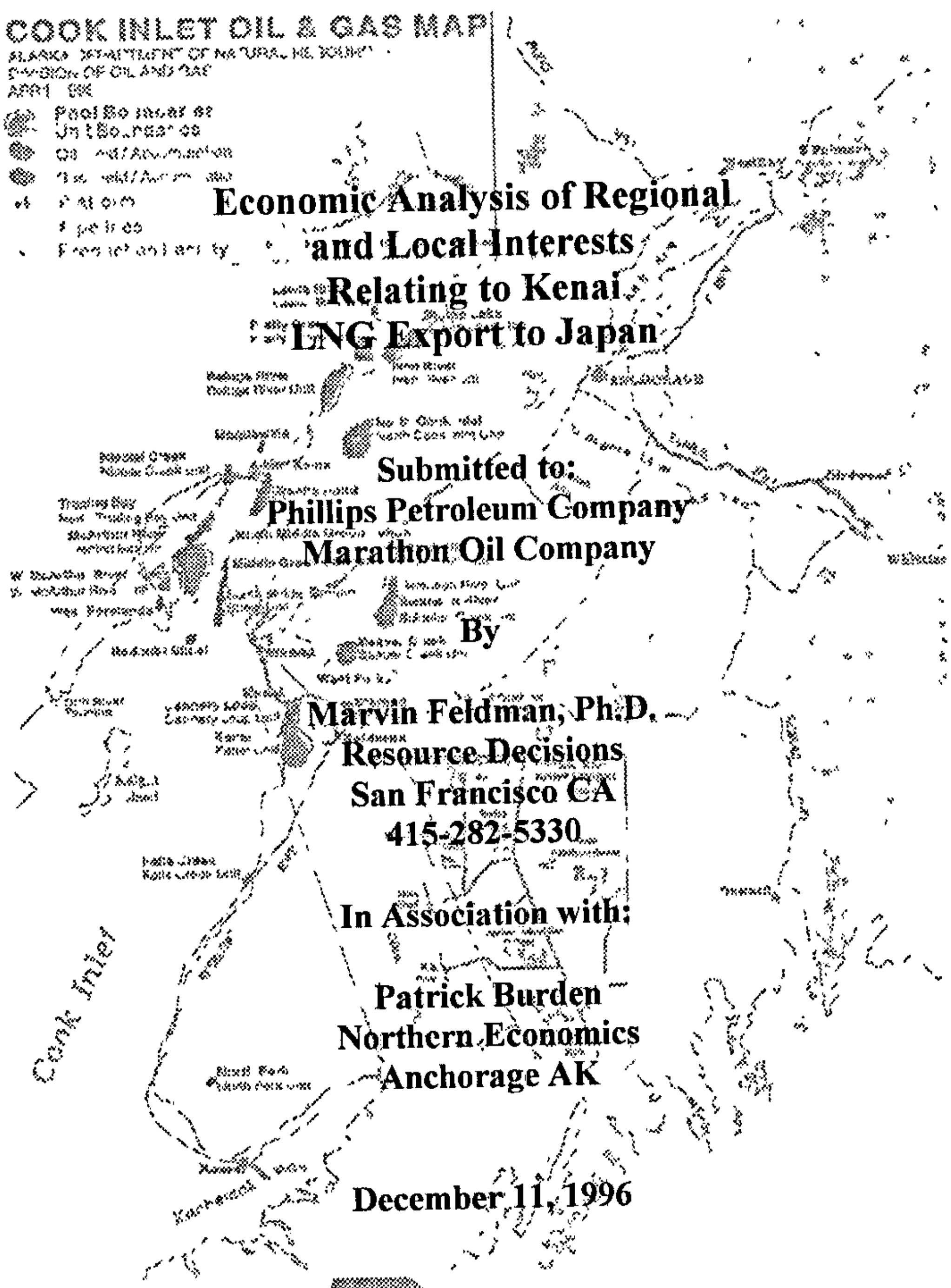
RECEIVED

DEC 12 1996

Laws & Regulations

APPENDIX C

RESOURCE DECISIONS "ECONOMIC ANALYSIS OF REGIONAL AND LOCAL INTEREST RELATING TO KENAI LNG EXPORT TO JAPAN"



Economic Analysis of Regional and Local Interests Relating to Kenai LNG Export to Japan

Submitted to:
Phillips Petroleum Company
Marathon Oil Company

By

Marvin Feldman, Ph.D.
Resource Decisions
San Francisco CA
415-282-5330

In Association with:

Patrick Burden
Northern Economics
Anchorage AK

December 11, 1996

RESOURCE DECISIONS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

This report presents the findings of an economic analysis performed to determine whether continued export of Cook Inlet liquefied natural gas (LNG) from Kenai to Japan is consistent with the public interest, both from the Alaskan and national points of view The results of this analysis indicate that LNG export is beneficial from both viewpoints During the period for which the export approval is requested, 2004 through 2009, natural gas and other energy supplies are more than sufficient to meet Alaska demands There is no effective demand for Kenai LNG from the rest of the U S Cessation of Kenai LNG exports would have detrimental effects on the Alaskan economy, the U S balance of trade, and U S /Japanese relations Cessation of exports would also directly reduce federal revenues by $23 million and state and local revenues by $21 million per year

From a local perspective, natural gas resources will remain in good supply through 2009, even if few or no new reserves are found, and pessimistic (high) assumptions are made regarding demand for natural gas Southcentral Alaska, which comprises the local market for Cook Inlet natural gas, is rich in energy resources with 3 8 trillion cubic feet (tcf) of proven gas reserves, 1 6 billion tons of proven coal reserves (the energy equivalent of 35 tcf of natural gas), and numerous undeveloped potential hydroelectric sites Furthermore, if a pipeline were built to bring the more than 28 tcf of North Slope natural gas reserves to market, it would provide a large back-up supply to augment Cook Inlet natural gas supplies

Two demand cases were postulated as the basis for projecting Southcentral Alaska energy and natural gas demand Pessimistic and Expected The Pessimistic case is biased in the direction of increasing natural gas demand This case is contrasted with the Expected case regarding anticipated demand Two supply cases were similarly postulated the Pessimistic case, based on existing reserves plus undiscovered potential resources which have a very high probability of being exceeded, and the Expected supply case, based on mean resource estimates

Under the combination of Expected supply and Expected demand cases, 2,000 billion cubic feet (bcf) of reserves of gas would remain available in 2009 in Cook Inlet This is a comfortable margin to allow orderly transition to other fuel supplies over many years in the event that more gas is not found or otherwise made available While the disposition of North Slope gas within the time frame of this study (2009) is somewhat uncertain, it is likely that these supplies will eventually be piped through Southcentral Alaska to overseas markets Such supply would provide an almost unlimited backstop source of natural gas in the unlikely event that no new local reserves are developed

A very adverse Pessimistic scenario was developed by combining the Pessimistic (high) demand case with the Pessimistic (low) supply case Even under this scenario Cook Inlet natural gas supplies remain adequate through 2009 and beyond

From a supply standpoint, before reserves dipped down to a few years' production, it is highly likely that exploration efforts would be intensified Exploration and production have historically been inhibited by low demand According to Potential Gas Committee (PGC) estimates (Scott, 1995), there is a nearly 100 percent probability that at least 600 bcf remain to be discovered, and a 50 percent probability that another 1,050 bcf remain, in addition to the 1996 proven reserves of 3,787 bcf

The low availability of gas supplies under the Pessimistic scenario would be tempered by price elasticity effects Before gas reserves reached a few years' consumption, price rises would provide incentive for additional gas drilling and substitution of other energy resources present in the region These include mine mouth coal-fired electric generation, hydroelectric, coalbed methane, and North Slope gas supplies

Thus, the likelihood of a local natural gas scarcity due to LNG export authorization is remote On the other hand, the tangible benefits of continued exportation are significant in terms of employment, personal income and tax revenues LNG manufacture provides a stable source of income and employment in an area noted for seasonal unemployment and a marked cyclic response to world oil price changes Direct indirect and induced employment in Alaska due to gas feedstock production and LNG manufacture currently accounts for 814 jobs and $42 8 million in personal income per year

From the national and international perspectives, continued export is even more beneficial than from the local perspective The prospect of finding a market for Cook Inlet LNG in the lower 48 states is vanishingly small Balanced against these remote possibilities of domestic use are the substantial benefits of export to Japan Both the overall foreign trade balance of the United States and the balance of U S trade with Japan would be improved By providing Japan with this LNG supply, the U S strengthens a diplomatic and economic ally to the benefit of both nations

Authorization of continued LNG export to Japan is clearly consistent with the public interest of Alaska and the entire U S

1.0 INTRODUCTION

Phillips Petroleum Company and Marathon Oil Company jointly own and operate a liquefied natural gas (LNG) manufacturing facility near Kenai, Alaska Since 1969, this facility has used Cook Inlet gas to manufacture LNG for export to Japan The export authorization for the Phillips/Marathon LNG facility expires in 2004 To continue its LNG export operation, Phillips/Marathon must obtain a new export authorization from the U S Department of Energy (DOE) To obtain a new export authorization, Phillips/Marathon must demonstrate that the project is not inconsistent with the public interest

In April 1996, Phillips and Marathon requested that Resource Decisions in San Francisco, in association with Northern Economics in Anchorage, perform an economic study of the public interest issues related to continued LNG export from Kenai to Japan

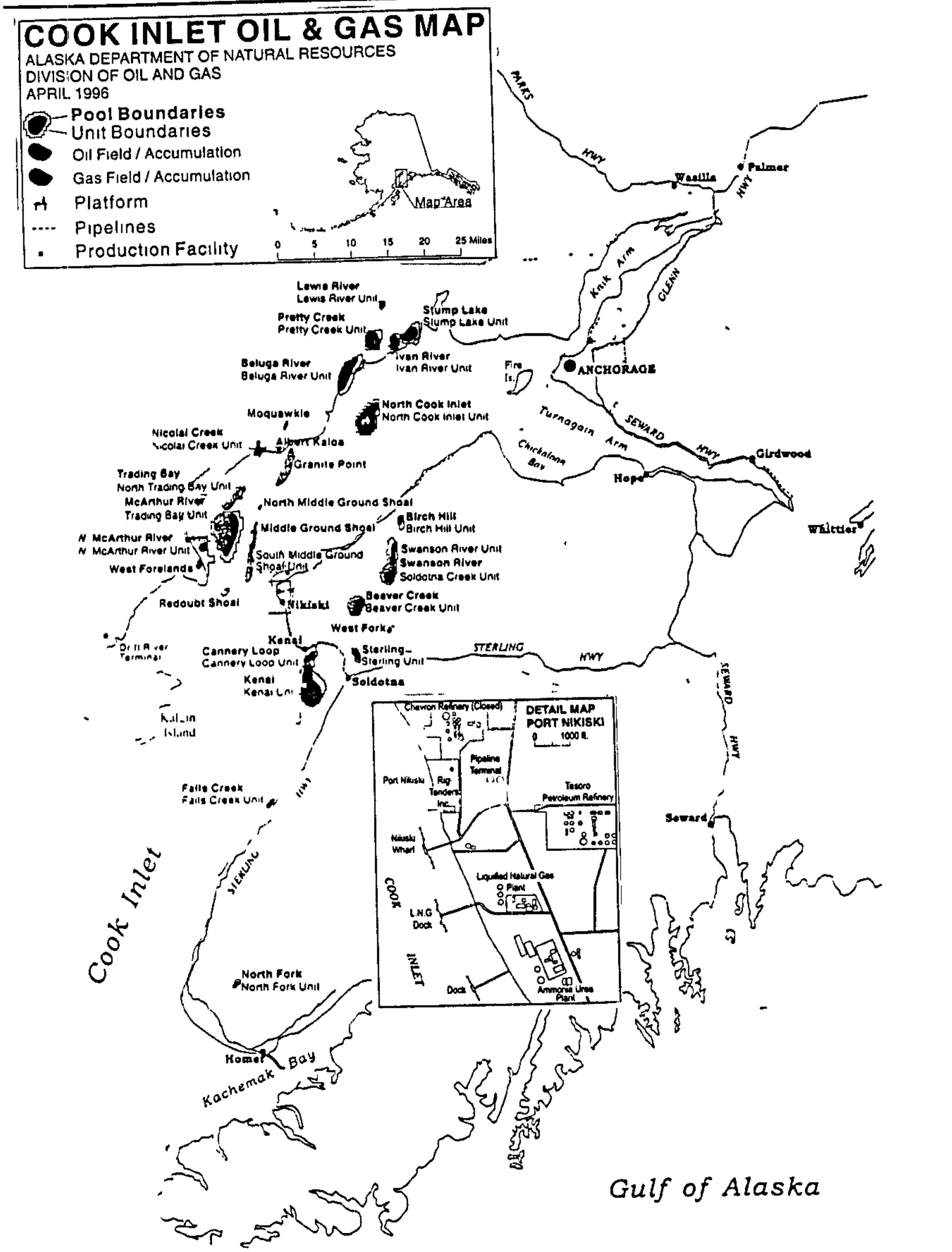
This report documents the methods and results of that study The period of analysis extends from the present through the year 2009 This time frame covers the 5-year period for which the export authorization is sought (April 1, 2004 through March 31, 2009) As the analysis extends to the end of 2009, a small additional conservative bias is thus introduced

The economic component of the public interest in Kenai LNG export encompasses several issues Foremost among them is the effect of continued export on local supplies The "local" market for Cook Inlet natural gas includes all of Southcentral Alaska and the interior extending from Homer in the south to Fairbanks in the north [1] This region, which is known as the "Southern Railbelt" defines the likely service area which is or could conceivably be served with Cook Inlet natural gas A map of the Cook Inlet Region showing natural gas fields is presented in **Figure 1-1**. Within this area, it is important to determine the present and projected future demand for natural gas and to evaluate the adequacy of known reserves and potential resources in meeting this demand

A second economic component relevant to the public interest issues raised by continued LNG export is the prospect for and effect of exporting the Kenai LNG to the lower 48 states rather than to Japan The question is whether lower 48 markets exist for this LNG, and if so, whether or not national economic interests would be affected A third economic consideration is the effect which cessation

[1] Fairbanks and Homer are not directly served by natural gas, but receive some gas-fired electrical energy from the Anchorage area

Figure 1-1
Description of Cook Inlet Natural Gas Resources



of LNG production would have on the local Alaska economy This report addresses all of these economic components of the public interest

1.1 PURPOSE

The purpose of this report is to document how continued export of Kenai LNG to Japan from 2004 through 2009 will impact the economic components of the public interest mentioned above Specifically, this report will address the following

- Railbelt demand for Cook Inlet natural gas for all existing and prospective use categories,
- Natural gas supplies in the Cook Inlet region and alternative gas and energy supplies in the Alaska Railbelt,
- Impacts of LNG export on taxes, royalties, employment and economic development in Alaska,
- The absence of economic viability of diverting the Kenai LNG export from Japan to the lower 48, and
- The strategic importance of Kenai LNG exports to the U S trade balance with Japan

1.2 BACKGROUND AND ISSUES

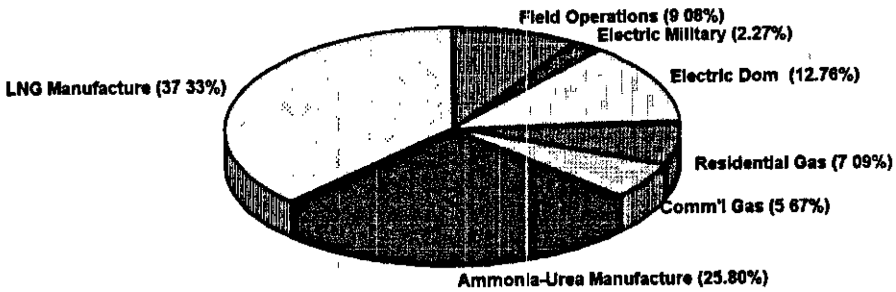
1.2.1 Background of Natural Gas Uses in Southcentral Alaska

The natural gas resources of the Cook Inlet were discovered in the late 1950s Presently competing uses for Cook Inlet gas resources are the Phillips/Marathon LNG facility, an ammonia-urea fertilizer plant and Southcentral Alaska's electrical and heating energy demands **Figure 1-2** illustrates the proportions of Cook Inlet gas which each use consumes

Despite these competing uses, demand has typically been well below supply, as evidenced by historically low prices and lack of gas drilling interest In the future, demand for gas for the LNG and ammonia-urea facilities is anticipated to remain fairly stable, but a number of local market forces will cause a modest increase in the demand for gas

In reviewing the gas supply situation, it is important to consider substitute energy sources which can be used for space heating and electrical generation These include coal, coalbed methane and hydropower Coal from both developed and undeveloped fields is plentiful in the region Further

Disposition of Cook Inlet Gas
1995 Consumption By Demand Category



Source ADNR, 1996

Figure 1-2

penetration for coal space heating is not expected, but a coal-fired electrical generation plant is expected to come on line in Healy in the next few months Coalbed methane has been identified in several areas (T. Smith, ADNR) Numerous hydroelectric sites have been identified in the region as well While no expansion of these resources is currently planned, these resources would, if developed, reduce local dependence on natural gas **Figure 1-3** illustrates the location of various energy sources in the Railbelt region

1.2.2 Southcentral Natural Gas Supply and Demand Issues

In addition to the normal supply and demand forces influencing Cook Inlet natural gas, several recent events may have a bearing on the determination of the public interest associated with continued export These recent events, described briefly below, will be addressed in depth in connection with the supply and demand analyses Table 1-1 summarizes 1995 Cook Inlet natural gas consumption

Electric Utility Demand: An electrical intertie was built in 1986 to allow Fairbanks, Alaska's second largest metropolitan area, to benefit from low-cost Cook Inlet gas supplies In addition, an existing Kenai-Anchorage intertie was completed in 1992 to accommodate Bradley Lake hydro

Figure 1-3
Energy Sources of the Railbelt Region

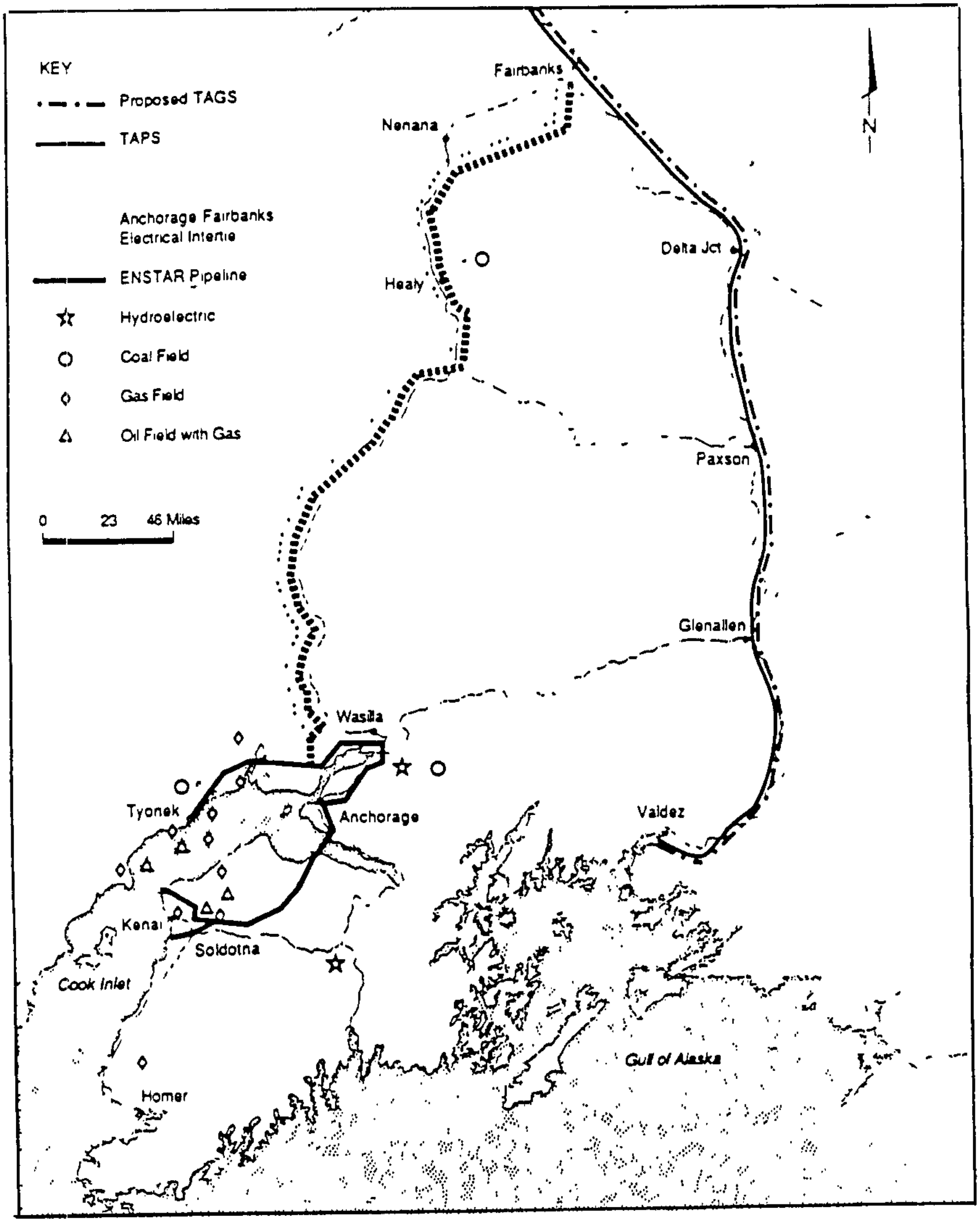


Table 1-1
Description of Cook Inlet Net Gas Consumption (1995)

	Billion Cubic Feet	Percent of Total
Field Operations	16 9	9%
Electric Generation		
Military	4 8	2%
Domestic	29 3	13%
Gas Utilities		
Residential	14 8	7%
Commercial	11 9	6%
Ammonia-Urea Manufacture	54 0	26%
LNG Manufacture	78 1	37%
TOTAL	**209.8**	**100%**

Note: Net gas consumption excluding gas reinjected into wells
Source: ADNR, April, 1996

project production More than 80 percent of Alaska's population resides within a single electrical grid fueled predominantly by Cook Inlet natural gas These effects are already included in the baseline from which demand is projected Potential future influences which might further increase gas usage by electric utilities include

- Possible conversion of existing duel fuel capacity to gas only,
- Increases in Fairbanks generation demand for gas, and
- Demographically driven increases in electricity usage

These factors are discussed in Section 2 2 1

Demographics: The Alaska economy has been growing very slowly over the past few years Slow growth is likely to continue and result in slower rates of increase in demand for gas This slow growth is primarily the result of declining crude oil production and depressed world oil prices and likely will be continued for the foreseeable future

Gas Pipelines: Enstar Natural Gas Company, which constructed a gas pipeline from the Beluga gas field to Anchorage in 1985, has expanded distribution lines in the communities of Wasilla and Palmer to enable residences and businesses to convert from diesel fuel to gas for home heating The distribution system increased local demand for Cook Inlet natural gas The natural gas distribution system was recently expanded via a retired military pipeline to provide gas service to Whittier

Hydroelectric and Coal Energy Supplies: The Railbelt region is amply endowed with coal and hydroelectric resources The Bradley Lake hydroelectric project began operation in 1991 No further hydroelectric developments are presently planned The Healy Clean Coal Project will commence operation in 1998 This project reduces the amount of gas-fired electrical energy moving over the intertie from Anchorage to Fairbanks This project will meet demand for electricity in the Fairbanks area, thus reducing demand for electrical generation moving over the intertie While no further hydroelectric or coal developments are currently anticipated, the resource base to support such development exists If developed, these projects would reduce demand for Cook Inlet gas, however, none of the cases assume further development of these natural gas substitutes, providing a cushion or conservative bias to the analysis [2]

1.3 METHODOLOGY

Several factors which might influence future supply and demand for natural gas resources are presently uncertain Because of these uncertainties, a scenario-based approach is used in this analysis Expected and Pessimistic assumptions are postulated for both supply and demand [3] In this context, "Pessimistic" refers to conditions which increase local demand or decrease local supplies of natural gas or substitute energy sources Pessimistic assumptions thus tend to militate against continued LNG export If it can be demonstrated that, despite these pessimistic assumptions, continued export is in the public interest, then the case is conclusively proven In contrast to the Pessimistic scenario, an Expected scenario utilizes the most likely estimates for the supply and demand for Cook Inlet gas supplies Thus, the Expected scenario reflects the most realistic appraisal of Cook Inlet natural gas supply demand balance

[2]The Southcentral region as defined in the *demand* analysis encompasses the area south of Fairbanks Seward and from Whittier west to Homer This is the logical *demand* area for cook inlet natural gas The Cook Inlet region, as defined in the natural gas *supply* analysis encompasses a more limited geographic region Cook Inlet is the supply region designation for all significant Alaska gas resources discovered to date outside of the north slope

[3]The term "conservative" as used in this study refers to assumptions which would make supplies less restricted at the end of the analysis period Thus conservative biases tend to provide an additional cushion, providing greater assurance that remaining gas supplies will be at least as great as those estimated

The analysis reported in this study consists of the following elements

- A demand model for the Southcentral region,[4]
- A supply analysis for Cook Inlet natural gas resources,
- A supply-demand analysis for Cook Inlet LNG, and
- Impact analyses of alternative supply-demand outcomes

Each of these elements is briefly described below

Demand: The demand model is based on a report by the Institute for Social and Economic Research (ISER) entitled Economic Projections Alaska and the Southern Railbelt 1995-2025 (ISER, 1995) ISER, a research center within the University of Alaska in Anchorage, is generally regarded as the definitive source for Alaska demographic analysis The demographic projections used in ISER, 1995 were prepared for Chugach Electric Association to assist in their long-term planning These demographic projections were coupled with original estimates of per-capita and other energy use parameters to produce the natural gas demand forecasts

In the analysis presented here, the Pessimistic case assumes that all uncertain factors affecting demand will result in increased demand This case includes high state oil revenue projections, aggressive petroleum development, and relatively rapid growth in all basic industry sectors The Expected case assumes the revenues and other demand factors are at their mean or expected levels The assumption underlying these cases are discussed in more detail in Sections 2 0 and 3 0

Supply: The supply analysis projects the Cook Inlet gas production through 2009 under Pessimistic and Expected assumptions The Pessimistic case assumes that production is limited to proven natural gas reserves plus the potential resources which are present with a nearly 100 percent certainty The Expected case is based on proven reserves plus mean estimates of potential resources Possible and speculative resources are disregarded in both cases The assumption underlying these cases are discussed in more detail in Sections 2 0 and 4 0

Supply-Demand Balance: Supply-demand balances are projected through 2009 based on the supply and demand scenarios discussed above The Pessimistic Supply-Demand scenario couples the

[4] The demand for gas-fired electric generation for Fairbanks (via the Anchorage Fairbanks intertie) is included in the demand region, although Fairbanks itself does not directly utilize natural gas

Pessimistic (high) demand case with the Pessimistic (low) supply case The Expected Supply-Demand scenario couples the mean or expected cases for both supply and demand

Impact Analysis: The impact analysis analyzes the regional and national economic effects of the three possible outcomes of the Department of Energy decision These outcomes are

- continued export of Kenai LNG to Japan,
- export of Kenai LNG to the lower 48 states, and
- closure of the Kenai LNG facility

1.4 SUPPLY AND DEMAND ASSUMPTIONS

A series of assumptions is used to define the Railbelt supply and demand situation under the Pessimistic and Expected scenarios These assumptions are summarized in **Table 1-2** and are described more fully in Section 2 0

1.5 SUMMARY OF RESULTS AND CONCLUSIONS

The analyses conducted in this study demonstrate that continued export of Kenai LNG is, in fact, consistent with the public interest Indeed, it is difficult to postulate plausible future conditions which do not support this conclusion Below is a brief summary of this study's findings

Demand: Cook Inlet domestic gas demand (total less fertilizer and LNG manufacture) has grown from 34 billion cubic feet (bcf) in 1974 to 78 bcf in 1996 By 2009, domestic gas demand is projected to fall to 70 bcf under the Expected scenario[5] and to rise to 91 bcf under the Pessimistic (high demand) scenario Total annual demand (including exports) is projected to fall to 201 bcf under the Expected scenario or to rise to 227 bcf under the Pessimistic (high demand) scenario

Supply: Supplies of Cook Inlet natural gas have always far exceeded demand Note that

- Most current supplies of natural gas were developed only incidentally to the exploration and development of oil,

[5]This fall is mainly attributable to the cessation of oil production in the Cook Inlet and the attendant reduction in gas for field operations

Table 1-2
Summary of Economic Assumptions

	Expected Scenario	Pessimistic Scenario
	Demand Assumptions	
Demographics	Use ISER Base Case	Use ISER High Case
Field Operations	Project 1995 in proportion to production, 75% related to oil stops in 2007.	Project 1995 in proportion to production
Electric Generation	**Military:** Project 1995 based on ISER military population. **Domestic:** Project 1995 based on ISER Base Case non-military population. Assumes constant per-capita consumption	**Military:** Project 1995 based on ISER military population. **Domestic:** Project 1995 based on ISER High Demand non-military population Assumes constant per-capita consumption
Utility Gas	Lower of 10 year average consumption per capita or 1995 demand per capita	Higher of 10 year average consumption per capita or 1995 demand per capita
Ammonia Manufacture	Continues at 1995 rate	Same
LNG Manufacture	78 4 bcf per year, constant	83 2 bcf per year, constant
	Supply Assumptions	
Cook Inlet Reserves	Use GeoQuest proven developed reserves (2928 bcf) plus proven undeveloped (859 bcf)	Use ADNR proven developed reserves (2,784 bcf) plus proven undeveloped (859 bcf)
Cook Inlet Resources (undiscovered)	Base on Potential Gas Committee most likely (F50) estimate of probable reserves — 1050 bcf.	Base on Potential Gas Committee Minimum (F100) estimate of probable reserves — 600 bcf

- Most of the current reserves were developed from fields which were discovered during the 1950s and 1960s,
- Proved reserves to production ratios have averaged 17, far in excess of the 9 1 ratios typically observed in the lower 48,
- Current proven (discovered) developed and undeveloped reserves total 3,787 bcf,
- There is a 50 percent probability that undiscovered resources of at least 1,050 bcf remaining to be discovered in the Cook Inlet area, and
- There is almost certainly at least 600 bcf of undiscovered commercially available resources remaining to be discovered in the Cook Inlet area

Supply/Demand Balance: Under Expected supply and demand conditions, about 2,000 bcf of gas will remain available in the Cook Inlet area by 2009 (the termination of the requested 5-year authorization extension),

Under the Expected supply and Pessimistic (high) demand conditions more than 1,700 bcf will remain available in 2009, and even if Pessimistic (low) supply conditions are coupled with Pessimistic demand conditions, gas supplies will remain abundant, with more than 1,200 bcf still available at the termination of the authorization period

Impacts of Discontinuing LNG Export:

Prospects for exporting LNG to the lower 48 are remote from an economic standpoint, anticipated market demand does not support high cost LNG supplies, and no west coast receiving terminals exist or are anticipated Even if economic conditions were favorable, environmental constraints and federal, state and local government approval delays for LNG receiving terminals being built on the west coast would likely prevent such export within the 15-year planning period on which this authorization request is based In the absence of lower 48 domestic markets, if LNG export authorization were denied, the facility would shut down Cessation of LNG production would result in a total loss (direct plus indirect) of 814 jobs in Kenai and elsewhere in Alaska, and the loss of $42 8 million per year in direct and indirect personal income State and local government revenues would be reduced by $20 8 million, federal revenues would be reduced by $23 million Cessation of exports would have a small but negative impact on the U S balance of trade worldwide and a more significant effect on the nation's already adverse balance of trade with Japan, an important U S ally and trading partner

1.6 REPORT ORGANIZATION

This analysis is divided into eight sections Section 2 0 describes the analytic framework and the interfuel substitution possibilities for natural gas An analysis of the demand for natural gas in the Southcentral Alaska is presented in Section 3 0 Section 4 0 analyzes the supply of natural gas and other substitute fuels in the Railbelt area of Alaska Section 5 0, the supply/demand balance, compares the results from the two previous sections Section 6 0 discusses the regional and national economic effects of alternative LNG operations and export outcomes References are provided in Section 7 0

2.0 ANALYTIC FRAMEWORK FOR SOUTHCENTRAL ALASKA SUPPLY/ DEMAND ANALYSIS

2.1 INTRODUCTION AND SUMMARY

The analysis of the Southcentral Alaska energy system and the projection of the possible impacts of continued export of LNG presented in this study relies on a simple and robust analytic framework A set of assumptions which are unfavorable to continued export is postulated for both the supply and demand sides of the energy balance This pessimistic set of assumptions imparts a conservative bias to the analysis By demonstrating that even with high demand and low supply assumptions Southcentral natural gas supplies are adequate, we conclusively demonstrate that continued export is consistent with the public interest The conservative Pessimistic scenario is contrasted with the Expected scenario Section 2 2 discusses the analytic framework in more detail

In Section 2 3 historic trends and proposed plans affecting each of the above substitution possibilities are discussed Expected and Pessimistic assumptions are postulated for each substitution option

2.2 ANALYTIC FRAMEWORK

The economic analysis conducted to determine whether export of Kenai LNG is consistent with the public interest consists of the following components

- competing local demand for natural gas,
- available local supplies of natural gas or substitute fuels,
- local economic impacts which would result from cessation of LNG manufacture,
- lower 48 demand for natural gas, and
- strategic economic considerations for Japanese-American trade relations

The first two items, local supply and local demand, constitute the potentially most important issues Because of their importance, the analysis focuses on examination of local supply/demand issues A framework for analyzing local supply/demand projections is presented below The remaining three items are discussed in Section 6 0

The relevant boundary for analyzing local energy supply demand balance is the area defined as Southcentral Alaska This area includes the Municipality of Anchorage, the Matanuska-Susitna Borough, and the Kenai Peninsula Borough The portion of electricity demand in Fairbanks which is supplied by Cook Inlet natural gas is also included in the demand region A comprehensive network of gas pipelines and electrical interties serves the area, making it a unified supply/demand region

2.2.1 Local Supply/Demand Scenarios

Projecting the future energy situation in the Southcentral Alaska area is made difficult not only by uncertainty with respect to energy prices, but also by the range of uncertain future situations which could affect natural gas supply/demand To surmount this difficulty, the analysis reported here relies on a scenario approach Two cases are postulated for both supply and demand

The Expected case is based on the supply and demand situation which is most likely to prevail These cases utilize the 50 percent probability for events which can be specified statistically (i e , oil price and potential undiscovered resources), and the best professional judgment for other uncertain events

The Pessimistic cases are based on a supply/demand situation which is biased against adequacy of gas supply surplus for LNG export Supply is thus biased toward the low side while demand is biased toward the high side For proposed projects affecting energy supplies, assumptions are made in each case which would maximize demand and minimize supply

By combining these unlikely supply and demand conditions, an extremely biased Pessimistic scenario is created The joint probability of all these unfavorable situations actually occurring is very low It is much more likely that the future will be more favorable for the natural gas supply-demand balance If even under this pessimistic scenario sufficient natural gas would be available to Southcentral Alaska, the case is convincingly made that export is not inconsistent with local interests

The Southcentral Alaska energy demand projections are presented in detail in Section 3 0 In the Expected case, oil and gas revenues, demographic projections and availability of proposed substitute fuel sources are based on the University of Alaska Institute for Social and Economic Research (ISER) Base Case projections (ISER, 1995) Demographic demand assumptions for the Pessimistic case are consistent with the high oil prices associated with ISER's High Case revenue projection as well as the development of large prospective projects which would increase natural gas demand All prospective projects which would tend to provide substitute fuels are assumed not to be developed, further exaggerating the Pessimistic bias

The Southcentral Alaska supply assumptions are developed in detail in Section 4 0 Supplies in the Expected case are limited to total proven reserves plus the 50 percent probability estimate of potential Cook Inlet natural gas resources The Pessimistic supply case assumes a slightly more conservative estimate of total proven reserves plus undiscovered potential resources which have a high probability of being exceeded

2.2.2 Price Assumptions

Energy price elasticities among fuels which could substitute for natural gas will, in reality, affect the demand for natural gas Coal is in abundant supply in the Railbelt area Oil can substitute for gas in most applications These interfuel substitutions are discussed in more detail in Section 2 3 To simplify the analysis, it is assumed that natural gas maintains its present price advantage over oil and coal in all interfuel substitution applications The Alaska Department of Revenue oil price projections, on which future demand is projected, are presented in Table 2-1 As seen on this table, projected real oil price escalation ranges from 0 14 percent per year for the Expected case to 1 02 percent for the Pessimistic case [6]

Table 2-1
Alaska Dept of Revenue World Oil Price Forecast

Base Case — Expected Scenario:					High Case — Pessimistic Scenario				
Year	Inflation	Index	ANS $ Nominal	ANS $ Real	Year	Inflation	Index	ANS $ Nominal	ANS $ Real
1995	2 91%	1 00	16 45	16 45	1995	3 64%	1 00	16 63	16 63
1996	2 99%	1 03	16 52	16 04	1996	4 43%	1 04	17 97	17 21
1997	2 99%	1 06	16 62	15 67	1997	4 43%	1 09	18 20	16 69
1998	3 18%	1 09	17 42	15 92	1998	4 64%	1 14	19 61	17 18
1999	3 18%	1 13	17 97	15 91	1999	4 64%	1 19	20 69	17 33
2000	3 18%	1 17	18 64	16 00	2000	4 64%	1 25	21 89	17 52
2001	3 18%	1 20	19 34	16 09	2001	4 71%	1 31	23 17	17 71
2002	3 18%	1 24	20 06	16 17	2002	4 71%	1 37	24 54	17 91
2003	3 18%	1 28	20 81	16 26	2003	4 71%	1 43	25 98	18 11
2004	3 18%	1 32	21 59	16 35	2004	4 71%	1 50	27 51	18 31

[6] Pessimistic in the sense that higher oil prices result in greater demand for natural gas

Table 2-1
Alaska Dept of Revenue World Oil Price Forecast

Base Case — Expected Scenario:					High Case — Pessimistic Scenario				
Year	Inflation	Index	ANS $ Nominal	ANS $ Real	Year	Inflation	Index	ANS $ Nominal	ANS $ Real
2005	3 18%	1 36	22 39	16 43	2005	4 71%	1 57	29 12	18 51
2006	3 18%	1 41	23 23	16 52	2006	4 71%	1 65	30 83	18 72
2007	3 18%	1 45	24 10	16 61	2007	4 71%	1 72	32 64	18 93
2008	3 18%	1 50	25 00	16 70	2008	4 71%	1 81	34 56	19 14
2009	3 18%	1 54	25 93	16 79	2009	4 71%	1 89	36 59	19 35
Real escalation rate, 1995 to 2009				0 14%					1 02%

Sources: Alaska Department of Revenue, Spring 1995 Revenue Sources Book
Inflation and nominal oil prices Alaska Department of Revenue, Spring 1995 Revenue Sources Book
Real Oil Prices Resource Decisions calculations

2.2.3 Energy-Related Projects in Southcentral Alaska: Supply Issue Status and Assumptions

Trans Alaska Gas System (TAGS): Natural gas reserves in excess of 28 tcf exist in developed North Slope fields (ADNR, 1996, Table 1) Several proposals for developing a transportation and marketing system for these reserves have been proposed The most advanced proposal is the Trans Alaska Gas Pipeline System or TAGS Yukon Pacific Corporation, a subsidiary of CSX Corporation, has obtained the environmental and regulatory approvals needed for this development Obtaining gas supply commitments and overcoming financing and marketing hurdles are all that remain to develop this vast resource However, in order to surmount these hurdles, some $15 billion in financing must be obtained to fund the pipeline to tidewater and the LNG plant and tanker fleet Such a large capital expenditure requires that the project must garner a large proportion of the growth in Pacific Rim LNG demand The pros and cons of this project are currently the subject of considerable study by a multi-agency task force (Knowles, 1996) Yukon Pacific expects that if current market negotiations are successful and if sales contract options can be obtained, the project could begin construction in 1997 and be completed in 2004 to 2006 If this were to occur, it would be a simple matter to tap into the pipeline at Glenallen to provide as much natural gas as Southcentral Alaska needs for the next 30 years (Lowenfels, 1996) Development of the TAGS project would provide an effective backstop against any shortage of natural gas in Southcentral Alaska for the foreseeable future If the sales commitments are not made within a fairly narrow window of opportunity, however, LNG from other proposed projects may satisfy Pacific Rim LNG demand, delaying production of North Slope gas

Expected Scenario: Although there is a good possibility that TAGS will come on line before 2009 and would thus be available to Southcentral Alaska, TAGS supplies are not included in the Expected scenario In keeping with the conservative bias of this study, we estimate that there might be less than a 50 percent chance that the project is developed within this time frame We therefore do not include North Slope gas in the supplies available to the Southcentral Alaska

Pessimistic Scenario: There is sufficient uncertainty to justify excluding TAGS from the Pessimistic scenario We therefore do not include North Slope gas in the supplies available to Southcentral Alaska

Coalbed Methane Alaska's extensive coal beds (see Section 3 0) could contain vast amounts (up to 1,000 tcf) of methane which would provide an unlimited backstop for conventional natural gas resources A preliminary test well completed in the Matanuska Valley in 1995 showed significant amounts of gas, with the gas quantity per ton increasing with depth (T Smith, 1995) It is not known at present whether this gas is commercially feasible, although a commercial test well program was conducted during the summer of 1996 (D Lappi, personal communication, 1996) Commercial feasibility will depend on the cost per well bore, the number of injection wells needed and the production per well bore Because of the commercial uncertainty, coalbed methane resources are not considered in either the Expected or the Pessimistic scenarios

2.2.4 Energy-Related Projects in Southcentral Alaska: Demand Issue Status and Assumptions

Gas Deliverability: The principal natural gas utility supplying Southcentral Alaska, Enstar, has relied on its suppliers not only to provide natural gas, but to accommodate fairly wide daily shifts in quantity supplied Thus far, producers have been able to provide this accommodation, allowing Enstar to operate without the need for gas storage [7] If Cook Inlet natural gas supplies begin to decline, it may be necessary for Enstar to provide storage facilities if stepped up production to follow load becomes impractical or uneconomical with respect to development of gas storage/peak shaving alternatives Enstar would then be in the same position as virtually all gas utilities in the U S

[7] Storage caverns, LNG storage/peak saving units, etc facilities are commonly used throughout the lower-48 states to supply gas for peak shaving and swing purposes

Because deliverability is not a supply issue but rather a storage issue, it will not be dealt with in this analysis

North Slope Gas Project-Induced Demand: For the Pessimistic case, we are consistent with the ISER High Demand Scenario in which TAGS is assumed to begin construction in 2005, build out over five years, and provide $400 million in state revenues during the first year of operations For the Expected case we use ISER's Base Demand Scenario in which "alternative use of North Slope gas" results in employment of 1,000 annually after 2000 These are very aggressive demand assumptions They impart a significant conservative bias in that demand impacts from project induced demand increases are not offset by additional TAGS supplies

Electric Generation: The Expected case is based on ISER Base Case demographics with no increase in end-user efficiency or conversion efficiencies The Pessimistic case is based on ISER's high demand demographics, again with no change in end-user efficiency or conversion efficiencies

Generation Fuel Substitution: For the Expected case, gas-fired electrical generation maintains existing fuel proportions (gas to coal, hydro, and oil) except that the Healy Clean Fuel Project comes on line in 1998 For the Pessimistic scenario, all new capacity after Healy is gas-fired

Chugach Electric Dual Fuel Conversion: Chugach is considering shutdown of dual fuel plants during the -2005 period, however, because these plants are already producing all of their electricity with natural gas, there is no need to adjust gas demand due to conversion, except insofar as heat rates for the replacement plants should be higher

Hydroelectric: Both cases assume no new hydroelectric projects based on personal communications with R Emmerman of the Alaska Division of Energy

Valdez Intertie: Chugach Electric is considering building an intertie to Valdez, which, if built, would cause a small increase in Cook Inlet gas demand to replace Valdez's oil-fired capacity This intertie, however, is unlikely to be operational until after the 2009 planning horizon of this study

LNG Export: Kenai LNG manufacture will require feedstocks of 78 4 bcf per year to export its contractually obligated supplies This constitutes the Expected case At its option, the purchasers may request additional deliveries of up to 3 9 addition TBTU (trillion British Thermal Units) per year This would result in a total feedstock requirement of 83 2 bcf per year The Pessimistic case assumes that this is the demand every year

Fertilizer Plant: UNOCAL, a manufacturer of urea fertilizer, does not at present have long-term committed natural gas feedstock supplies (K Tabler, personal communication) Furthermore, its plant is of outmoded design Nevertheless, to be conservative, both the Expected and Pessimistic cases assume that current demand for gas for urea continues at its 1995 level

Natural Gas Distribution System Expansion: Soon after development of Kenai natural gas reserves, pipelines were originally built from the Kenai area to Anchorage Alaska Pipeline Company (Enstar Natural Gas Company) completed a gas pipeline from the Beluga gas field on the west side of Cook Inlet to Anchorage in 1985 To provide gas to the Matanuska-Susitna Borough, the pipeline was routed around Cook Inlet and Knik Arm rather than more directly by underwater pipeline Enstar has expanded distribution lines in the local communities of Wasilla and Palmer to enable residences and businesses to convert from diesel fuel to gas for home heating The distribution system has resulted in substantial increases in gas sales for Enstar Recently, the distribution system was expanded to the community of Whittier via the conversion of an existing products pipeline from Anchorage to Whittier to natural gas service

In recent years, there has been some discussion of the possibility of expanding natural gas pipelines to provide gas to Fairbanks, Homer and Seward Because no applications or plans have been filed for these possible projects, they are not considered in either the Expected or the Pessimistic cases In both cases the existing natural gas distribution system is expected to remain in its present form

Gas Marketing Changes: Certain changes in the marketing of Cook Inlet gas have occurred in recent years Enstar used to be both the transportation pipeline and supplier of natural gas to military users and Anchorage's Municipal Power and Light Recently, these two users have begun purchasing natural gas directly from producers rather than through Enstar In addition, a new natural gas marketing/brokering company, Aurora Gas Inc , has begun operation These marketing changes, however, affect neither the demand nor the supply of Cook Inlet natural gas, although they may affect retail price These effects, therefore, are not considered in the supply/demand analysis presented here

2.2.5 Coal Versus Gas-Fired Generation Capacity

Enormous coal reserves exist in the Railbelt region, however, coal use in electrical generation is limited to the Fairbanks area If Railbelt natural gas resources are depleted or if they become relatively expensive, coal-fired electrical capacity could be brought on line at only marginally higher cost Several proposals are under consideration to use the vast coal reserves of the Railbelt area for electrical generation If developed, coal-fired generation would reduce the need for gas-fired generation The relative price of coal, which in turn depends on development of export markets, is an important determinant of coal-fired generation development

The coal resources of the Railbelt occur in three main fields the Usibelli Coal Mine, the Beluga/Susitna field and the Matanuska field The Usibelli Coal Mine is the only operating coal mine in Alaska Located near Fairbanks, this field contains over 850 million tons of measured coal reserves, largely reserves at the Usibelli mine are under lease to other coal companies The total potential resource base is over 17 billion tons This mine supplies approximately 87 MW of coal-fired generation capacity in the Fairbanks area (Dames & Moore, 1987)

The Beluga/Susitna field is located in an undeveloped area across the Cook Inlet from Anchorage and Kenai The field has approximately 750 million tons of measured reserves with total potential resources estimated at over 37 billion tons This field is world-class in terms of its size and the amount of easily strippable reserves within a short distance of low-cost marine transport

The Matanuska coal field is the smallest of the fields discussed here with only 6 6 million tons of measured reserves and 248 million tons of potential resources However, the low sulfur values and high BTU content of this coal make it attractive for power generation As noted above, this field is also being investigated for commercial coalbed methane production

Coal fired power plants operated by Golden Valley Electric Association (GVEA) and Fairbanks Municipal Utilities (FM) consumed approximately 273,000 tons of coal in 1994 with electrical generation by the military representing an additional 44,000 tons in the same year Coal accounted for 65 percent of the total MWH generated by the two utilities in 1994 (Alaska Electric Power Statistics, 1994) [Alaska Systems Coordinating Council and the Alaska Department of Community Affairs, Division of Energy, October 1995]

Although a number of projects for mine mouth electric generating plants have been proposed within the past ten years, only the Healy Clean Coal Project is under construction The relative abundance and low cost of natural gas for utility generation coupled with the high cost associated with meeting clean air requirements for coal plants have made such developments unattractive Thus, despite the vast coal resource in Southcentral Alaska, no coal-fired capacity is presently planned Therefore, neither the Pessimistic nor the Expected scenario includes consideration of coal-fired generation This imparts a further conservative bias to this analysis, in that known coal reserves could back out a large part of electrical generation which presently contributes to gas demand

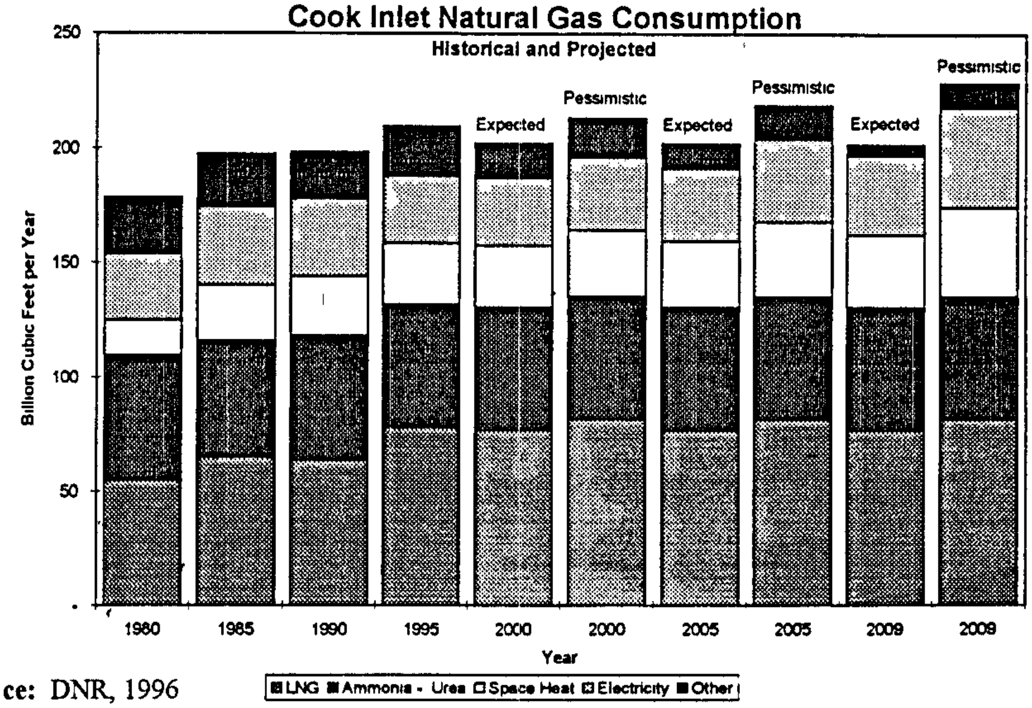
3.0 SOUTHCENTRAL ALASKA NATURAL GAS DEMAND ANALYSIS

This section discusses the demand for natural gas in Southcentral Alaska The first subsection summarizes the demand projection results for the region Section 3 2 presents the economic and demographic assumptions specific to the demand analysis The components of gas demand are then discussed in Section 3 3 This section ends with a description of the model used in the analysis

3.1 SUMMARY OF NATURAL GAS DEMAND

Figure 3-1 illustrates the historic and projected future demands for natural gas in Southcentral Alaska Growth in demand for natural gas from Cook Inlet through 2009 will be largely a function of increased use of gas for domestic purposes in Southcentral Alaska These domestic uses (space heating, electrical generation, military, and petroleum manufacture) together account for 37 percent of current demand The remaining 63 percent is used for LNG and ammonia-urea manufacture, uses which are not slated to grow to any significant extent

Figure 3-1
Cook Inlet Natural Gas Consumption



Source: DNR, 1996

In the Expected case, growth in domestic sales of gas will be modest Cumulative domestic consumption between 1996 and 2009 will be 973 bcf If, as in the Pessimistic case, economic growth is rapid, domestic sales could cumulatively be as high as 1,105 bcf over the same period – approximately 14 percent higher Because changes in the pattern of use of gas for the manufacture of ammonia-urea are unrelated to local economic conditions, that pattern should be the same under either scenario

3.1.1 Total Demand

Expected Scenario: Total use grows slowly, with annual consumption decreasing slightly from 206 bcf to about 196 bcf in 2007, increasing only slightly through 2009 (see **Table 3-1**) The pattern of consumption is a function of the rate of growth of the Southcentral Alaska economy and decreasing use of natural gas for field operations from declining Cook Inlet oil fields

Gas use for electricity generation and space heating grows from 61 bcf in 1996 to 70 bcf in 2009 Cumulative gas for these uses over the period from 1996 through 2009 will be 899 bcf Total cumulative gas use for the same period will be 2,838 bcf This consists of 1,075 bcf (38 percent) for LNG manufacture, 756 bcf (27 percent) for ammonia-urea manufacture, 435 bcf (15 percent) for civilian electricity generation, 397 bcf (14 percent) for utility gas, 108 bcf (4 percent) for field operations (including venting and shrinking but excluding other), and 66 bcf (2 percent) for electricity generation for military use

Two domestic uses — electricity generation and space heat — are the two main drivers of consumption growth in this scenario Domestic use of gas is expected to continue to grow with the economy and population Total growth of gas use is relatively slow because domestic uses comprise a relatively small portion of the total use of gas These two uses account for 29 percent of current demand for natural gas, and are projected to rise to 35 percent of total consumption in 2009 The other two main uses, LNG manufacture and urea fertilizer production are expected to remain at their present levels The final use category, oil and gas field operations, accounts for only about 2 percent of demand This use is expected to decline as the Cook Inlet oil fields approach depletion

Pessimistic Case: As shown in **Table 3-2,** total use grows moderately until 2005 under this Pessimistic Case Consumption increases from a level of approximately 213 bcf in 1996 to 219 bcf in 2005 Development of the Trans-Alaska Gas System (TAGS) and other petroleum industry development on the North Slope results in significant population growth and economic expansion in Southcentral Alaska and consumption increases to 227 bcf by 2009 Electricity generation and utility

Table 3-2
Total Gas Demand Historic and Pessimistic Case
(bcf)

Year	Electricity Generation	Gas utilities Residential	Gas utilities Commercial	Gas utilities Military	Ammonia-urea	Field operations	LNG production	Total
1980	28 76	7 77	7 75	4 76	54 70	20 09	54 8	178 68
1981	29 07	7 95	7 83	4 56	53 84	20 56	68 8	192 63
1982	30 11	9 98	9 04	4 83	55 22	20 96	64 4	194 58
1983	31 55	10 20	8 91	4 60	50 34	19 34	67 7	192 66
1984	31 57	11 00	9 90	4 34	50 08	20 51	65 9	193 29
1985	34 19	12 45	11 97	4 53	50 69	18 64	65 2	197 65
1986	34 24	11 94	11 30	4 53	35 73	18 41	61 9	178 06
1987	31 58	12 03	11 04	4 66	45 23	18 53	60 9	183 94
1988	32 04	12 29	10 96	4 82	51 88	19 14	63 3	194 45
1989	32 92	13 56	11 67	5 02	54 50	19 35	64 4	201 37
1990	33 92	13 97	11 92	4 94	54 50	15 54	63 9	198 69
1991	30 63	13 44	11 26	4 70	54 75	20 22	65 5	200 49
1992	28 55	14 33	11 61	4 96	55 00	21 01	66 2	201 68
1993	27 36	13 41	10 83	4 68	56 60	18 96	67 3	199 18
1994	28 36	14 77	11 84	4 69	55 40	18 78	76 7	210 49
1995	29 26	14 85	11 87	4 75	54 00	16 87	78 1	209 74
1996	29 45	14 94	11 95	4 79	54 00	16 66	81 5	213 29
1997	29 69	15 07	12 05	4 84	54 00	15 41	81 5	212 56
1998	30 16	15 31	12 24	4 89	54 00	14 16	81 5	212 26
1999	30 88	15 67	12 53	4 94	54 00	13 24	81 5	212 76
2000	31 78	16 13	12 90	4 99	54 00	12 33	81 5	213 62
2001	32 66	16 58	13 25	5 04	54 00	11 73	81 5	214 76
2002	33 27	16 88	13 50	5 09	54 00	11 12	81 5	215 36
2003	33 85	17 18	13 74	5 14	54 00	10 52	81 5	215 92
2004	34 73	17 63	14 09	5 19	54 00	9 92	81 5	217 06
2005	35 95	18 24	14 59	5 24	54 00	9 34	81 5	218 86
2006	37 39	18 98	15 17	5 29	54 00	8 77	81 5	221 11
2007	39 07	19 83	15 85	5 35	54 00	5 04	81 5	220 64
2008	40 66	20 63	16 50	5 40	54 00	5 11	81 5	223 79
2009	42 06	21 35	17 07	5 45	54 00	5 17	81 5	226 60

gas are the primary components affected by this growth Military consumption also increases incrementally over time to reflect marginal increases in the number of personnel stationed at local military bases

By 2009, gas use for electricity generation and space heating will account for about 38 percent of all consumption in contrast to about 28 percent currently Total cumulative gas use over the period from 1996 through 2009 will be 3,038 bcf This consists of 1,141 bcf (38 percent) for LNG manufacture, 756 bcf (25 percent) for ammonia-urea manufacture, 481 bcf (16 percent) for civilian electricity generation, 440 bcf (15 percent) for utility gas, 149 bcf (5 percent) for field operations (including venting and shrinking but excluding other), and 72 bcf (2 percent) for military use

3.2 ECONOMIC AND DEMOGRAPHIC ASSUMPTIONS

Since the time of statehood in 1959 the economic and demographic growth of the state of Alaska can be characterized as a series of cycles of rapid growth followed by consolidation Between 1960 and 1995 annual average growth rates of population and employment were 3 percent and 4 percent, respectively

Most of the cycles in growth during this period are attributable to developments in the petroleum industry — the discovery of oil in Cook Inlet, the discovery of oil in Prudhoe Bay, the first oil embargo in 1973, the dramatic increase in the price of oil in 1979, and the dramatic decrease in the price of oil in 1986 Alaska has grown from a state with virtually no petroleum industry in 1959 to the second-highest producing state in the U S Alaska produced 541,654,000 barrels of crude in 1995, while Texas produced 559,647,000 (Energy Information Administration, 1996) Alaska is tied with Texas for 26 percent of U S crude oil reserves (Energy Information Administration, 1995)

Growth of the petroleum industry has resulted in dramatic increases in state government spending over the past 35 years but the other basic industries in the state have also contributed to growth of the economy and population These other industries include fish harvesting and processing, timber harvesting and processing, mining, and the tourism industry Military and federal civilian government were also major contributors to the state's growth but have declined in recent years due to federal budget constraints

The rate of growth Alaska has experienced in the past, however, can be explained only partially by growth in basic industries[8] Support sectors of the economy — the services sector, infrastructure, and state-local government have been important growth engines Support sectors have experienced much more rapid rates of growth than the basic sectors of the economy, primarily because, at the time of statehood, these sectors of the economy were quite primitive, and also because of the contribution of petroleum related revenues to the state government and subsequent effects on state spending for infrastructure and local government support

At the time of statehood, federal government employment completely dominated the Alaska economy and accounted for half of total jobs Two-thirds of these government jobs were military The transient nature of this employment, coupled with the seasonal nature of the other major basic industries at the time — fishing, timber, mining — resulted in an economy with little activity not directly related to the military, the administration of federal programs, or the extraction and primary processing of natural resources Total employment in 1961 was 94,000 Nearly two-thirds of this employment was in basic sector activities, support sector jobs (services, infrastructure, and state-local government) accounted for about one-third

Today the situation is reversed About one job in four is in the basic industries, and the other three are in the support (trade, services, and finance), infrastructure (transportation, communications, utilities, and construction), and state-local government sectors Employment in the basic sectors has increased about 2 percent The service and state-local government sectors are about six times as large as they were at statehood, and employment in the infrastructure sector has grown fourfold Clearly, most of the growth in the economy has occurred in these nonbasic sectors

Historically, economic and demographic growth has tended to concentrate in the Southcentral Alaska region of the state, particularly in the Greater Anchorage area including the Matanuska-Susitna Borough **(Table 3-3)** The share of state population in Southcentral Alaska (Anchorage, Matanuska-Susitna Borough, and Kenai Peninsula Borough) has increased from 43 percent in 1960 to 58 percent in 1995, while the share of employment grew from 47 percent in 1970 to 56 percent in 1995 In particular, support and infrastructure employment growth has concentrated in the major urban areas of the state In contrast, state and local government employment and basic sector growth have been more evenly distributed throughout the state with the exception of petroleum industry employment growth, half of which has taken place at regional headquarters in Anchorage

[8]Basic industries are economic sectors which produce more than is consumed within the region and thus export their product outside of the region

Table 3-3
Historical Southern Railbelt Economic and Demographic Data

	Anchorage		Matanuska-Susitna Borough		Kenai Peninsula Borough		Southern Railbelt	
Year	Population	Employment	Population	Employment	Population	Employment	Population	Employment
1980	182504	78124	18637	3264	26424	8397	227565	89785
1981	188527	86162	19908	3700	27599	9115	236034	98977
1982	201299	95081	23063	4382	31051	9853	255413	109316
1983	216164	102703	27971	5354	35148	10399	279283	118456
1984	226195	108386	33552	6542	38275	11402	298022	126330
1985	233870	110888	37670	6996	40645	12213	312185	130097
1986	235133	105602	39974	6699	41653	11435	316760	123736
1987	227974	99553	39050	6193	40871	10804	307895	116550
1988	222950	99951	37965	6207	39949	11089	300864	117247
1989	221884	103440	38953	6510	40117	13067	300954	123017
1990	226338	109962	39683	7077	40802	13891	306823	130930
1991	237216	112979	40494	7878	42242	14376	319952	135233
1992	240258	114138	44582	8253	44019	14474	328859	136865
1993	248296	116603	45936	8667	44411	15451	338643	140721
1994	250542	120100	48745	9950	46818	15816	346105	145866
1995	249349	120600	50167	10450	46372	16122	345888	147172

Note Wage and salary employment

Sources ISER, 1995
Northern Economics database from data originally provided by Alaska Department of Labor

Another important way in which Southcentral Alaska differs from the rest of the state is that the level of population is largely determined by the health of the economy A large proportion of the population is employed, and changes in employment opportunities lead to commensurate changes in population Elsewhere in the state, population change is not as sensitive to changing employment opportunities This was demonstrated during the economic recession in the state which began in late 1985 The recession largely affected jobs in the service and infrastructure sectors, and significant outmigration from Southcentral Alaska occurred in response to declining job opportunities

The assumptions regarding future economic and demographic trends presented in the following sections are from a report by the Institute for Social and Economic Research (ISER) entitled Economic Projections Alaska and the Southern Railbelt 1995-2025 ISER, a research center within the University of Alaska in Anchorage, is generally regarded as the definitive source for Alaska demographic analysis The demographic projections presented in ISER's report were prepared for Chugach Electric Association to assist in their long-term planning The Expected case presented in this analysis uses ISER's base case demographic and economic assumptions and projections from that report, and the Pessimistic case uses ISER's high case demographic and economic assumptions

3.2.1 Economic and Demographic Assumptions - Expected Case

This case assumes activity consistent with the most likely pattern of growth of the Alaska population and economy **(Table 3-4)** The real world oil price is assumed to rise to $17 in 1998 and grows by 0 5 percent annually thereafter, based on the Alaska Department of Revenue Spring 1995 Mid Case Scenario (see Table 2-1) Oil production, however, declines at a 5 percent annual rate Despite the price improvement, declines in state-owned production (where royalties are paid with oil production), severance taxes, and other petroleum industry related revenues lead to state government revenues trending downward in real terms The deterioration of the major source of state revenues results in the reimposition of income taxes, a reduction in the Permanent Fund Dividend, and the use of a portion of the Permanent Fund earnings to fund the state operating budget

Petroleum industry exploration and development activity remains relatively constant as labor-intensive marginal fields are brought into production and enhanced oil recovery methods continue to be applied An alternative use of North Slope natural gas occurs under this case resulting in employment of 1,000 persons after 2000

Growth is expected to occur in mining and tourism, with other basic sectors experiencing minimal change over the projected time period Several new mines are assumed to be developed including the AJ and Kensington mines near Juneau and the Fort Knox mine near Fairbanks Tourism is assumed to expand by 5 percent through 2000 and 4 percent per year through 2009

Over the period from 1996 to 2000 statewide employment growth is projected to occur at the rate of 0 2 percent annually, while population growth is 0 1 percent annually From 2000 through 2010 employment and population are expected to increase at an annual rate of 1 2 and 1 4 percent respectively These rates compare with the 3 34 and 2 81 percent annual increases for employment and population over the 1980 through 1990 time period For Southcentral Alaska, employment

Table 3-4
Southern Railbelt Economic and Demographic Projections
Expected Case

	Anchorage		Matanuska-Susitna Borough		Kenai Peninsula Borough		Southern Railbelt	
Year	Population	Employment	Population	Employment	Population	Employment	Population	Employment
1996	248981	120032	51354	10381	46523	15605	346858	146018
1997	248554	119151	52287	10490	46835	15624	347676	145265
1998	249578	119935	53207	10692	47143	15745	349928	146372
1999	248481	118825	53496	10622	47223	15684	349200	145131
2000	249012	119660	54097	10786	47444	15832	350553	146278
2001	251417	121277	55066	11026	47895	16049	354378	148352
2002	255137	123110	56429	11315	48551	16269	360117	150694
2003	258227	123905	57834	11507	49254	16391	365315	151803
2004	261146	124814	59247	11727	49932	16537	370325	153078
2005	264709	126812	60771	11983	50709	16734	376189	155529
2006	269039	128021	62518	12313	51581	16979	383138	157313
2007	273323	129497	64284	12591	52467	17175	390074	159263
2008	277919	131509	66121	12953	53353	17442	397393	161904
2009	282401	133208	67909	13255	54225	17665	404535	164128

Source: ISER, 1995

growth is expected to average about 1 0 percent annually over the 1996 through 2009 time frame while population growth is 1 2 percent annually

Although these growth rates are about one-third of their historical growth rates, they are consistent with a likely growth scenario for the economy and population because of declining oil production and associated petroleum related revenues The subsequent effect of this decline on the state-local government sector and the maturation of the support and infrastructure sectors of the economy also contribute to slower growth Economic growth will be further retarded by the substantially slower growth in the state-local government sector, which currently accounts for 17 percent of statewide employment Growth of the support and infrastructure sectors of the economy will be modest compared to historical rates because much of the past growth in these sectors was a manifestation of the process of maturation of the economy (a one-time phenomenon) and was not in response to particular basic industry developments This maturation process is not fully complete but future growth in these sectors will occur at a rate which more closely approximates basic sector activity The projected basic sector growth will result in slower overall economic growth in the future with the majority of future jobs in the state being created in the support and infrastructure sectors of the economy

3.2.2 Economic and Demographic Assumptions - Pessimistic Case

The Pessimistic Case assumes developments that will contribute to rapid rates of employment and population growth for Southcentral Alaska (**Table 3-5**) The average price of North Slope crude oil is assumed to rise to $19 in 1998 and increase at a 1 5 percent annual rate thereafter (Alaska Department of Revenue Spring 1995 High Case Scenario) Crude oil production continues to decline but at a lesser rate of 2 percent per year The net result is a growing petroleum sector and increasing state petroleum-related revenues through 2009 The ISER scenario anticipates that income taxes will be reimposed, the Permanent Fund Dividend will be reduced, and other revenue generating or outlay reducing actions identified in the Expected case also will occur in the Pessimistic case Additional petroleum industry activity anticipated under this scenario includes construction of a natural gas pipeline from the North Slope to Valdez (beginning in 2005 with operations starting in 2010), development of oil fields in the Arctic National Wildlife Refuge and federal waters offshore Alaska's coast, and additional discoveries in Cook Inlet

Non-petroleum basic sector economic activity is assumed to exceed the Expected case in the following other respects Two coal mines are anticipated to commence operation in Southcentral Alaska during the 2000-2005 time period, and another gold mine will open in the Fairbanks area in the late 1990s Unspecified mining activity is expected to increase at 5 percent annually The historical downward trend in military employment ceases and strength levels increase 1 percent annually The rate of growth of civilian federal employment increases at 0 5 percent annually, a doubling of the long-term trend since 1960

Over the 1996-2000 time period statewide employment is projected to grow at the rate of 1 3 percent annually while population grows 0 9 percent Over the 2000-2009 time frame these rates increase substantially with employment and population increasing at annual rates of 2 5 percent and 2 8 percent, respectively These rates compare with historic rates between 1980 and 1990 of 3 3 percent for employment and 2 8 percent for population

Table 3-5
Southern Railbelt Economic and Demographic Projections
Pessimistic Case

	Anchorage		Matanuska-Susitna Borough		Kenai Peninsula Borough		Southern Railbelt	
Year	Population	Employment	Population	Employment	Population	Employment	Population	Employment
1996	249876	141240	51576	12563	46683	17696	348135	171499
1997	250789	141225	53054	12777	47238	17791	351081	171793
1998	253810	143559	54709	13215	48106	18193	356625	174967
1999	258508	146609	57427	13950	49157	18564	365092	179123
2000	263703	149694	60494	14756	51555	19544	375752	183994
2001	269574	152983	63147	15416	53469	20240	386190	188639
2002	273984	154154	64904	15596	54434	20357	393322	190107
2003	277985	155633	66971	15902	55261	20495	400217	192030
2004	284333	159093	69729	16503	56595	20878	410657	196474
2005	292893	163602	73588	17328	58518	21413	424999	202343
2006	303373	169513	78020	18350	60714	22111	442107	209974
2007	315864	177401	83383	19531	62701	22933	461948	219865
2008	329680	184815	86334	20577	64659	23679	480673	229071
2009	341315	190353	89671	21326	66318	24223	497304	235902

Source: ISER, 1995

For Southcentral Alaska, employment and population growth are projected to average about 0 2 percent more than the statewide growth rates primarily because of very high growth rates in the Matanuska-Susitna Borough

Although the statewide and Southcentral Alaska growth rates are lower than historical rates, they are consistent with a high growth scenario because a majority of the economic growth from the time of statehood to the present has been in the service, infrastructure, and state-local government sectors which are projected to grow at a slower rate in the future than in the past A significant part of the growth of the service and infrastructure sectors in the past served to transform the Railbelt economy from one dominated by the federal government to one with a full range of infrastructure and support activities and this growth cannot be expected to continue The rapid growth of the state-local government sector in the past has been largely the result of the availability of petroleum revenues that are not expected to increase in real terms in the future (price increases are tempered by declining crude oil production in the North Slope oil fields)

3.3 NATURAL GAS DEMAND

Since the commencement of natural gas consumption from Cook Inlet in 1965, use has grown to average about 200 bcf annually in six major uses These uses are electricity generation, gas delivered by utilities, military, field operations, ammonia-urea manufacture, and LNG manufacture Each of these uses is discussed below

3.3.1 Electricity Generation

Historical Patterns: Over 80 percent of the electricity generated by the electric utilities in the Southern Railbelt is supplied by natural gas produced in Cook Inlet **(Figure 3-2)** Generation from three hydroelectric facilities provides almost all of the remaining 20 percent In the Northern Railbelt, which is outside of the study area, coal-fired plants and combustion turbines burning #2 fuel oil, supply the Fairbanks area

Net Generation in the Southern Railbelt in 1994 by Source
(megawatt hours)

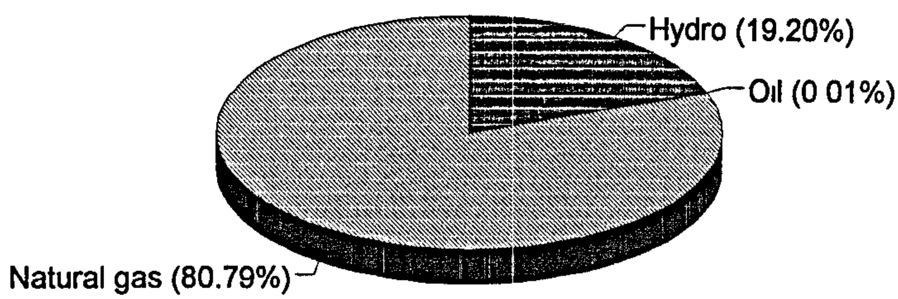


Figure 3-2

Source: Alaska Department of Community and Regional Affairs, Division of Energy and the Alaska Systems Coordinating Council, 1995 [Alaska Electric Power Statistics, 1960-1994]

Until late 1986, natural gas generation supplied most of the needs of only Southcentral Alaska, but with completion of the Railbelt electrical intertie, the Fairbanks area receives natural gas-produced electricity by wholesale purchase from the Anchorage utilities Prior to that time growth in the use of gas for electricity generation had been a function of growth in Southcentral Alaska market Completion of the intertie meant that gas consumption would be affected to some degree by increases in electricity consumption in Fairbanks area as well as in Southcentral Alaska

Natural gas has dominated electrical generation because of its relatively inexpensive price, the relatively low capital cost of capacity additions, and the short time necessary to bring new units on line These factors should continue to influence the selection of future generation modes and make natural gas an attractive method of producing electricity compared to coal, hydropower, or fuel oil

Historically, the consumption of electricity in the Railbelt has grown very rapidly, primarily because of rapid economic growth as well as increased market penetration and appliance saturation Growth in population, reduction of average household size, and, particularly in the time shortly after statehood, extension of distribution facilities to the entire Railbelt have contributed to rapid growth in the number of customers Growth in consumption per customer has been a function of strong growth in real per capita income, the relatively low price of electricity (compared to prices elsewhere in the U S), and the maturation of the commercial sector of the economy Electricity used for space heating has been significant in the Fairbanks area and Matanuska-Susitna Borough, but is less so at present This is due to the relatively high cost of space heating by coal- and fuel oil-fired electricity in Fairbanks and the extension of utility gas distribution lines to the Matanuska-Susitna Borough with gas supplanting electrical heating

Electricity Generation - Expected Case: In this case, projected gas demand for electricity generation fluctuates around the current level of 29 bcf per year until 2002, when domestic demand begins to increase **(Table 3-6)** Demand reaches 34 bcf in 2009 The pattern of use is a function of moderate population and economic growth in the region as projected by ISER's base case

Electricity Generation - Pessimistic Case: In the Pessimistic Case, projected gas demand for electricity generation increases continually from the current level of about 29 bcf per year reaching 42 bcf in 2009 **(Table 3-7)** This is the result of the higher population and economic growth in Southcentral Alaska as projected under ISER's high case

Table 3-6
Projected Consumption of Cook Inlet Gas - Expected Case
(billion of cubic feet)

Year	Electricity Generation	Gas utilities: Residential	Gas utilities: Commercial	Gas utilities: Military	Ammonia-urea	Field operations	LNG production	Total
1996	29 33	14 89	11 90	4 75	54 00	16 09	76 80	207 76
1997	29 40	14 92	11 93	4 75	54 00	14 40	76 80	206 20
1998	29 59	15 02	12 00	4 75	54 00	12 71	76 80	204 87
1999	29 53	14 99	11 98	4 75	54 00	11 44	76 80	203 48
2000	29 64	15 04	12 03	4 75	54 00	10 16	76 80	202 43
2001	29 97	15 21	12 16	4 75	54 00	9 32	76 80	202 20
2002	30 45	15 46	12 36	4 75	54 00	8 47	76 80	202 28
2003	30 89	15 68	12 54	4 75	54 00	7 62	76 80	202 27
2004	31 32	15 89	12 71	4 75	54 00	6 78	76 80	202 29
2005	31 81	16 10	12 91	4 75	54 00	5 93	76 80	202 34
2006	32 40	16 44	13 18	4 75	54 00	5 08	76 80	202 62
2007	32 99	17 06	13 64	4 75	54 00	--	76 80	198 66
2008	33 61	17 06	13 64	4 75	54 00	--	76 80	199 84
2009	34 21	17 36	13 88	4 75	54 00	--	76 80	201 00

Table 3-7
Projected Consumption of Cook inlet Gas - Pessimistic Case
(billion of cubic feet)

Year	Electricity Generation	Gas utilities: Residential	Gas utilities: Commercial	Gas utilities: Military	Ammonia-urea	Field operations	LNG production	Total
1996	29 45	14 94	11 95	4 79	54 00	16 66	81 50	213 29
1997	29 69	15 07	12 05	4 84	54 00	15 41	81 50	212 56
1998	30 16	15 31	12 24	4 89	54 00	14 16	81 50	212 26
1999	30 88	15 67	12 53	4 94	54 00	13 24	81 50	212 76
2000	31 78	16 13	12 90	4 99	54 00	12 33	81 50	213 62
2001	32 66	16 58	13 25	5 04	54 00	11 73	81 50	214 76
2002	33 27	16 88	13 50	5 14	54 00	11 12	81 50	215 36
2003	33 85	17 18	13 74	5 19	54 00	10 52	81 50	215 92
2004	34 73	17 63	14 09	5 24	54 00	9 92	81 50	217 06
2005	35 95	18 24	14 59	5 29	54 00	9 34	81 50	218 86
2006	37 39	18 98	15 17	5 35	54 00	8 77	81 50	221 11
2007	39 07	19 83	15 85	5 40	54 00	5 04	81 50	220 64
2008	40 66	20 63	16 50	5 45	54 00	5 11	81 50	223 79
2009	42 06	21 35	17 07	5 51	54 00	5 17	81 50	226 60

3.3.2 Utility Gas

Historical Patterns: Gas distributed by utilities and third party wholesalers for space heating, water heating, cooking, and other miscellaneous purposes is the second largest current domestic use of Cook Inlet gas **(Table 3-8)** Like the gas used for electricity generation, the ultimate end users of most of this gas are residences and commercial customers because there is very little manufacturing in Southcentral Alaska with the exception of petroleum products and fish processing

Table 3-8
Historical Consumption of Cook Inlet Gas
(billion of cubic feet)

		Gas utilities						
Year	**Electricity Generation**	**Residential**	**Commercial**	**Military**	**Ammonia-urea**	**Field ope rations**	**LNG production**	**Total**
1980	28 76	7 77	7 75	4 76	54 70	20 09	54 84	178 68
1981	29 07	7 95	7 83	4 56	53 84	20 56	68 82	192 63
1982	30 11	9 98	9 04	4 83	55 22	20 96	64 44	194 58
1983	31 55	10.20	8 91	4 60	50 34	19 34	67 73	192 66
1984	31 57	11 00	9 90	4 34	50 08	20 51	65 88	193 29
1985	34 19	12 45	11 97	4 53	50 69	18 64	65 18	197 65
1986	34 24	11 94	11 30	4 53	35 73	18 41	61 91	178 06
1987	31 58	12 03	11 04	4 66	45 23	18 53	60 88	183 94
1988	32 04	12 29	10 96	4 82	51 88	19 14	63 33	194 45
1989	32 92	13 56	11 67	5 03	54 50	19 35	64 35	201 37
1990	33 92	13 97	11 92	4 94	54 50	15 54	63 92	198 70
1991	30 63	13 44	11 26	4 70	54 75	20 22	65 49	200 49
1992	28 55	14.33	11 61	4.96	55 00	21 01	66 22	201 68
1993	27 36	13 41	10 83	4 68	56 60	18 96	67 33	199 18
1994	28 36	14 77	11 84	4 69	55 40	18 78	76 65	210 49
1995	29 26	14 85	11 87	4 75	54 00	16 87	78 14	209 74

Utility gas is currently available to most of the potential customers in Southcentral Alaska but not to the Fairbanks area The only communities of significant size not currently served by gas in Southcentral Alaska are Homer and Seward Outlying and sparsely populated areas in other parts of Southcentral Alaska are also unserved

When gas became available in Southcentral Alaska, it quickly penetrated existing markets and consumption grew rapidly Gas is now the most important source of energy for space heating in

Anchorage and parts of the Kenai Peninsula and Matanuska-Susitna Borough This is the result both of its low relative cost and its convenience Penetration of gas space heating in the Anchorage area has increased from 71 percent in 1980 to 82 percent in 1990 Significant shares are also accounted for by electricity (14 percent), and fuel oil (1 percent) (U S Department of Commerce, 1996)

Utility Gas - Expected Case: Natural gas distributed to final users by gas utilities for space heating and other purposes increases from almost 27 bcf in 1996 to 31 bcf in 2009 (Table 3-6) This growth is attributable to population and economic growth in the existing market as well as minor expansion of existing gas distribution systems into currently unserved areas Expansion of utility gas to Fairbanks, Homer, or Seward is not projected under this case

Utility Gas - Pessimistic Case Space heating and other uses of utility gas increase from about 27 bcf in 1996 to slightly more than 38 bcf by 2009 (Table 3-7) This growth is attributable to higher population and economic growth in the existing market as well as minor expansion of existing gas distribution systems into currently unserved areas

3.3.3 Military Use

Historical Patterns Natural gas is used by the two military installations in the Anchorage area, Fort Richardson and Elmendorf Air Force Base, for electricity generation and space heating (Table 3-8) Since use of gas began in 1969 the pattern has been for annual consumption to slowly decline This is a function of a gradual decline in personnel assigned to the bases and conservation efforts on the part of the military to minimize fuel costs

Military Use - Expected Case: Military use of natural gas remains constant at the current level (Table 3-6) Natural gas continues to be used for electricity generation and space heating in the Anchorage area The military installations in Fairbanks continue to generate electricity and provide space heating from existing sources and do not rely upon Cook Inlet gas-fired electricity delivered over the intertie

Military Use - Pessimistic Case: Military use of natural gas expands in accordance with ISER's assumption that military strength levels increase 1 percent annually over time Consumption for gas-fired electricity and space heating in the Anchorage area bases increases from less than 5 bcf in 1996 to slightly less than 6 bcf in 2009 (Table 3-7) The Fairbanks area bases continue to rely upon other energy sources

3.3.4 Gas Use for Field Operations

Historical Patterns: A significant amount of natural gas is consumed in the process of production of both oil and gas This category of field operations consists of vented and flared gas, shrinkage (the volume reduction in natural gas that occurs when liquids are extracted from it, primarily from gas produced in conjunction with oil), as well as gas actually used on the lease to power pumps, generating equipment, and other machinery on the offshore platforms and onshore facilities

Annual gas use on the lease has remained quite stable since the early 1970s in the range of 12 to 16 bcf, with the peak in the late 1970s (Table 3-8) Crude oil production accounts for most of the field gas use As crude oil production has declined over time, producers have used additional field gas in attempts to minimize decline This has resulted in relatively stable volumes of gas used on leases However, as oil production continues to decline, field use of gas is expected to taper off in proportion to oil production

Gas Use for Field Operations - Expected Case: Gas use on the lease associated with the production of oil and gas declines at the same rate as oil production in Cook Inlet The Alaska Department of Natural Resources (DNR) is projecting that crude oil production will cease in 2006 (Alaska Department of Natural Resources, 1996) Crude oil production currently requires most of the gas used in field operations and after 2006 gas used in the field for natural gas production is projected to be minimal (effectively zero) under this case (Table 3-6)

Gas Use for Field Operations - Pessimistic Case: Gas use on the lease associated with the production of gas and oil remains declines at a rate consistent with DNR's projected oil and gas production in Cook Inlet with crude oil production accounting for 75 percent of the current use of gas in field operations and gas production requiring 25 percent of the current use After 2006, gas production increases but, because of the small amounts of gas required for field operations, the volume of gas remains near 5 bcf through 2009 (Table 3-7)

3.3.5 Ammonia-Urea Manufacturing

Historical Patterns: Since 1969, UNOCAL has operated a plant on the Kenai Peninsula that uses natural gas in the production of ammonia-urea The initial annual use rate was in the range of 20 bcf The plant was expanded after ten years and annual use now averages about 54 bcf annually, varying somewhat from year to year with activity of the world fertilizer market and maintenance activity

(Table 3-8) For example, in 1986 and 1987 the plant did not operate at full capacity as some of the major equipment was being replaced

Ammonia-Urea Manufacture - Expected Case: The annual consumption rate for the plant is expected to average 54 bcf throughout the projection period (Table 3-6) Demand may decrease in some years due to maintenance or refurbishment activities at the plant, but to be conservative, consumption is assumed to remain level over time

Ammonia-Urea Manufacture - Pessimistic Case: No information was found to suggest that plant expansion and increased consumption is likely to occur Consumption for manufacturing ammonia-urea is expected to average 54 bcf under any future scenario (Table 3-7)

3.3.6 Liquefied Natural Gas Manufacturing

Historical Patterns: Phillips-Marathon has a contract for the annual export of 64 4 TBTU (trillion BTUs – delivered) of liquefied natural gas To deliver the contracted LNG it is necessary to withdraw 77 bcf from the field The difference between the feedstock withdrawn from the fields and the amount of gas delivered as LNG is accounted for by gas used in LNG manufacture as well as boil-off during transport to Japan Net efficiency of the process averages 82 5 percent Gas consumption for LNG averaged 65 bcf from 1981 through 1993 (Table 3-8) In 1994 consumption increased to about 77 bcf as a result of Japan's demand for full contractual quantity

Liquefied Natural Gas Manufacture - Expected Case: Under the Expected Case LNG manufacture is expected to continue to consume 77 bcf annually throughout the study period (Table 3-6)

Liquefied Natural Gas Manufacture - Pessimistic Case: Gas consumption in the manufacture and transportation of LNG increases to 81 5 bcf annually in 1996 under this case (Table 3-7) Deliveries in any given year could increase to this higher amount if the Japanese LNG buyers exercise their right to request deliveries of up to 6% above the base annual contract quantity of 64 4 trillion Btu It is unlikely that the Japanese buyers would exercise this right in every year, thus lending a conservative bias to this case

3.4 DEMAND MODELING

The demand projections presented in this report are based upon an economic-demographic model of Southcentral Alaska which drives the natural gas demand functions The economic-demographic model is the MAP Econometric Modeling System of the Institute of Social and Economic Research (ISER) of the University of Alaska, Anchorage The MAP model has been used for nearly 15 years to produce economic projections for the State of Alaska and its regions

The MAP Econometric Modeling System combines an econometric model of the state with demographic, fiscal, and regional models and generates detailed annual projections of economic and demographic activity through the year 2010 Separate but consistent projections for each of the three areas within Southcentral Alaska were produced These regions are Anchorage, Kenai Peninsula Borough, and Matanuska-Susitna Borough Each region corresponds to a Census Area and a Borough (Alaska equivalent of a county) Each projection is driven by an internally consistent scenario of input assumptions regarding world oil prices, basic sector economic development in the state, state and local government fiscal behavior, and long-term national economic trends

World oil price assumptions form an important element of the economic and demographic projections because of both the significance of the petroleum industry in the economic base of the state and the importance of petroleum revenues in the financing of state and local government World oil price assumptions and consistent petroleum revenue projections are taken from the Alaska Department of Revenue (ADOR) — see Table 2-1 The Expected case utilizes oil price and revenue projections deemed most likely by the ADOR The Pessimistic case utilizes high oil price levels and revenue projections felt by the ADOR to have a lower probability of being achieved

The natural gas demand estimates are linked to the population estimates of ISER's model or driven by assumptions about the future demand for industrial uses of gas Electricity generation and utility gas consumption in the analysis are primarily a function of population related demands in the study region ISER's High Case projection was used to produce the Pessimistic case demand projection and the mid case projection was used to produce the Expected case demand projection

Other factors that could influence consumption were investigated but discarded for various reasons For example, gas consumption per capita for electricity generation in Southcentral Alaska has decreased significantly over the past 15 years (see **Figure 3-3**) but most of this decrease is associated with events that are not anticipated for the future Bradley Lake hydroelectric facility came on-line in 1991, displacing gas -fired generation, and large gas-fired generators were converted to combined cycle turbines during the 1980s resulting in greater generating efficiencies This analysis assumes that current efficiencies for generating equipment and end-use appliances and equipment remain constant over the study period for both cases This results in a conservative bias (i e , less gas will be used than projected) to the analysis since some incremental gain in efficiency is likely over the time period

Figure 3-3
Gas Consumption for Electricity Generation in Southcentral Alaska
Per Capita Consumption 1980-1995

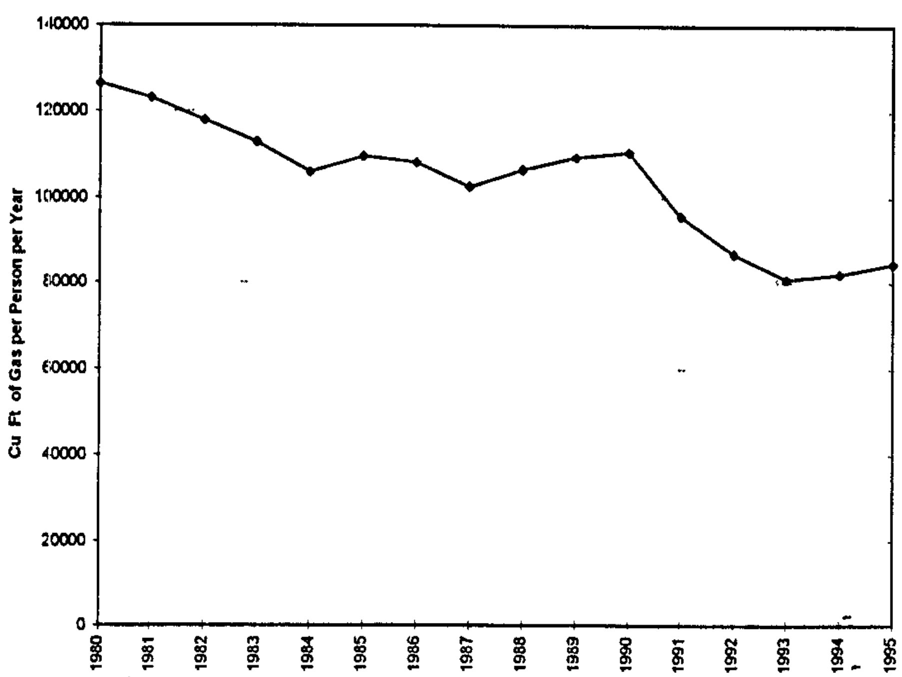


Figure 3-3

Implicit in this analysis is the assumption that customer preferences, government conservation measures, as well as price and income elasticities in those end-uses that are sensitive to these factors (space heating and electric utility use) continue unaltered In addition, we assume that natural gas market share for space heating is not significantly eroded by gas price increases toward parity with fuel oil

In addition to different assumptions regarding the level of population and employment in Southcentral Alaska, the two demand case projections also differ with regard to assumptions about the volume of gas used for LNG manufacture, development of a natural gas pipeline from the North Slope, and the volume of gas required for field operations in Cook Inlet

The two case projections which result from this analysis represent the maximum and most likely value for the amount of gas consumption in future years based on current information If events other than those projected in the economic scenarios and gas market scenarios occur, it is likely that they will result in gas use similar to the Expected case and very unlikely that gas use would exceed that of the Pessimistic case

4.0 SUPPLY ANALYSIS

4.1 INTRODUCTION

Natural gas from Cook Inlet is important to residents of Southcentral Alaska as an energy resource for heating and electrical generation An indication of the importance of gas is that where utility gas is available, almost all space heating relies directly on natural gas Where utility gas is not available, gas-fired electricity competes with fuel oil and wood

The terms *probable resources, reserves, proven developed* and *proven undeveloped* are used throughout this summary to discuss natural gas supplies It is important that distinctions among the terms be maintained Each term is defined below, consistent with the Potential Gas Committee's definition (PGC, 1995)

- *Gas Reserves* are that portion of the identified gas resource base whose existence has been demonstrated through actual production or test drilling In general, reserves can be extracted under existing economic and operating conditions Reserves are generally not identified until sufficient drilling has been completed to permit delineation of the field and estimation of the size of the reservoir

- *Proven Developed Reserves* are that portion of reserves which are part of field which are already producing or have in place production wells and gathering systems

- *Proven Undeveloped Reserves* are that portion of reserves which are known to exist from their association with producing fields, but for which developed production facilities are not already in place These include "behind-the-pipe" reserves (proven reserves contiguous with developed fields but not developed for production) and incremental reserves in developed fields which are known to be available with additional compression facilities

- *Undiscovered Potential Resources* are resources whose existence has not been confirmed, but is inferred from its association with existing fields or from stratigraphic, geological or geophysical information

- *Probable Resources* According to PGC's definition, probable resources are that portion of potential resources which are

> "associated with known fields and are the most assured of potential supplies A relatively large amount of geological and engineering information is available to aid in the estimation of these resources The discovered portion includes supplies from *existing pools* in known productive reservoirs Although pools containing this gas have been discovered, their extent has not been delineated by development drilling Therefore, the existence and quantity of gas in the undrilled pool are as yet unconfirmed The undiscovered part is expected to come from future new pool discoveries within existing fields either in reservoirs productive in the field or in shallower or deeper formations known to be productive elsewhere in the same geologic province or subprovince" (PGC, 1995, page 6)

- *Possible Resources* are less assured because they are not associated with known fields, but they are associated with productive formations in productive provinces

- *Speculative Resources* are the least assured supplies because they are expected in formations and province that have not been proven to be productive

Resources and reserves are generally described in terms of recoverable resources or recoverable reserves estimate which takes into account the fact that physical and technological constraints mean only a portion of resources or reserves can be brought to the surface

4.2 COOK INLET NATURAL GAS RESERVES

4.2.1 Historic Reserves

Cook Inlet gas fields began production in the mid 1960s and by the end of 1995 had produced about 4 8 tcf, net of injection, with 209 bcf of that total in 1995 (ADNR, 1995, page 35, ADNR 1996 page 39, and Beasley, personal communication) **Table 4-1** shows the estimated recoverable reserves, historical production and reserves to production ratios for Cook Inlet natural gas from 1980 to 1996 The reserve estimates presented in Table 4-1 include only developed and shut-in reserves Production (and consumption, which closely follows production) has varied from 184 to 215 bcf over this time period, fluctuating with economic activity in the region During the past 16 years, reserve levels fluctuated between 4,600 and 2,200 bcf

Table 4-1
Estimated Remaining Recoverable Reserves and Historical Production in Cook Inlet
(Billion Cubic Feet)

Year	Proven Reserves	Consumed Reserves	Reserve/Production Ratio
1980	3,544	185	19 2
1981	3,785	199	19 1
1982	3,594	207	17 4
1983	3,422	212	16 1
1984	3,426	215	15 9
1985	3,264	218	15 0
1986	4,664	193	24 2
1987	4,377	196	22 3
1988	4,158	197	21 1
1989	3,906	205	19 0
1990	3,619	210	17 2
1991	3,417	207	16 5
1992	3,215	208	15 4
1993	2,827	201	14 1
1994	2,187	190	11 5
1995*	3,052	210	14 6
1996	2,842		
Average	3,529	203	17 4

Note

* 1995 reserves adjusted as per personal communication, W Van Dyke, ADNR, 1996

Sources:

1 Reserves , ADNR, Historical And Projected Oil and Gas Consumption for years 1980 to 1996

2 Consumption ADNR, 1996, Table 6

Reserves have generally been developed when declines in reserves to production ratios have declined to the mid teens This ratio, which indicates the number of years that current reserves will last at present production rates, has ranged from 11.5 to 24 2 years **(Figure 4-1)** The average reserves/production ratio over this time period (17 2) is almost double the U S average of approximately 9 years

Because a large capital investment is required to develop a gas reservoir into recoverable reserves, gas reserves will be developed at a rate comparable with the growth in demand Most of the development drilling in the Cook Inlet Basin has occurred in connection with oil exploration and development There is little interest in new Cook Inlet gas exploration under current prices New reserves will consist of developing existing proven undeveloped gas reserves, and exploration and development of new fields In any event, the petroleum industry can be expected to develop only sufficient gas reserves to cover near-term demand The industry will likely seek to moderate its investments in proven reserves to avoid unnecessary capital carrying costs

Considerable historical and subsurface information is available about the gas reserves and potential in the Cook Inlet area Because the larger structures have been explored, state resource agencies do not anticipate major new discoveries Additional discoveries of moderate to small size, comparable to the 300 bcf Cannery Loop discovery and the Pretty Creek discovery, are expected in this mature drilling province, and a few intermediate size fields (500 bcf to 1 tcf) may also be discovered With the existing infrastructure, a number of these gas finds may be commercially viable (Kornbrath, 1987)

As noted above, in the past exploration in the Cook Inlet Basin has focused on oil, gas discoveries have primary occurred as a by-product of oil exploration Until recently, the petroleum industry has not had sufficient incentive to explore for gas Older gas sales contracts met the industry's basic cost structure requirements, but coupled with the existence of substantial proven reserves, did not provide sufficient incentives for true gas exploration **Table 4-2** shows that most of the known gas reserves in Cook Inlet were discovered during the 1950s and 1960s when the industry was actively exploring for oil

The only relatively new discovery of Cook Inlet gas is the West McArthur River field which was discovered in 1991 Another 1991 discovery, the Sunfish prospect, was drilled by Phillips Petroleum Company in partnership with ARCO Alaska Inc Although original estimates were much higher, current reserves estimates are 25 million barrels of oil and 20 bcf of gas

Table 4-2
Estimated Remaining Recoverable Gas Reserves in Cook Inlet by Field (Billion Cubic Feet)

Type/Name	Remaining Recoverable Reserves	Year of Discovery
Proven and Developed		
Beaver Creek	122	1967
Beluga River	488	1962
Cannery Loop	50	1978
Granite Point	29	1965
Ivan River, Lewis River, Pretty Creek and Stump Lake	75	1960
Kenai	174	1959
McArthur River	600	1968
Middle Ground Shoal	15	1962
North Cook Inlet	1000	1962
North Trading Bay	20	1965
Sterling	23	1961
Swanson River	155	1957
Trading Bay	29	1979
West Fork	3	1960
West McArthur River	1	1991
Proven but Undeveloped or Shut-in		
Birch Hill	11	1965
Falls Creek	13	1961
Nicolai Creek	2	1966
North Fork	12	1965
West Foreland	20	1962
Total	2,842*	

Note: *The total includes both developed and shut-in reserves
Sources: Discovery dates Beasley, 1995
Reserves ADNR, 1996

4.2.2 Current Reserves

Cook Inlet reserves have been estimated by the ADNR[9] (ADNR, 1996, page 4) as well as independently by the private geophysical consulting firm Schlumberger Geoquest Reservoir Technologies (GeoQuest) Table 4-2 summarizes information on gas resources and gas reserves in Cook Inlet As seen in **Table 4-3,** government estimates of developed reserves total 2,784 bcf compared to GeoQuest's estimate of 2,928, a difference of only 144 bcf An additional reserve category includes proven reserves in non-producing fields Both ADNR and GeoQuest agree that there are 58 bcf in this category[10] In addition to the proven developed reserves, GeoQuest has estimated proven undeveloped reserves (these reserves are not estimated by ADNR) These include reserves which are "behind the pipe" expansions of existing fields (486 bcf), and reserves which would be available with additional compression (315 bcf), which, together with additional reserves of 58 bcf, totals 859 bcf

4.2.3 Cook Inlet Natural Gas Resources

Most of the geologic structures in the current Cook Inlet production area (south of Point Possession and north of Kalgin Island) have been drilled to test for oil With few exceptions, these structures have commercial quantities of hydrocarbons, either oil or gas

The limited drilling which has occurred in the Lower Cook Inlet and Susitna basins of the region has established that poor stratigraphic conditions exist for oil accumulations in these areas The mapped source rocks and presence of coal in those relatively unexplored basins strongly indicate that the structures in these regions will be gas-bearing As a result, a number of structures in these basins have not been drilled because a market does not exist for additional gas supplies

The Department of Natural Resources Division of Oil and Gas has identified 21 proven fields in Cook Inlet (1996) Generalized geologic maps of the region encompassing Upper and Lower Cook Inlet and Susitna basins show at least 20 identified structures which have not yet been drilled, and a number of magnetic and geophysical anomalies which suggest additional structures

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[9] Some of the estimates reported in ADNR 1996 were made by the Alaska Oil and gas Conservation Commission (AOGCC)

[10] This corresponds to ADNR's "proven but Undeveloped or Shut-in" category on page 4

Table 4-3
Comparison of Cook Inlet Reserve Estimates: Proven Developed Reserves
Billion Cubic Feet (January 1996)

	Proven Developed Reserves		
	GeoQuest	**ADNR**	**GeoQuest Less ADNR**
Beaver Creek	20	122	-102
Beluga River	625	488	137
Birch Hill			0
Cannery Loop	35	50	-16
Falls Creek			0
Granite Point	29	29	0
Ivan River	84	75	9
Kenai	145	174	-30
McArthur	591	600	-9
Middle Ground Shoal	14	15	-1
Nicolai Creek			0
NCIU	1049	1000	49
North Fork			0
North Trading Bay	20	20	0
Sterling	23	23	0
Sunfish			0
Swanson Gas	22		22
Swanson Hemlock	240	155	85
Trading Bay	28	29	-1
West Foreland			0
West Fork	3	3	0
West McArthur R	1	1	0
Total	**2928**	**2784**	**144**

Table 4-4 presents two estimates of undiscovered resources in the Cook Inlet region The probabilities refer to the likelihood that the resources to be discovered are at least as high as specified For example a 95 percent estimate has only a 5 percent probability that the resource will be less than that estimated, a 50 percent probability is the most likely or mean estimate Comparing the two estimates, that of the Potential Gas Committee is the lowest, in that the mean total probable resource is 1,050 bcf This compares to 1754 bcf for the MMS/USGS 1996/1995

In addition to probable resources, the PGC (1994) estimates possible and speculative resources (see definition in Section 4 2) Most likely (50 percent probability) PGC estimate of possible resources adds another 2,100 bcf which might be found in known productive formations not associated with known productive fields The PGC mean estimate of speculative resources suggests that an additional 3,400 bcf remains to be discovered in formations not known to be productive

Table 4-4
Estimates of Potential Undiscovered Gas Resources in the Cook Inlet Basin

Source	Probability that Quantity Is at Least the Given Value	Billions of Cubic Feet
MMS/USGS 1996/1995:		
Federal Offshore	95	400
	50	890
	5	1650
Onshore & State Offshore	95	78
	50	864
	5	2841
Total Fed + State	95	478
	50	1754
	5	4491
Potential Gas Committee 1995:		
Probable Onshore	100	400
	50	650
	0	1600
Probable Offshore	100	200
	50	400
	0	800
Total Onshore + Offshore	100	600
	50	1050
	0	2400

4.2.4 Other Gas Supplies Available to Cook Inlet

At least three other sources of gas might be available to Cook Inlet North Slope gas, Susitna and Lower Cook Inlet Basin dry gas and coalbed methane

Susitna and Lower Cook Inlet Dry Gas: While information in Table 4-4 is for the Cook Inlet Basin only, additional resources might be found in the Susitna Basin and in Lower Cook Inlet, where limited drilling has occurred to date (Kornbrath, 1987) These resources are not included in the quantities shown in Table 4-4because they are located far from existing infrastructure and any gas discoveries of this size range would be expensive to develop on a per-thousand-cubic-foot basis It is anticipated that industry would seek to explore and develop other geologic structures closer to the present production area before developing the Lower Cook Inlet or the Susitna Basin for natural gas Generalized geologic maps of the region show at least 20 identified structures which have not yet been drilled, and a number of magnetic and geophysical anomalies which suggest additional structures This limited drilling in the Susitna and Lower Cook Inlet basins can be explained by their apparent poor stratigraphic conditions for oil accumulations The mapped source rocks and presence of coal strongly indicate that the structures in these regions would be gas-bearing Up to the present, there has been little incentive for these resources to be explored, as gas supplies have been available at relatively low cost These resources would be classified as "possible resources" under PGC nomenclature

North Slope Gas Reserves: Proven gas reserves on the North Slope of Alaska are estimated to be 35 tcf, with 26 tcf contained within the Prudhoe Bay unit alone (Knowles memo, 1996, page 1) The North Slope region produces a very large amount of gas in association with oil production, but there is no significant market for the gas other than operating the oil production facilities and injection for enhanced oil recovery

Yukon-Pacific Corporation as well as a consortium of three major North Slope Producers (ARCO, BP, and Exxon) have proposed large LNG export projects A proposed pipeline route would parallel the existing Trans Alaska Oil Pipeline going from Prudhoe Bay to Valdez where it would be converted to LNG for export to Far East markets Because the pipeline would pass through Southcentral Alaska, it would be possible to siphon off a small amount to supply Southcentral Alaska's needs [11] Alaska governmental agencies (Knowles, 1996) have expressed reservations that

[11] The entire 1995 Southcentral Alaska non-industrial demand is less than 10 percent of the pipeline capacity According to Lowenfels 1996, a large portion of this demand could be accommodated by additional compression on the pipeline without reducing the amount available for export

the financial and marketing hurdles in this $15 billion project can be readily overcome While it is somewhat uncertain whether North Slope gas will reach Southcentral Alaska within the time frame of this study (before 2009), it is likely that these supplies will eventually be available to provide a backstop to Cook Inlet supplies

Coalbed Methane: As discussed in Section 2 3 1, coalbed methane has been shown to exist in the Matanuska Valley in Southcentral Alaska, but it is uncertain whether this gas will be economically feasible as an energy source A commercial test well drilling program conducted in the summer of 1996 should resolve this uncertainty If this resource is found to be commercial, given the likely extent of the coal bed from which the methane derives, this resource could, if needed, provide a significant source of additional natural gas supplies

4.3 SUPPLY SCENARIO SUMMARY

As discussed previously, uncertainty with regard to supplies of Cook Inlet natural gas and other substitute energy sources to meet Southcentral Alaska's energy needs will be addressed by two scenarios — an Expected scenario and a Pessimistic scenario The Expected supply scenario is based on the most likely outcomes of uncertain supply issues, while the Pessimistic scenario assumes that uncertain issues will result in lower supplies Even the Expected scenario is fairly pessimistic in that several supply issues which might be reasonably expected to break in favor of additional supplies are assumed to have unfavorable outcomes

4.3.1 Expected Supply Case

Reserves: Under the Expected case, proven reserves are assumed to equal the sum of the GeoQuest estimated proven developed reserves (2,928 bcf) plus the proven undeveloped reserves (859 bcf) Thus the total proven reserves is expected to be 3,787 bcf The GeoQuest reserve estimate is selected as the expected case because this estimate is based on the most current and most thorough analysis of Cook Inlet reserves presently available

Resources: Under the expected case, it is assumed that the PGC 50 percent probability estimate of probable onshore and offshore resources represents all the resources available to Cook Inlet This estimate adds 1,050 bcf of resources to the proven reserves, for a total reserves plus resources available from Cook Inlet of 4,837 bcf

This scenario has several conservative biases The selection of the PGC probable estimate is conservative, in that it is the lowest of the three publicly available estimates Furthermore "possible" and "speculative resource" estimates are excluded Also excluded are a number of energy supplies which might reasonably be expected to contribute to Southcentral Alaska's energy needs, namely possible gas resources from unexplored structures in the Susitna and Lower Cook Inlet basins, North Slope gas, and coalbed methane

4.3.2 Unfavorable Supply Case

Reserves: Under the Pessimistic case, proven reserves are assumed to equal the sum of the ADNR 1996 estimated proven developed reserves (2,784 bcf) plus GeoQuest's estimate[12] of proven undeveloped reserves (859 bcf) Thus the total proven reserves is expected to be 3,643 bcf The ADNR reserve estimate is selected as the Pessimistic case because it is somewhat lower than the GeoQuest estimate

Resources: Under the Pessimistic case, it is assumed that the PGC 100 percent probability estimate of probable onshore and offshore resources represents all the resources available to Cook Inlet This estimate adds 600 bcf of resources to the proven reserves, for a total reserves plus resources available from Cook Inlet of 4,243 bcf

In addition to the conservative biases built into the Expected case, the Pessimistic case is lower because only probable resources, which are present with a virtually 100 percent probability are included

[12]ADNR's estimate of undeveloped or shut-in proven reserves is limited to a few shut-in undeveloped fields It does not include reserves behind-the-pipe or available with additional compression (see Section 4 2 2)

5.0 RAILBELT REGION SUPPLY/DEMAND BALANCE

This section compares the results of the previous supply and demand analyses In comparing supply and demand under the Expected and Unfavorable scenario, four scenarios are possible These are presented in the matrix below

Natural Gas Available to the Railbelt after 2009 (billion cubic feet)

	Expected Supply	Pessimistic Supply
Expected Demand	Scenario I 2,000	Scenario II 1,406
Pessimistic Demand	Scenario III 1,798	Scenario IV 1,204

Scenario I represents the most likely (expected) situation with respect to gas supply and demand Scenario IV combines unfavorable supply and unfavorable demand scenarios to represent an unlikely pessimistic scenario Scenarios II and III represent intermediate situations The amount of natural gas remaining at the end of the each year under each of the four scenarios is shown in **Figure 5-1.**

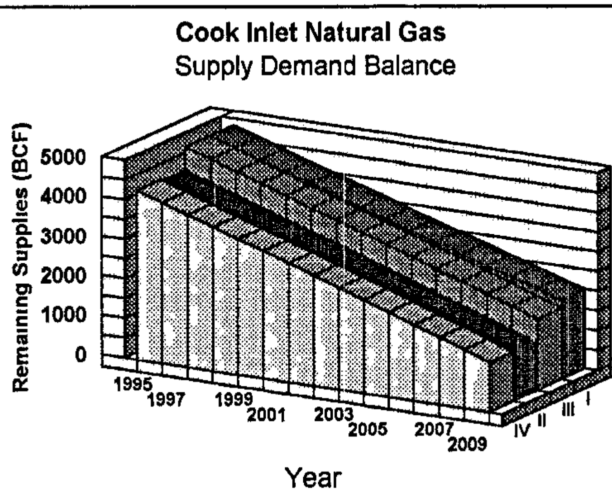

Figure 5-1

5 1 EXPECTED DEMAND: SCENARIO I AND SCENARIO III

Scenarios I and III both utilize the expected supply for gas However, Scenario I assumes the expected 50 percent probability demand scenario whereas Scenario III assumes the Pessimistic demand scenario Figure 5-1 illustrates the convergence of gas supply and Expected demand for Scenarios I and III

As shown in **Table 5-1** (the source of the data in Figure 5-1), by the year 2009 estimated remaining reserves under Scenario I (Expected demand and Expected supply) total 2,000 bcf For Scenario III, which factors in the unfavorable demand scenario, the estimated remaining reserves are 1,748 bcf by 2009 Thus for both Scenarios I and III substantial reserves would remain at the end of the period of the requested export authorization

Table 5-1
Remaining Cook Inlet Gas Supplies under Alternative Scenarios (bcf)

Year	Expected Demand	Pessimistic Demand	Scenario I	Scenario II	Scenario III	Scenario IV
1995	210	210	4837	4243	4837	4243
1996	208	213	4629	4035	4624	4030
1997	206	212	4423	3829	4412	3818
1998	205	212	4218	3624	4200	3606
1999	203	213	4015	3421	3987	3393
2000	202	214	3813	3219	3773	3179
2001	202	215	3611	3017	3558	2964
2002	202	215	3409	2815	3343	2749
2003	202	216	3207	2613	3127	2533
2004	202	217	3005	2411	2910	2316
2005	202	219	2803	2209	2691	2097
2006	203	221	2600	2006	2470	1876
2007	199	221	2401	1807	2249	1655
2008	200	224	2201	1607	2025	1431
2009	201	227	2000	1406	1798	1204

5.2 PESSIMISTIC DEMAND: SCENARIO II AND SCENARIO IV

Scenarios II and IV both assume the Pessimistic supply scenario for gas However, Scenario II assumes the Expected (mean) demand scenario, whereas Scenario IV assumes the Pessimistic (high) demand scenario Figure 5-1 illustrates the convergence of gas supply and demand for Scenarios II and IV.

As shown in Table 5-1, the estimated remaining reserves for Scenario II total 1,450 bcf at the end of year 2009 For Scenario IV, which reflects the unfavorable supply scenario and represents the worst plausible scenario, estimated remaining reserves total 1,248 bcf in the year 2009 Thus, under the unfavorable supply and demand scenario for Scenario IV, considerable reserves would still remain following the 5-year period of the requested export authorization extension

The results of this analysis assuming the worst plausible combination of supply and demand scenario are conservative Ordinarily, the supply of gas would increase in response to increasing oil prices which is the underlying premise of the Pessimistic (high demand) case Therefore, the combination of a low supply and high demand (both Pessimistic cases) is even more pessimistic, hence more conservative, than the individual supply and demand components considered above The fact that even the extremely conservative assumptions embodied in the Pessimistic scenario still indicate remaining natural gas reserves constitutes compelling evidence that LNG export will not result in local scarcity

6.0 ALTERNATIVE OUTCOMES IMPACT ANALYSIS

The DOE decision regarding the Phillips/Marathon LNG export authorization could result in three outcomes The first potential outcome preserves the status quo pursuant to which LNG from the Kenai plant continues to be exported to Japan The second consists of continued LNG production, however, the LNG would be exported to the lower 48 instead of to Japan The third outcome would involve neither LNG production nor export to either of the two destinations under a situation involving both plant closure and shut-in of associated gas feedstock production

Sections 2 0 through 5 0 of this report have examined natural gas supply and demand from an Alaska perspective This section examines the impacts which might occur if the Kenai LNG facility is shut down or if the LNG were to be restricted to lower 48 markets Section 6 2 describes local and regional employment, income and revenue impacts which would result from cessation of LNG production Section 6 3 shifts to national and international perspectives to examine the strategic importance of LNG export to Japan Section 6 4 discusses the feasibility of delivering Kenai LNG to terminals in the lower 48 states

6.1 SUMMARY OF ALTERNATIVE OUTCOMES ANALYSIS

The results of the alternative outcomes impact analysis are summarized as follows

- Cessation of the LNG plant operations would result in the direct loss of 163 jobs and $8 0 million in personal income and the loss of 122 indirect jobs and $4 1 million in indirect personal income in the Kenai Peninsula Borough and elsewhere in Alaska
- Loss of revenues associated with production of natural gas feedstock used in LNG manufacture would result in the direct loss of 275 jobs and $21 4 million in personal income and the loss of 254 indirect jobs and $9 3 million in indirect personal income in the Kenai Peninsula Borough (KPB) and elsewhere in Alaska

Thus, cessation of LNG operations would result in an estimated loss of $42 8 million in personal income and 814 jobs (direct and indirect)

Export of Kenai LNG to the lower 48 states is not politically or economically feasible in that transportation costs to existing lower 48 LNG import terminals are higher than to Japan In addition, due to an abundance of various sources of natural gas supply, lower 48 LNG sales prices would be lower than landed prices in Japan Additional market demand for LNG in the lower 48 does not now exist nor is it likely to materialize in the foreseeable future No west coast LNG receiving facilities currently exist, and none are anticipated

Japan has made attempts to reduce its dependence on oil through energy policies aimed at energy diversification both by type of energy source and by geographic distribution Discontinued export of Kenai LNG to Japan would hamper these efforts as well as result in a negative effect on the U S /Japan balance of trade Discontinuing LNG exports would also adversely affect Japan's efforts to reduce its strategic vulnerability,

6.2 LOCAL/REGIONAL EFFECTS OF LNG PRODUCTION

Southcentral Alaska's population of 610,000 resides in 214,00 households Exactly half of the population (305,000) is employed, earning $14 4 billion in 1994 (ISER, 1995, page C-1) The average household income in 1994 was over $67,000, which is well above the national average

The Kenai Peninsula Borough (KPB), within which the Phillips-Marathon LNG facility is located, has an estimated 1993 population of 44,000 (ISER, 1995) dispersed throughout a land area of 25,600 square miles (Kenai Peninsula Borough, 1987) Thus KPB houses about 7 3 percent of the Southcentral region's population, and a like percentage of households Most of the population is concentrated in the Central Peninsula around the twin cities of Kenai and Soldotna where over 60 percent of the population resides Other population centers are Homer to the south and Seward to the southeast

6.2.1 Regional Economic Base

Petroleum, commercial fishing and tourism dominate the economy of the KPB region Petroleum production began in the Cook Inlet region in 1959, and since that time, over 1 2 billion barrels of oil have been produced (ADNR, 1996, page 22) Oil production peaked in 1970, and with annual production currently at less than 15 percent of the peak year, the fields are well into their decline ADNR projects oil production only through 2006, " because regional production depends on economic factors which cannot be reasonably estimated beyond then" (ADNR, 1996, page 5) In contrast, gas production continues to expand slowly, controlled by local market demand In 1994, petroleum production[13] directly employed about 5,600 in Southcentral Alaska, of which 1,132 were in the KPB (Alaska Department of Labor 1994)

[13]Includes a small component of mining employment as well

The Phillips-Marathon LNG facility is located on the shores of Cook Inlet north of the City of Kenai The facility is one of three petroleum processing installations in a complex which includes the Tesoro refinery and the Union Chemical ammonia-urea plant Together these plants form the petroleum processing component of the economic base of the economy and directly employ about 300

A second basic industry of the area is commercial fishing, which consists of fish harvesting and processing Both activities are highly seasonal, and fluctuate dramatically from year to year and over longer cycles with the size of the salmon, bottomfish and shellfish harvests Statistics on the number of workers engaged in fish harvesting are unavailable because most fishermen are independent proprietors, but data on fish processing illustrate the cyclical nature of the industry In 1994, average annual fish processing employment was about 1,000 Employment is concentrated in the summer months with July employment ten times the winter employment levels (Alaska Department of Labor, 1995)

Because of the region's many parks, excellent fishing and spectacular scenery, tourism is a significant basic industry This industry has grown in response to growth in the nearby population center of Anchorage where the majority of tourist visitors to the Peninsula originate A significant portion of the jobs in the trade, service, and transportation sectors of the economy can be attributed to tourism The fact that July traffic counts along the major highways generally exceed the annual average by 100 percent while January traffic levels are about 50 percent of the annual average indicates the highly seasonal nature of this industry (Kenai Peninsula Borough, 1987)

6.2.2 Regional Employment

In 1994, non-agricultural wage and salary employment in the Kenai Peninsula Borough was 15,700 State and local government employment represents the largest component with a total of 3,654 jobs The government sector, which has always been significant to the economy, has grown in size in recent years Government employment, however, is subject to fluctuations based upon the volatility of state petroleum revenues, which are the source of the majority of state and local revenues The construction industry, largely dependent upon government spending and capital expenditures of the petroleum industry, is also important to the local economy, having accounted for about 10 percent of the jobs in recent years This industry is also seasonal (ISER, 1995)

The economy can thus be characterized as small, with a few basic sectors depending largely on natural resource production and processing The economic base tends to be cyclical, not only over seasons but also from year to year, as commodity prices and resource stocks fluctuate A significant number of people living on the Peninsula commute to petroleum-related jobs on the North Slope, and a significant number of jobs in the private sector are dependent upon state and local government grants funded from petroleum revenues Thus, the dependence of the economic base on a few resources is greater than the employment numbers alone would suggest

Economic growth was particularly rapid in the early 1980s because of high oil prices and growing state and local government spending in the region In late 1985 a statewide recession began, lasting until 1988 This recession, caused in part by sharply lower oil prices, resulted in significant reductions in the number of jobs and population in the Kenai Peninsula Borough Reductions were most dramatic in the government and construction sectors This effect is also evident in other parts of the state The economic recovery was fueled by the Valdez oil spill cleanup efforts in 1989 and the escalation of oil prices as a result of the Iraqi invasion of Kuwait in 1990 While this boost was short-lived, it sparked business confidence in Alaska and the Peninsula In 1992 the economy again began contracting, led by the collapse of salmon prices, and a general round of cost-cutting lay-offs The year 1993 was expansive, led by increases in the construction and retail sectors, despite reduced oil prices and closures of major pulp and mining plants These trends continued into 1994, with continued down-sizing in the petroleum sector and the military. Reduction in oil revenues resulted in a government revenue shortfall in 1994 Very slow growth characterized economic performance in 1995

6.2.3 Role of LNG Facility in Local Economy

Because of its constant rate of production, the Phillips/Marathon LNG manufacturing facility provides an important source of stability to the economy, helping to offset both seasonal and cyclical fluctuations in other basic activities The LNG plant currently (1994) provides full-time employment for 39 Alaskans Gas production associated with LNG feedstock requires 37 full-time employees An additional 3 full-time personnel are associated with transportation-related matters Thus the LNG export creates 79 full-time jobs in Kenai at a total annual wage of $5 4 million, for an average annual wage of $69,000 Although accounting for only 0 5 percent of the non-agricultural wage and salary employment in the KPB, LNG export-related wages directly account for 1 2 percent of the total earnings in the Borough

The total income and employment added to the economy by the plant includes a number of other direct activities of the facility as well as the multiplier effect from local purchases by employees Other direct effects on the economy are associated with the local purchase of commodities and services by the plant in the normal course of operations and maintenance, the periodic purchases for repair, replacement and upgrading of facilities including construction employment, the ships which dock at the facility to transport the LNG, and local taxes paid by the plant

The local purchases of the plant itself are estimated to average $7 5 million annually (Porter, 1996) Local purchases associated with lease operations add another $4 4 million per year On average, a ship docks at the plant every nine days and spends two days loading During this time, the ship purchases provisions, and its 34 sailors make local purchases which are estimated to total $0 15 million annually (Porter, 1996) The amount spent on ship provisions is estimated to be $1 0 million annually Thus a total of $13 million in local purchases is associated with LNG export

Taxes and royalties add significantly to state and local government revenues The plant pays approximately $1 51 million annually in property taxes to KPB This is a significant proportion of total Borough tax revenues which currently total about $37 6 million in 1995 (DCRA, 1996) Production tax and royalty payments to Alaska for natural gas feedstocks totaled $17 6 million in 1995 (Stephenson, 1996) State income taxes for plant and lease operations totaled $1 7 million in 1995 (Royer, 1996) Thus the total state and local taxes and royalties associated with LNG export totaled $20 8 million in 1995 Federal income taxes associated with LNG export totaled $23 million in 1995 (Swanson, 1996)

The direct economic impacts of tax revenues, local purchases, local income and employment have indirect and induced effects as they reverberate through the economy The leverage which direct economic factors have can be calculated through the use of "multipliers" which show how the local economy responds to employment, income and revenues from these "basic" or export activities Table 6-1 summarizes the direct and indirect and induced effects With the inclusion of these indirect and induced effects, the annual contribution of the LNG plant to the local economy is estimated to be $12 1 million in personal income, with 285 full-time equivalent jobs The proportion of jobs directly attributable to the plant is low because of the high average wage paid at the plant relative to all jobs in the economy The high wages support a relatively large number of lower paying support jobs

Natural gas production for LNG feedstock also represents a significant economic impact on both local and state economies Total employment in the region attributable to gas production is estimated to be 529 jobs (direct and indirect) which produce $30 7 million in personal income

Table 6-1
Economic Impacts of LNG Export Operations

	Alaska Employment (Full-Time)			Alaska Personal Income (Million 1995$)		
	Direct	Multiplier	Total	Direct	Multiplier	Total
LNG Manufacture						
Payroll	42	2 26[a]	95	$2 9	1 69	$4 9
Local Purchases	86[c]	1 4[b]	120	$2 6[d]	1 4[b]	$3 6
Local Taxes	17[c,f]	1 98[a]	33	$1 2[f]	1 4[b]	$1 7
State Taxes	19[c,f]	1 98[a]	37	$1 4[f]	1 4[b]	$1 9
Subtotal - Plant	163		285	$8 0		$12 1
LNG Gas Feedstock						
Payroll	37	2 26[a]	84	$2 5	1 69	$4 3
Local Purchases	44[e]	1 4[b]	62	$1 3[d]	1 4[b]	$1 8
Royalties + Prod Tax	194[c]	1 98[a]	384	$17 6	1 4[b]	$24 6
Subtotal - Feedstock	275		529	$21 4		$30 7
Total	438		814	$29 5		$42 8

Notes:

a Based on Northern Economics, 1995
b Assume conservative multiplier
c 11 02 government employees per $1 million revenues (Northern Economics, 1995)
d $13 million at 0 3 local value added
e Based on one employee per $100,000 in gross sales
f Based on 80 percent property tax used for government wages

If LNG manufacture were halted, economic losses to the State of Alaska would be considerable The combined impact of feedstock gas production and LNG manufacture accounts for 814 jobs and $42 8 million in personal income

6.3 STRATEGIC AND ECONOMIC SIGNIFICANCE OF LNG EXPORT TO JAPAN

Thus far this report has focused on the importance of Cook Inlet gas from the Alaska perspective This section shifts the focus from the local to national and international perspectives Japan is an important U S trading partner and political ally Although Kenai LNG provides Japan with a minor part of its total energy supply, Kenai LNG is important in maintaining diversity of supply and price stability The balance of trade benefits from continued LNG imports are likewise small, but strategically important The U S has maintained a substantially negative balance of trade with Japan in recent years Although no single export project can be expected to reverse the trade balance between the two nations, LNG export is significant in both its absolute and its symbolic significance in correcting the trade imbalance

6.4 IMPACT OF KENAI LNG DELIVERY TO THE LOWER 48 STATES

If Kenai LNG is not exported to Japan, it could conceivably be used domestically However, the economic conditions which would render LNG delivery to the lower 48 economically viable are quite improbable

The lower 48 states have three operational LNG terminals located on the eastern seaboard and one on the coast of the Gulf of Mexico, these are in Everett, Massachusetts, Cove Point, Maryland, Elba Island, Georgia and Lake Charles, Louisiana Only two of these facilities are active LNG receiving terminals Distrigas, a subsidiary of the Cabot Corporation, operates the Everett, Massachusetts terminal It has an operational capability of regasifying about 100 million feet per day (mmcfd) Trunkline LNG Company operates the Lake Charles, Louisiana terminal The facility currently receives occasional LNG shipments from Algeria on a very limited basis

Columbia LNG Corporation operates the Cove Point, Maryland terminal It has the capability of regasifying 1,000 mcfd This facility has been modified with the addition of a small liquefaction (LNG) unit and is currently being used to provide gas peak shaving volumes in periods of high demand It would require at least 12-18 months for the facilities to become fully operational and receive LNG cargoes by ship In any case shipment from Kenai would not be economic for reasons discussed in Section 6 4 1

Southern Energy Company operates the Elba Island, Georgia terminal This facility last received a shipment of LNG in April 1980 Southern continues to maintain the facilities in anticipation of future deliveries (Wingenroth, July 1986)

6.4.1 Economics of LNG Delivery to the Lower 48

The cost to transport LNG to the lower 48 terminals from Kenai would be higher than to Japan for two reasons (1) distances are greater, and (2) potentially smaller ships would be needed

The distance from Kenai to the lower 48 terminals via the Panama Canal is between 4,700 and 5,100 nautical miles In comparison, the distance between Kenai and Japan is 3,300 nautical miles The use of 125,000 cubic meter LNG tankers would require a shipping route many thousands of miles longer than the shorter route through the Panama Canal Although LNG has been shipped from Kenai to the Everett facility in the past, smaller LNG tankers made the deliveries so that passage through the Panama Canal could be accomplished (Auchy, November 1987) Using the shorter Panama Canal route results in increased transportation costs because the smaller LNG tankers would need to make additional trips to deliver the same amount of LNG

In 1995, the operators of the Kenai facilities received $3 34 per mmbtu equivalent for their LNG delivered to Japan LNG delivered to the lower 48 terminals, however, would have to be competitively priced to compete with other sources of gas supply or other alternative fuels available in those regions, resulting in a lower LNG sales price This is approximately twice the 1995 wholesale price of natural gas in most coastal U S markets The greater distance to the lower 48 facilities and potential use of smaller vessels would make such a transaction even less attractive to Kenai operators Kenai netback prices for LNG would not cover the cost of LNG manufacture Thus, barring unlikely and unforeseen increases in lower 48 natural gas prices, Kenai LNG export to the lower 48 is economically infeasible

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APPENDIX D

GEOQUEST "PROVEN RESERVES ASSESSMENT
COOK INLET ALASKA"

PROVEN RESERVE ASSESSMENT
COOK INLET, ALASKA
EFFECTIVE JANUARY 1, 1996

Prepared for

Phillips Alaska Natural Gas Corporation
and
Marathon Oil Company

Prepared by

GeoQuest
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March 1996

Schlumberger
GeoQuest

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COOK INLET, ALASKA
EFFECTIVE JANUARY 1, 1996

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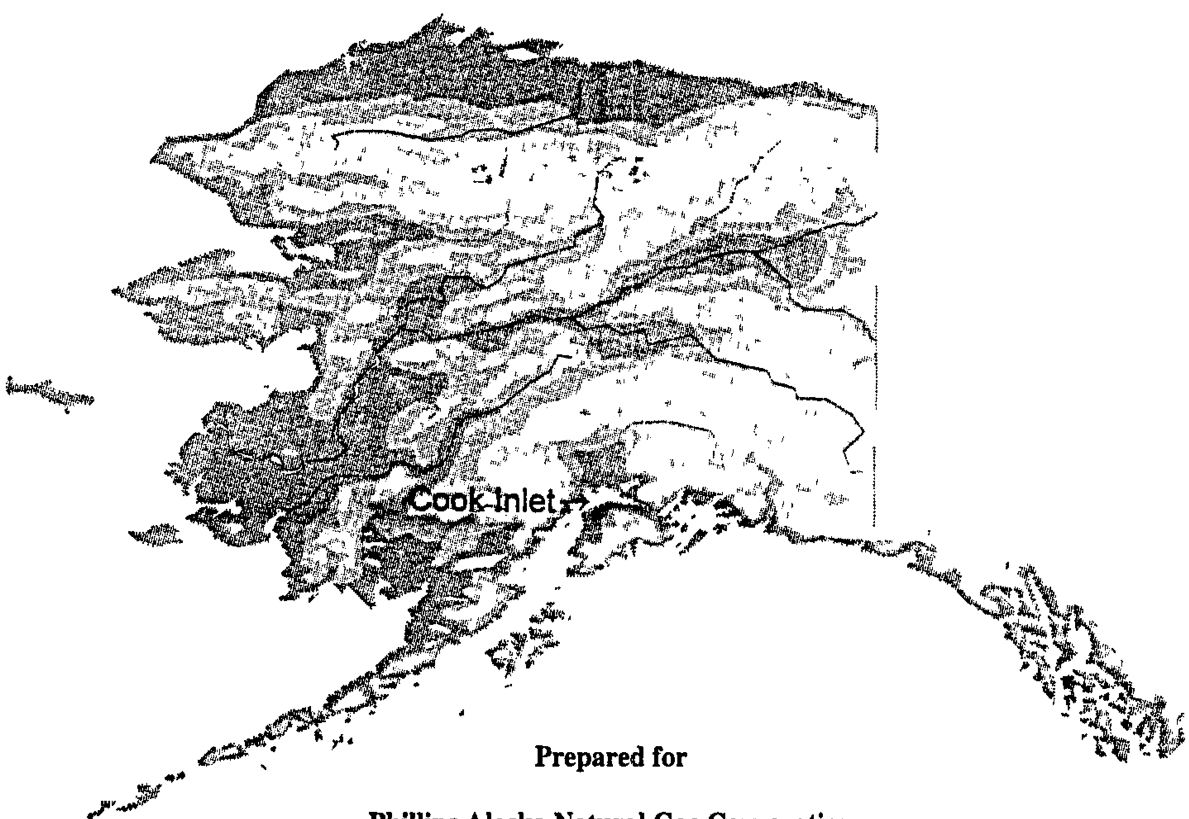

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1. Introduction

Objectives

The purpose of this study is to provide an assessment of the Cook Inlet area's remaining proven gas reserves as of January 1, 1996 This includes both proved developed and proved undeveloped reserves, which are defined in Table 1 This assessment will be used to support an application to the U S Department of Energy seeking an extension of the Kenai LNG export authorization

This study focused on 10 of the largest producing fields within the Cook Inlet area as shown in Figure 1 Each field was evaluated using public domain information in order to facilitate reserve comparisons with various regulatory agencies, and to enable other analysts to use the data without violating proprietary rights The main data sources included the Alaska Oil and Gas Conservation Commission (AOGCC), the Alaska Department of Natural Resources, and Dwight's Energydata, Inc If data were missing in the state records, either Phillips or Marathon supplied them from their own files As these data had already been made public, they are not considered proprietary, and are included in the main body of the report

The remaining gas attributable to smaller fields in the Cook Inlet area was not analyzed as it is not suspected to contribute significant volumes to the bulk of the reserve base Remaining reserves in these fields were instead assigned per the AOGCC's January 1996 estimates The sum of this gas represents 4 6% of total remaining gas in Cook Inlet and thus does not significantly impact the overall conclusions

2. Summary

Total Proved Gas Reserves — 3,787.1 Bcf

Summarized below are the total remaining proved developed and proved undeveloped gas reserves in the Cook Inlet area, as of January 1, 1996

COOK INLET
Proved Developed, January 1996

	Remaining Gas, BCF	Method of Reserve Determination
Beaver Creek	20.0	Volumetrics
Beluga River	625.0	Material Balance
Cannery Loop	34.5	Production Performance
*Granite Point	29.0	—
Ivan River	84.2	Production Performance
Kenai	144.5	Production Performance
McArthur	591.0	Material Balance
*Middle Ground Shoal	14.0	—
NCIU	1,049.0	Material Balance
*North Trading Bay	20.0	—
*Sterling	23.0	—
Swanson Gas	22.0	Production Performance
Swanson Hemlock	240.0	Material Balance
*Trading Bay	28.0	—
*West Fork	3.0	—
*West McArthur River	1.0	—
Total	**2,928.2**	

* Denotes AOGCC-assigned gas reserves

COOK INLET
Proved Undeveloped, January 1996

	Remaining Gas, BCF	Method of Reserve Determination
Beaver Creek	133 4	Volumetrics
Beluga River	165 0	Material Balance
*Birch Hill	11 0	—
Cannery Loop	6 7	Analogy
*Falls Creek	13 0	—
Kenai	233 7	Material Balance/Volumetrics
McArthur	64 7	Volumetrics and Analogy
*Nicolai Creek	2 0	—
NCIU	115 0	Material Balance
*North Fork	12 0	—
Swanson Gas	50 0	Volumetrics
Sunfish	32 4	Volumetrics
*West Foreland	20 0	—
Total	**858.9**	

* Denotes AOGCC-assigned gas reserves

3. Conclusions

1. Total proven gas reserves in Cook Inlet area are 3 787 1 Bcf as of January 1 1996

2. Installation of compression in currently developed fields will alone supply incremental gas reserves of 430 3 Bcf

3. Proved undeveloped, behind-pipe reserves total 428 6 Bcf

4. There is considerable potential in untapped sands located behind pipe These sands may contribute a significant volume to the current reserve base

5. The reserves contained in this report are based upon a technical analysis of available data using accepted engineering principles, and were calculated with a high degree of certainty

6. This text represents a summary of work performed Please refer to the detailed report titled "Proven Reserve Assessment" for the details on analysis of reserve assignment

4. Methodology

Reserve analysis in this study utilized three different techniques of evaluation (1) volumetrics and analogy, (2) material balance calculations, and (3) production performance extrapolation Each of these methods is discussed in detail below

4.1. Volumetrics and Analogy

One of the first tasks to perform for a volumetric analysis is a petrophysical review to determine the reservoir parameters that form the basis for any volumetric calculation This was done by analyzing several key wells from the field being evaluated

Log analysis, as relevant to determining hydrocarbon accumulations, is a technique of reading the output of open hole logs and converting that information into useable and realistic in situ values of certain reservoir parameters The most commonly run open hole logging tools are resistivity and porosity devices From these logs, values of water saturation and formation porosity may be obtained

Porosity is the fraction or percentage of space available in the reservoir rock for the storage of fluid It is defined as the ratio of the void space in the rock to the bulk volume, or

$$\phi = \frac{V_p}{V_b} \times 100 = \frac{V_b - V_g}{V_b} \times 100, \%$$

where ϕ = porosity, %
V_p = pore volume
V_b = bulk volume
V_g = grain volume

In this study, the porosities were derived from the density, neutron, or sonic log, or a combination of these logs

Water Saturation. Water saturation is the fraction or percentage of the pore volume of the reservoir rock that is filled with water It is generally assumed, unless otherwise known, that the pore volume not filled with water is filled with hydrocarbons Determining water and hydrocarbon saturation is one of the basic objectives of well logging

All water saturation determinations from resistivity logs in clean (non-shaly) formations with homogeneous intergranular porosity are based on Archie's water saturation equation, or variations thereof The equation is

$$S_w^n = \frac{FR_w}{R_t}$$

where R_w = the formation resistivity, ohm-m
R_t = the true formation resistivity, ohm-m
F = the formation resistivity factor, dimensionless
n = saturation exponent (generally 2)

F is usually obtained from the measured porosity of the formation through the relationship

$$F = \frac{a}{\phi^m}$$

where m = 2
a = 1

The accuracy of the Archie equation depends largely on the accuracy of the input parameters R_w, F, and R_t The deep resistivity measurement (induction or laterolog) must be corrected for borehole, bed thickness, and invasion The most appropriate porosity log (sonic, neutron, density, or other) or combination of porosity and lithology measurements should be used to obtain porosity, and the proper porosity-to-formation factor relationship must be used Finally, the R_w value should be verified in as many ways as possible calculation from the SP curve, water catalog, calculation from nearby water-bearing formation, and/or water sample measurements

Reliable reserve figures are often needed early in the life of a well or field when only a minimal amount of information is available This is when volumetric calculations are most often made and when they are most often subject to inaccuracies in the available data

When sufficient subsurface control is available, contour maps of geologic structure and/or net formation thickness may be drawn and used to determine the bulk productive volume of the reservoir. A structural contour map is used in preparing the isopach maps where there is an oil-water, gas-water, or gas-oil contact such as that shown in Figure 2 The contact line is the zero isopach line Reservoir volume is obtained by planimetering the areas between the isopach lines of the reservoir or of the individual units being considered The main problems in preparing a map of this type are the proper interpretation of the net sand thickness and outlining the productive area of the field as defined by the fluid contacts, faults, permeability barriers, or other limits

If the size of a reservoir, its lithologic characteristics, and the properties of the reservoir fluids are known, the amount of original-gas-in-place (OGIP) may be calculated with the following formula

$$G = 43560 \, x \, \mathrm{A} \, x \, \mathrm{h} \, x \, \phi \, x \left(1 - \mathrm{S_w}\right) x \, \mathrm{B_g}$$

where G = Gas-in-place, scf
A = Area, acres
h = net pay, feet
ϕ = Porosity, fraction
S_w = Water saturation, fraction
B_g = Gas formation volume factor, scf/rcf

Where volumetric calculations were used in this study, GeoQuest relied on data supplied by the AOGCC In computing the reservoir volume, the gas-water contact and faults were utilized in defining the reservoir limits Net pay values were derived from interpretation of the petrophysical data or from AOGCC values Maps were then planimetered, and with the results from the log analysis, a calculation of OGIP was made A 90% recovery factor was applied to OGIP to determine recoverable gas This is the typical recovery factor observed in Cook Inlet sands and correlates well with historical performance.

Volumetric analysis has inherent uncertainties The possibility of sand discontinuity, fluid flow barriers, or other parameters that may affect the volume of hydrocarbons calculated, should be considered In this study, a risk factor of 33% was applied to the calculated volume of estimated ultimate undeveloped reserves to account for these uncertainties In other words, the recoverable undeveloped reserves were reduced by one-third

Analogy Analogy can be defined as the inference that if two or more things agree with one another in some respects, they will probably agree in others In the petroleum industry, this idea is often used to compare an oil and/or gas field to another field with similar characteristics These similarities may include depositional environment, rock lithology, porosity, permeability, fluid properties, depth of productive interval, and drive mechanism The more similarities between fields, the more reliable the analogy

For this project, producing sands were evaluated for the purpose of determining reserve potential of analogous sands located behind pipe, but not yet producing

4.2. Material Balance Calculation

Volumetric Gas Reservoirs The gas reservoirs in Cook Inlet behave as volumetric or closed reservoirs and do not have any sizable attached aquifers The material balance equation applicable to these reservoirs is

$$GB_{gi} = (G - G_p)B_g$$

which may be modified by substituting the expression for gas formation volume factor, B_g

$$B_g = 0.00504\frac{zT}{p}, \; (RB/scf)$$

where z = Gas deviation factor
T = Reservoir temperature, °R
p = Reservoir pressure, psia

Then,

$$G\left(0.00504\frac{z_i T_i}{P_i}\right) = (G - G_p)\left(0.00504\frac{zT}{P}\right)$$

and since reservoir temperature is constant, $T_i = T$, so

$$G\frac{z_i}{p_i} = (G - G_p)\frac{z}{p}$$

Rearranging,

$$G\frac{p}{z} = (G - G_p)\frac{p_i}{z_i}$$

or,

$$\frac{p}{z} = \frac{p_i}{z_i} - \frac{G_p}{G}\frac{p_i}{z_i}$$

which is the equation of a straight-line relationship between G_p and p/z For volumetric gas reservoirs, when observed values of p/z are plotted versus G_p, a straight line results and may be extrapolated to p/z = 0, at which point $G = G_p$ If abandonment is expected to occur at a particular pressure, P_{abd}, then the straight line may be extended to $(p/z)_{abd}$, at which point G_p equals the estimated ultimate recovery

Figure 3 illustrates the estimation of initial gas-in-place and reserves with the familiar p/z plot Under most conditions, the higher pressure data points are given greater consideration in the extrapolation of the line This is because there are many reasons for a pressure test not to build-up properly, but there are few reasons why a pressure would read too high Abandonment pressures were supplied by Marathon and/or Phillips and account for current field operating conditions and expenses The pressures are based upon current pipeline configurations and pressures Proved undeveloped gas reserves were assigned where additional compression is planned The additional compression serves to lower the abandonment pressure

4.3. Production Performance

Decline curve analysis is a forecasting technique where data is either extrapolated to forecast reserves, or is matched to an appropriate type curve to forecast reserves

Exponential Decline

A decline rate that appears as a straight line on a semi-logarithmic graph of production rate vs time is referred to as an exponential decline curve The characteristic of exponential decline is that the rate of decline is proportional to the rate of production, or

$$dq/dt = -aq$$

where dq/dt = rate of decline, Mcf/mo/mo
q = rate of production, Mcf/mo
a = decline factor, 1/mo

The minus sign denotes that production is declining with time

If the variables are separated and integrated, the rate at any time can be calculated from the initial rate if the decline factor is known

$$\int_{q_i}^{q} \frac{dq}{q} = -a\int_{0}^{t} dt$$

$$\ln q - \ln q_i = -at, \text{ or}$$

$$q = q_i e^{-at}$$

where q = producing rate at time t, Mcf/mo
q_i = producing rate at time zero, Mcf/mo
t = producing time, mo

The above equation can be used to calculate the producing rate at any time based on the rate at any earlier time In this case, the rate at the earlier time is q_i and t is the time interval between the earlier time and the time at which q is to be calculated

The cumulative gas produced from a well at any time can be determined by integrating the previous equation with respect to time

$$G_p = \int_{0}^{t} q_i e^{-at} dt$$

$$G_p = \frac{q_i - q_i e^{-at}}{a} = \frac{q_i - q}{a}$$

This states that the cumulative production for a well equals the difference between the initial rate and the rate for the time at which G_p is calculated, divided by the decline factor. Producing rates must be in a time unit consistent with that used for the decline factor, a The total gas produced during any time period can be found by assigning the rate at the beginning of the period to q_i and rate at the end of the period to q

Plotting production rate vs cumulative production and employing the method described above will achieve the same results as the rate-time plot.

Hyperbolic Decline For most wells, the decline rate continuously decreases as the production rate declines, which causes the semi-log plot to bend upward from a straight line This type of decline is called hyperbolic The equation expressing the change in rate for hyperbolic decline is

$$dq / dt = -a_i \left(\frac{q}{q_i} \right)^n q$$

where a_i = the decline factor at the time correspondent to the rate q_i, 1/mo

Although hyperbolic declines are common, they are not employed in the evaluation of any of the fields in this report

Production decline curves can be used to estimate reserves for a reservoir once an extrapolatable decline trend is established Only the portions of decline curves that correspond to capacity operation can be analyzed reliably Because of this limitation, reservoirs that have been subjected to production proration are not amenable to decline curve analysis In the Cook Inlet area, many fields experience seasonal fluctuations in demand, which causes erratic production behavior and precludes the use of this analysis technique Furthermore, reservoir studies based on material balance and fluid displacement principles usually give more reliable results than those based on decline curve analysis In such studies, decline curve analysis may be used as a check on reserve figures determined by other means

Old fields, or fields with insufficient data on reservoir rock and fluid properties, may not be subject to a detailed reservoir study In such cases, decline curve analysis may be the only means of estimating future producing rates and reserves

Decline curve analysis was performed to determine the recoverable reserves for applicable fields Because reserve and economic analysis requires using an appropriate abandonment rate, the recoverable reserves were calculated with an abandonment rate based on the economic limit These rates were supplied by Marathon or Phillips and take into account the applicable operating conditions and variable expenses associated with each field In most fields, an economic limit of 500 Mcf/d per well is utilized The Kenai Field, which has an economic field limit of 10 MMcf/d, is an exception to this due to its larger size

All recoverable reserves are defined as economic reserves, in other words, they are calculated to the point at which the field's revenue no longer exceeds its' operating costs All reserve values are expressed as gross values or 100% ownership Figure 4 presents an example of the use of decline analysis

5. Field Summary

The following discussions on each field present the results of the reserve analysis performed on proved developed and undeveloped gas Proved developed reserves are classified as those reserves to be recovered from currently producing wells Proved undeveloped reserves are known with certainty to be recoverable, but require a significant capital expenditure in order to obtain them All reserve estimates in this report are effective as of January 1, 1996

The productive horizons in the Cook Inlet area range in depth from 3000 to 10,500 feet The main sands consist of the shallow Sterling formation found at 3000 to 4000 feet, down through the Beluga and Tyonek formations, to the deeper (10,500') Hemlock sand All gas volumes estimated in this report are to be produced from these horizons Full details on each field may be found in the main report

5.1. Beaver Creek

Proved Developed

Remaining proved developed gas reserves in the Beaver Creek Field were determined through volumetric calculations No other methods were utilized as pressure data was sparse and new well completions in the field make performance extrapolation difficult In Beaver Creek, the Beluga and Sterling sands are the main gas-producing horizons Reservoir parameters for these sands were obtained from the AOGCC, and drainage areas were derived from the available structure maps of both the Beluga and Sterling formations

Gas-in-place for the Sterling and Beluga formations are 204 2 Bcf and 109 6 Bcf, respectively Utilizing a 90% recovery factor and subtracting the cumulative production through December 1995, remaining gas in the Sterling is 59 8 Bcf and in the Beluga is 93 6 Bcf. Only 20 0 Bcf of this gas is estimated to be produced from current wells

Proved Undeveloped

Proved undeveloped gas reserves of 133 4 Bcf were assigned to the Beaver Creek Field, and will have to be recovered through well recompletions These reserves are volumetric estimates derived from currently producing wells, but require well recompletions in order to be recovered There are additional behind-pipe sands that appear to be gas-bearing and represent an upside potential

5.2. Beluga River

Proved Developed

There was adequate pressure data in both the Sterling and Beluga zones to use material balance calculations in estimating reserves The p/z plots indicate a total ultimate recovery of 1115 0 Bcf at an abandonment pressure of 400 psia Cumulative production through 1995 is approximately 490 0 Bcf, leaving 625 0 Bcf of proved developed gas to be recovered as of January 1, 1996 Volumetrics were not used in this field, because identifying the location of the gas-water contact, and determining net pay in the Beluga, are difficult

Proved Undeveloped

Material balance was also used in the determination of proved undeveloped reserves Incremental gas reserves of 165 0 Bcf will be recovered when compression reduces the abandonment pressure to approximately 100 psia which is currently underway.

5.3. Cannery Loop

Proved Developed

Decline curve analysis was used in the estimation of remaining proved developed gas reserves for both the Beluga and the Tyonek formations An exponential decline rate of 15 0% and 11 6% per year was extrapolated from performance trends on the Beluga and Tyonek, respectively This calculates 9 8 and 24 7 Bcf of remaining gas for the Beluga and Tyonek, respectively A check on the validity of this method of evaluation was made by utilizing volumetrics Assuming a 90% recovery factor, gas-in-place for the Beluga and Tyonek was back-calculated and equals 42 2 and 82 7 Bcf, respectively Utilizing the reservoir parameters set forth by the AOGCC, a drainage area was established for each producing formation, 1637 acres for the Beluga and 3250 acres for the Tyonek Both of these values appear reasonable, are well within the norm of Cook Inlet drainage areas, and indicate that the volumetric data supports the results of the decline analysis

Proved Undeveloped

Proved undeveloped gas reserves assigned to the Cannery Loop Field are based upon compressor installation and analogy to the Kenai Field These two fields are adjacent to each other and have similar reservoir and production characteristics In the Kenai Field, a 6 0% increase over original recovery attributable to compression is expected This same increase was applied to the ultimate recovery of 112 4 Bcf in Cannery Loop, to obtain an expected incremental gas reserve of 6 7 Bcf

5.4. Ivan River

Proved Developed

Extrapolation of the historical production performance was used in determining the remaining proved developed gas reserves for the Ivan River Field Decline curve analysis was used because no pressure or volumetric data was available A 13 5% exponential decline was derived and projects a remaining gas reserve of 84 2 Bcf as of January 1, 1996 There are currently four wells producing without compression from this field Rates have recently been restricted due to completion problems and the need to control sand and water production

Proved Undeveloped

There are no proved undeveloped reserves assigned to this field, however, the installation of compression would represent an upside potential

5.5. Kenai Field

Proved Developed

The Kenai Field is producing from the Sterling, Beluga, and Tyonek formations Proved developed reserves were assigned through the extrapolation of rate vs cumulative gas performance curves, and were validated with material balance. The sum of the remaining gas reserves for all formations in Kenai is 144 5 Bcf Gas-in-place of 2680 0 Bcf was derived by using pressure data available from the AOGCC for each of the formations, constructing p/z plots, and then taking the sum of each formation's gas-in-place

Proved Undeveloped

Proved undeveloped reserves were assigned in two areas (1) installation of compression provides additional gas reserves of 143 6 Bcf, and (2) behind-pipe sands identified in the Beluga and Tyonek were assigned reserves of 39 0 and 51.1 Bcf, respectively Compression will reduce the current suction pressure of 150 psia to 50 psia The behind-pipe reserves were determined on the basis of volumetrics and analogy

5.6. McArthur River Field

Proved Developed

Material balance calculations were used in the determination of proved developed gas reserves for McArthur River Pressure data was available from the AOGCC on both individual producing sands and groups of producing sands Utilizing an abandonment suction pressure of 300 psi, the individual p/z plots indicate a total of 591.0 Bcf of remaining gas as of January 1, 1996

Proved Undeveloped

Proved undeveloped reserves were assigned to behind-pipe sands on the basis of performance of analogous production and volumetric parameters Undeveloped gas reserves attributable to these sands is 64 7 Bcf

5.7. North Cook Inlet Unit (NCIU)

Proved Developed

Proved developed gas reserves of 1,049 0 Bcf are assigned to NCIU on the basis of material balance calculations and an abandonment suction pressure of 400 psia Yearly pressures used in constructing the p/z plots are derived from the arithmatic average of all pressures recorded for each year.

Proved Undeveloped

Proved undeveloped reserves are to be realized from the installation of additional compression to reduce abandonment pressure These incremental reserves are 115 0 Bcf of undeveloped gas remaining as of January 1, 1996

5.8. Swanson River Gas Field

Proved Developed

Proved developed gas reserves in the Sterling formation were estimated from rate vs cumulative gas performance Although pressure data was available, p/z plots indicate less gas-in-place than has already been produced The extrapolated decline rate of 5% and an abandonment rate of 1 MMcf/day results in a remaining gas reserve of 22 0 Bcf

Proved Undeveloped

Proved undeveloped reserves in Swanson River were estimated from volumetrics, analogy, and well tests The "B" sands in the Swanson River area have been tested and found to be commercial in several wells In addition, analysis of the open hole logs indicates that these sands extend across a large area Undeveloped gas reserves from the "B" sands are determined to be 50 0 Bcf

5.9. Swanson River Hemlock Gas

Proved Developed

Proved developed reserves from gas associated with the oil production from the Hemlock formation was determined from volumetric and material balance calculations The Hemlock has been producing oil under a combination of gas and water injection, and is now undergoing the blowdown phase of reservoir depletion

Oil-in-place of approximately 519 MMBbls was determined through volumetric calculations An initial dissolved gas oil ratio of 350 scf/STB gives a total original gas of 182 0 Bcf Total injected gas is 2700 0 Bcf, total produced gas is 2516 0 Bcf, and total gas remaining in the reservoir at abandonment is estimated to be 126 0 Bcf. The result is

240 0 Bcf of proved developed gas remaining to be produced during the blowdown phase of this field's production

Proved Undeveloped

No undeveloped gas reserves are assigned to the Hemlock formation

5.10. Sunfish Field

Proved Undeveloped

The Sunfish Field is an oil reservoir delineated by three wells that have been drilled and tested successfully in the Sunfish sand. The sand correlates well across an area of approximately 4 sections, and well tests indicate that a producing gas oil ratio of 900 scf/STB may be expected A production platform is in place but production from this sand has not yet began

Proved undeveloped gas reserves of 32.4 Bcf were assigned on the basis of volumetric parameters and well tests

TABLE 1

SOCIETY OF PETROLEUM EVALUATION ENGINEERS

Definitions for Oil and Gas Reserves

Reserves

Reserves are estimated volumes of crude oil, condensate, natural gas, natural gas liquids, and associated substances anticipated to be commercially recoverable from known accumulations from a given date forward under existing economic conditions, by established operating practices, and under current government regulations Reserves estimates are based on interpretation of geologic and/or engineering data available at the time of the estimate

Reserves estimates generally will be revised as reservoirs are produced, and as additional geologic and/or engineering data become available, or as economic conditions change

Reserves do not include volumes of crude oil, condensate, natural gas, or natural gas liquids being held in inventory If required for financial reporting or other special purposes, reserves may be reduced for on-site usage and/or processing losses

The ownership status of reserves may change due to the expiration of a production license or contract, and when relevant to reserve assignment such changes should be identified for each reserve classification

Reserves may be attributed to either natural reservoir energy or improved recovery methods Improved recovery includes all methods for supplementing natural reservoir energy to increase ultimate recovery from a reservoir Such methods include pressure maintenance, cycling, waterflooding, thermal methods, chemical flooding, and the use of miscible and immiscible displacement fluids

All reserves estimates involve some degree of uncertainty, depending chiefly on the amount and reliability of geologic and engineering data available at the time of the estimate and the interpretation of these data The relative degree of uncertainty may be conveyed by placing reserves in one of two classifications, either proved or unproved Unproved reserves are less certain to be recovered than proved reserves and may be subclassified as probable or possible to denote progressively increasing uncertainty

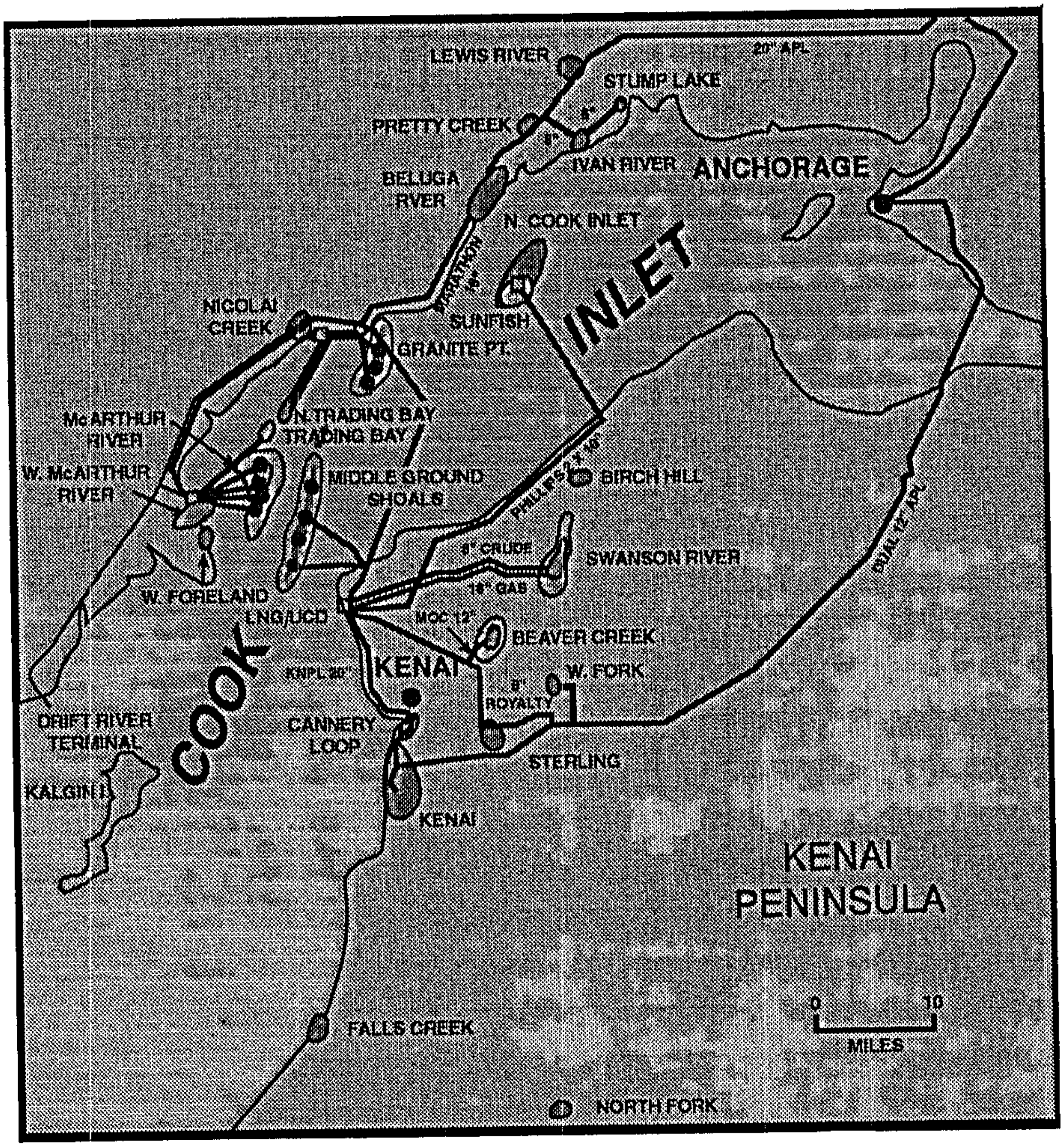
Proved Reserves

Proved reserves can be estimated with reasonable certainty to be recoverable under current economic conditions Current economic conditions include prices and costs prevailing at the time of the estimate Proved reserves may be developed or undeveloped

In general, reserves are considered proved if commercial producibility of the reservoir is supported by actual production or formation tests The term proved refers to the estimated volume of reserves and not just to the productivity of the well or reservoir In certain instances, proved reserves may be assigned on the basis of electrical and other type logs and/or core analysis that indicate subject reservoir is hydrocarbon bearing and is analogous to reservoirs in the same area that are producing, or have demonstrated the ability to produce on a formation test

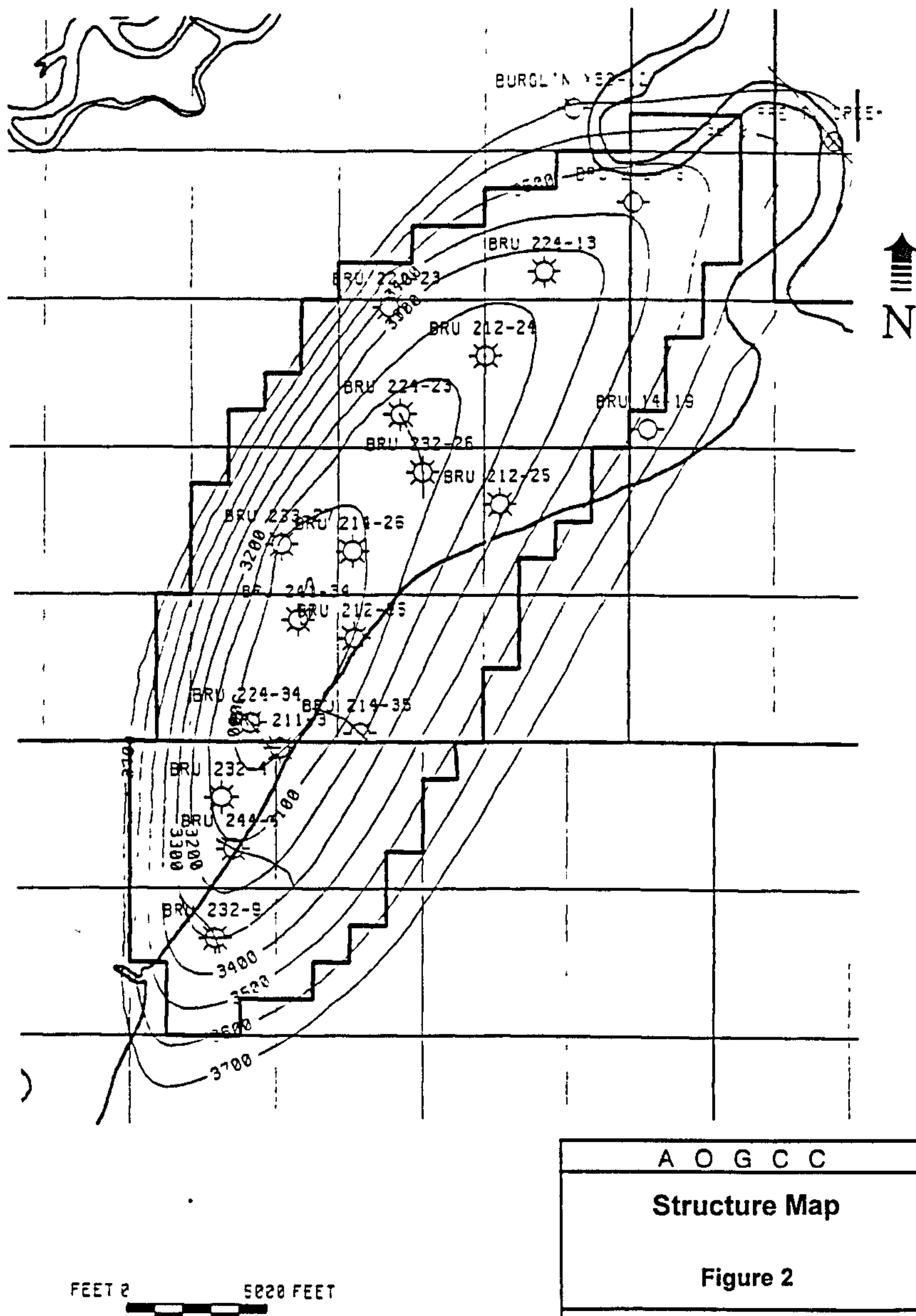
The area of a reservoir considered proved includes the area delineated by drilling and defined by fluid contacts, if any, and the undrilled areas that can be reasonably judged as commercially productive on the basis of available geologic and engineering data In the absence of data on fluid contacts, the lowest known structural occurrence of hydrocarbons controls the proved limit unless otherwise indicated by definitive engineering or performance data

Proved reserves must have facilities to process and transport those reserves to market that are operational at the time of the estimate, or there is a commitment or reasonable expectation to install such facilities in the future



Cook Inlet Gas Fields

Figure 1



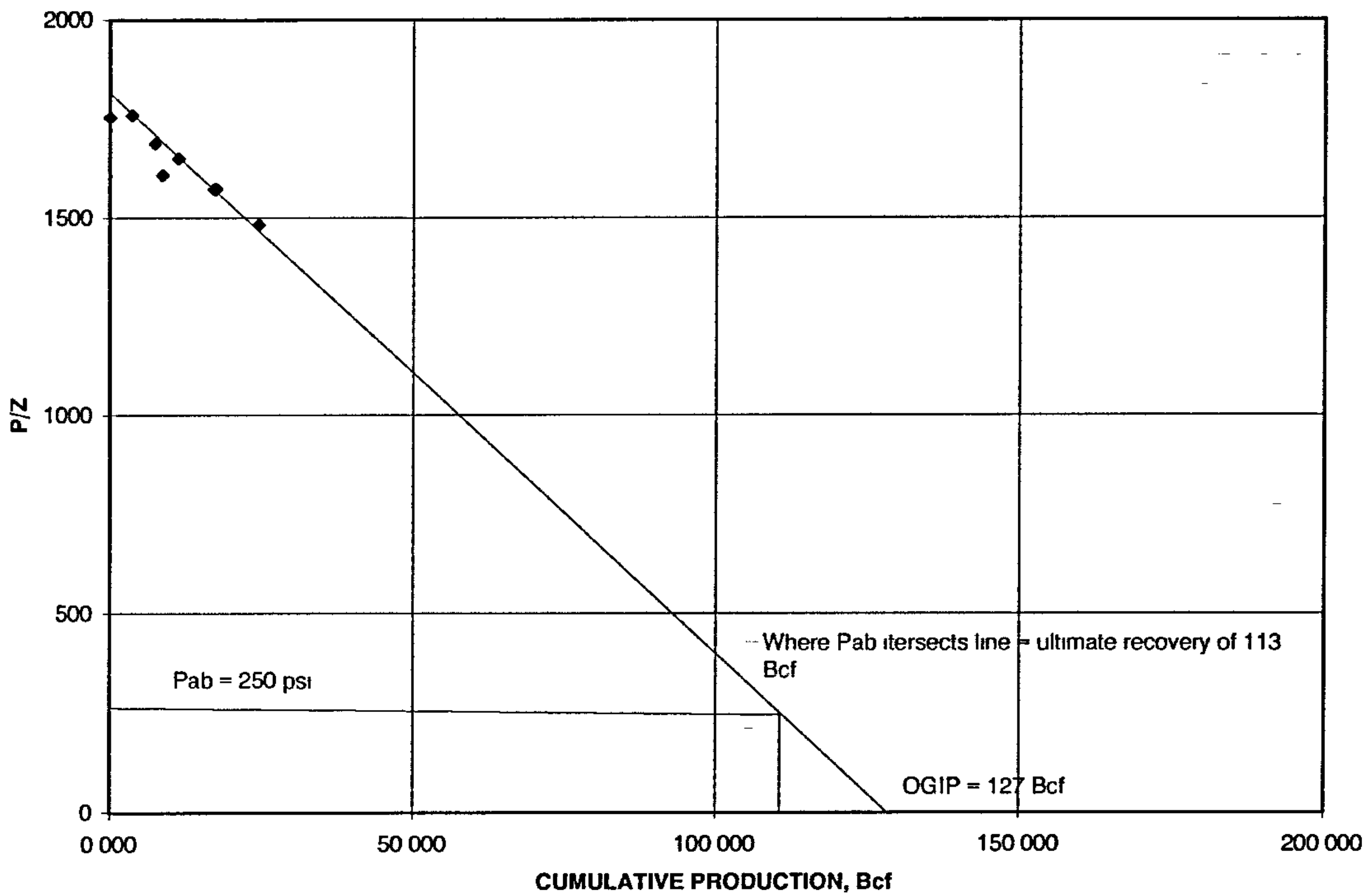
A O G C C

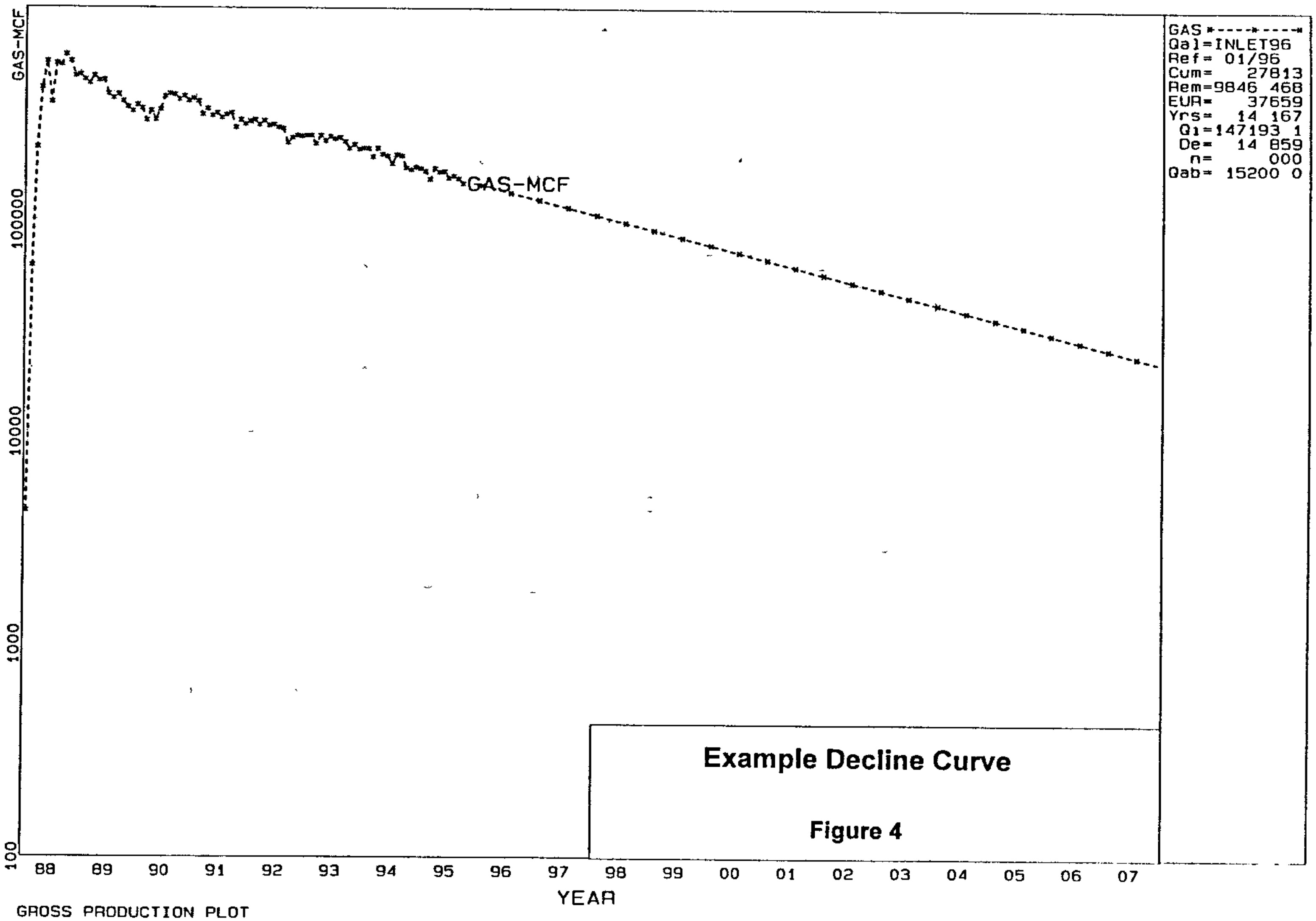
Structure Map

Figure 2

REPRODUCED WITH OPERATOR PERMISSION

Figure 3
EXAMPLE - MATERIAL BALANCE





Example Decline Curve

Figure 4

BEAVER CREEK

Beaver Creek Field

Proved Developed

The Beaver Creek Field has produced 129 0 Bcf from the Sterling and Beluga formations since 1973 There are currently three active wells producing in Beaver Creek Remaining proved developed gas reserves in the Beaver Creek Field were determined through volumetric calculations No other methods were utilized as pressure data was sparse and new well completions in the field make performance extrapolation difficult In Beaver Creek, the Beluga and Sterling sands are the main gas producing horizons at depths of approximately 8100 and 5000 feet subsea, respectively Reservoir parameters for these sands were obtained from the AOGCC, and are presented on the attached worksheet Drainage areas were derived from the structure maps available on both the Beluga and Sterling formations, which are also included

In the Beluga formation, net pay is estimated to be 50 feet with an average porosity of 19% Water saturation is approximately 50%, and a drainage area of 2162 acres is calculated from the structure map Original-gas-in-place was determined to be 109 6 Bcf and assuming a recovery efficiency of 90%, total recoverable gas is equal to 98 6 Bcf The Beluga has produced 5 0 Bcf through December 1995, which indicates remaining gas of 93 6 Bcf The Sterling formation has an approximate 110 feet of net pay, 30% porosity, and a water saturation of 40% A drainage area of 1435 acres was used to calculate 204 2 Bcf of gas-in-place A recovery factor of 90% and cumulative production of 124 0 Bcf through 1995, indicate remaining gas reserves of 59 8 Bcf Only 20 Bcf of Beluga gas is estimated to be recovered as proved developed gas Sterling production is shut-in and recompletions in both formations are required to recover remaining estimates

Proved Undeveloped

Proved undeveloped gas reserves of 59 8 Bcf and 73 6 Bcf for the Sterling and Beluga, respectively, were assigned to Beaver Creek. These reserves are volumetric estimates derived from the proved developed wells Recompletions are planned for both formations, two in the Sterling, and four in the Beluga There are other behind-pipe sands which appear to be gas-bearing and represent an upside potential Two log sections from wells BCU #1 and #9 are provided, and show the similarities between the producing sands and sands located behind-pipe Future recompletions in these sands are recommended

All pertinent pressure and production data, along with data supporting the volumetrics, is included in the following pages

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Beaver Creek
Location	Kenai County, Alaska
Operator	Marathon
Reserve Basis:	Volumetrics
Reserve Classification:	Proved Developed

Material Balance
Source AOGCC

Pressures (psi) Initial ______, Current ______, Abandonment ______

Remarks Pressure data sparse, production data questionable — appears Sterling and Beluga production was combined and reported together for each formation through 1988

Production Parameters
Source Dwight's

		Sterling Bcf	Beluga
a	Recorded Prod Through ______		
b	______ Months Est Production		
c	Cumulative Production Through 12/95		5 0
d	Current Rate/Month		100 MM/MO
e	Abandonment Rate/Month		15 2 MM/MO
f	Decline Characteristic (di)		
g	Decline Exponent (n)		
h	Remaining Recovery		20 0
i	Ultimate Recovery		98 6

Remarks

Reservoir Parameters
Source AOGCC/Marathon

		Sterling	Beluga
a	Net Thickness	110'	50'
b	Porosity	30%	19%
c	Water Saturation	40%	50%
d	Hydrocarbon Thickness	19 8	4 75
e	Volume Factor	165 scf/rcf	245
f	Drainage Area	1435	2162
g	Original Volume in Place	204 2 Bcf	109 6 Bcf
h	Recovery Efficiency	90%	90%
i	Ultimate Recovery	183 8 Bcf	98 6 Bcf
j	Cumulative Recovery	124 0 Bcf	5 0 Bcf
k	Remaining Recovery	59 8 Bcf	93 6 Bcf

Remarks Recompletions required to recover volumetric estimates of remaining gas

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Beaver Creek
Location	Kenai County, Alaska
Operator	Marathon
Reserve Basis:	Volumetrics
Reserve Classification.	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ____________, Current ____________, Abandonment ____________

Remarks ____________

Production Parameters
Source

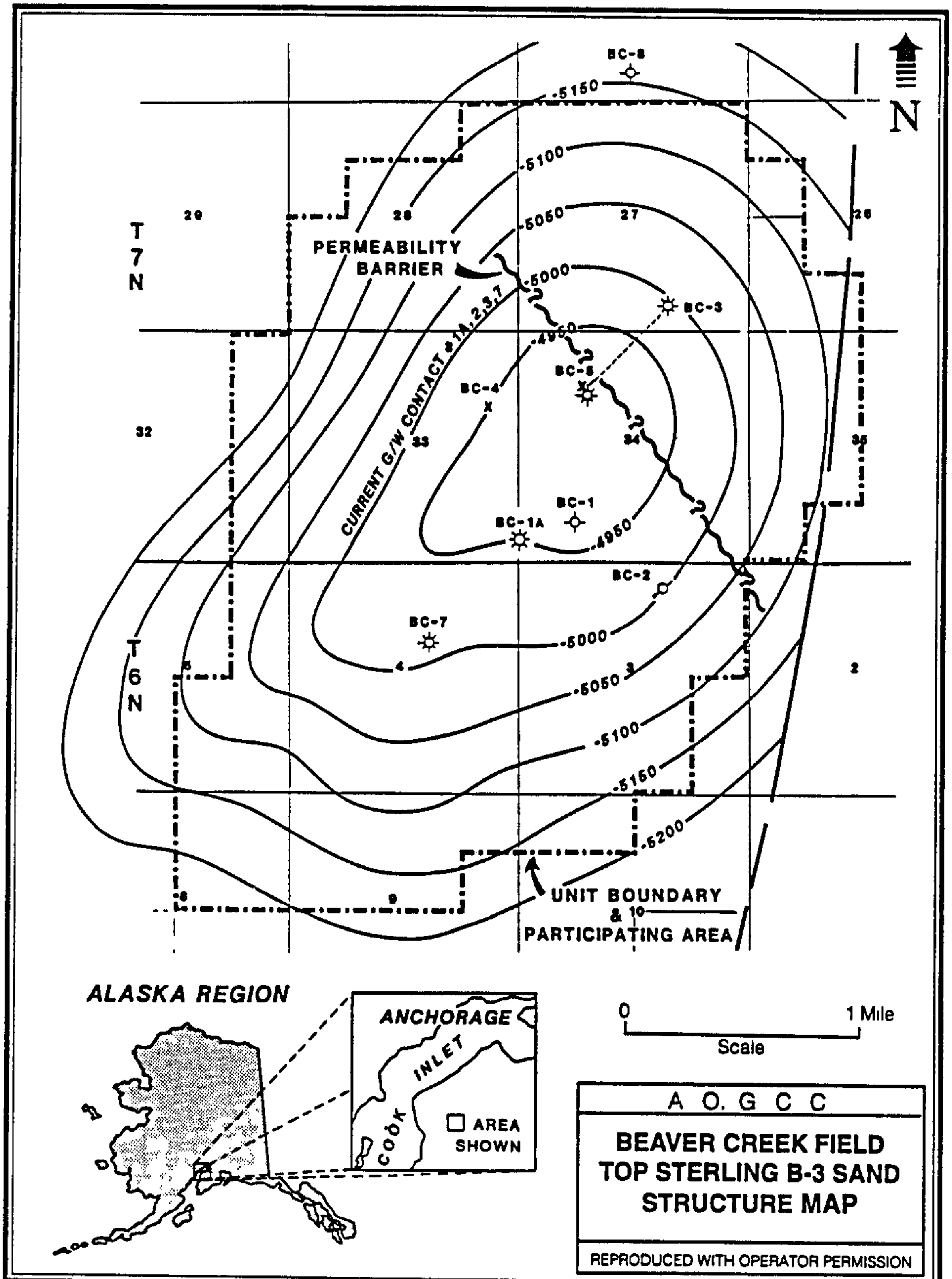
		Bcf
a	Recorded Prod Through ____________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks ____________

Reservoir Parameters See Proved Developed worksheet
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks Recompletions planned for both Beluga and Sterling formations Reserves based upon volumetrics performed on proved developed wells Proved undeveloped reserves are 59 8 Bcf for Sterling and 73 6 for Beluga



BC-8
-5150
N
-5100
29
28
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26
T
7
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-5050
PERMEABILITY
BARRIER
-5000
BC-3
CURRENT G/W CONTACT #1A,2,3,7
-4950
BC-5
BC-4
32
33
34
35
BC-1
BC-1A
-4950
BC-2
BC-7
-5000
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6
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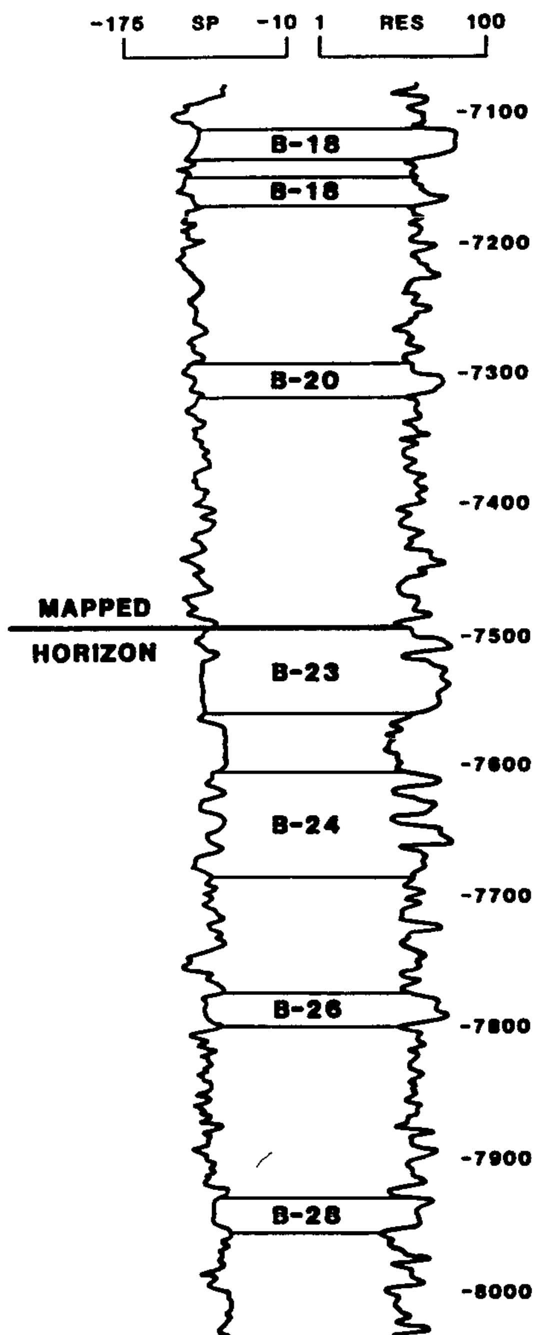
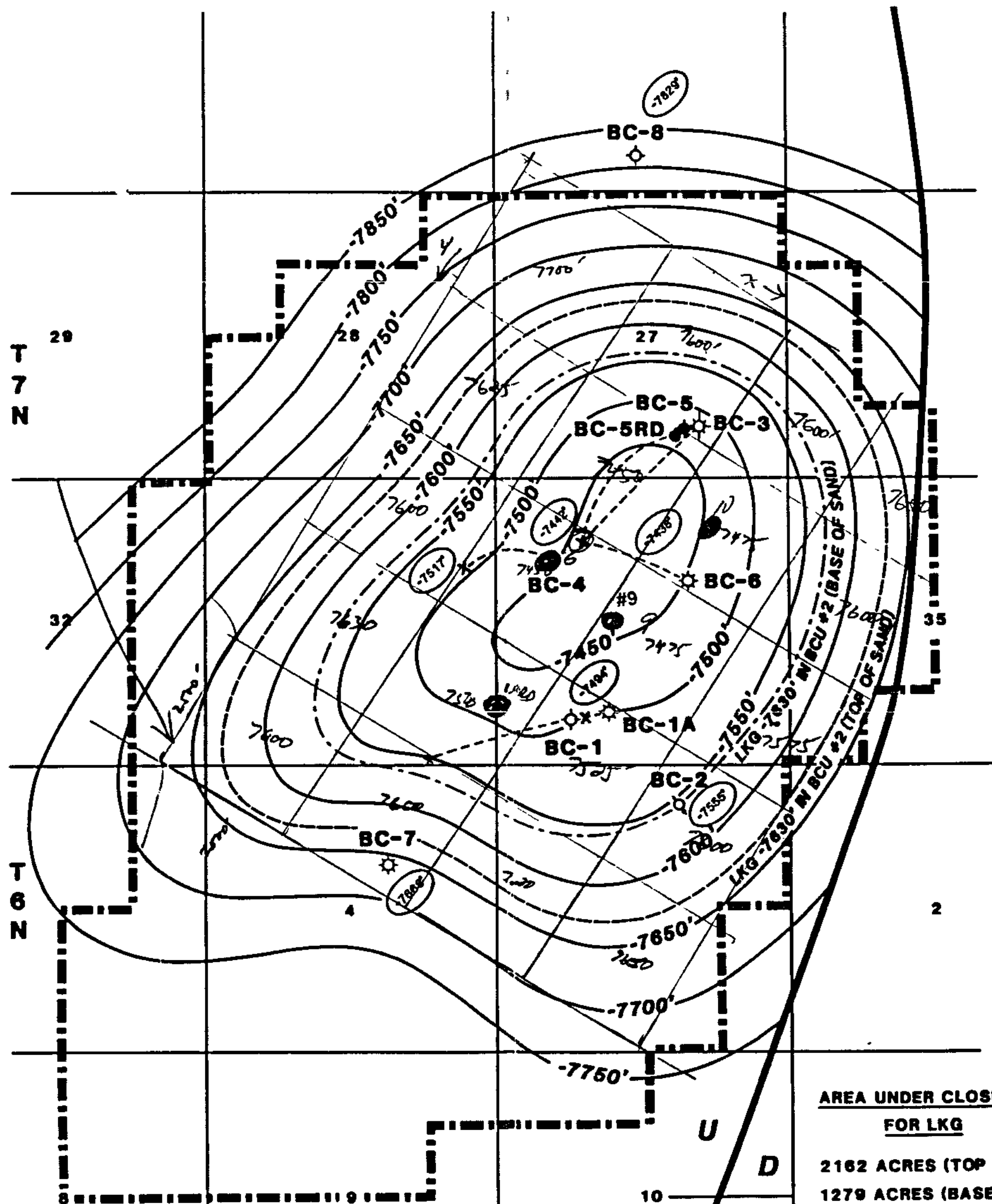
-5050
-5100
-5150
-5200
8
9
UNIT BOUNDARY
&
10
PARTICIPATING AREA
ALASKA REGION
ANCHORAGE
INLET
COOK
AREA
SHOWN
0
1 Mile
Scale
A O. G C C
BEAVER CREEK FIELD
TOP STERLING B-3 SAND
STRUCTURE MAP
REPRODUCED WITH OPERATOR PERMISSION

TYPE LOG

BC-1A





AREA UNDER CLOSURE

FOR LKG

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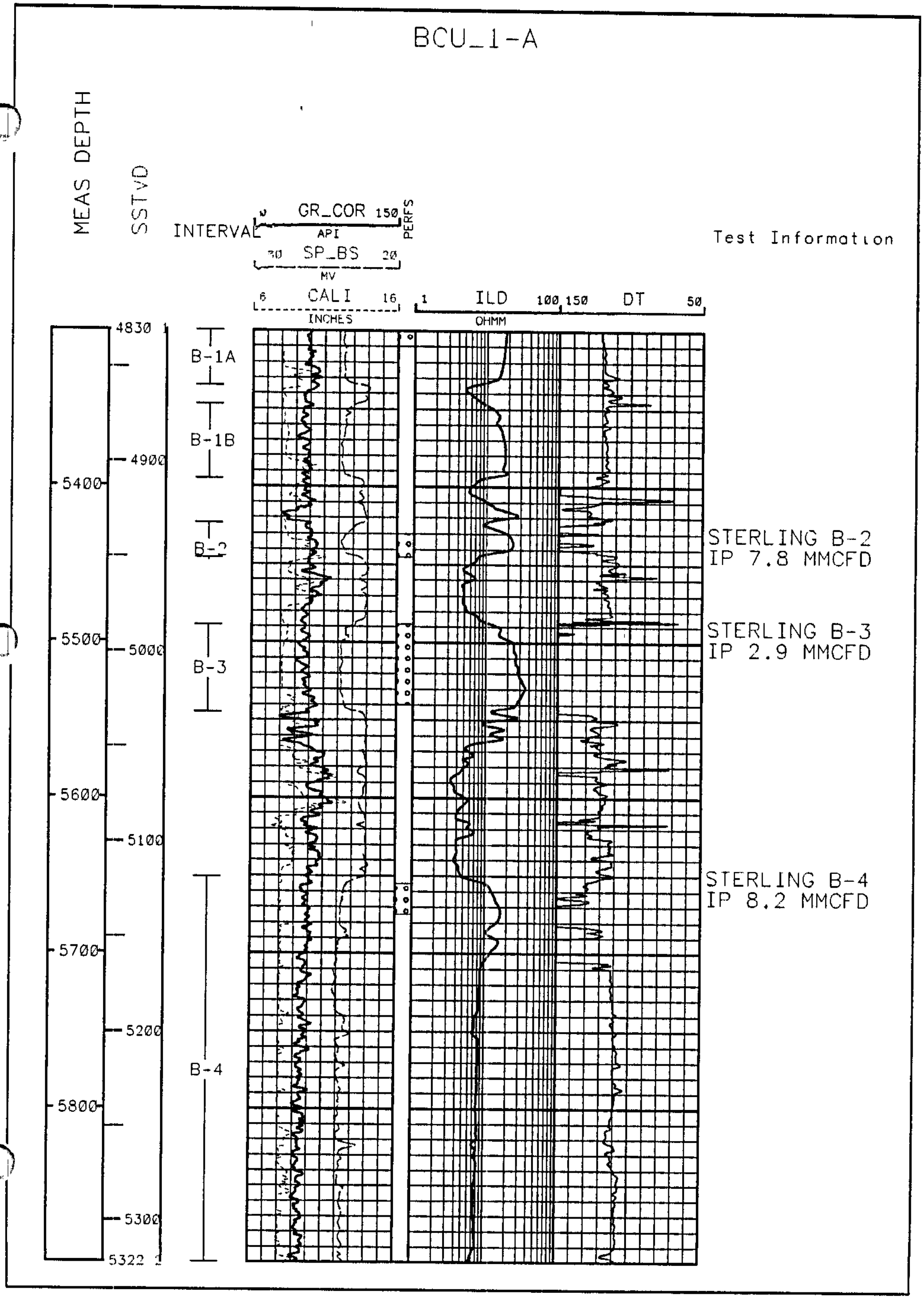
1279 ACRES (BASE OF SA



BCU_1-A
MEAS DEPTH
SSTVD
INTERVAL
GR_COR
API
PERFS
SP_BS
MV
CALI
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OHMM
DT
Test Information
4830
4900
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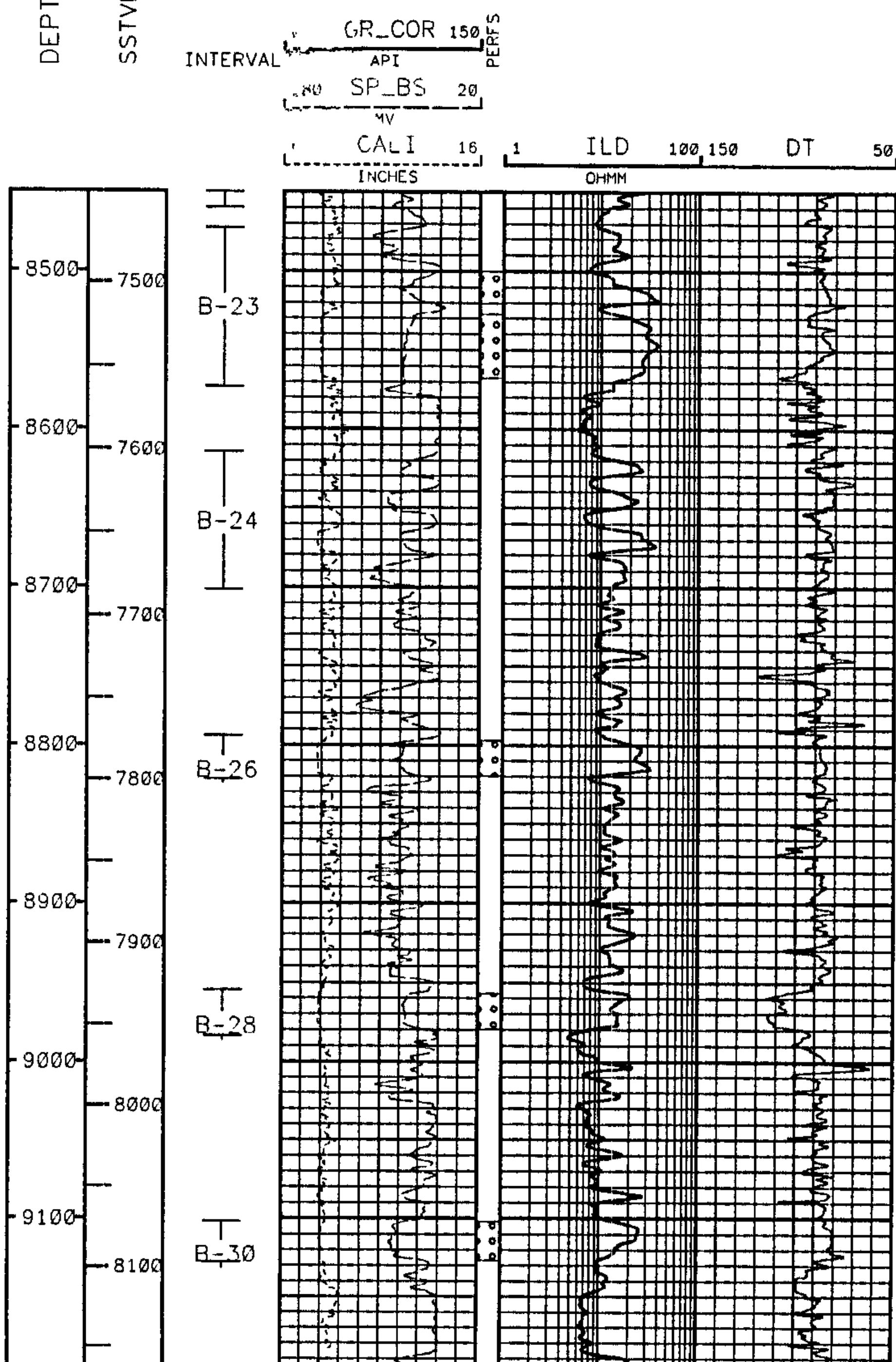
5100
5200
5300
5322
5400
5500
5600
5700
5800
B-1A
B-1B
B-2
B-3
B-4
STERLING B-2
IP 7.8 MMCFD
STERLING B-3
IP 2.9 MMCFD
STERLING B-4
IP 8.2 MMCFD

BCU_1-A



Test Information

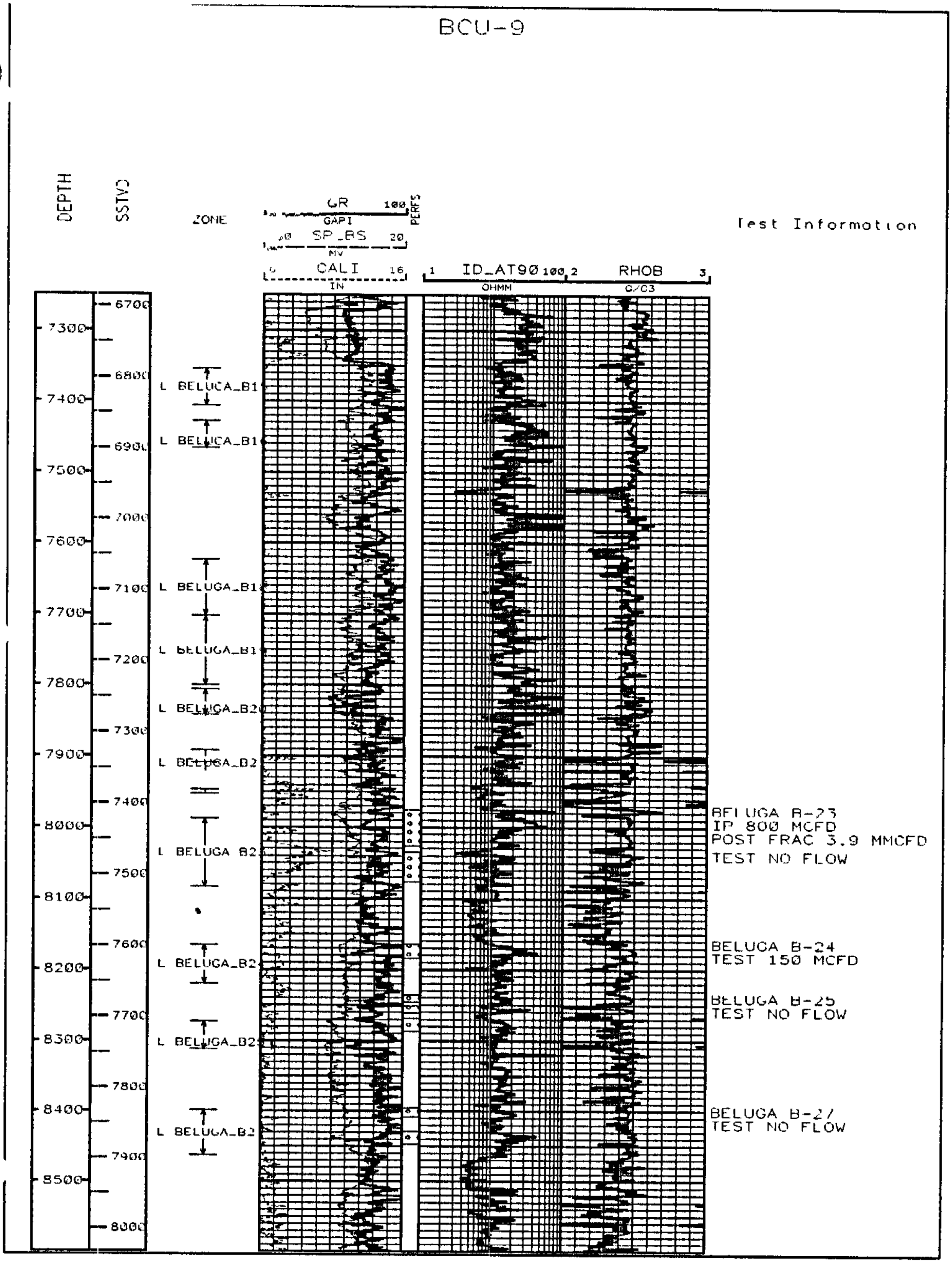
BELUGA B-23
TEST 2.7 MMCFD

BELUGA B-26

BELUGA B-26 & B-28
COMBINED IP 9 1 MMCF

BFLUGA B-28
IP 9 3 MMCFD

BELUGA B-30
TEST 40 MCFD



BCU-9
DEPTH
SSTVD
ZONE
GR
GAPI
100
PERFS
SP_BS
MV
20
CALI
IN
16
ID_AT90
OHMM
1
100
RHOB
G/C3
2
3
Test Information
7300
7400
7500
7600
7700
7800
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7500
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L BELUGA_B1
L BELUGA_B1
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L BELUGA_B1
L BELUGA_B2
L BELUGA_B2
L BELUGA B2
L BELUGA_B2
L BELUGA_B2
L BELUGA_B2
BELUGA B-23
IP 800 MCFD
POST FRAC 3.9 MMCFD
TEST NO FLOW
BELUGA B-24
TEST 150 MCFD
BELUGA B-25
TEST NO FLOW
BELUGA B-27
TEST NO FLOW

BEAVER CREEK GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	PI	Pc	S G	TEMP	CUM PROD	CUM PROD	P/Z
1973	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	2 FLWG	3800-2200	3800-2200	0 56	101	54 1	54 1	2622
1974	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	1 FLWG	3800-2200	3800-2200	0 56	101	73 8	73 4	
1977	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	1 FLWG	3800-2200	NA	0 56	117	570 9	570 4	
1978	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	1 FLWG	3800-2200	3800-2200	0.56	142-107	808 1	807 7	
1983	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	4 FLWG	3800-2200	3800-2140	0 56	142-107	9688 6	9677 8	2539
1984	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	4 FLWG	3800-2200	3800-2080	0 56	142-107	18923 0	18912.2	
1990	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	3 FLWG	3800-2200	NA	0 56	142-107	79177 6	100965 4	
1991	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	3 FLWG	3800-2200	NA	0.56	142-107	79840 5	110658 6	
1992	MARATHON	BEAVER CRK 1-A	2/10/67	BELUGA/STERLING	3 FLWG	3800-2200	NA	0 56	142-107	80431 0	117386 3	

BELUGA RIVER

Beluga River Field

Proved Developed

The Beluga River Field produces gas from both the Sterling and Beluga zones There was adequate pressure data from both formations to utilize material balance calculations for reserve calculations The p/z plots indicate a total ultimate recovery of 1115 0 Bcf at an abandonment pressure of 400 psia Cumulative production through 1995 is approximately 490 0 Bcf, leaving 625 0 Bcf of proved developed gas to be recovered as of January 1, 1996 Volumetric analysis was not used in calculating reserves, as identifying the location of the gas-water contact and net pay in the Beluga, are difficult

Proved Undeveloped

Material balance was also used in the determination of proved undeveloped reserves Incremental gas reserves of 165 0 Bcf will be recovered when compression installation reduces the abandonment pressure to approximately 100 psia This compression is currently being installed

All supporting data including reserve summary worksheets, maps, and pressure and production data follow this discussion

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Beluga River
Location	Tyonek County, Alaska
Operator	Arco
Reserve Basis:	Material Balance
Reserve Classification:	Proved Developed

Material Balance

Source AOGCC

Pressures (psi) Initial ~2300 ; Current ~1300 ; Abandonment ~400

Remarks P/Z indicates remaining gas as follows

Sterling = 385 Bcf
Beluga = 240 Bcf
Total = 625 Bcf
EUR = 1115 Bcf

Production Parameters

Source Dwight's

		Bcf
a	Recorded Prod Through 9/95	
b	3 Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks

Reservoir Parameters

Source

a Net Thickness
b Porosity
c Water Saturation
d Hydrocarbon Thickness
e Volume Factor
f Drainage Area
g Original Volume in Place
h Recovery Efficiency
i Ultimate Recovery
j Cumulative Recovery
k Remaining Recovery

Remarks

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Beluga River
Location	Tyonek County, Alaska
Operator	Arco
Reserve Basis:	Material Balance
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________, Current ________, Abandonment ~100

Remarks Incremental reserves of 165 Bcf to be realized when additional compression is installed

Production Parameters
Source

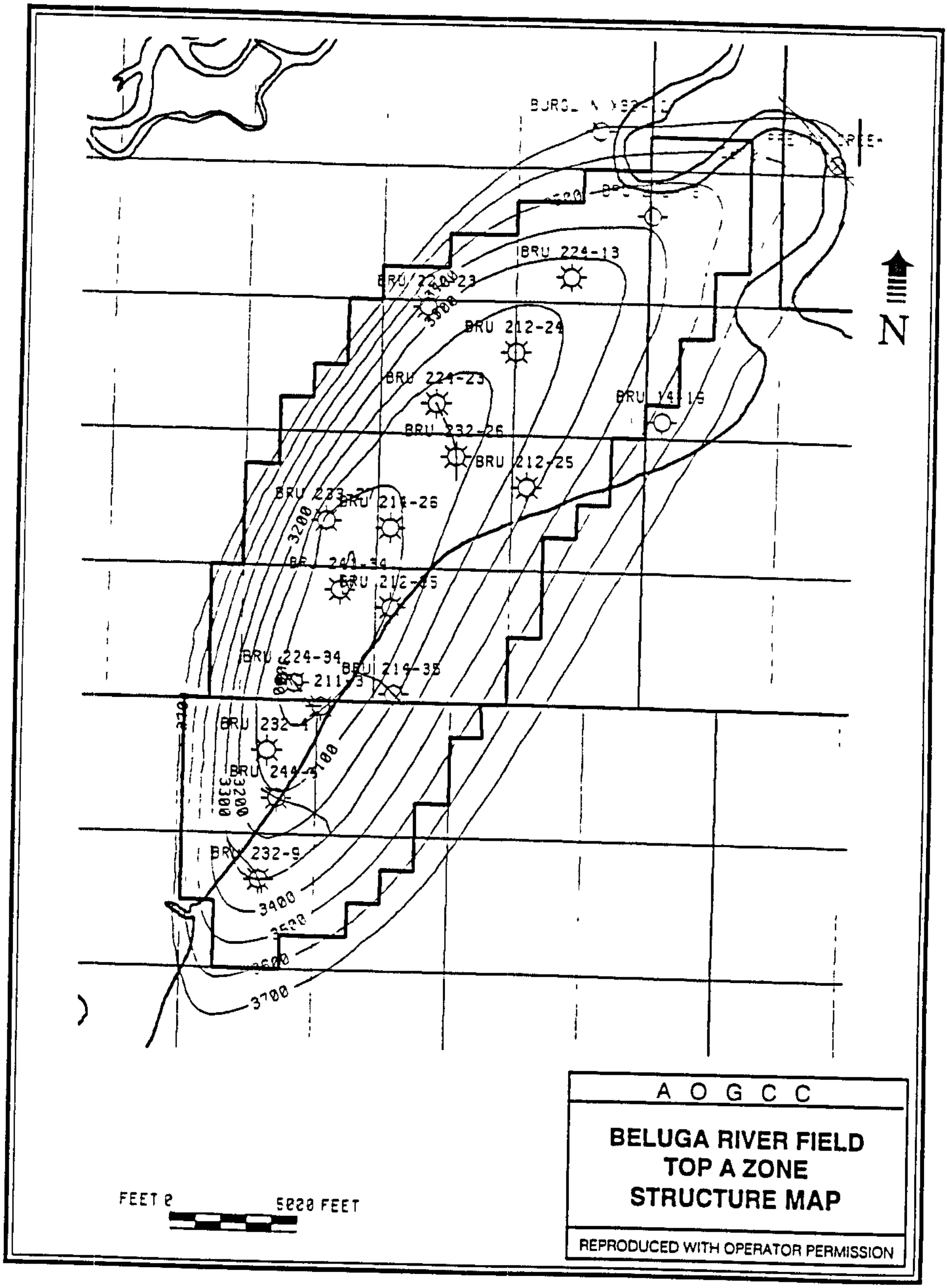
		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks

Reservoir Parameters
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

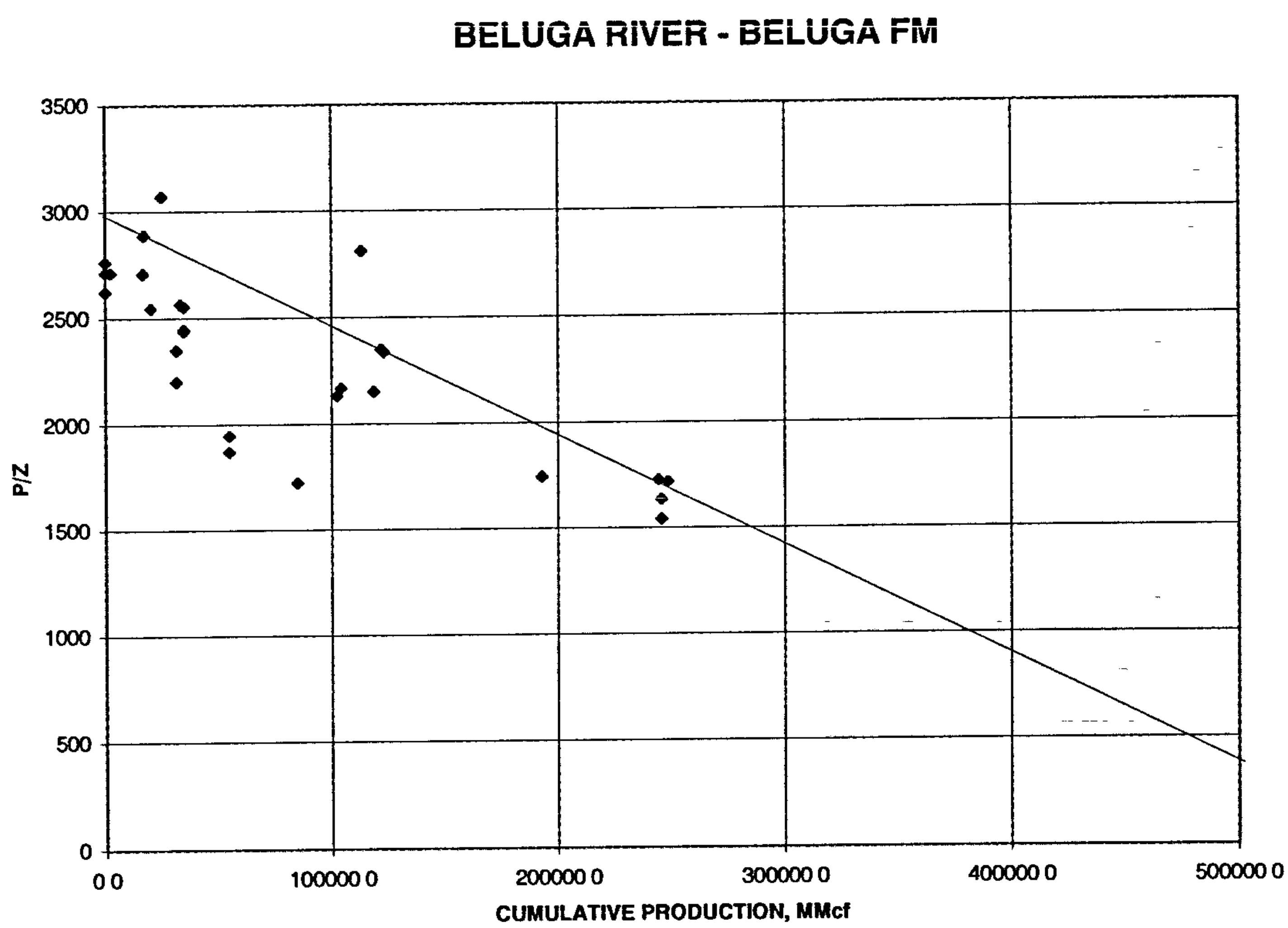
Remarks



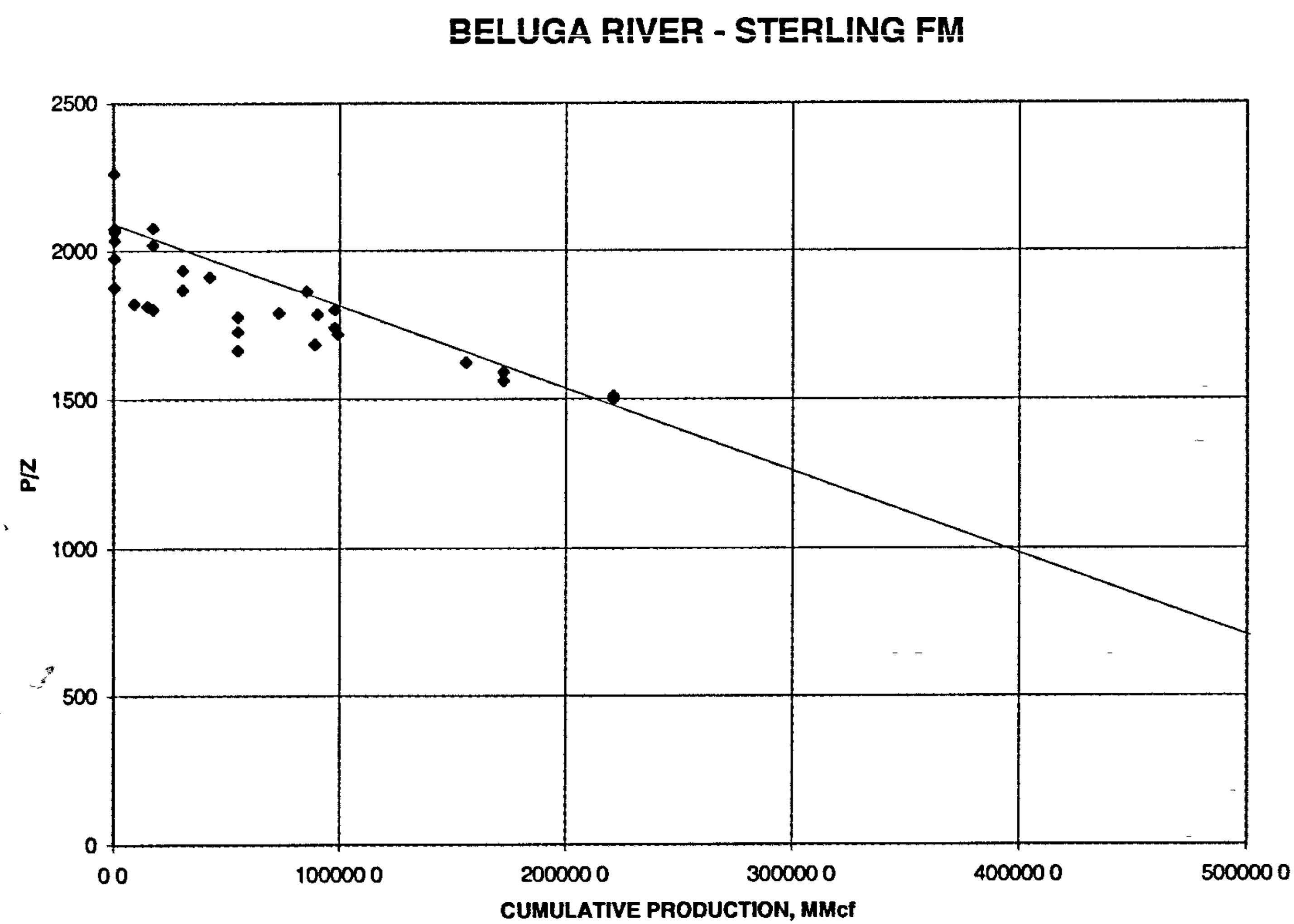
A O G C C

BELUGA RIVER FIELD
TOP A ZONE
STRUCTURE MAP

REPRODUCED WITH OPERATOR PERMISSION



BELUGA RIVER - BELUGA FM
3500
3000
2500
2000
1500
1000
500
0
P/Z
0 0
100000 0
200000 0
300000 0
400000 0
500000 0
CUMULATIVE PRODUCTION, MMcf



BELUGA RIVER - STERLING FM
P/Z
2500
2000
1500
1000
500
0
0 0
100000 0
200000 0
300000 0
400000 0
500000 0
CUMULATIVE PRODUCTION, MMcf

BELUGA RIVER

YEAR	PRODUCING FM	Pc	S G	TEMP	CUM PROD	Zc	P/Z
Dec-68	STERLING	1883	0 56	100	113 4	0 833	2261
Jan-72	STERLING	1732	0 56	100	485 5	0 839	2065
Feb-72	STERLING	1663	0 56	100	485 5	0 842	1975
Dec-72	STERLING	1740	0 56	100	496 9	0 838	2075
Dec-72	STERLING	1588	0 56	100	496 9	0 846	1877
Dec-72	STERLING	1710	0 56	100	496 9	0 84	2036
Feb-76	STERLING	1545	0 56	100	9118 3	0 849	1820
Jan-77	STERLING	1539	0 56	100	14927 4	0 849	1812
Jun-77	STERLING	1741	0 56	100	17414 9	0 838	2077
Jun-77	STERLING	1531	0 56	100	17414 9	0 85	1802
Jun-77	STERLING	1698	0 56	100	17414 9	0 84	2020
Sep-79	STERLING	1582	0 56	100	30764 6	0 847	1869
Sep-79	STERLING	1633	0 56	100	30764 6	0 844	1935
Mar-81	STERLING	1615	0 56	100	42772 7	0 845	1912
Oct-82	STERLING	1511	0 56	100	54921 6	0 851	1776
Oct-82	STERLING	1426	0 56	100	54921 6	0 856	1665
Oct-82	STERLING	1474	0 56	100	54921 6	0 853	1728
Oct-84	STERLING	1522	0 56	100	73196 2	0 85	1790
Dec-85	STERLING	1578	0 56	100	85407 1	0 847	1863
Mar-86	STERLING	1441	0 56	100	88949 6	0 855	1685
Apr-86	STERLING	1518	0 56	100	90053 7	0 85	1785
Dec-86	STERLING	1485	0 56	100	97822 7	0 853	1742
Dec-86	STERLING	1530	0 56	100	97822 7	0 85	1801
Jan-87	STERLING	1467	0 56	100	99068 3	0 854	1719
Sep-90	STERLING	1395	0 56	100	155912 7	0 859	1625
Apr-91	STERLING	1348	0 56	100	172335 2	0 862	1564
Apr-91	STERLING	1370	0 56	100	172335 2	0 86	1592
Apr-94	STERLING	1306	0 56	100	220825 3	0 865	1510
Apr-94	STERLING	1298	0 56	100	220825 3	0 866	1500
Feb-63	BELUGA	2236	0 56	100	0 0	0 825	2711
Mar-63	BELUGA	2166	0 56	100	0 0	0 826	2623
Dec-63	BELUGA	2277	0 56	100	8 1	0 825	2761
Dec-68	BELUGA	2236	0 56	100	2223 2	0 825	2711
Dec-72	BELUGA	2232	0 56	100	16645 4	0 825	2706
Jan-73	BELUGA	2379	0 56	100	16963 4	0 824	2886
Mar-74	BELUGA	2103	0 56	100	20109 4	0 827	2544
Oct-75	BELUGA	2532	0 56	100	25155 9	0 825	3068
Mar-77	BELUGA	2118	0 56	100	33387 1	0 827	2563
Jun-77	BELUGA	2025	0 56	100	34882 2	0 828	2444
Jun-77	BELUGA	2020	0 56	100	34882 2	0 829	2438
Jun-77	BELUGA	2112	0 56	100	34882 2	0 827	2551
Sep-79	BELUGA	1582	0 56	100	54788 7	0 847	1869
Sep-79	BELUGA	1640	0 56	100	54788 7	0 844	1945
Oct-79	BELUGA	1835	0 56	100	31478 6	0 835	2199
Oct-79	BELUGA	1950	0 56	100	31478 6	0 831	2348
Oct-79	BELUGA	1835	0 56	100	31478 6	0 835	2199
Oct-82	BELUGA	1470	0 56	100	84951 7	0 854	1722
Aug-84	BELUGA	1784	0 56	100	102452 0	0 837	2132
Oct-84	BELUGA	1810	0 56	100	104136 8	0 835	2167
Jul-85	BELUGA	2317	0 56	100	113189 9	0 824	2811
Dec-85	BELUGA	1798	0 56	100	118442 4	0 836	2151
Mar-86	BELUGA	1951	0 56	100	121856 7	0 83	2349
Apr-86	BELUGA	1941	0 56	100	122944 0	0 831	2337
Apr-91	BELUGA	1486	0 56	100	192817 0	0 852	1743
Mar-94	BELUGA	1474	0 56	100	244476 0	0 853	1728
Apr-94	BELUGA	1403	0 56	100	245639 6	0 858	1635
Apr-94	BELUGA	1331	0 56	100	245639 6	0 863	1542
Jun-94	BELUGA	1467	0 56	100	248368 0	0 854	1719

CANNERY LOOP

Cannery Loop Field

Proved Developed

The Cannery Loop Field has been producing gas from the Beluga and Tyonek formations since 1988 Pressure data is sparse, so decline analysis was used in the estimation of remaining proved developed gas reserves for both the Beluga and the Tyonek formations As the field has not been subject to seasonal demand and has been producing at capacity, this method was considered the most reliable. An exponential decline rate of 15% and 11 6% per year was extrapolated from performance trends on the Beluga and Tyonek, respectively. This establishes 9 8 and 24 7 Bcf of remaining gas for the Beluga and Tyonek, respectively, and is summarized on the following worksheet

A check on the results of this method of evaluation was made by utilizing volumetrics Assuming a 90% recovery factor, gas-in-place for the Beluga and Tyonek was back-calculated to be 42 2 and 82 7 Bcf, respectively Utilizing the reservoir parameters set forth by the AOGCC, a drainage area was established for each producing formation, 1637 acres for the Beluga and 3250 acres for the Tyonek Both of these areas appear reasonable, are well within the norm of Cook Inlet drainage areas, and indicate that the volumetrics support the results of the decline analysis The following pages present all the data used in the analysis, including a location map, production plots and tabulations, and pressure data

Proved Undeveloped

Proved undeveloped gas reserves assigned to the Cannery Loop Field are based upon compressor installation, and analogy to the Kenai Field The two fields are adjacent to each other and have similar reservoir and production characteristics In the Kenai Field, a 6% increase over original recovery is attributable to additional compression This increase was applied to the ultimate recovery of 112.4 Bcf in Cannery Loop, to obtain incremental gas reserves of 6 74 Bcf

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Cannery Loop
Location	Kenai County, Alaska
Operator	Unocal/Marathon
Reserve Basis:	Production Performance
Reserve Classification:	Proved Developed

Material Balance
Source Marathon

Pressures (psi) Initial ________; Current ________, Abandonment ________

Remarks ________

Production Parameters
Source Dwight's

		Beluga Bcf	Tyonek
a	Recorded Prod Through ______		
b	____ Months Est Production		
c	Cumulative Production Through 12/95	28.0	50.0
d	Current Rate/Month	147 MM	269 MM
e	Abandonment Rate/Month	0.5 MM	0.5 MM
f	Decline Characteristic (di)	14.9%	11.6%
g	Decline Exponent (n)	0	0
h	Remaining Recovery	9.8	24.7
i	Ultimate Recovery	38.0	74.4

Remarks If assume 90% recovery, decline and volumetrics indicate. Beluga OGIP = 42.2 Bcf
Tyonek OGIP= 82.7 Bcf

Reservoir Parameters
Source AOGCC

		Beluga	Tyonek
a	Net Thickness	33'	17'
b	Porosity	20%	21%
c	Water Saturation	45%	45%
d	Hydrocarbon Thickness	3.63	1.96
e	Volume Factor	163 scf/rcf	298 scf/rcf
f	Drainage Area	*	*
g	Original Volume in Place	42.2 Bcf	82.7 Bcf
h	Recovery Efficiency	90%	90%
i	Ultimate Recovery	39.0 Bcf	106.0 Bcf
j	Cumulative Recovery	28.0 Bcf	50.0 Bcf
k	Remaining Recovery	11.0 Bcf	56.0 Bcf

Remarks *Drainage area back calculated. Beluga = 1637 Acres. Tyonek = 3250 Acres.
Total area in unit ~8064 Acres.

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Cannery Loop
Location	Kenai County, Alaska
Operator	Unocal/Marathon
Reserve Basis:	Analogy
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________; Current ________; Abandonment ________

Remarks Kenai Field is analogous to Cannery Loop - took the percent increase in recoverable gas due to compression installation in Kenai and applied to Cannery Loop. This represents a 6% increase of original recovery which is equal to 6.74 Bcf in Cannery Loop.

Production Parameters
Source

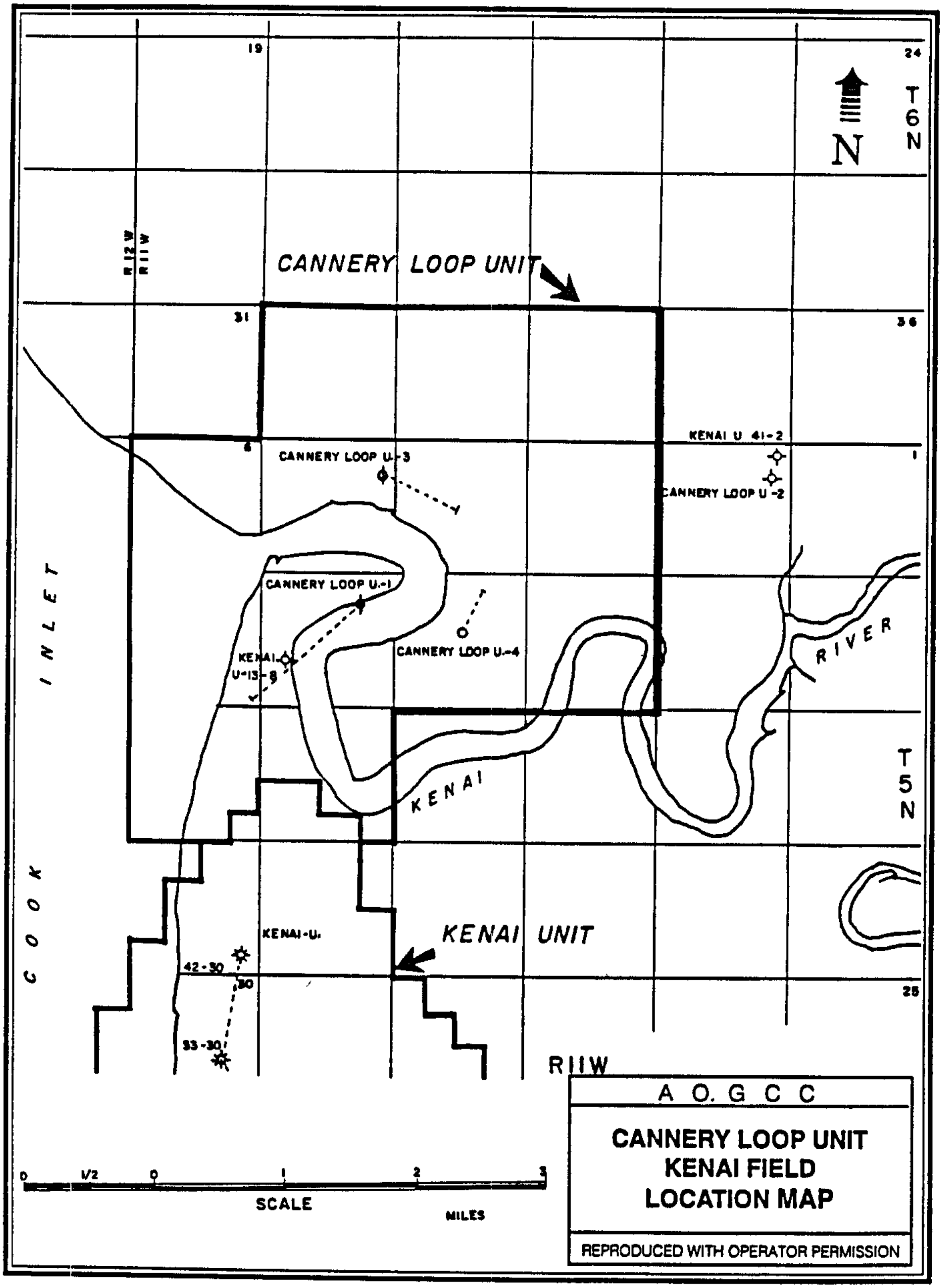
		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks

Reservoir Parameters
Source AOGCC

		Beluga
a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks



19
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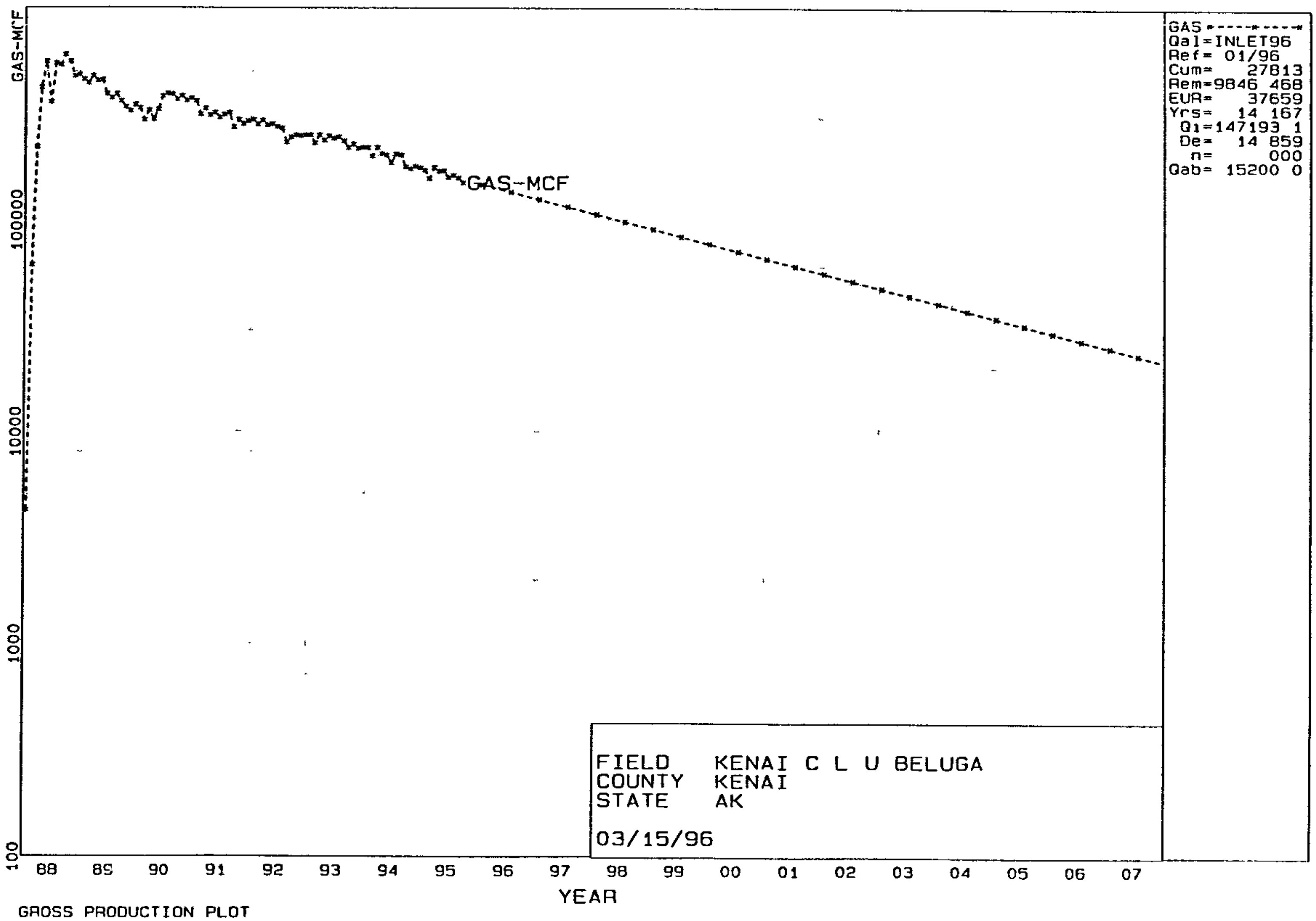
R12W
R11W
CANNERY LOOP UNIT
31
36
KENAI U 41-2
6
1
CANNERY LOOP U-3
CANNERY LOOP U-2
CANNERY LOOP U.-1
KENAI U-13-8
CANNERY LOOP U.-4
RIVER
KENAI
INLET
COOK
T
5
N
KENAI UNIT
KENAI-U.
42-30
30
33-30
25
R11W
0 1/2 0 1 2 3
SCALE
MILES
A.O.G.C.C
CANNERY LOOP UNIT
KENAI FIELD
LOCATION MAP
REPRODUCED WITH OPERATOR PERMISSION


GAS-MCF
100000
10000
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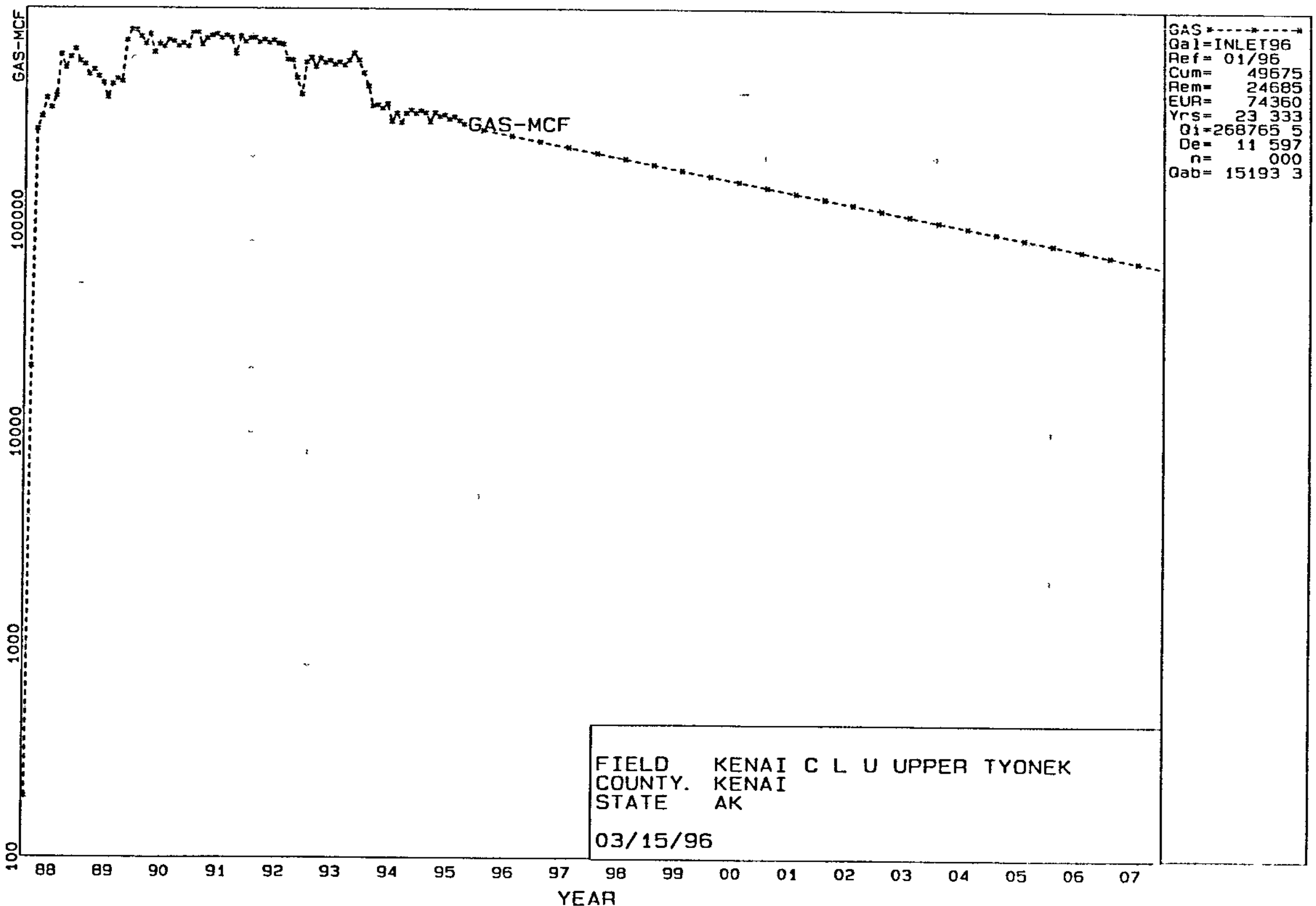
YEAR
GROSS PRODUCTION PLOT
GAS-MCF
GAS
Qal=INLET96
Ref= 01/96
Cum= 27813
Rem=9846 468
EUR= 37659
Yrs= 14 167
Qi=147193 1
De= 14 859
n= 000
Qab= 15200 0
FIELD KENAI C L U BELUGA
COUNTY KENAI
STATE AK
03/15/96



GROSS PRODUCTION PLOT

CANNERY LOOP FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	Pi	Pc	S G	TEMP	CUM PROD
1990	UNOCAL	14-6	Apr-79	UPPER TYONEK	2 FLWG	5105	NA	0 56	144	19324 4
1991	UNOCAL	14-6	Apr-79	UPPER TYONEK	2 FLWG	5105	NA	0 56	144	27928 7
1992	UNOCAL	14-6	Apr-79	UPPER TYONEK	2 FLWG	5105	NA	0 56	144	35366 6
1994	UNOCAL	14-6	Apr-79	UPPER TYONEK	1 FLWG/1 SI	5105	NA	0 56	144	46095 9

CANNERY LOOP FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	Pi	Pc	S G	TEMP	CUM PROD
1990	UNOCAL	14-6	Apr-79	BELUGA	1 FLWG	2310	NA	0 56	126	13831 7
1991	UNOCAL	14-6	Apr-79	BELUGA	1 FLWG	2310	NA	0 56	126	17545 7
1992	UNOCAL	14-6	Apr-79	BELUGA	1 FLWG	2310	NA	0 56	126	20742 9
1994	UNOCAL	14-6	Apr-79	BELUGA	1 FLWG/2 SI	2310	NA	0 56	126	25890 8

ARIES SEQUENCE NUMBER 6
FIELD RESERVOIR KENAI C L U BELUGA
COUNTY KENAI , STATE AK

DATE 03/06/9c
TIME 13:30 02
PAGE 29
COOKINLT DBS

PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	0	0	0	0 00	0	0
1/88	0	4225	0	0	0 00	0	4,225
2/88	0	60674	163	0	0 00	0	64,899
3/88	0	219150	279	0	0 00	0	284,049
4/88	0	417860	279	0	0 00	0	701 909
5/88	0	554515	279	0	0 00	0	1,256 424
6/88	0	357317	2166	0	0 00	0	1 613 741
7/88	0	543554	2545	0	0 00	0	2,157,295
8/88	0	535269	1425	0	0 00	0	2,692 564
9/88	0	597914	2499	0	0 00	0	3,290,478
10/88	0	556181	3854	0	0 00	0	3 846,659
11/88	0	473839	2916	0	0 00	0	4,320,498
12/88	0	481062	3072	0	0 00	0	4,801,560
TOT/88	0	4801560	19477	0		0	4,801,560
1/89	0	456645	4200	0	0 00	0	5,258,205
2/89	0	439037	3282	0	0 00	0	5,697,242
3/89	0	474678	3162	0	0 00	0	6,171,920
4/89	0	450858	3570	0	0 00	0	6,622,778
5/89	0	454695	3627	0	0 00	0	7,077,473
6/89	0	390374	135	0	0 00	0	7,467,847
7/89	0	373423	83	0	0 00	0	7,841,270
8/89	0	389071	31	0	0 00	0	8,230,341
9/89	0	361168	70	0	0 00	0	8,591,509
10/89	0	338983	44	0	0 00	0	8,930,492
11/89	0	324474	12	0	0 00	0	9,254,966
12/89	0	347093	57	0	0 00	0	9,602,059
TOT/89	0	4800499	18273	0		0	9,602,059
1/90	0	334634	23	0	0 00	0	9,936,693
2/90	0	293972	6	0	0 00	0	10,230,665
3/90	0	325923	0	0	0 00	0	10,556,588
4/90	0	296014	0	0	0 00	0	10,852,602
5/90	0	330618	40	0	0 00	0	11,183,220
6/90	0	380583	28	0	0 00	0	11,563,803
7/90	0	391831	36	0	0 00	0	11,955,634
8/90	0	388426	25	0	0 00	0	12,344 060
9/90	0	369003	46	0	0 00	0	12,713,063
10/90	0	382512	17	0	0 00	0	13,095,575
11/90	0	363225	30	0	0 00	0	13,458,800
12/90	0	372945	46	0	0 00	0	13,831,745
TOT/90	0	4229686	297	0		0	13,831,745
1/91	0	361563	62	0	0 00	0	14,193,308
2/91	0	313711	112	0	0 00	0	14,507,019
3/91	0	334085	150	0	0 00	0	14,841,104
4/91	0	310059	30	0	0 00	0	15,151,163
5/91	0	318576	25	0	0 00	0	15,469,739
6/91	0	302675	0	0	0 00	0	15,772,414
7/91	0	312373	47	0	0 00	0	16,084,787
8/91	0	318667	31	0	0 00	0	16,403,454
9/91	0	272529	3	0	0 00	0	16,675 983
10/91	0	295890	31	0	0 00	0	16,971,873
11/91	0	282699	60	0	0 00	0	17,254,572
12/91	0	291082	31	0	0 00	0	17,545,654
TOT/91	0	3713909	582	0		0	17,545,654
TOTAL	0	17545654	38629	0		0	17,545,654

ARIES SEQUENCE NUMBER 6
FIELD RESERVOIR KENAI C L U BELUGA
COUNTY KENAI , STATE AK

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	17545654	38629	0	0 00	0	17,545 654
1/92	0	296068	93	0	0 00	0	17 841,722
2/92	0	280980	43	0	0 00	0	18 122 702
3/92	0	293212	131	0	0 00	0	18 415,914
4/92	0	278569	114	0	0 00	0	18 694 483
5/92	0	281475	75	0	0 00	0	18,975 958
6/92	0	273335	165	0	0 00	0	19,249,293
7/92	0	269723	70	0	0 00	0	19,519 016
8/92	0	231475	0	0	0 00	0	19,750 491
9/92	0	244433	60	0	0 00	0	19,994,924
10/92	0	249959	108	0	0 00	0	20,244,883
11/92	0	247863	107	0	0 00	0	20,492,746
12/92	0	250142	366	0	0 00	0	20,742,888
TOT/92	0	3197234	1332	0		0	20,742,888
1/93	0	250288	69	0	0 00	0	20,993,176
2/93	0	229662	50	0	0 00	0	21,222,838
3/93	0	249864	45	0	0 00	0	21,472,702
4/93	0	236211	74	0	0 00	0	21,708,913
5/93	0	247368	1800	0	0 00	0	21,956,281
6/93	0	241060	28	0	0 00	0	22,197,341
7/93	0	244854	5	0	0 00	0	22,442,195
8/93	0	234089	55	0	0 00	0	22,676,284
9/93	0	217780	27	0	0 00	0	22,894,064
10/93	0	226961	140	0	0 00	0	23,121,025
11/93	0	216202	54	0	0 00	0	23,337,227
12/93	0	218733	78	0	0 00	0	23,555,960
TOT/93	0	2813072	2425	0		0	23,555,960
1/94	0	218121	15	0	0 00	0	23,774,081
2/94	0	199190	15	0	0 00	0	23,973 271
3/94	0	218800	46	0	0 00	0	24,192,071
4/94	0	204644	88	0	0 00	0	24,396,715
5/94	0	200885	95	0	0 00	0	24,597,600
6/94	0	185084	128	0	0 00	0	24,782,684
7/94	0	203683	0	0	0 00	0	24,986,367
8/94	0	200830	19	0	0 00	0	25,187,197
9/94	0	176916	73	0	0 00	0	25,364,113
10/94	0	173404	117	0	0 00	0	25,537,517
11/94	104	177765	57	1709279	35 40	104	25,715,282
12/94	0	175550	88	0	0 00	104	25,890,832
TOT/94	104	2334872	741	22450692		104	25,890,832
1/95	0	170771	104	0	0 00	104	26,061,603
2/95	0	156100	70	0	0 00	104	26,217,703
3/95	0	175858	53	0	0 00	104	26,393,561
4/95	0	169032	46	0	0 00	104	26,562,593
5/95	0	169649	78	0	0 00	104	26,732,242
6/95	0	158268	101	0	0 00	104	26,890,510
7/95	0	161900	211	0	0 00	104	27,052,410
8/95	0	157286	43	0	0 00	104	27,209,696
9/95	0	149276	48	0	0 00	104	27,358 972
10/95							
11/95							
12/95							
TOT/95	0	1468140	754	0		104	27,358,972
TOTAL	104	27358972	43881	263067038		104	27,358,972

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FIELD RESERVOIR KENAI C L U UPPER TYONEK
COUNTY KENAI STATE AK

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT %	CUM OIL BBL	CUM GAS MCF
PRIOR	0	0	0	0	0 00	0	0
1/88	0	193	0	0	0 00	0	193
2/88	0	20414	5	0	0 00	0	20 607
3/88	0	267460	186	0	0 00	0	288,067
4/88	0	307324	186	0	0 00	0	595 391
5/88	0	375187	186	0	0 00	0	970 578
6/88	0	337779	108	0	0 00	0	1 308,357
7/88	0	383518	134	0	0 00	0	1 691,875
8/88	0	602056	1474	0	0 00	0	2 293,931
9/88	0	521452	210	0	0 00	0	2 815,383
10/88	0	585101	348	0	0 00	0	3,400,484
11/88	0	638125	240	0	0 00	0	4,038 609
12/88	0	559483	603	0	0 00	0	4,598,092
TOT/88	0	4598092	3680	0		0	4,598 092
1/89	0	540623	1920	0	0 00	0	5,138,715
2/89	0	483415	465	0	0 00	0	5,622,130
3/89	0	509376	3330	0	0 00	0	6,131,506
4/89	0	473877	2394	0	0 00	0	6,605,383
5/89	0	442602	47	0	0 00	0	7,047,985
6/89	0	376808	164	0	0 00	0	7,424,793
7/89	0	437360	136	0	0 00	0	7,862 153
8/89	0	462093	158	0	0 00	0	8,324,246
9/89	0	449968	70	0	0 00	0	8,774,214
10/89	0	703718	292	0	0 00	0	9,477,932
11/89	0	789627	255	0	0 00	0	10,267,559
12/89	0	785022	276	0	0 00	0	11,052,581
TOT/89	0	6454489	9507	0		0	11,052 581
1/90	0	732245	237	0	0 00	0	11,784,826
2/90	0	676667	310	0	0 00	0	12,461,493
3/90	0	750326	171	0	0 00	0	13,211,819
4/90	0	617307	260	0	0 00	0	13,829 126
5/90	0	671679	374	0	0 00	0	14,500,805
6/90	0	656075	257	0	0 00	0	15,156,880
7/90	0	708044	265	0	0 00	0	15,864,924
8/90	0	694778	217	0	0 00	0	16,559,702
9/90	0	660309	196	0	0 00	0	17,220,011
10/90	0	679231	157	0	0 00	0	17,899,242
11/90	0	656775	72	0	0 00	0	18,556,017
12/90	0	768426	127	0	0 00	0	19,324 443
TOT/90	0	8271862	2643	0		0	19,324,443
1/91	0	767749	310	0	0 00	0	20,092,192
2/91	0	672518	280	0	0 00	0	20,764,710
3/91	0	719319	153	0	0 00	0	21,484,029
4/91	0	741113	210	0	0 00	0	22,225,142
5/91	0	754399	254	0	0 00	0	22,979,541
6/91	0	722492	84	0	0 00	0	23,702,033
7/91	0	743045	213	0	0 00	0	24,445,078
8/91	0	724556	248	0	0 00	0	25,169,634
9/91	0	608656	242	0	0 00	0	25 778,290
10/91	0	736063	267	0	0 00	0	26,514,353
11/91	0	693214	225	0	0 00	0	27,207,567
12/91	0	721174	208	0	0 00	0	27,928,741
TOT/91	0	8604298	2694	0		0	27,928,741
TOTAL	0	27928741	18524	0		0	27,928,741

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FIELD RESERVOIR KENAI C L U UPPER TYONEK
COUNTY: KENAI STATE AK

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PRODUCTION LEDGER

DATE	OIL BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	27928741	18524	0	0 00	0	27,928 74[illegible]
1/92	0	724502	124	0	0 00	0	28,653,243
2/92	0	692045	132	0	0 00	0	29,345,288
3/92	0	711037	227	0	0 00	0	30,056,325
4/92	0	686300	125	0	0 00	0	30,742 625
5/92	0	706650	160	0	0 00	0	31 449 275
6/92	0	679901	401	0	0 00	0	32,129 176
7/92	0	673878	147	0	0 00	0	32,803,054
8/92	0	574028	260	0	0 00	0	33,377 082
9/92	0	569403	313	0	0 00	0	33 946,485
10/92	0	470076	286	0	0 00	0	34,416 561
11/92	0	393281	145	0	0 00	0	34,809 842
12/92	0	556715	442	0	0 00	0	35,366,557
TOT/92	0	7437816	2762	0		0	35,366,557
1/93	0	585212	145	0	0 00	0	35,951,769
2/93	0	530305	104	0	0 00	0	36,482,074
3/93	0	579259	190	0	0 00	0	37,061,333
4/93	0	553676	306	0	0 00	0	37,615,009
5/93	0	565857	4120	0	0 00	0	38,180,866
6/93	0	542889	78	0	0 00	0	38,723,755
7/93	0	556279	72	0	0 00	0	39,280,034
8/93	0	539629	240	0	0 00	0	39,819,663
9/93	0	568566	149	0	0 00	0	40,388 229
10/93	0	614635	448	0	0 00	0	41,002 864
11/93	0	570326	166	0	0 00	0	41,573,190
12/93	0	496342	232	0	0 00	0	42,069,532
TOT/93	0	6702975	6250	0		0	42,069,532
1/94	0	429877	27	0	0 00	0	42,499,409
2/94	0	346874	27	0	0 00	0	42,846,283
3/94	0	350259	59	0	0 00	0	43,196,542
4/94	0	338331	98	0	0 00	0	43,534,873
5/94	180	355002	122	1972233	40 40	180	43,889,875
6/94	0	293305	106	0	0 00	180	44,183,180
7/94	0	320861	0	0	0 00	180	44,504,041
8/94	0	290173	21	0	0 00	180	44,794,214
9/94	0	320315	122	0	0 00	180	45,114,529
10/94	0	332124	133	0	0 00	180	45,446,653
11/94	0	319928	70	0	0 00	180	45,766,581
12/94	37	329352	112	8901405	75 17	217	46,095,933
TOT/94	217	4026401	897	18554843		217	46,095,933
1/95	42	322560	133	7680000	76 00	259	46,418,493
2/95	5	292205	126	58441000	96 18	264	46,710,698
3/95	0	323066	97	0	0 00	264	47,033,764
4/95	0	309605	84	0	0 00	264	47,343,369
5/95	50	315307	141	6306140	73 82	314	47,658,676
6/95	0	300804	60	0	0 00	314	47,959,480
7/95	0	308208	109	0	0 00	314	48,267,688
8/95	36	296181	83	8227250	69 75	350	48,563,869
9/95	29	285582	93	9847655	76 23	379	48,849,451
10/95							
11/95							
12/95							
TOT/95	162	2753518	926	16997025		379	48,849,451
TOTAL	379	48849451	29359	128890372		379	48,849,451

IVAN RIVER

Ivan River Field

Proved Developed

There are currently four wells producing from the Sterling Formation in the Ivan River field, with rates being restricted due to completion problems, and the need to control sand and water production Very little data was available from public sources on the Ivan River Field There was no pressure data to undertake material balance calculations, and insufficient information to perform a volumetric analysis Production data was obtained from Dwight's Energydata and extrapolation of the historical production performance was used in determining the remaining proved developed gas reserves. An exponential decline curve of 13 5% was derived and projects remaining gas reserves of 84 2 Bcf as of January 1, 1996

Proved Undeveloped

There are no proved undeveloped reserves assigned to this field A summary worksheet and production data follows this discussion

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Ivan River
Location	Tyonek County, Alaska
Operator.	Unocal
Reserve Basis:	Production Performance
Reserve Classification:	Proved Developed

Material Balance
Source

Pressures (psi) Initial ____________; Current ____________, Abandonment ____________

Remarks No pressure data available.

Production Parameters
Source Dwight's

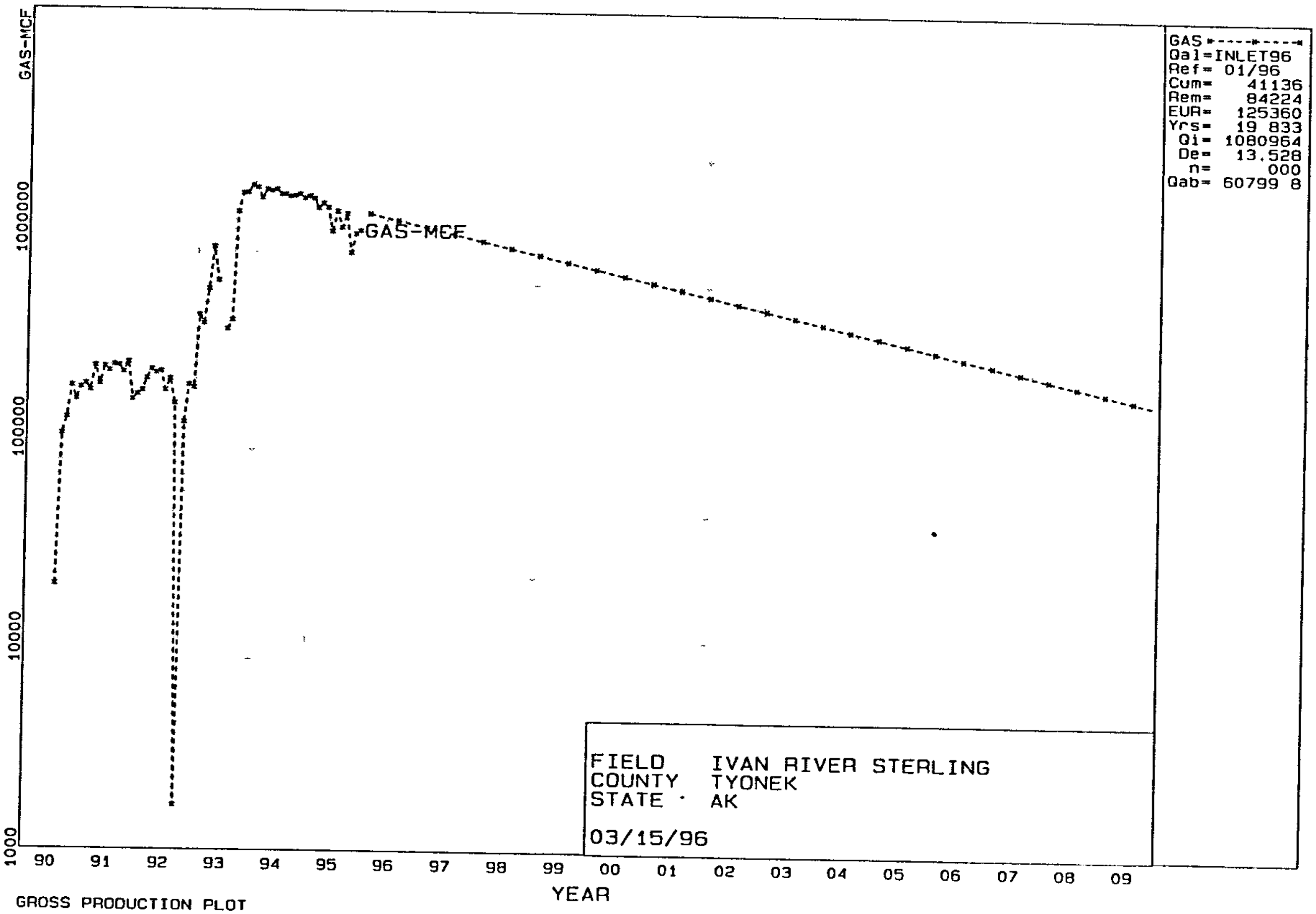
		Sterling Bcf
a	Recorded Prod Through 11/95	40.0
b	1 Month Est Production	1.1
c	Cumulative Production Through 12/95	41.1
d	Current Rate/Month	1.10
e.	Abandonment Rate/Month	0.06
f	Decline Characteristic (di)	13.5%
g	Decline Exponent (n)	0
h	Remaining Recovery	84.2
i	Ultimate Recovery	125.3

Remarks Abandonment rate equivalent to 2.0 MM/d. Reserves extrapolated from rate-time decline analysis. Production rates down in mid 1995 due to completion problems and water influx — operator restricting rate to control.

Reservoir Parameters
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks No data.



GROSS PRODUCTION PLOT

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FIELD RESERVOIR IVAN RIVER STERLING
COUNTY TYONEK , STATE AK

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P R O D U C T I O N   L E D G E R

DATE	OIL BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS, MCF
PRIOR	0	0	0	0	0 00	0	0
1/90	0	0	0	0	0 00	0	0
2/90	0	0	0	0	0 00	0	0
3/90	0	0	0	0	0 00	0	C
4/90	0	0	0	0	0 00	0	C
5/90	0	0	0	0	0 00	0	C
6/90	0	0	0	0	0 00	0	C
7/90	0	17968	2	0	0 00	0	17 968
8/90	0	93655	4	0	0 00	0	111 623
9/90	0	112403	5	0	0 00	0	224,026
10/90	0	158873	0	0	0 00	0	382 899
11/90	0	137031	9	0	0 00	0	519,930
12/90	0	156386	16	0	0 00	0	676,316
TOT/90	0	676316	36	0		0	676,316
1/91	0	162439	12	0	0 00	0	838,755
2/91	0	151586	7	0	0 00	0	990,341
3/91	0	197897	18	0	0 00	0	1,188,238
4/91	0	162457	15	0	0 00	0	1,350,695
5/91	0	196501	22	0	0 00	0	1,547,196
6/91	0	187777	20	0	0 00	0	1,734,973
7/91	0	200270	19	0	0 00	0	1 935,243
8/91	0	198927	25	0	0 00	0	2,134,170
9/91	0	185412	24	0	0 00	0	2,319,582
10/91	0	206367	25	0	0 00	0	2,525 949
11/91	0	137262	17	0	0 00	0	2,663 211
12/91	0	145369	14	0	0 00	0	2,808,580
TOT/91	0	2132264	218	0		0	2,808,580
1/92	0	151705	17	0	0 00	0	2,960,285
2/92	0	173422	19	0	0 00	0	3,133,707
3/92	0	191289	20	0	0 00	0	3,324,996
4/92	0	184060	18	0	0 00	0	3,509,056
5/92	0	187620	25	0	0 00	0	3,696,676
6/92	0	152314	17	0	0 00	0	3,848,990
7/92	0	172784	21	0	0 00	0	4,021,774
8/92	0	131955	17	0	0 00	0	4,153,729
9/92	0	1624	0	0	0 00	0	4,155,353
10/92	0	107437	118	0	0 00	0	4,262,790
11/92	0	162211	52	0	0 00	0	4,425,001
12/92	0	157301	38	0	0 00	0	4,582,302
TOT/92	0	1773722	362	0		0	4,582,302
1/93	0	349607	53	0	0 00	0	4,931,909
2/93	0	318663	35	0	0 00	0	5,250,572
3/93	0	465672	68	0	0 00	0	5,716,244
4/93	0	737943	74	0	0 00	0	6,454,187
5/93	0	510973	53	0	0 00	0	6,965,160
6/93	0	0	0	0	0 00	0	6,965 160
7/93	0	299726	23	0	0 00	0	7,264,886
8/93	0	331433	32	0	0 00	0	7,596 319
9/93	0	1090083	108	0	0 00	0	8,686,402
10/93	0	1336845	130	0	0 00	0	10,023,247
11/93	0	1344856	133	0	0 00	0	11,368,103
12/93	0	1451758	133	0	0 00	0	12,819,861
TOT/93	0	8237559	842	0		0	12,819,861
TOTAL	0	12819861	1458	0		0	12,819,861

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FIELD RESERVOIR IVAN RIVER STERLING
COUNTY TYONEK , STATE AK

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	12819861	1458	0	0 00	0	12,819 86_
1/94	0	1421669	99	0	0 00	0	14,241,530
2/94	0	1268578	96	0	0 00	0	15 510 108
3/94	0	1394791	116	0	0 00	0	16,904,899
4/94	0	1371332	114	0	0 00	0	18 276,231
5/94	0	1397333	130	0	0 00	0	19 673,564
6/94	0	1324713	126	0	0 00	0	20,998 277
7/94	0	1327457	121	0	0 00	0	22 325,734
8/94	0	1294647	113	0	0 00	0	23,620 381
9/94	0	1302423	120	0	0 00	0	24,922,804
10/94	0	1327492	120	0	0 00	0	26,250,296
11/94	0	1270438	118	0	0 00	0	27,520,734
12/94	0	1295595	117	0	0 00	0	28,816,329
TOT/94	0	15996468	1390	0		0	28,816,329
1/95	0	1267408	111	0	0 00	0	30,083,737
2/95	0	1141235	92	0	0 00	0	31,224 972
3/95	0	1203039	99	0	0 00	0	32,428,011
4/95	0	1149712	116	0	0 00	0	33,577 723
5/95	0	886430	71	0	0 00	0	34,464,153
6/95	0	1104104	109	0	0 00	0	35,568,257
7/95	0	925428	95	0	0 00	0	36,493,685
8/95	0	1074528	101	0	0 00	0	37 568,213
9/95	0	700876	71	0	0 00	0	38,269,089
10/95	0	863769	112	0	0 00	0	39,132,858
11/95	0	894468	134	0	0 00	0	40,027 326
12/95							
TOT/95	0	11210997	1111	0		0	40,027,326
TOTAL	0	40027326	3959	0		0	40,027,326

KENAI

Kenai Field

Proved Developed

The Kenai Gas Field has a total of 34 active completions in the Sterling, Beluga, and Tyonek formations Twenty-four wells are completed in the Sterling, six in the Beluga, and four in the Tyonek Proved developed reserves were assigned through the extrapolation of rate vs cumulative gas performance curves, and were validated with material balance plots Available pressure data was rather erratic and was not relied upon solely for the estimation of reserves Production data was obtained from Dwight's Energydata and rate vs. cumulative production plots were constructed Decline curves were extrapolated for each formation and are summarized in the following reserve worksheet The field economic abandonment rate of 10 MMcfpd was prorated among the formations based upon the number of wells producing from each The sum of the remaining gas reserves for all formations in Kenai is 144 5 Bcf Gas-in-place of 2680 0 Bcf was derived from pressure data available from the AOGCC for each of the formations, constructing p/z plots, and then taking the sum of each formation's gas-in-place

Proved Undeveloped

Proved undeveloped reserves are based on (1) compression reducing the abandonment suction pressure from 150 to 50 psia results in incremental gas reserves of 143 6 Bcf, and (2) behind-pipe sands identified in the Beluga and Tyonek were assigned reserves of 39 0 and 51 1 Bcf, respectively Reserves determined by the installation of compression assumed a recovery factor of 90% will be attained Since proved developed reserves represent an 84% recovery of OGIP, the incremental reserves are the difference between these two recovery factors Behind-pipe reserves were determined by volumetrics and analogy, and relied upon data supplied by the AOGCC and the operator. In the Beluga formation, volumetric parameters were derived from the structure map and a seven well cross-section of open hole logs From analysis of log characteristics, production performance and DST results, it was determined that there remains 65 feet of unperforated net pay The average porosity is 19% and water saturation averages 40% With a drainage area of 1083 acres, original-gas-in-place is estimated at 65 7 Bcf Ultimate recovery of 59.1 Bcf was then risked by 33% to obtain remaining reserves of 39 0 Bcf

Reserves in the Tyonek formation were evaluated using the same method as discussed above Reservoir parameters include 60' of net pay, porosity of 16%, water saturation of 45%, and a drainage area equal to 1375 acres An ultimate recovery of 77 4 Bcf was risked by 33% to obtain remaining reserves of 51.1 Bcf

All data used in the analysis of the Kenai Field follows this discussion Back-up data includes summary worksheets, maps, cross-sections, and production/pressure data

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Kenai Gas Field
Location	Kenai County, Alaska
Operator	Marathon
Reserve Basis:	Production Performance/Material Balance
Reserve Classification:	Proved Developed

Material Balance
Source AOGCC

Pressures (psi) Initial ______, Current ______; Abandonment ______

Remarks Σ AOGCC P/Z GIP = 2680 Bcf

Production Parameters
Source Dwight's

		Sterling Bcf	Beluga Bcf	Tyonek Bcf
a	Recorded Prod Through 9/95	1,743 9	147 0	230 2
b	3 Months Est Production	1 8	0 4	0 6
c	Cumulative Production Through 12/95	1,745 7	147 4	230 8
d	Current Rate/Month	1,145 0	112 0	148 0
e	Abandonment Rate/Month	233 8	31 2	38 9
f	Decline Characteristic (di)	8 8%	12 7%	10 4%
g	Decline Exponent (n)	0	0	0
h	Remaining Recovery	124 3	7 6	12 6
i	Ultimate Recovery	1,870 0	155 0	243 4

Remarks Sum of remaining gas = 144 5 Bcf Abandonment rate = 10 MM/d for entire field — prorated for each formation according to number of wells producing in each

Reservoir Parameters
Source

a Net Thickness ______
b Porosity ______
c Water Saturation ______
d Hydrocarbon Thickness ______
e Volume Factor ______
f Drainage Area ______
g Original Volume in Place ______
h Recovery Efficiency ______
i. Ultimate Recovery ______
j Cumulative Recovery ______
k Remaining Recovery ______

Remarks. ______

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Kenai Gas Field
Location	Kenai County, Alaska
Operator	Marathon
Reserve Basis:	Material Balance
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________, Current ________; Abandonment ~100

Remarks Incremental reserves of 143.6 Bcf due to additional compression.

Production Parameters
Source

		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks

Reservoir Parameters
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Kenai Gas Field - Beluga
Location	Kenai County, Alaska
Operator	Marathon
Reserve Basis:	Volumetrics/Analogy
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________, Current ________, Abandonment ________

Remarks ____________________

Production Parameters
Source

		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks ____________________

Reservoir Parameters
Source AOGCC/Marathon

		Beluga
a	Net Thickness	65'
b	Porosity	19%
c	Water Saturation	40%
d	Hydrocarbon Thickness	7.41
e	Volume Factor	188 scf/rcf
f	Drainage Area	1083
g	Original Volume in Place	65.7 Bcf
h	Recovery Efficiency	90%
i	Ultimate Recovery	*59.1 Bcf
j	Cumulative Recovery	--
k	Remaining Recovery	39.0 Bcf

Remarks Identified unperf'd sands that had similar characteristics to producing sands and/or DST results. Upper Beluga in Well 41-7 looks excellent, but assume it has been drained by Well #31-7 and #43-6X and was not assigned additional reserves. *Risked by 33% to account for uncertainties in sand continuity.

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Kenai Gas Field - Tyonek
Location	Kenai County, Alaska
Operator:	Marathon
Reserve Basis:	Volumetrics/Analogy
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ______, Current ______; Abandonment ______

Remarks ______

Production Parameters
Source

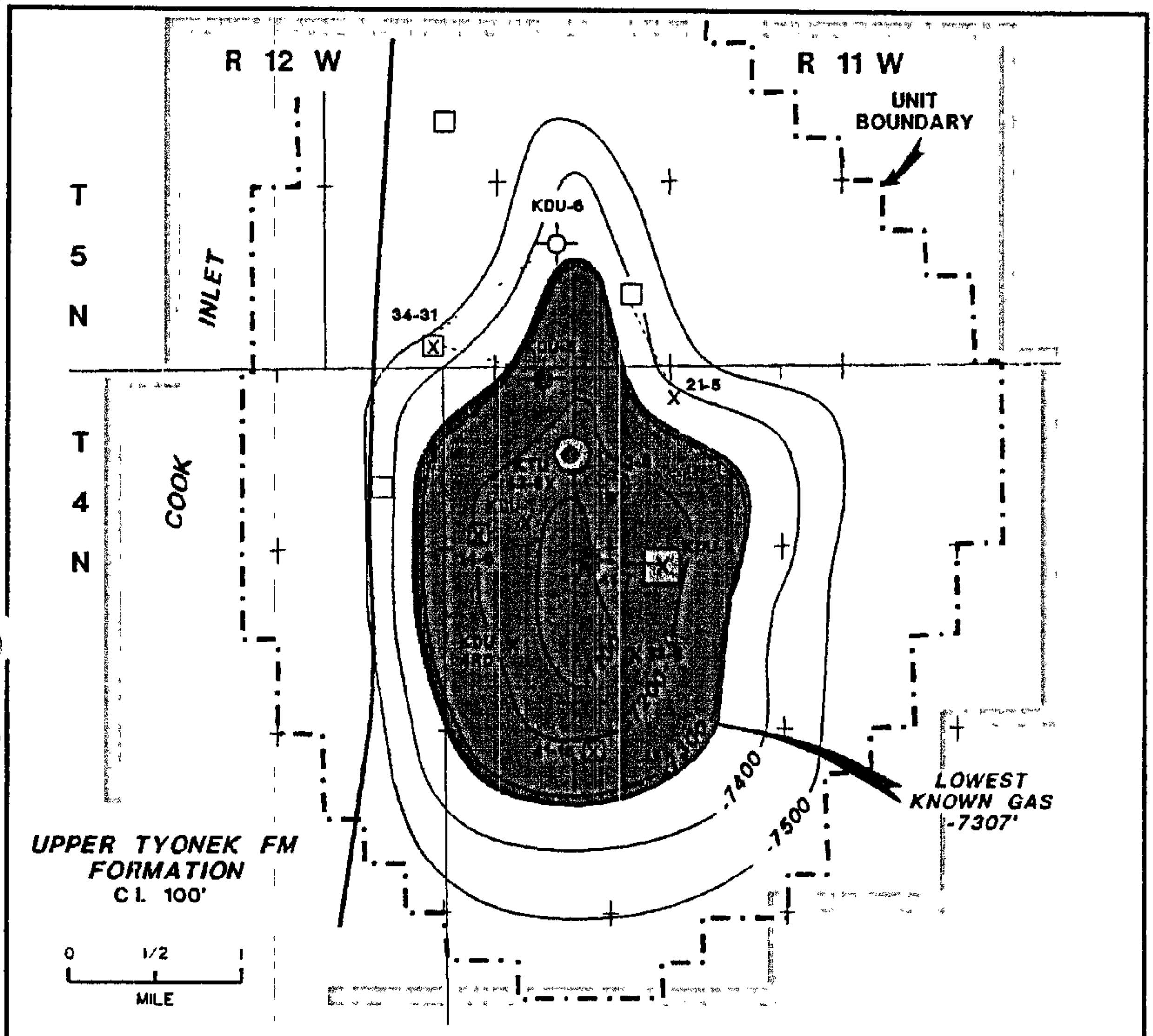
		Bcf
a	Recorded Prod Through ______	
b	______ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

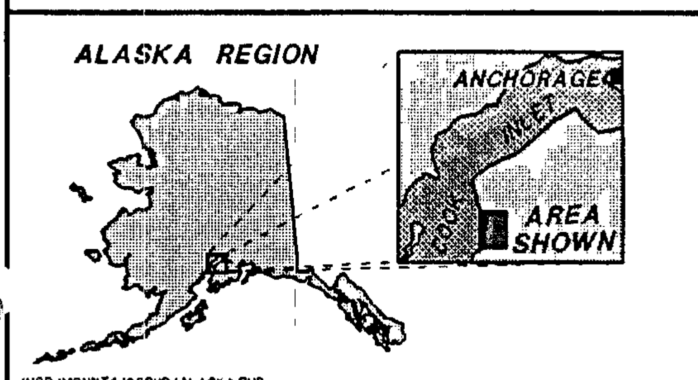
Remarks ______

Reservoir Parameters:
Source AOGCC/Marathon

		Tyonek D-1
a	Net Thickness	60'
b	Porosity	16%
c	Water Saturation	45%
d	Hydrocarbon Thickness	5.28
e	Volume Factor	272 scf/rcf
f	Drainage Area	1375
g	Original Volume in Place	86 Bcf
h	Recovery Efficiency	90%
i	Ultimate Recovery	77.4 Bcf*
j	Cumulative Recovery	
k	Remaining Recovery	51.1 Bcf

Remarks. *Risk by 33% to account for uncertainties in sand continuity.. D-1 sand had initially tested 5 MM/d at original pressure.





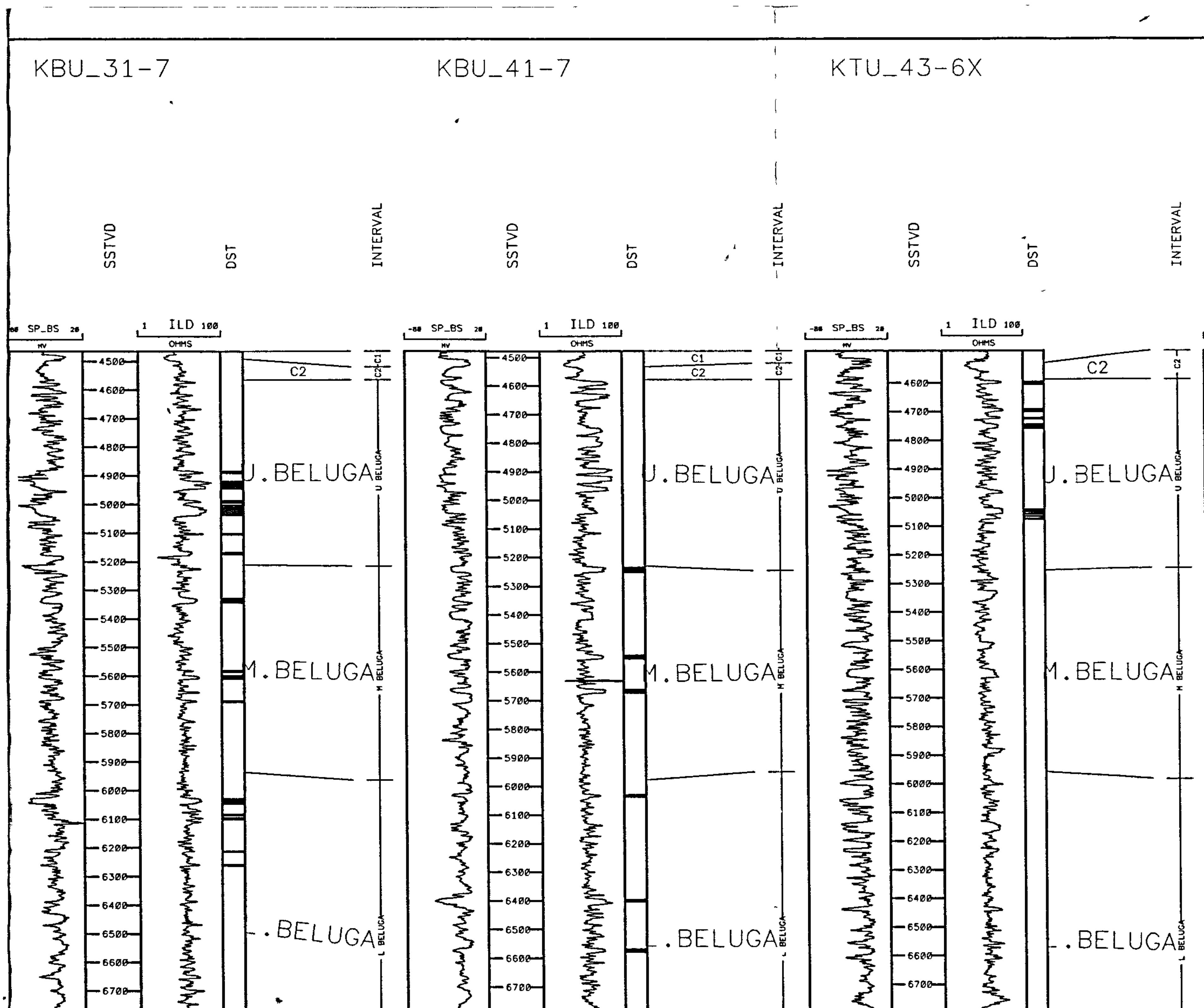
MARATHON OIL COMPANY
ALASKA REGION

KENAI FIELD
KENAI UNIT
KENAI ALASKA

TYONEK FM DEVELOPMENT

NET WI = 100%

JUNE 1995



KBU_31-7
KBU_41-7
KTU_43-6X
SSTVD
DST
INTERVAL
SP_BS
MV
ILD
OHMS
C1
C2
U.BELUGA
M.BELUGA
.BELUGA
4500
4600
4700
4800
4900
5000
5100
5200
5300
5400
5500
5600
5700
5800
5900
6000
6100
6200
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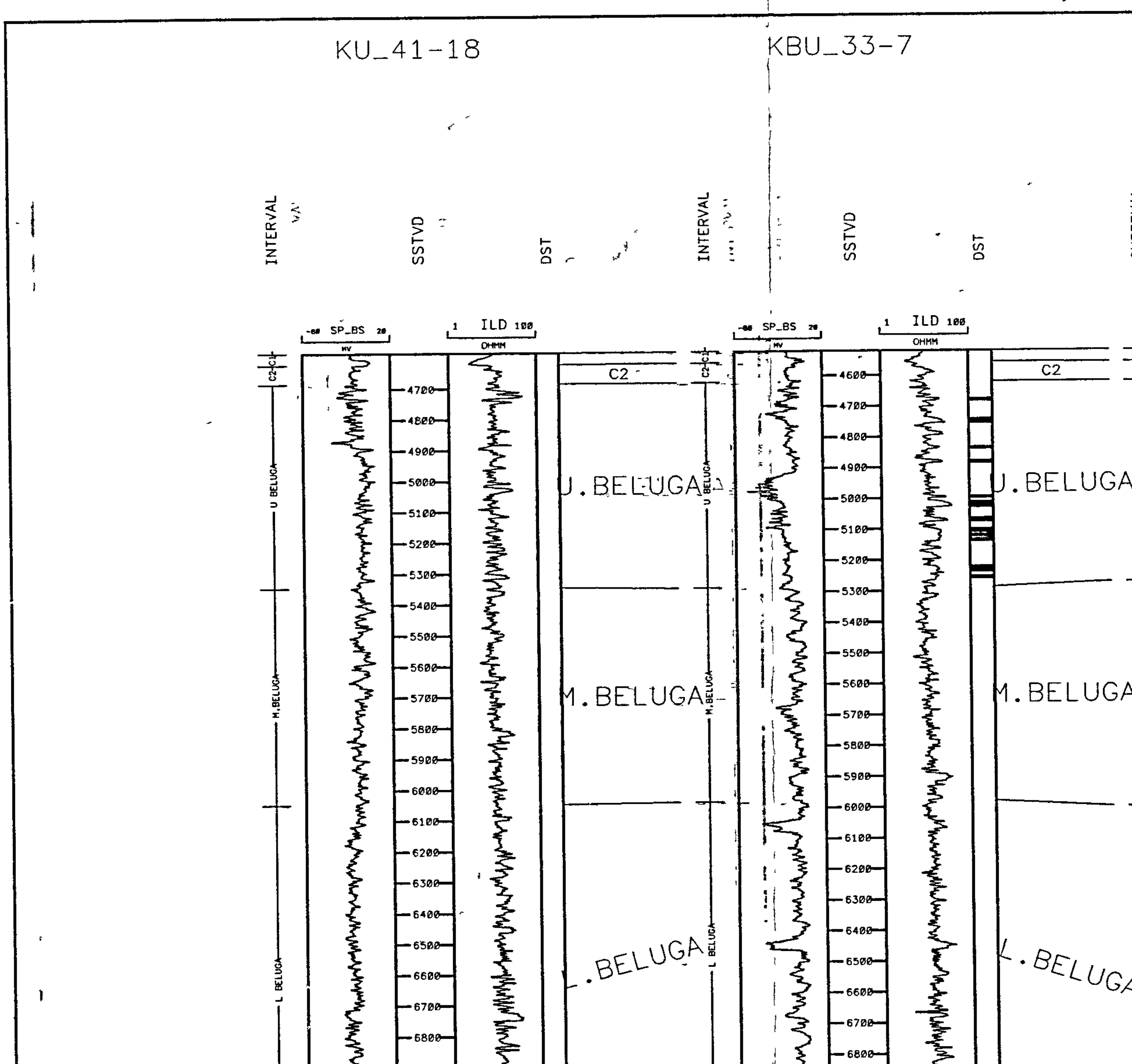
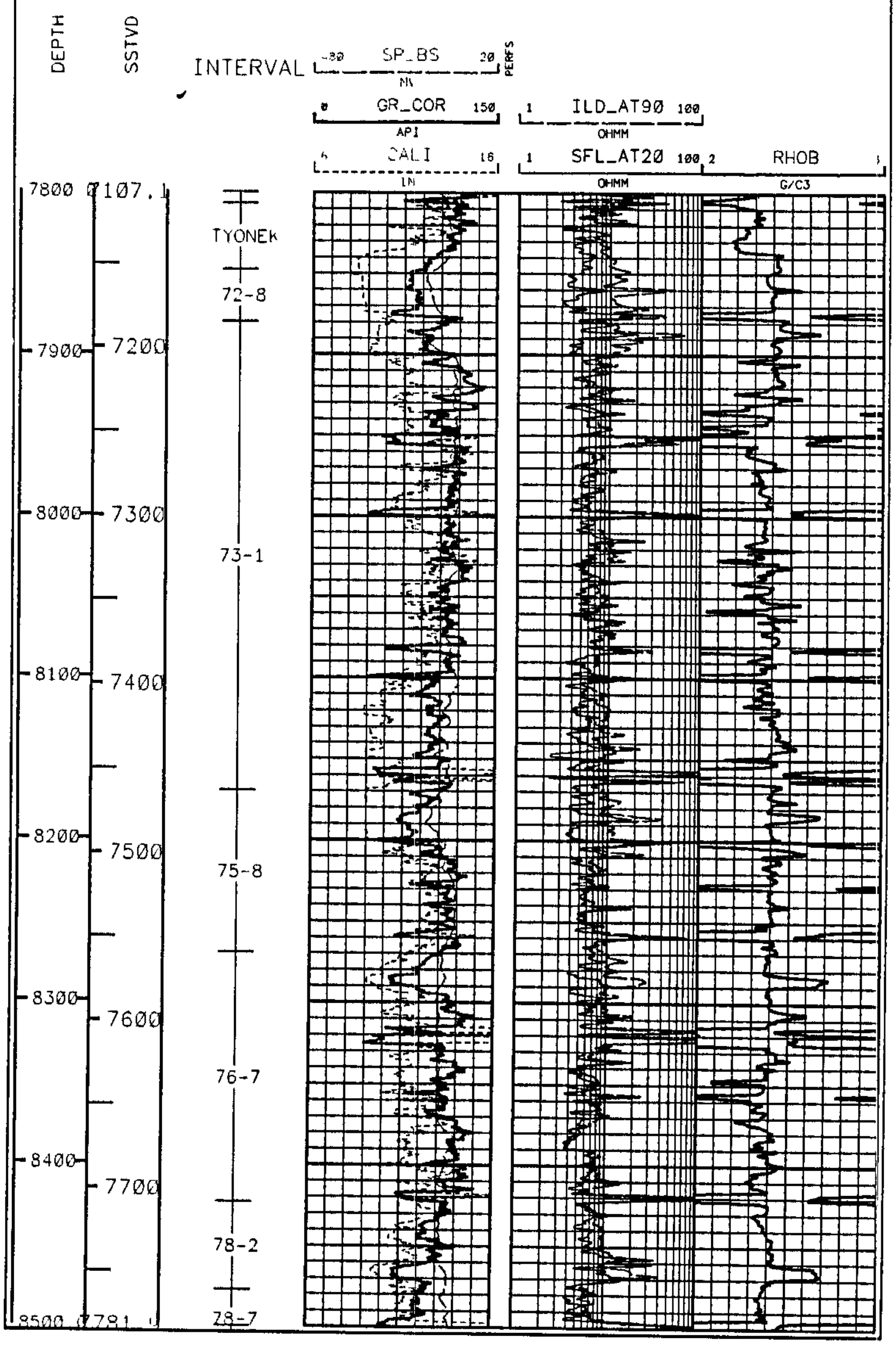
6400
6500
6600
6700

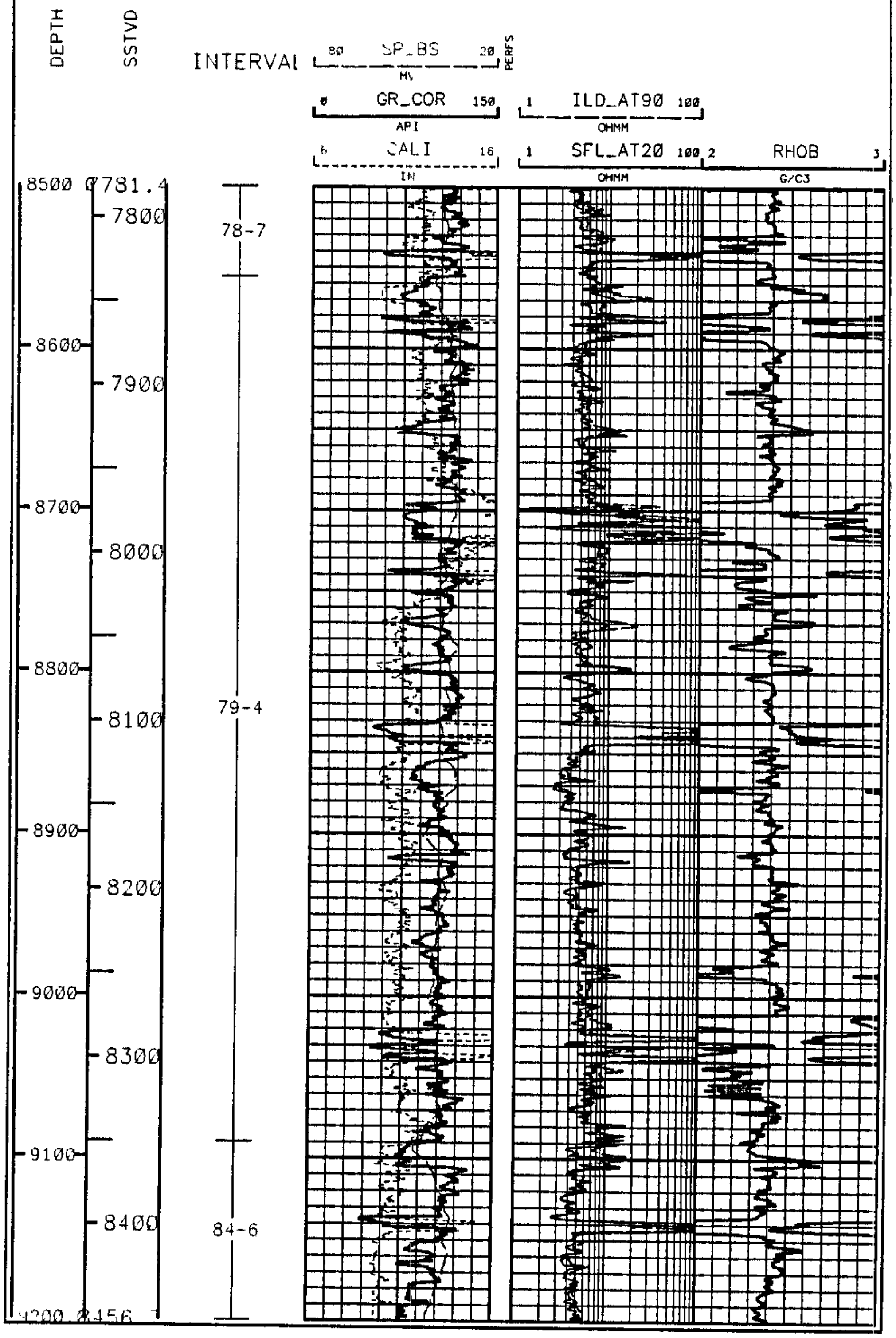


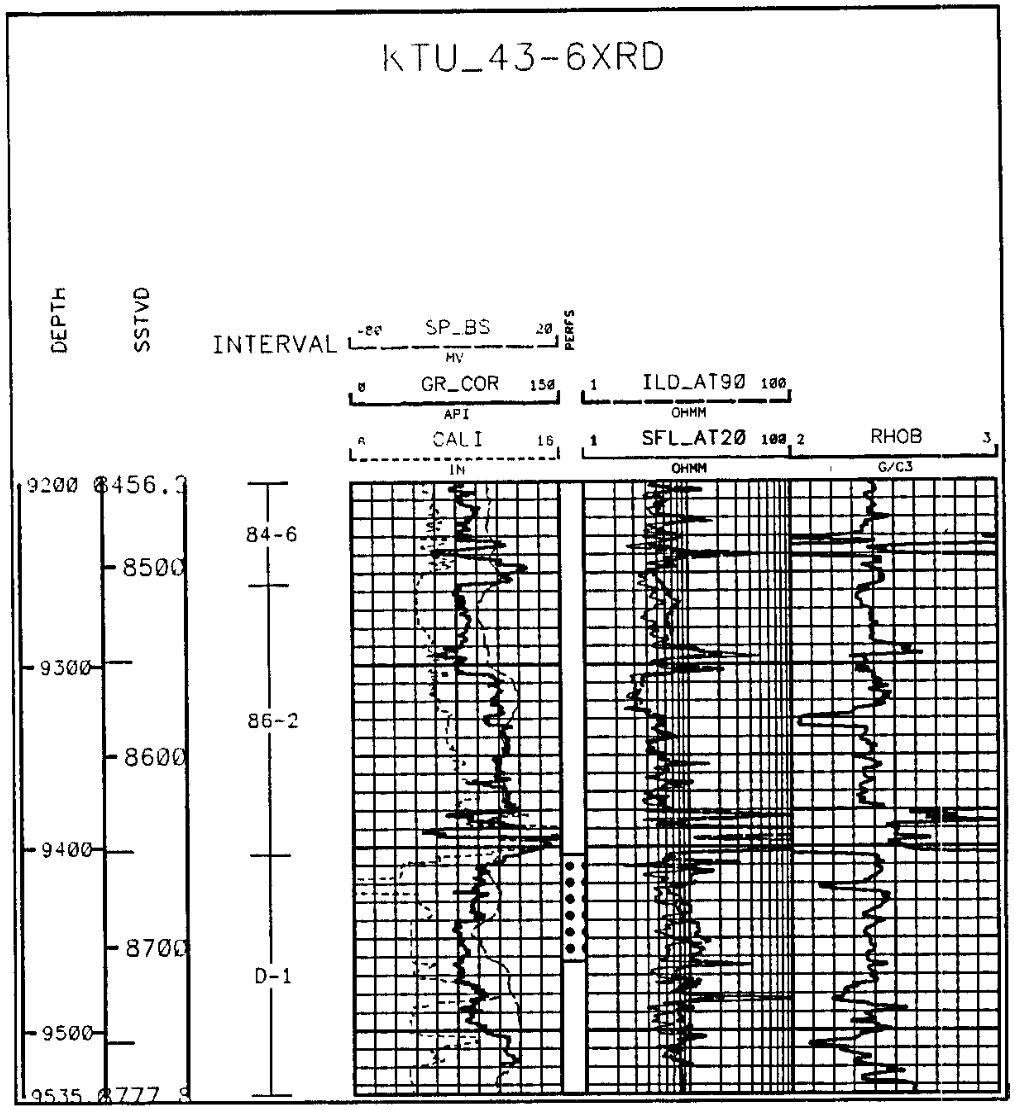
KU_41-18
KBU_33-7
INTERVAL
SSTVD
DST
SP_BS
MV
ILD
OHMM
C2
C1
U. BELUGA
M. BELUGA
L. BELUGA
4600
4700
4800
4900
5000
5100
5200
5300
5400
5500
5600
5700
5800
5900
6000
6100
6200
6300
6400
6500
6600
6700
6800

KTU_43-6XRD

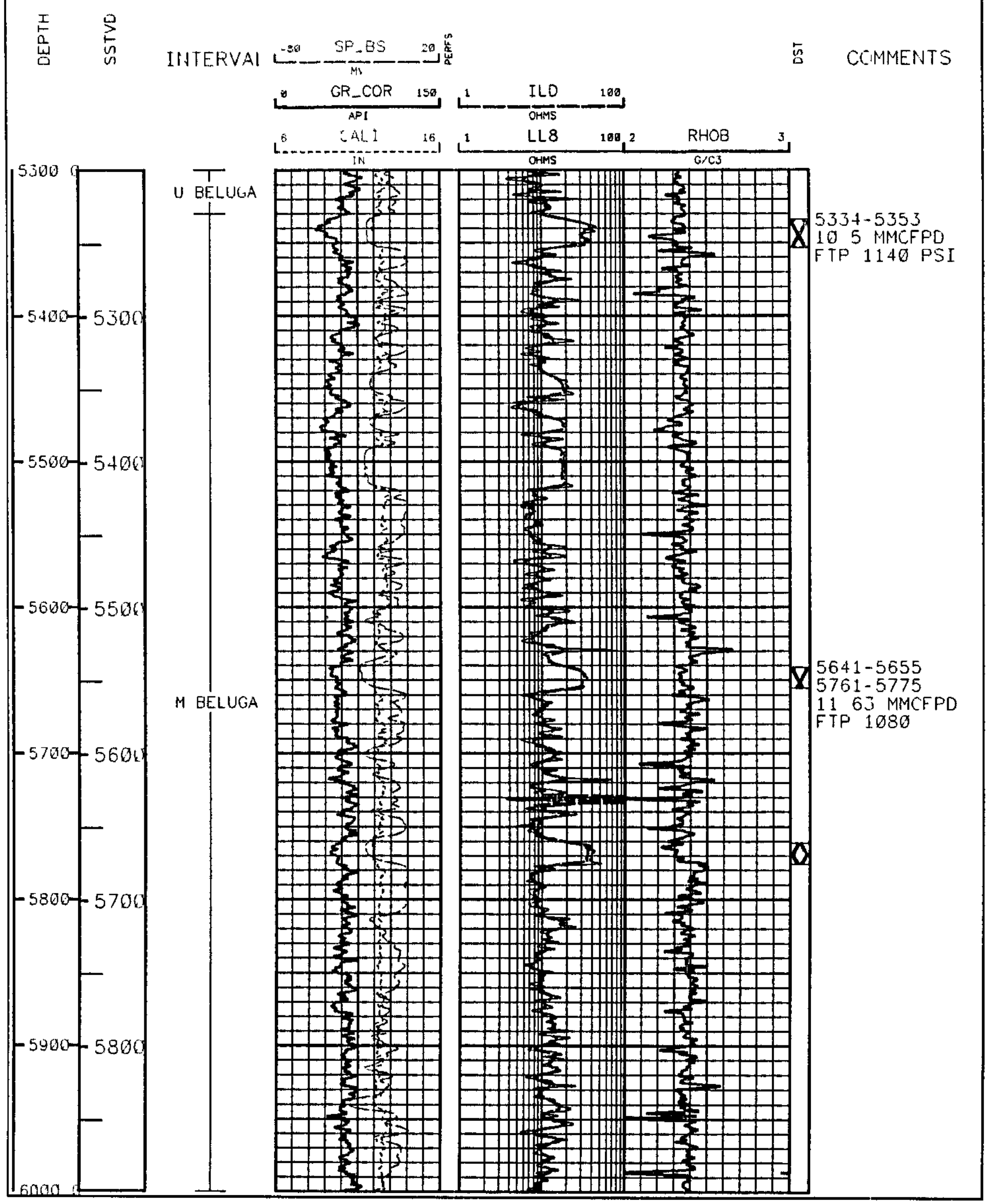

DEPTH
SSTVD
INTERVAL
-80 SP_BS 20
MV
PERFS
0 GR_COR 150
API
1 ILD_AT90 100
OHMM
6 CALI 16
IN
1 SFL_AT20 100
OHMM
2 RHOB 3
G/C3
7800
7107.1
TYONEK
72-8
7900
7200
8000
7300
73-1
8100
7400
8200
7500
75-8
8300
7600
76-7
8400
7700
78-2
8500
7781
78-7

KTU_43-6XRD


DEPTH
SSTVD
INTERVAL
80 SP_BS 20 PERFS
MV
0 GR_COR 150
API
1 ILD_AT90 100
OHMM
6 CALI 16
IN
1 SFL_AT20 100
OHMM
2 RHOB 3
G/C3
8500 7781.4
7800
78-7
8600
7900
8700
8000
8800
8100
79-4
8900
8200
9000
8300
9100
8400
84-6
9200 8456

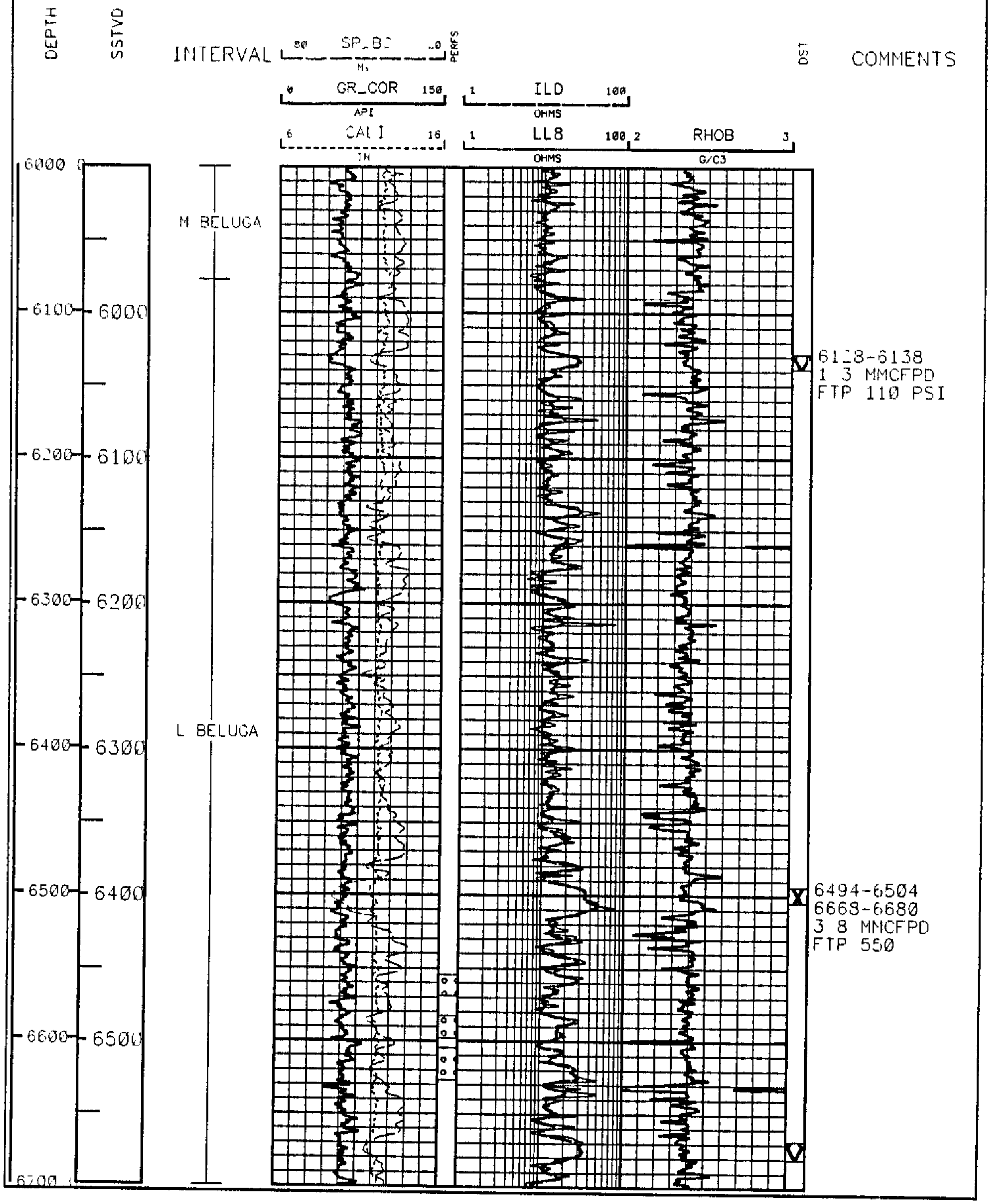

KTU_43-6XRD
DEPTH
SSTVD
INTERVAL
SP_BS -20 20 MV
PERFS
GR_COR 0 150 API
CALI 6 16 IN
ILD_AT90 1 100 OHMM
SFL_AT20 1 100 OHMM
RHOB 2 3 G/C3
9200 8456.3
8500
9300
86-2
8600
9400
8700
D-1
9500
9535 8777
84-6

KBU_41-7

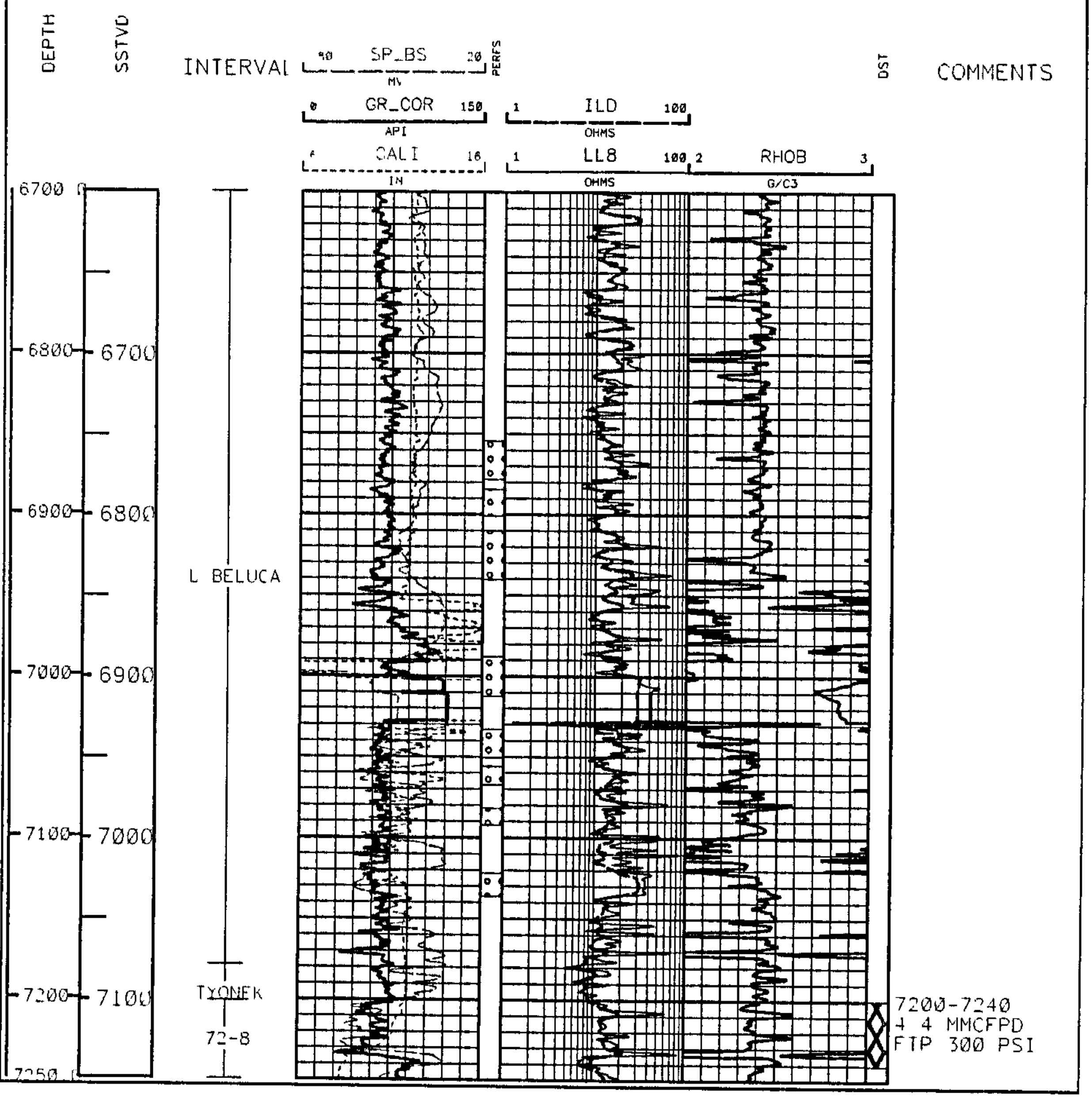


DEPTH
SSTVD
INTERVAL
-80 SP_BS 20
MV
PERFS
0 GR_COR 150
API
6 CALI 16
IN
1 ILD 100
OHMS
1 LL8 100
OHMS
2 RHOB 3
G/C3
DST
COMMENTS
5300
5400 5300
5500 5400
5600 5500
5700 5600
5800 5700
5900 5800
6000
U BELUGA
M BELUGA
5334-5353
10 5 MMCFPD
FTP 1140 PSI
5641-5655
5761-5775
11 63 MMCFPD
FTP 1080

KBU 41-7

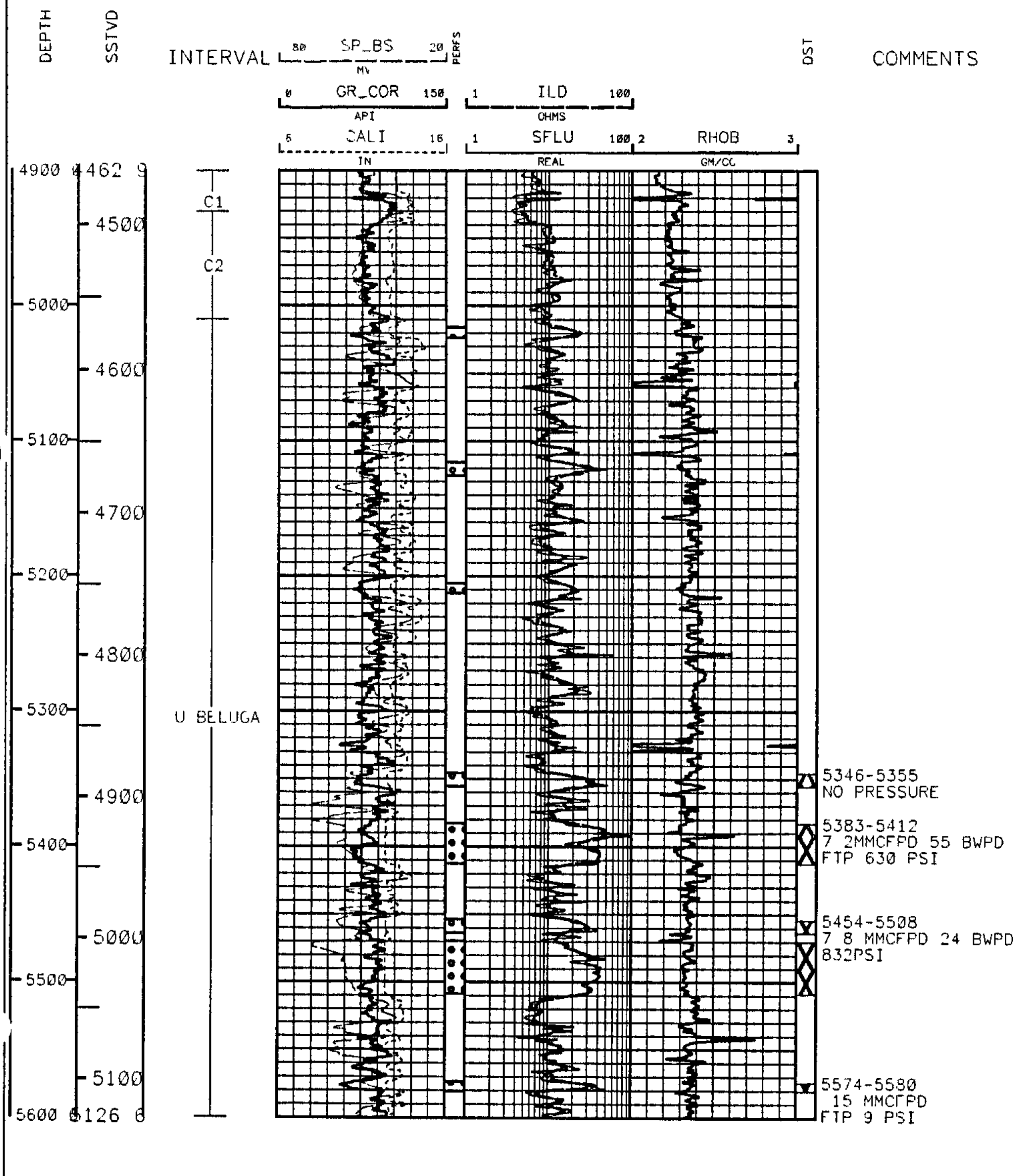

DEPTH
SSTVD
INTERVAL
SP_BC
MV
PERFS
GR_COR
API
CALI
IN
ILD
OHMS
LL8
OHMS
RHOB
G/C3
DST
COMMENTS
6000
6100
6200
6300
6400
6500
6600
6700
M BELUGA
L BELUGA
6128-6138
1 3 MMCFPD
FTP 110 PSI
6494-6504
6668-6680
3 8 MMCFPD
FTP 550

KBU_41-7



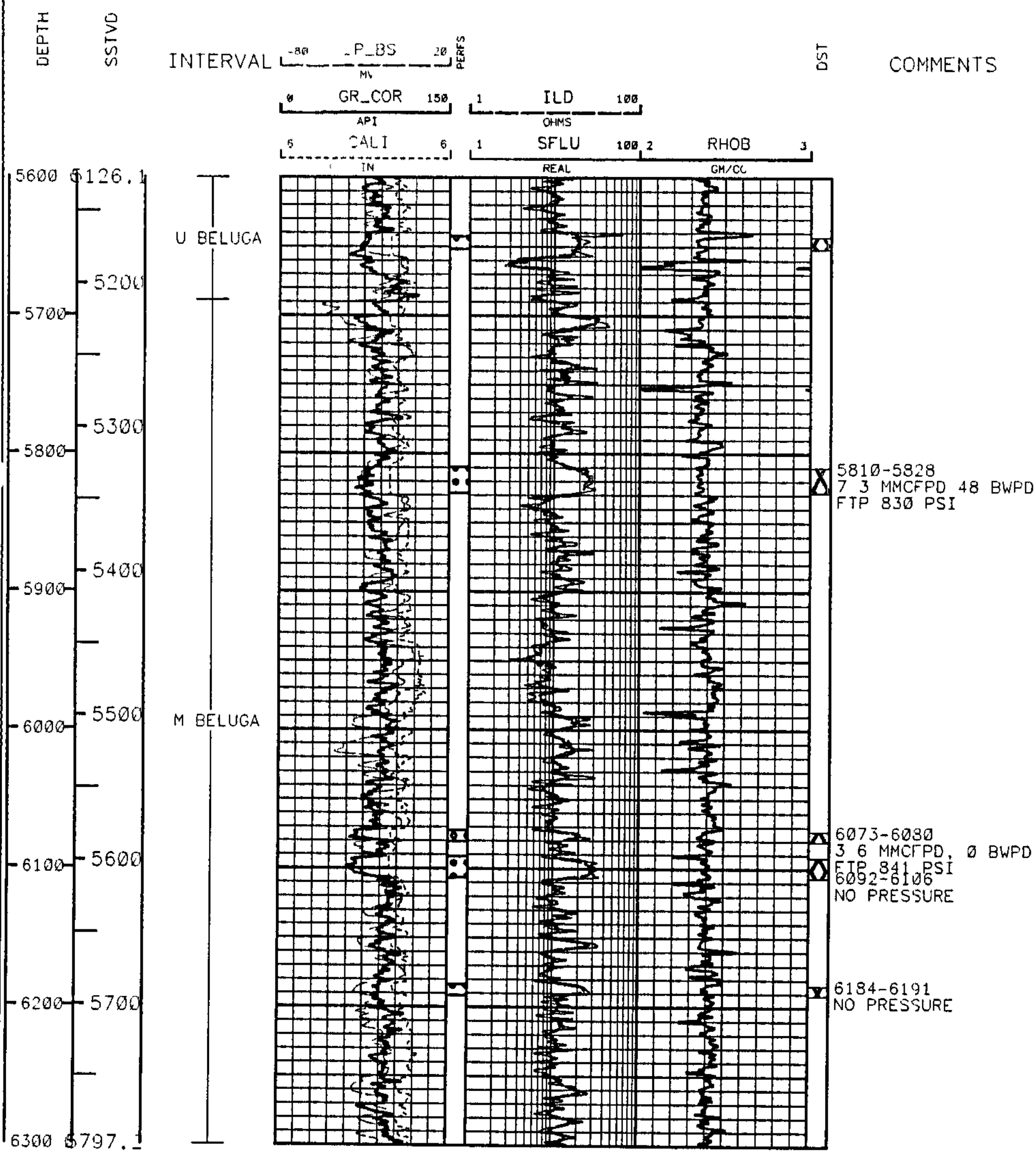
DEPTH
SSTVD
INTERVAL
SP_BS
90
20
MV
PERFS
GR_COR
0
150
API
CALI
6
16
IN
ILD
1
100
OHMS
LL8
1
100
OHMS
RHOB
2
3
G/C3
DST
COMMENTS
6700
6800
6900
7000
7100
7200
7250
6700
6800
6900
7000
7100
L BELUGA
TYONEK
72-8
7200-7240
4 4 MMCFPD
FTP 300 PSI

KBU_31-7

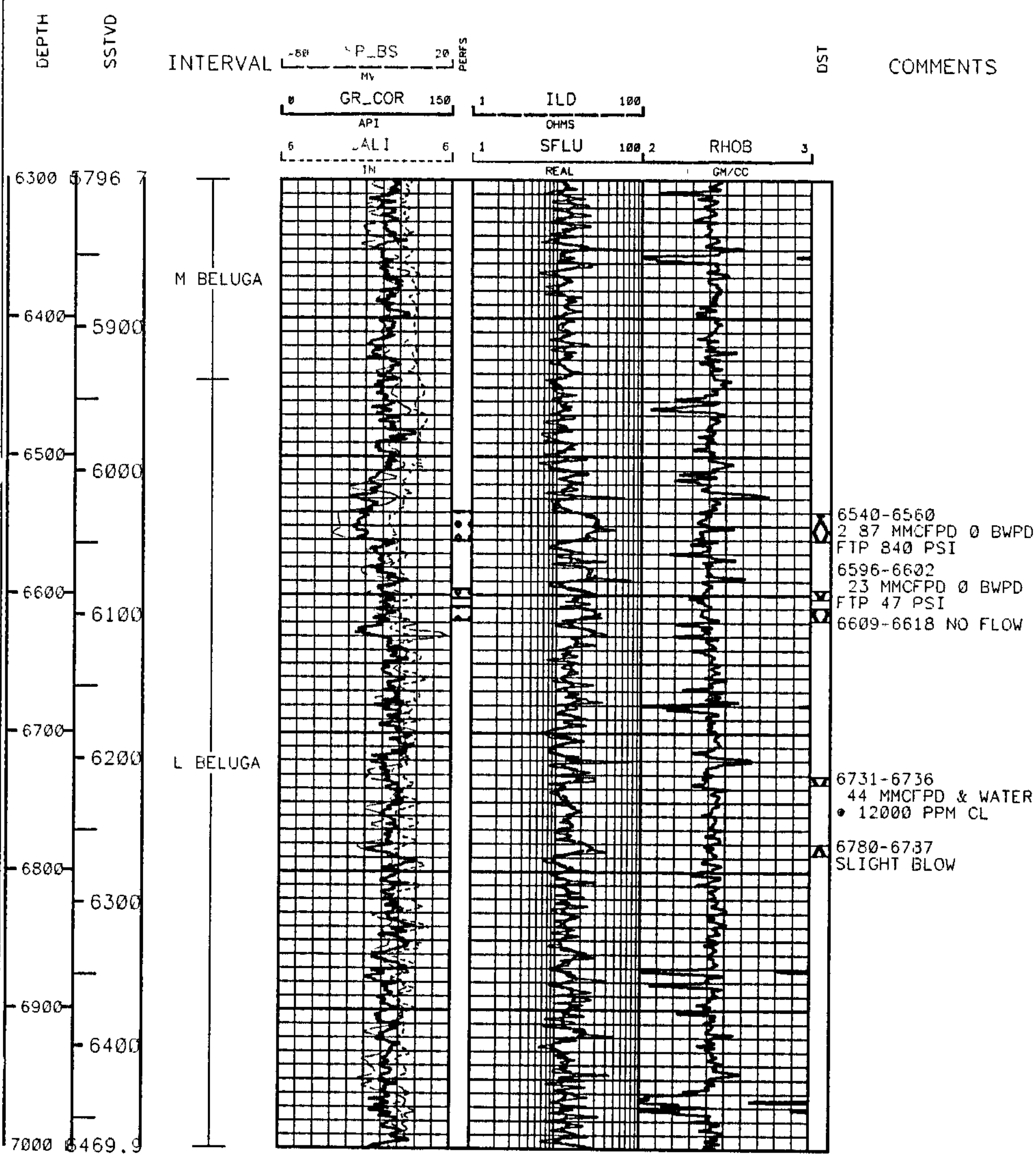


DEPTH
SSTVD
INTERVAL
SP_BS
80
20
MV
PERFS
GR_COR
0
150
API
ILD
1
100
OHMS
CALI
6
16
IN
SFLU
1
100
REAL
RHOB
2
3
GM/CC
DST
COMMENTS
4900
4462 9
4500
5000
4600
5100
4700
5200
4800
5300
4900
5400
5000
5500
5100
5600
5126 6
C1
C2
U BELUGA
5346-5355
NO PRESSURE
5383-5412
7 2MMCFPD 55 BWPD
FTP 630 PSI
5454-5508
7 8 MMCFPD 24 BWPD
832PSI
5574-5580
15 MMCFPD
FTP 9 PSI

KBU_31-7

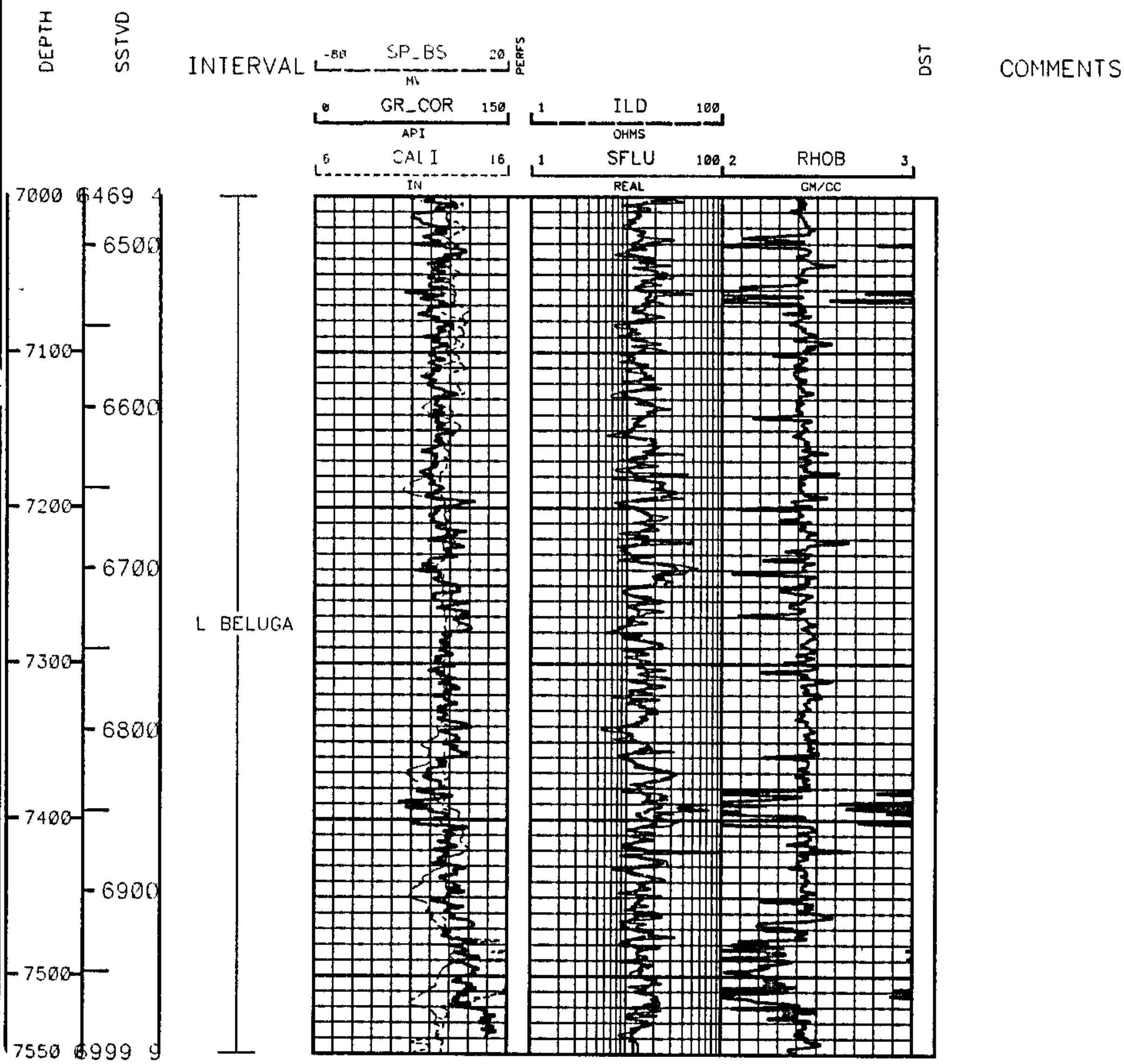

DEPTH
SSTVD
INTERVAL
-80 _P_BS 20
MV
PERFS
0 GR_COR 150
API
6 CALI 6
IN
1 ILD 100
OHMS
1 SFLU 100
REAL
2 RHOB 3
GM/CC
DST
COMMENTS
5600 6126.1
5200
5700
5300
5800
5400
5900
5500
6000
5600
6100
5700
6200
6300 6797.1
U BELUGA
M BELUGA
5810-5828
7 3 MMCFPD 48 BWPD
FTP 830 PSI
6073-6080
3 6 MMCFPD, 0 BWPD
FTP 841 PSI
6092-6106
NO PRESSURE
6184-6191
NO PRESSURE

KBU_31-7



DEPTH
SSTVD
INTERVAL
SP_BS -80 20 MV
PERFS
GR_COR 0 150 API
CALI 6 6 IN
ILD 1 100 OHMS
SFLU 1 100 REAL
RHOB 2 3 GM/CC
DST
COMMENTS
6300 5796.7
6400 5900
6500 6000
6600 6100
6700 6200
6800 6300
6900 6400
7000 6469.9
M BELUGA
L BELUGA
6540-6560
2 87 MMCFPD 0 BWPD
FTP 840 PSI
6596-6602
23 MMCFPD 0 BWPD
FTP 47 PSI
6609-6618 NO FLOW
6731-6736
44 MMCFPD & WATER
12000 PPM CL
6780-6737
SLIGHT BLOW

KBU_31-7



DEPTH
SSTVD
INTERVAL
-80 SP_BS 20
MV
PERFS
0 GR_COR 150
API
6 CALI 16
IN
1 ILD 100
OHMS
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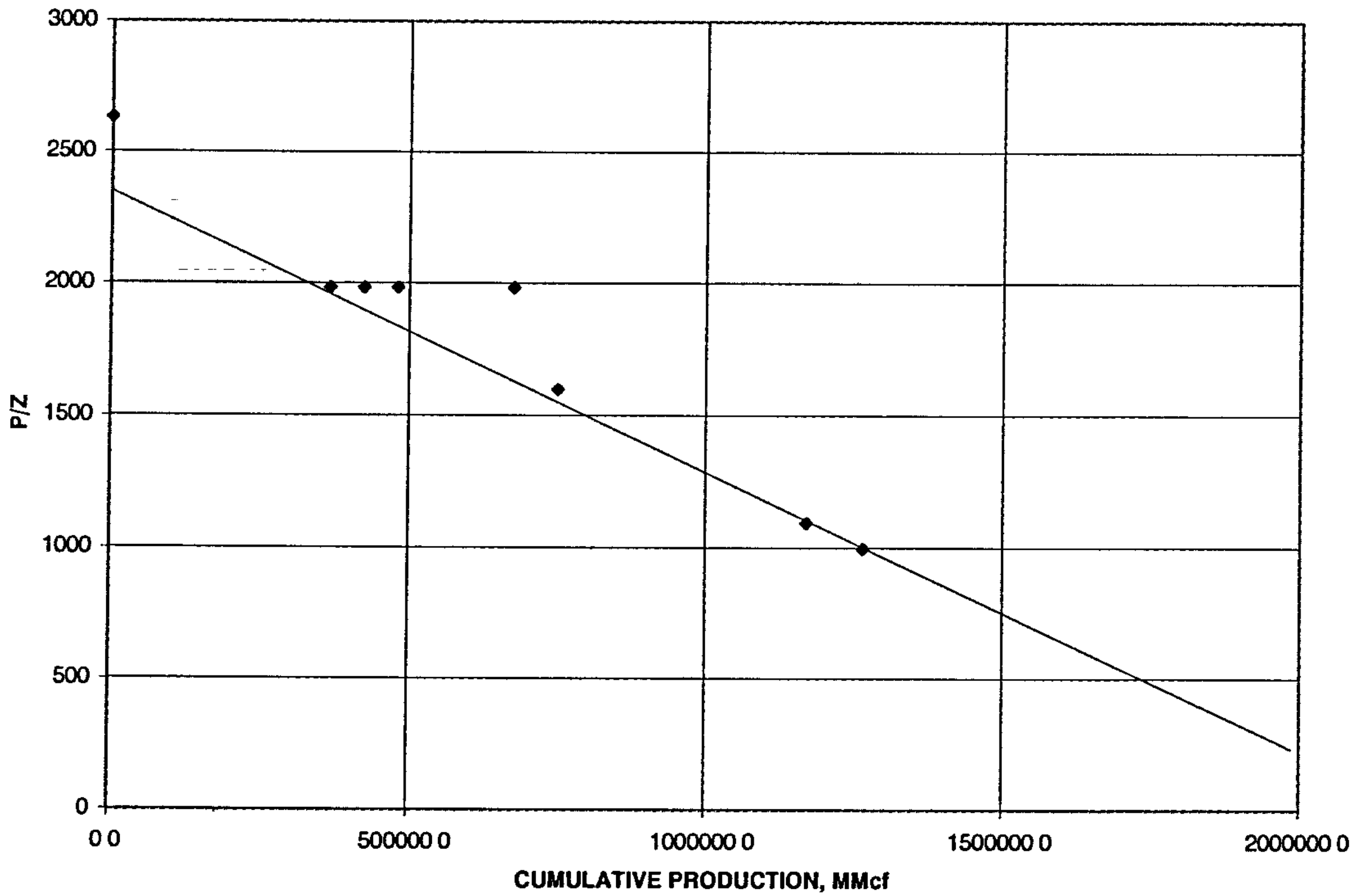
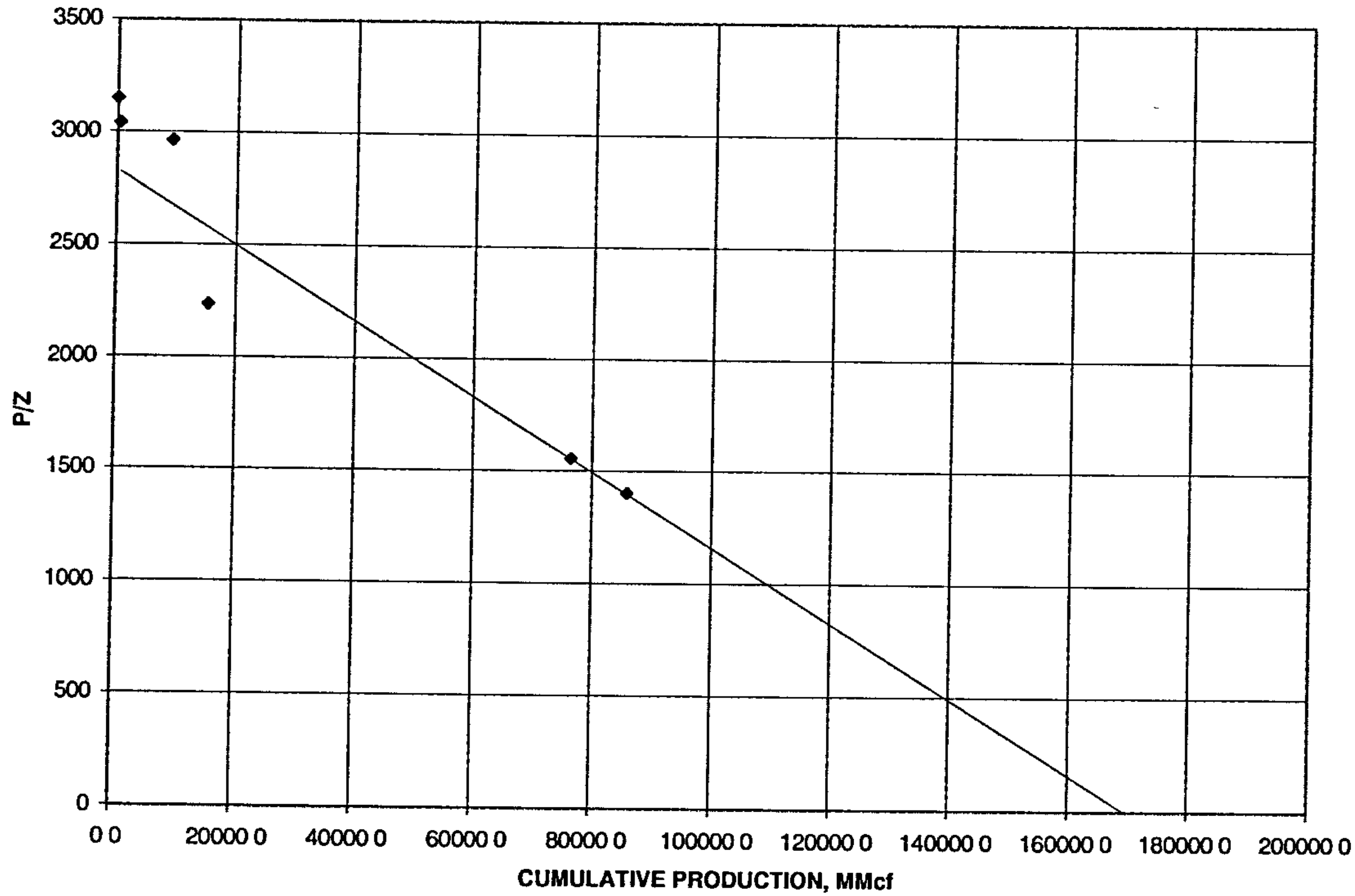
REAL
2 RHOB 3
GM/CC
DST
COMMENTS
7000 6469 4
6500
7100
6600
7200
6700
L BELUGA
7300
6800
7400
6900
7500
7550 6999 9

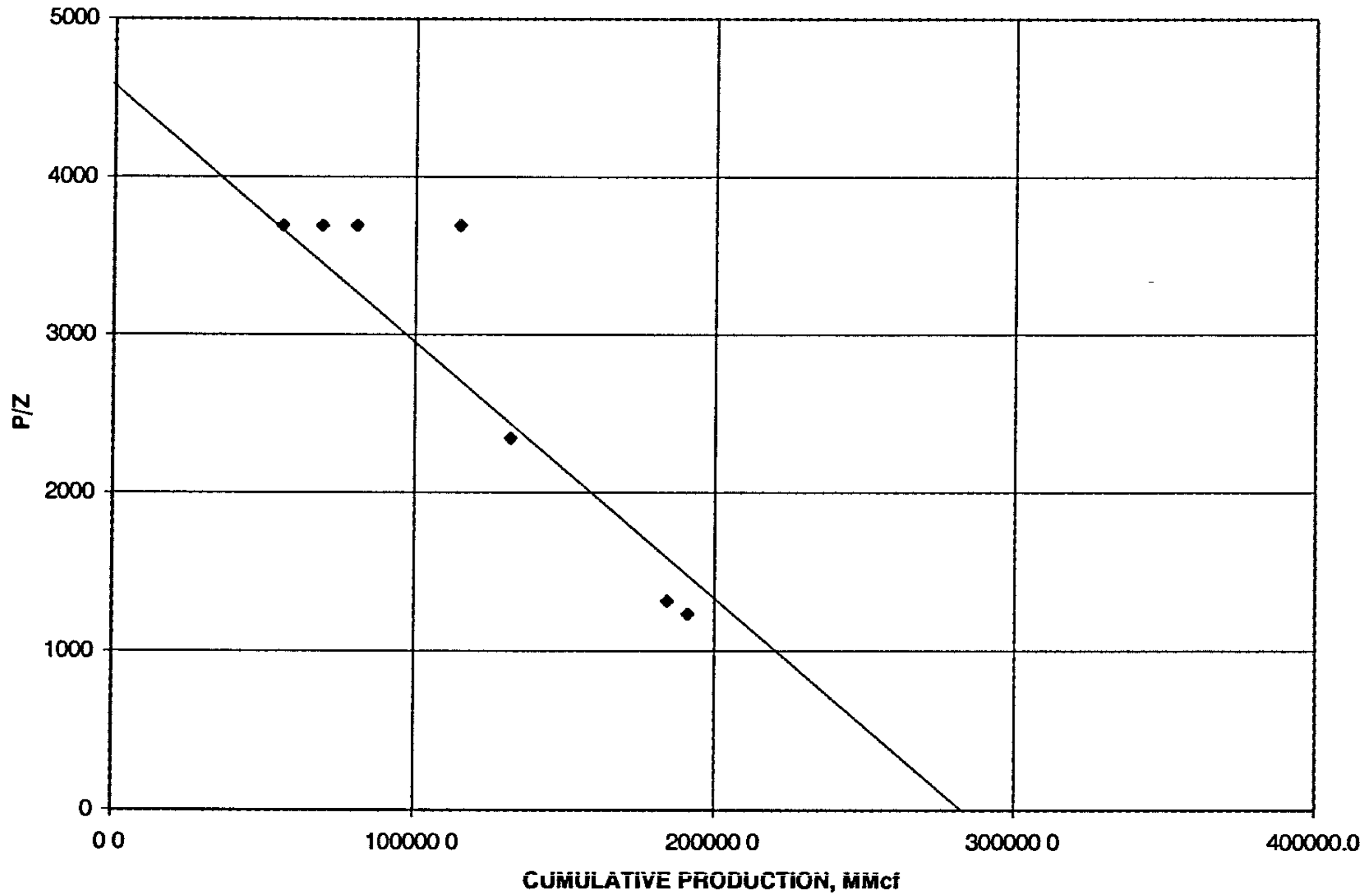
KENAI - STERLING

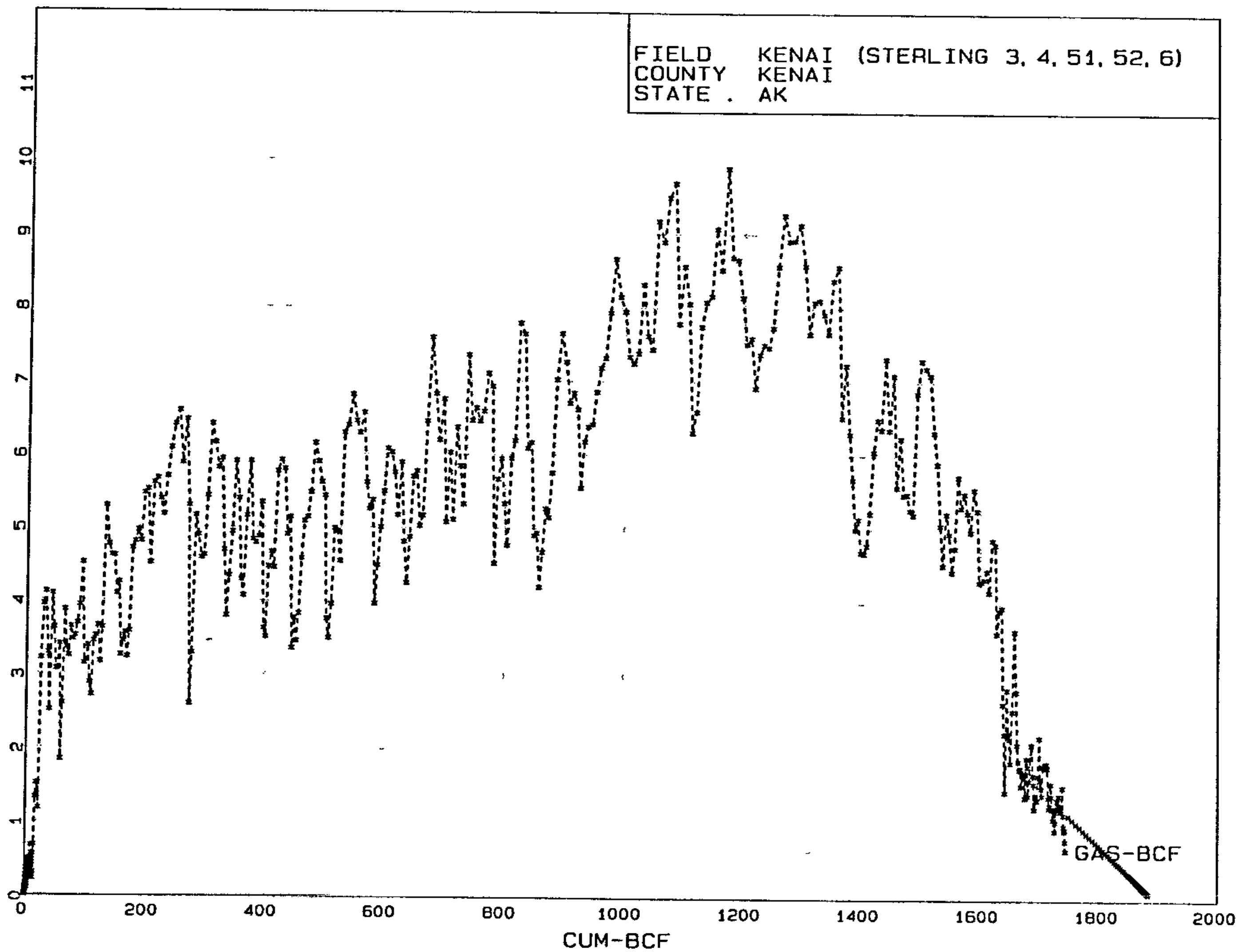


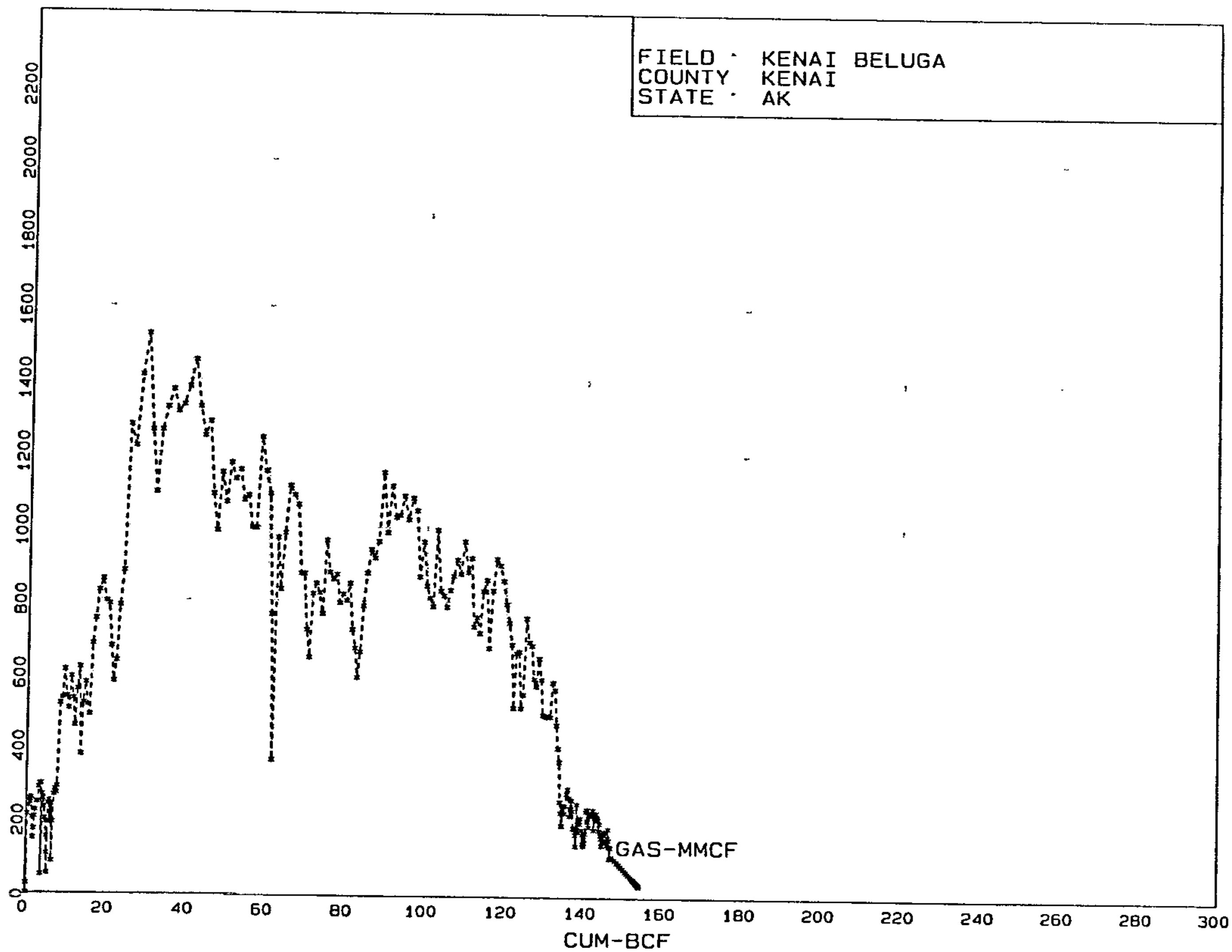
KENAI - BELUGA



KENAI - TYONEK




FIELD KENAI (STERLING 3, 4, 51, 52, 6)
COUNTY KENAI
STATE . AK
0
1
2
3
4
5
6
7
8
9
10
11
0
200
400
600
800
1000
1200
1400
1600
1800
2000
CUM-BCF
GAS-BCF


FIELD: KENAI BELUGA
COUNTY KENAI
STATE: AK
GAS-MMCF
CUM-BCF
0
200
400
600
800
1000
1200
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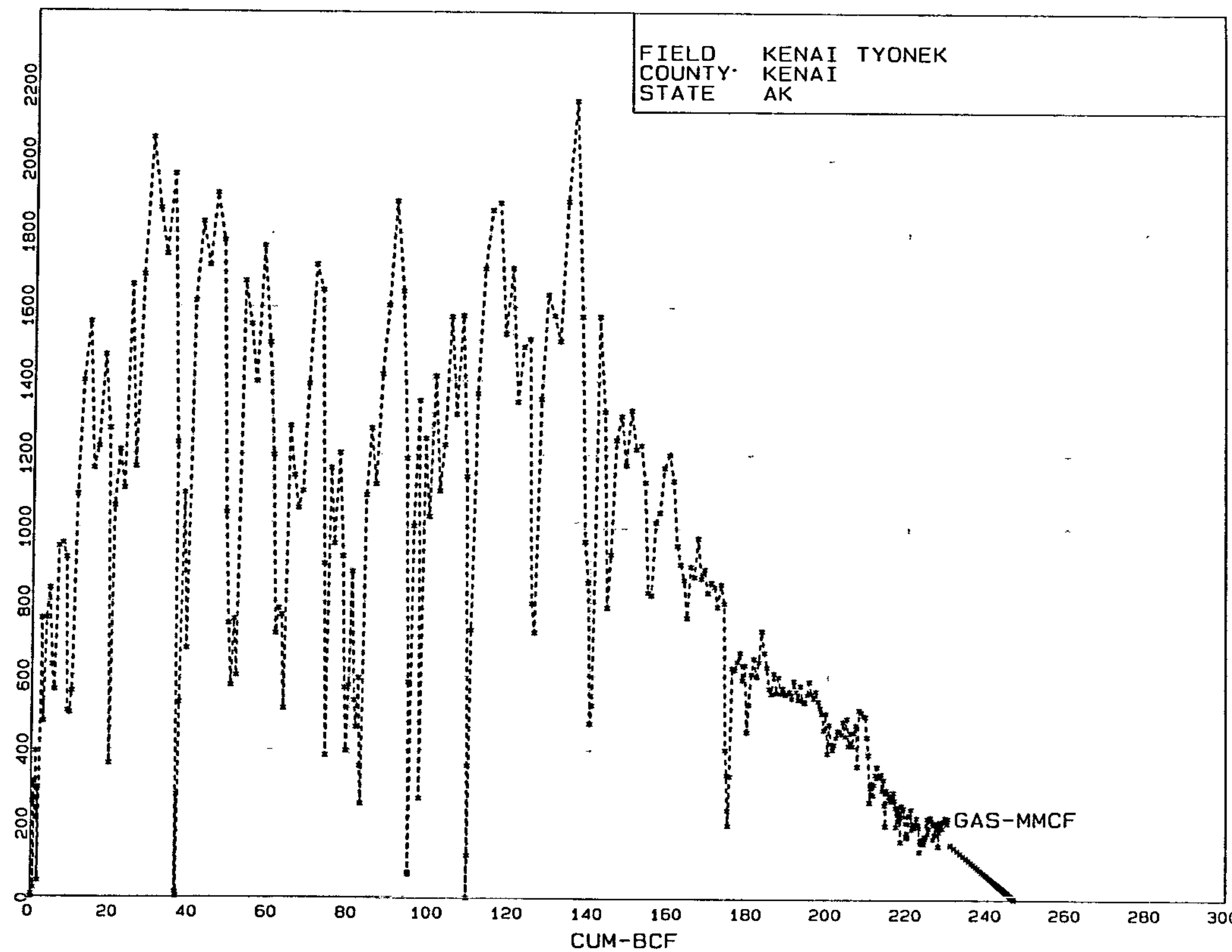
220
240
260
280
300


FIELD KENAI TYONEK
COUNTY KENAI
STATE AK
GAS-MMCF
CUM-BCF
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300

KENAI GAS FIELD-STERLING FORMATION

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	Pi	Pc	S G	TEMP	CUM PROD	P/Z
										0 0	2632
1971	UNOCAL	14-6	10/11/59	STERLING	25 FLWG/4 SI	1862-2505	NA	0 56	102-105	306025 9	
1972	UNOCAL	14-6	10/11/59	STERLING	25 FLWG/5 SI	1862-2505	1622-1735	0 56	102-105	366470 3	1985
1973	UNOCAL	14-6	10/11/59	STERLING	26 FLWG/4 SI	1862-2505	1622-1735	0 56	102-105	424613 3	1985
1974	UNOCAL	14-6	10/11/59	STERLING	27 FLWG/5 SI	1862-2505	1622-1735	0 56	102-105	481305 7	1985
1977	UNOCAL	14-6	10/11/59	STERLING	30 FLWG/3 SI	1862-2505	1622-1735	0 56	103-109	676540 4	1985
1978	UNOCAL	14-6	10/11/59	STERLING	30 FLWG/1 SI	1862-2505	1340-1430	0 56	103-109	750533 2	1601
1983	UNOCAL	14-6	10/11/59	STERLING	46 FLWG/6 SI	1862-2505	940-1025	0 56	103-109	1170608 9	1095
1984	UNOCAL	14 6	10/11/59	STERLING	47 FLWG/6 SI	1862-2505	875-930	0 56	103-109	1266022 2	998
1990	UNOCAL	14-6	10/11/59	STERLING	37 FLWG/? SI	1862-2505	NA	0 56	91-100	1660369 6	
1991	UNOCAL	14-6	10/11/59	STERLING	34 FLWG/? SI	1862-2505	NA	0 56	91-100	1681076 1	
1992	UNOCAL	14-6	10/11/59	STERLING	35 FLWG/? SI	1862-2505	NA	0 56	91-100	1700879 8	
1994	UNOCAL	14-6	10/11/59	STERLING	29 FLWG/24 SI	1862-2505	NA	0 56	91-100	1734330 0	

KENAI GAS FIELD-BELUGA FORMATION

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	Pi	Pc	S G	TEMP	CUM PROD	P/Z
										0 0	3148
1974	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	1 FLWG	2592	2500	NA	98	475 4	3040
1977	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	2 FLWG	2558	2500	0 56	115	9274 2	2965
1978	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	2 FLWG	2558	1900	0 56	115	15521 6	2237
1983	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	4 FLWG/1 SI	2558	1362	0 56	115	76467 6	1557
1984	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	5 FLWG	2558	1240	0 56	115	85853 2	1404
1990	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	5 FLWG	2558	NA	0 56	100	136299 7	
1991	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	5 FLWG	2558	NA	0 56	100	138765 4	
1992	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	5 FLWG	2558	NA	0 56	100	140987 5	
1994	UNOCAL	14-6	10/11/59	BELUGA UNDEFINE	4 FLWG/3 SI	2558	NA	0 56	100	145648 8	

KENAI GAS FIELD-TYONEK FORMATION

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	Pi	Pc	S G	TEMP	CUM PROD	P/Z
											4635
1970	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	NA	0 56	143	29382 9	
1972	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	3300	0 56	143	55961 4	3697
1973	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	3300	0 56	143	69163 4	3697
1974	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	3300	0.56	143	80480 4	3697
1977	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	3300	0 56	143	114974 4	3697
1978	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	2050	0 56	143	132023 9	2346
1983	UNOCAL	14-6	10/11/59	TYONEK	3 FLWG	4416	1195	0 56	143	184559 1	1319
1984	UNOCAL	14-6	10/11/59	TYONEK	4 FLWG	4416	1125	0 56	143	191375 5	1236
1990	UNOCAL	14-6	10/11/59	TYONEK	2 FLWG	4416	NA	0 56	143	219120 0	
1991	UNOCAL	14-6	10/11/59	TYONEK	4 FLWG	4416	NA	0 56	156	221528 4	
1992	UNOCAL	14-6	10/11/59	TYONEK	4 FLWG	4416	NA	0 56	156	223689 4	
1994	UNOCAL	14-6	10/11/59	TYONEK	4 FLWG	4416	NA	0 56	156	228257 5	

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FIELD RESERVOIR KENAI (STERLING 3,4,51,52,6)
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P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	0	0	0	0 00	0	0
1/60	0	0	0	0	0 00	0	0
2/60	0	0	0	0	0 00	0	0
3/60	0	0	0	0	0 00	0	0
4/60	0	0	0	0	0 00	0	0
5/60	0	0	0	0	0 00	0	0
6/60	0	0	0	0	0 00	0	0
7/60	0	0	0	0	0 00	0	0
8/60	0	0	0	0	0 00	0	0
9/60	0	0	0	0	0 00	0	0
10/60	0	0	0	0	0 00	0	0
11/60	0	16576	0	0	0 00	0	16,576
12/60	0	898	0	0	0 00	0	17,474
TOT/60	0	17474	0	0		0	17,474
1/61	0	0	0	0	0 00	0	17 474
2/61	0	0	0	0	0 00	0	17,474
3/61	0	0	0	0	0 00	0	17,474
4/61	0	0	0	0	0 00	0	17,474
5/61	0	0	0	0	0 00	0	17,474
6/61	0	0	0	0	0 00	0	17,474
7/61	0	27847	0	0	0 00	0	45,321
8/61	0	8997	0	0	0 00	0	54,318
9/61	0	0	0	0	0 00	0	54,318
10/61	0	25211	0	0	0 00	0	79,529
11/61	0	61603	0	0	0 00	0	141,132
12/61	0	91060	0	0	0 00	0	232,192
TOT/61	0	214718	0	0		0	232,192
1/62	0	102541	0	0	0 00	0	334,733
2/62	0	97670	0	0	0 00	0	432,403
3/62	0	120991	0	0	0 00	0	553,394
4/62	0	101015	0	0	0 00	0	654,409
5/62	0	87010	0	0	0 00	0	741,419
6/62	0	70025	0	0	0 00	0	811,444
7/62	0	71217	0	0	0 00	0	882,661
8/62	0	80614	0	0	0 00	0	963,275
9/62	0	111985	0	0	0 00	0	1,075,260
10/62	0	144915	0	0	0 00	0	1,220,175
11/62	0	204400	0	0	0 00	0	1,424,575
12/62	0	267792	0	0	0 00	0	1,692,367
TOT/62	0	1460175	0	0		0	1,692,367
1/63	0	360987	0	0	0 00	0	2,053,354
2/63	0	272432	0	0	0 00	0	2,325,786
3/63	0	347249	0	0	0 00	0	2,673,035
4/63	0	316364	0	0	0 00	0	2,989,399
5/63	0	243924	0	0	0 00	0	3,233,323
6/63	0	202081	0	0	0 00	0	3,435,404
7/63	0	93666	0	0	0 00	0	3,529,070
8/63	0	107963	0	0	0 00	0	3,637,033
9/63	0	133753	0	0	0 00	0	3,770,786
10/63	0	236330	0	0	0 00	0	4,007,116
11/63	0	363646	0	0	0 00	0	4,370,762
12/63	0	427144	0	0	0 00	0	4,797,906
TOT/63	0	3105539	0	0		0	4,797,906
TOTAL	0	4797906	0	0		0	4,797,906

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	4797906	0	0	0 00	0	4,797,906
1/64	0	487886	0	0	0 00	0	5,285,792
2/64	0	445878	0	0	0 00	0	5,731 670
3/64	0	449584	0	0	0 00	0	6,181,254
4/64	0	347389	0	0	0 00	0	6,528,643
5/64	0	326339	0	0	0 00	0	6,854,982
6/64	0	236537	0	0	0 00	0	7,091,519
7/64	0	231210	0	0	0 00	0	7,322,729
8/64	0	229951	0	0	0 00	0	7,552,680
9/64	0	224983	0	0	0 00	0	7,777 663
10/64	0	337024	0	0	0 00	0	8,114,687
11/64	0	501880	0	0	0 00	0	8,616,567
12/64	0	674509	0	0	0 00	0	9,291,076
TOT/64	0	4493170	0	0		0	9,291,076
1/65	0	497394	0	0	0 00	0	9,788,470
2/65	0	566938	0	0	0 00	0	10,355,408
3/65	0	399553	0	0	0 00	0	10,754,961
4/65	0	476254	0	0	0 00	0	11,231,215
5/65	0	430430	0	0	0 00	0	11,661,645
6/65	0	291516	0	0	0 00	0	11,953,161
7/65	0	223301	0	0	0 00	0	12,176,462
8/65	0	224405	0	0	0 00	0	12,400,867
9/65	0	311374	0	0	0 00	0	12,712,241
10/65	0	556492	0	0	0 00	0	13,268,733
11/65	0	680008	0	0	0 00	0	13,948,741
12/65	0	1327677	0	0	0 00	0	15,276,418
TOT/65	0	5985342	0	0		0	15,276,418
1/66	0	1517184	0	0	0 00	0	16,793,602
2/66	0	1349588	0	0	0 00	0	18,143,190
3/66	0	1509648	0	0	0 00	0	19,652,838
4/66	0	1178648	0	0	0 00	0	20,831,486
5/66	0	3208892	0	0	0 00	0	24,040,378
6/66	0	3942082	0	0	0 00	0	27,982,460
7/66	0	4108283	0	0	0 00	0	32,090,743
8/66	0	3282722	0	0	0 00	0	35,373,465
9/66	0	2509474	0	0	0 00	0	37,882,939
10/66	0	4084813	0	0	0 00	0	41,967,752
11/66	0	3623279	0	0	0 00	0	45,591,031
12/66	0	3060347	0	0	0 00	0	48,651,378
TOT/66	0	33374960	0	0		0	48,651,378
1/67	0	3076916	0	0	0 00	0	51,728,294
2/67	0	3398579	0	0	0 00	0	55,126,873
3/67	0	1841657	0	0	0 00	0	56,968,530
4/67	0	2600545	0	0	0 00	0	59,569,075
5/67	0	3865950	0	0	0 00	0	63,435,025
6/67	0	3353417	0	0	0 00	0	66,788,442
7/67	0	3243472	0	0	0 00	0	70,031,914
8/67	0	3636678	0	0	0 00	0	73,668,592
9/67	0	3466356	0	0	0 00	0	77,134,948
10/67	0	3514848	0	0	0 00	0	80,649,796
11/67	0	3684544	0	0	0 00	0	84,334,340
12/67	0	3933002	0	0	0 00	0	88,267,342
TOT/67	0	39615964	0	0		0	88,267,342
TOTAL	0	88267342	0	0		0	88,267,342

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	88267342	0	0	0 00	0	88,267,342
1/68	0	4508134	0	0	0 00	0	92 775 476
2/68	0	3144127	0	0	0 00	0	95,919,603
3/68	0	3178917	0	0	0 00	0	99,098 520
4/68	0	3381556	0	0	0 00	0	102,480,076
5/68	0	2884736	0	0	0 00	0	105 364,812
6/68	0	2714746	0	0	0 00	0	108,079,558
7/68	0	3443606	0	0	0 00	0	111,523,164
8/68	0	3513311	0	0	0 00	0	115,036,475
9/68	0	3653203	0	0	0 00	0	118,689,678
10/68	0	3167378	0	0	0 00	0	121,857,056
11/68	0	3628637	0	0	0 00	0	125,485,693
12/68	0	5280132	0	0	0 00	0	130,765,825
TOT/68	0	42498483	0	0		0	130,765,825
1/69	0	4758283	0	0	0 00	0	135,524,108
2/69	0	4612189	0	0	0 00	0	140,136,297
3/69	0	4605797	0	0	0 00	0	144,742,094
4/69	0	4089379	0	0	0 00	0	148,831,473
5/69	0	4245380	0	0	0 00	0	153,076,853
6/69	0	3258293	0	0	0 00	0	156,335,146
7/69	0	3446613	0	0	0 00	0	159,781,759
8/69	0	3558408	0	0	0 00	0	163,340,167
9/69	0	3237152	0	0	0 00	0	166 577,319
10/69	0	3578896	0	0	0 00	0	170,156,215
11/69	0	4706909	0	0	0 00	0	174,863,124
12/69	0	4799735	0	0	0 00	0	179,662,859
TOT/69	0	48897034	0	0		0	179,662,859
1/70	0	4953226	0	0	0 00	0	184,616,085
2/70	0	4805498	0	0	0 00	0	189,421,583
3/70	0	5457552	0	0	0 00	0	194,879,135
4/70	0	5507512	0	0	0 00	0	200,386,647
5/70	0	4510077	0	0	0 00	0	204,896,724
6/70	0	5599146	0	0	0 00	0	210,495,870
7/70	0	5655229	0	0	0 00	0	216,151,099
8/70	0	5378118	0	0	0 00	0	221,529,217
9/70	0	5168927	0	0	0 00	0	226,698,144
10/70	0	5686563	0	0	0 00	0	232,384,707
11/70	0	6076392	0	0	0 00	0	238,461,099
12/70	0	6397385	0	0	0 00	0	244,858,484
TOT/70	0	65195625	0	0		0	244,858,484
1/71	0	6578483	0	0	0 00	0	251,436,967
2/71	0	5871882	0	0	0 00	0	257,308,849
3/71	0	6458537	0	0	0 00	0	263,767,386
4/71	0	5291191	0	0	0 00	0	269,058,577
5/71	0	2603765	0	0	0 00	0	271,662,342
6/71	0	3293877	0	0	0 00	0	274,956,219
7/71	0	5155627	0	0	0 00	0	280,111,846
8/71	0	4888951	0	0	0 00	0	285,000,797
9/71	0	4582405	0	0	0 00	0	289,583,202
10/71	0	4616957	0	0	0 00	0	294,200,159
11/71	0	5424368	0	0	0 00	0	299,624,527
12/71	0	6400381	0	0	0 00	0	306,024,908
TOT/71	0	61166424	0	0		0	306,024,908
TOTAL	0	306024908	0	0		0	306,024,908

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	306024908	0	0	0 00	0	306,024,908
1/72	0	6146640	0	0	0 00	0	312,171,548
2/72	0	5806390	0	0	0 00	0	317,977,938
3/72	0	5929093	0	0	0 00	0	323 907,031
4/72	0	4686115	0	0	0 00	0	328,593,146
5/72	0	3799736	0	0	0 00	0	332 392 882
6/72	0	4338938	0	0	0 00	0	336,731 820
7/72	0	4937459	0	0	0 00	0	341,669 279
8/72	0	5894063	0	0	0 00	0	347 563,342
9/72	0	5389781	0	0	0 00	0	352,953,123
10/72	0	4289229	0	0	0 00	0	357,242,352
11/72	0	4072058	0	0	0 00	0	361,314,410
12/72	0	5155933	0	0	0 00	0	366,470,343
TOT/72	0	60445435	0	0		0	366,470,343
1/73	0	5898279	0	0	0 00	0	372,368,622
2/73	0	4836800	0	0	0 00	0	377,205,422
3/73	0	4789743	0	0	0 00	0	381,995,165
4/73	0	4872297	0	0	0 00	0	386,867,462
5/73	0	5338530	0	0	0 00	0	392,205,992
6/73	0	3631872	0	0	0 00	0	395,837,864
7/73	0	3515642	0	0	0 00	0	399,353,506
8/73	0	4469427	0	0	0 00	0	403,822,933
9/73	0	4662876	0	0	0 00	0	408,485,809
10/73	0	4455403	0	0	0 00	0	412,941,212
11/73	0	5760176	0	0	0 00	0	418,701,388
12/73	0	5911887	0	0	0 00	0	424,613,275
TOT/73	0	58142932	0	0		0	424,613,275
1/74	0	5794277	0	0	0 00	0	430,407,552
2/74	0	4903861	0	0	0 00	0	435,311,413
3/74	0	5138456	0	0	0 00	0	440,449,869
4/74	0	3362439	0	0	0 00	0	443,812,308
5/74	0	3769879	0	0	0 00	0	447,582,187
6/74	0	3463305	0	0	0 00	0	451,045,492
7/74	0	3830872	0	0	0 00	0	454,876,364
8/74	0	4580357	0	0	0 00	0	459,456,721
9/74	0	5084815	0	0	0 00	0	464,541,536
10/74	0	5143764	0	0	0 00	0	469,685,300
11/74	0	5476739	0	0	0 00	0	475,162,039
12/74	0	6143622	0	0	0 00	0	481,305,661
TOT/74	0	56692386	0	0		0	481,305,661
1/75	0	5892984	0	0	0 00	0	487,198,645
2/75	0	5618976	0	0	0 00	0	492,817,621
3/75	0	5430822	0	0	0 00	0	498,248,443
4/75	0	3764225	0	0	0 00	0	502,012,668
5/75	0	3503845	0	0	0 00	0	505,516,513
6/75	0	3961583	0	0	0 00	0	509,478,096
7/75	0	4991069	0	0	0 00	0	514,469,165
8/75	0	4953796	0	0	0 00	0	519,422,961
9/75	0	4544581	0	0	0 00	0	523,967,542
10/75	0	6288438	0	0	0 00	0	530,255,980
11/75	0	6393909	0	0	0 00	0	536,649,889
12/75	0	6808451	0	0	0 00	0	543,458,340
TOT/75	0	62152679	0	0		0	543,458,340
TOTAL	0	543458340	0	0		0	543,458,340

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P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	543458340	0	0	0 00	0	543 458,340
1/76	0	6450004	0	0	0 00	0	549,908,344
2/76	0	6291938	0	0	0 00	0	556,200,282
3/76	0	6562141	0	0	0 00	0	562,762,423
4/76	0	5615384	0	0	0 00	0	568,377 807
5/76	0	5255039	0	0	0 00	0	573,632,846
6/76	0	5373068	0	0	0 00	0	579,005,914
7/76	0	3968742	0	0	0 00	0	582,974,656
8/76	0	4493221	0	0	0 00	0	587,467,877
9/76	0	5005951	0	0	0 00	0	592,473,828
10/76	0	5496826	0	0	0 00	0	597,970 654
11/76	0	6078064	0	0	0 00	0	604,048,718
12/76	0	6026635	0	0	0 00	0	610,075,353
TOT/76	0	66617013	0	0		0	610,075,353
1/77	0	5755522	0	0	0 00	0	615,830,875
2/77	0	5173340	0	0	0 00	0	621,004,215
3/77	0	5890257	0	0	0 00	0	626,894,472
4/77	0	4810714	0	0	0 00	0	631,705,186
5/77	0	4253734	0	0	0 00	0	635,958,920
6/77	0	4877733	0	0	0 00	0	640,836,653
7/77	0	5696184	0	0	0 00	0	646,532,837
8/77	0	5768964	0	0	0 00	0	652,301,801
9/77	0	5028730	0	0	0 00	0	657,330,531
10/77	0	5168633	0	0	0 00	0	662,499,164
11/77	0	6450124	0	0	0 00	0	668,949,288
12/77	0	7591110	0	0	0 00	0	676,540,398
TOT/77	0	66465045	0	0		0	676,540,398
1/78	0	6823463	0	0	0 00	0	683,363,861
2/78	0	6196480	0	0	0 00	0	689,560,341
3/78	0	6752311	0	0	0 00	0	696,312,652
4/78	0	5082655	0	0	0 00	0	701,395,307
5/78	0	6029464	0	0	0 00	0	707,424,771
6/78	0	5116608	0	0	0 00	0	712,541,379
7/78	0	6369919	0	0	0 00	0	718,911,298
8/78	0	5844080	0	0	0 00	0	724,755,378
9/78	0	5326727	0	0	0 00	0	730,082,105
10/78	0	7353608	0	0	0 00	0	737,435,713
11/78	0	6461881	0	0	0 00	0	743,897,594
12/78	0	6635567	0	0	0 00	0	750,533,161
TOT/78	0	73992763	0	0		0	750,533,161
1/79	0	6454518	0	0	0 00	0	756,987,679
2/79	0	6585902	0	0	0 00	0	763,573,581
3/79	0	7104183	0	0	0 00	0	770,677,764
4/79	0	6926631	0	0	0 00	0	777,604,395
5/79	0	4522509	0	0	0 00	0	782,126,904
6/79	0	5664425	0	0	0 00	0	787,791,329
7/79	0	5945233	0	0	0 00	0	793,736,562
8/79	0	5333132	0	0	0 00	0	799,069,694
9/79	0	4769281	0	0	0 00	0	803,838,975
10/79	0	5949956	0	0	0 00	0	809,788,931
11/79	0	6192231	0	0	0 00	0	815,981,162
12/79	0	7788369	0	0	0 00	0	823,769,531
TOT/79	0	73236370	0	0		0	823,769,531
TOTAL	0	823769531	0	0		0	823,769,531

P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	823769531	0	0	0 00	0	823 769 531
1/80	0	7641553	0	0	0 00	0	831,411,084
2/80	0	6090045	0	0	0 00	0	837,501,129
3/80	0	6166009	0	0	0 00	0	843,667,138
4/80	0	4903071	0	0	0 00	0	848 570,209
5/80	0	4936545	0	0	0 00	0	853 506,754
6/80	0	4205500	0	0	0 00	0	857,712 254
7/80	0	4675393	0	0	0 00	0	862 387,647
8/80	0	5264957	0	0	0 00	0	867,652,604
9/80	0	5150995	0	0	0 00	0	872,803 599
10/80	0	5755427	0	0	0 00	0	878,559 026
11/80	0	7023322	0	0	0 00	0	885,582 348
12/80	0	7649530	289400	0	0 00	0	893,231,878
TOT/80	0	69462347	289400	0		0	893,231,878
1/81	0	7261376	0	0	0 00	0	900,493,254
2/81	0	6705352	0	0	0 00	0	907,198,606
3/81	0	6842707	0	0	0 00	0	914,041,313
4/81	0	6618430	0	0	0 00	0	920,659,743
5/81	0	5552675	0	0	0 00	0	926,212,418
6/81	0	6178534	0	0	0 00	0	932,390,952
7/81	0	6384551	0	0	0 00	0	938,775,503
8/81	0	6416866	0	0	0 00	0	945,192,369
9/81	0	6855286	0	0	0 00	0	952,047,655
10/81	0	7184027	2761	0	0 00	0	959,231,682
11/81	0	7317536	2422	0	0 00	0	966,549,218
12/81	0	7932759	3103	0	0 00	0	974,481,977
TOT/81	0	81250099	8286	0		0	974,481,977
1/82	0	8659434	3040	0	0 00	0	983,141,411
2/82	0	8146472	2024	0	0 00	0	991,287,883
3/82	0	7947722	1669	0	0 00	0	999,235,605
4/82	0	7336591	1474	0	0 00	0	1,006,572,196
5/82	0	7248660	1637	0	0 00	0	1,013,820,856
6/82	0	7381552	1675	0	0 00	0	1,021,202,408
7/82	0	8315538	1963	0	0 00	0	1,029,517,946
8/82	0	7619912	2171	0	0 00	0	1,037,137,858
9/82	0	7435900	2152	0	0 00	0	1,044,573,758
10/82	0	9175937	2292	0	0 00	0	1,053,749,695
11/82	0	8896330	2025	0	0 00	0	1,062,646,025
12/82	0	9495586	2137	0	0 00	0	1,072,141,611
TOT/82	0	97659634	24259	0		0	1,072,141,611
1/83	0	9688654	2204	0	0 00	0	1,081,830,265
2/83	0	7786911	1993	0	0 00	0	1,089,617,176
3/83	0	8563975	1272	0	0 00	0	1,098,181,151
4/83	0	8058012	1115	0	0 00	0	1,106,239,163
5/83	0	6307806	840	0	0 00	0	1,112,546,969
6/83	0	6591449	999	0	0 00	0	1,119,138,418
7/83	0	7748553	1165	0	0 00	0	1,126,886,971
8/83	0	8077959	1093	0	0 00	0	1,134,964,930
9/83	0	8161881	1060	0	0 00	0	1,143,126,811
10/83	0	9072930	1395	0	0 00	0	1,152,199,741
11/83	0	8517403	1284	0	0 00	0	1,160,717,144
12/83	0	9891745	1410	0	0 00	0	1,170,608,889
TOT/83	0	98467278	15830	0		0	1,170,608,889
TOTAL	0	1170608889	337775	0		0	1,170,608 889

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PRODUCTION LEDGER

DATE	OIL BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	1170608889	337775	0	0 00	0	1,170,608 889
1/84	0	8686595	1492	0	0 00	0	1,179,295,484
2/84	0	8656101	1423	0	0 00	0	1,187,951,585
3/84	0	8145004	1638	0	0 00	0	1,196,096 589
4/84	0	7511922	873	0	0 00	0	1,203,608 511
5/84	0	7592277	642	0	0 00	0	1 211,200,788
6/84	0	6914827	406	0	0 00	0	1,218,115,615
7/84	0	7374216	388	0	0 00	0	1,225,489,831
8/84	0	7504191	271	0	0 00	0	1,232,994,022
9/84	0	7466690	690	0	0 00	0	1,240,460,712
10/84	0	7734116	626	0	0 00	0	1,248,194,828
11/84	0	8566303	967	0	0 00	0	1,256 761,131
12/84	0	9261102	1001	0	0 00	0	1,266,022,233
TOT/84	0	95413344	10417	0		0	1,266,022,233
1/85	0	8911868	960	0	0 00	0	1,274,934,101
2/85	0	8917839	1149	0	0 00	0	1,283,851,940
3/85	0	9128688	1149	0	0 00	0	1,292,980,628
4/85	0	8579396	1150	0	0 00	0	1,301,560,024
5/85	0	7650761	1722	0	0 00	0	1,309,210,785
6/85	0	8083806	1537	0	0 00	0	1,317,294,591
7/85	0	8109518	1817	0	0 00	0	1,325,404,109
8/85	0	7922005	3116	0	0 00	0	1,333,326,114
9/85	0	7657729	2796	0	0 00	0	1,340,983,843
10/85	0	8375419	3420	0	0 00	0	1,349,359,262
11/85	0	8563625	2682	0	0 00	0	1,357,922,887
12/85	0	6516601	1544	0	0 00	0	1,364,439,488
TOT/85	0	98417255	23042	0		0	1,364,439,488
1/86	0	7227710	912	0	0 00	0	1,371,667,198
2/86	0	6297848	759	0	0 00	0	1,377,965,046
3/86	0	5675127	749	0	0 00	0	1,383,640,173
4/86	0	5001044	868	0	0 00	0	1,388,641,217
5/86	0	5139626	571	0	0 00	0	1,393,780,843
6/86	0	4691232	492	0	0 00	0	1,398,472,075
7/86	0	4679066	358	0	0 00	0	1,403,151,141
8/86	0	4786213	386	0	0 00	0	1,407,937,354
9/86	0	5219633	322	0	0 00	0	1,413,156,987
10/86	0	6054656	3890	0	0 00	0	1,419,211,643
11/86	0	6489299	4965	0	0 00	0	1,425,700,942
12/86	0	6358573	1458	0	0 00	0	1,432,059,515
TOT/86	0	67620027	15730	0		0	1,432,059,515
1/87	0	7318926	2187	0	0 00	0	1,439,378,441
2/87	0	6350035	2104	0	0 00	0	1,445,728,476
3/87	0	7091609	2270	0	0 00	0	1,452,820,085
4/87	0	5572112	1784	0	0 00	0	1,458,392,197
5/87	0	6238158	1870	0	0 00	0	1,464,630,355
6/87	0	5469797	959	0	0 00	0	1,470,100,152
7/87	0	5480027	1451	0	0 00	0	1,475,580,179
8/87	0	5266690	348	0	0 00	0	1,480,846,869
9/87	0	5203633	545	0	0 00	0	1,486,050,502
10/87	0	6851785	563	0	0 00	0	1,492,902,287
11/87	0	7296253	644	0	0 00	0	1,500,198,540
12/87	0	7189404	352	0	0 00	0	1,507,387,944
TOT/87	0	75328429	15077	0		0	1,507,387,944
TOTAL	0	1507387944	402041	0		0	1,507,387,944

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	1507387944	402041	0	0 00	0	1,507,387,944
1/88	0	7097765	884	0	0 00	0	1,514,485,709
2/88	0	6322336	1149	0	0 00	0	1,520,808,045
3/88	0	5890804	975	0	0 00	0	1,526 698,849
4/88	0	5061667	915	0	0 00	0	1 531,760,516
5/88	0	4519779	750	0	0 00	0	1,536,280,295
6/88	0	5215961	534	0	0 00	0	1,541,496 256
7/88	0	4948908	736	0	0 00	0	1 546,445,164
8/88	0	4433592	399	0	0 00	0	1,550,878,756
9/88	0	4753978	892	0	0 00	0	1,555,632,734
10/88	0	5720248	1868	0	0 00	0	1 561,352 982
11/88	0	5305296	1578	0	0 00	0	1,566,658,278
12/88	0	5494229	3274	0	0 00	0	1 572,152,507
TOT/88	0	64764563	13954	0		0	1,572,152,507
1/89	0	5232526	1518	0	0 00	0	1,577,385,033
2/89	0	4981032	2546	0	0 00	0	1,582,366,065
3/89	0	5549801	2490	0	0 00	0	1,587,915,866
4/89	0	5267086	2017	0	0 00	0	1,593,182,952
5/89	0	4294553	846	0	0 00	0	1,597,477,505
6/89	0	4307285	1189	0	0 00	0	1,601,784,790
7/89	0	4338065	278	0	0 00	0	1,606,122,855
8/89	0	4448816	636	0	0 00	0	1,610,571,671
9/89	0	4161175	367	0	0 00	0	1,614,732,846
10/89	0	4866013	299	0	0 00	0	1,619,598,859
11/89	0	4807977	1379	0	0 00	0	1 624,406,836
12/89	0	3600594	971	0	0 00	0	1,628,007,430
TOT/89	0	55854923	14536	0		0	1,628,007,430
1/90	0	3911897	499	0	0 00	0	1,631,919,327
2/90	0	3951839	858	0	0 00	0	1,635,871,166
3/90	0	2647917	885	0	0 00	0	1,638,519,083
4/90	0	2245465	381	0	0 00	0	1,640,764,548
5/90	0	1460068	330	0	0 00	0	1,642,224,616
6/90	0	2842482	536	0	0 00	0	1,645,067,098
7/90	0	2255445	2061	0	0 00	0	1,647,322,543
8/90	0	2180710	2081	0	0 00	0	1,649,503,253
9/90	0	1857342	3445	0	0 00	0	1,651,360,595
10/90	0	2555807	4697	0	0 00	0	1,653,916,402
11/90	0	3633770	5084	0	0 00	0	1,657,550,172
12/90	0	2819445	5809	0	0 00	0	1,660,369,617
TOT/90	0	32362187	26666	0		0	1,660,369,617
1/91	0	2103368	4130	0	0 00	0	1,662,472,985
2/91	0	1879979	4116	0	0 00	0	1,664,352,964
3/91	0	1765188	1026	0	0 00	0	1,666,118,152
4/91	0	1786655	765	0	0 00	0	1,667,904,807
5/91	0	1545966	122	0	0 00	0	1,669,450,773
6/91	0	1700305	330	0	0 00	0	1,671,151,078
7/91	0	1725034	347	0	0 00	0	1,672,876,112
8/91	0	1660145	180	0	0 00	0	1,674,536,257
9/91	0	1390671	487	0	0 00	0	1,675,926,928
10/91	0	1919711	553	0	0 00	0	1,677,846,639
11/91	0	1811575	872	0	0 00	0	1,679,658,214
12/91	0	1417910	419	0	0 00	0	1,681,076,124
TOT/91	0	20706507	13347	0		0	1,681,076,124
TOTAL	0	1681076124	470544	0		0	1,681,076,124

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	1681076124	470544	0	0 00	0	1 681,076,124
1/92	0	1616323	321	0	0 00	0	1,682,692,447
2/92	0	1924441	386	0	0 00	0	1,684,616,888
3/92	0	2103172	463	0	0 00	0	1,686,720,060
4/92	0	1697114	280	0	0 00	0	1,688,417,174
5/92	0	1577002	256	0	0 00	0	1,689 994 176
6/92	0	1239095	301	0	0 00	0	1,691,233,271
7/92	0	1425262	153	0	0 00	0	1,692,658,533
8/92	0	1360429	300	0	0 00	0	1,694,018,962
9/92	0	1357020	164	0	0 00	0	1,695,375,982
10/92	0	1680979	167	0	0 00	0	1,697,056 961
11/92	0	2196251	507	0	0 00	0	1,699,253,212
12/92	0	1626552	270	0	0 00	0	1,700,879,764
TOT/92	0	19803640	3568	0		0	1,700,879,764
1/93	0	1513187	142	0	0 00	0	1,702,392,951
2/93	0	1418214	246	0	0 00	0	1,703,811,165
3/93	0	1819894	335	0	0 00	0	1,705,631,059
4/93	0	1797079	512	0	0 00	0	1,707,428,138
5/93	0	1844769	1034	0	0 00	0	1,709,272,907
6/93	0	1853561	753	0	0 00	0	1,711,126,468
7/93	0	1798120	886	0	0 00	0	1,712,924,588
8/93	0	1394038	352	0	0 00	0	1,714,318,626
9/93	0	1250995	381	0	0 00	0	1,715,569,621
10/93	0	1286209	368	0	0 00	0	1,716,855,830
11/93	0	1578039	765	0	0 00	0	1,718,433,869
12/93	0	1413085	651	0	0 00	0	1,719,846,954
TOT/93	0	18967190	6425	0		0	1,719,846,954
1/94	0	1233694	244	0	0 00	0	1,721,080,648
2/94	0	1094641	135	0	0 00	0	1,722,175,289
3/94	0	1254603	146	0	0 00	0	1,723,429,892
4/94	0	1179084	81	0	0 00	0	1,724,608,976
5/94	0	940675	44	0	0 00	0	1,725,549,651
6/94	0	1061317	335	0	0 00	0	1,726,610,968
7/94	0	1239149	176	0	0 00	0	1,727,850,117
8/94	0	1356133	111	0	0 00	0	1,729,206,250
9/94	0	1294927	216	0	0 00	0	1,730,501,177
10/94	0	1417189	48	0	0 00	0	1,731,918,366
11/94	0	1203615	73	0	0 00	0	1,733,121,981
12/94	0	1208013	200	0	0 00	0	1,734,329,994
TOT/94	0	14483040	1809	0		0	1,734,329,994
1/95	0	1284796	207	0	0 00	0	1,735,614,790
2/95	0	1198874	233	0	0 00	0	1,736,813,664
3/95	0	1527562	360	0	0.00	0	1,738,341,226
4/95	0	1158529	287	0	0 00	0	1,739,499,755
5/95	0	1006523	318	0	0 00	0	1,740,506,278
6/95	0	941017	586	0	0 00	0	1,741,447,295
7/95	0	963608	242	0	0 00	0	1,742,410,903
8/95	0	803812	428	0	0 00	0	1,743,214,715
9/95	0	674865	1073	0	0 00	0	1,743,889,580
10/95							
11/95							
12/95							
TOT/95	0	9559586	3734	0		0	1,743,889,580
TOTAL	0	1743889580	486080	0		0	1,743,889,580

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DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	0	0	0	0 00	0	0
1/74	0	0	0	0	0 00	0	0
2/74	0	0	0	0	0 00	0	0
3/74	0	0	0	0	0 00	0	0
4/74	0	0	0	0	0 00	0	0
5/74	0	0	0	0	0 00	0	0
6/74	0	0	0	0	0 00	0	0
7/74	0	0	0	0	0 00	0	0
8/74	0	0	0	0	0 00	0	0
9/74	0	0	0	0	0 00	0	0
10/74	0	26082	0	0	0 00	0	26 082
11/74	0	213468	0	0	0 00	0	239,550
12/74	0	235877	0	0	0 00	0	475,427
TOT/74	0	475427	0	0		0	475,427
1/75	0	255632	0	0	0 00	0	731 059
2/75	0	243716	0	0	0 00	0	974,775
3/75	0	258708	0	0	0 00	0	1,233,483
4/75	0	203602	0	0	0 00	0	1,437,085
5/75	0	148718	0	0	0 00	0	1,585,803
6/75	0	173704	0	0	0 00	0	1,759,507
7/75	0	207549	0	0	0 00	0	1,967,056
8/75	0	225283	0	0	0 00	0	2,192,339
9/75	0	247732	0	0	0 00	0	2,440,071
10/75	0	246331	0	0	0 00	0	2,686,402
11/75	0	286922	0	0	0 00	0	2,973,324
12/75	0	295729	0	0	0 00	0	3,269,053
TOT/75	0	2793626	0	0		0	3,269,053
1/76	0	296805	0	0	0 00	0	3,565,858
2/76	0	50983	0	0	0 00	0	3,616,841
3/76	0	268188	0	0	0 00	0	3,885,029
4/76	0	256025	0	0	0 00	0	4,141,054
5/76	0	232624	0	0	0 00	0	4,373,678
6/76	0	202937	0	0	0 00	0	4,576,615
7/76	0	192474	0	0	0 00	0	4,769,089
8/76	0	154079	0	0	0 00	0	4,923,168
9/76	0	107301	0	0	0 00	0	5,030,469
10/76	0	54270	0	0	0 00	0	5,084,739
11/76	0	242868	0	0	0 00	0	5,327,607
12/76	0	251520	0	0	0 00	0	5,579,127
TOT/76	0	2310074	0	0		0	5,579,127
1/77	0	190275	0	0	0 00	0	5,769,402
2/77	0	219340	0	0	0 00	0	5,988,742
3/77	0	240573	0	0	0 00	0	6,229,315
4/77	0	86931	0	0	0 00	0	6,316,246
5/77	0	192827	0	0	0 00	0	6 509,073
6/77	0	267349	0	0	0 00	0	6,776,422
7/77	0	282709	0	0	0 00	0	7,059,131
8/77	0	272351	0	0	0 00	0	7,331,482
9/77	0	289236	0	0	0 00	0	7,620,718
10/77	0	515223	0	0	0 00	0	8,135,941
11/77	0	530558	0	0	0 00	0	8,666,499
12/77	0	607735	0	0	0 00	0	9,274,234
TOT/77	0	3695107	0	0		0	9,274,234
TOTAL	0	9274234	0	0		0	9,274,234

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DATE	OIL, BBL	GAS MCF	WATER BBL	GOR, CF/BBL	WATER CUT %	CUM OIL BBL	CUM GAS MCF
PRIOR	0	9274234	0	0	0 00	0	9 274,234
1/78	0	534768	0	0	0 00	0	9 809 002
2/78	0	501847	0	0	0 00	0	10 310 849
3/78	0	588201	0	0	0 00	0	10 899,050
4/78	0	529350	0	0	0 00	0	11 428,400
5/78	0	456427	0	0	0 00	0	11,884 827
6/78	0	554181	0	0	0 00	0	12 439 008
7/78	0	615122	0	0	0 00	0	13,054,130
8/78	0	378360	0	0	0 00	0	13,432,490
9/78	0	517630	0	0	0 00	0	13,950 120
10/78	0	573239	0	0	0 00	0	14 523,359
11/78	0	511891	0	0	0 00	0	15 035 250
12/78	0	486344	0	0	0 00	0	15,521,594
TOT/78	0	6247360	0	0		0	15,521 594
1/79	0	678751	0	0	0 00	0	16,200 345
2/79	0	746693	0	0	0 00	0	16,947,038
3/79	0	824860	0	0	0 00	0	17,771 898
4/79	0	854930	0	0	0 00	0	18,626,828
5/79	0	795235	0	0	0 00	0	19,422,063
6/79	0	787901	0	0	0 00	0	20 209,964
7/79	0	673428	0	0	0 00	0	20,883 392
8/79	0	578032	0	0	0 00	0	21,461,424
9/79	0	633592	0	0	0 00	0	22,095,016
10/79	0	784135	0	0	0 00	0	22 879,151
11/79	0	878930	0	0	0 00	0	23,758,081
12/79	0	1276389	0	0	0 00	0	25,034,470
TOT/79	0	9512876	0	0		0	25 034,470
1/80	0	1218194	0	0	0 00	0	26,252,664
2/80	0	1411856	0	0	0 00	0	27,664,520
3/80	0	1523537	0	0	0 00	0	29 188,057
4/80	0	1261798	0	0	0 00	0	30 449 855
5/80	0	1093211	0	0	0 00	0	31,543 066
6/80	0	1262079	0	0	0 00	0	32,805,145
7/80	0	1324875	0	0	0 00	0	34,130,020
8/80	0	1372957	0	0	0 00	0	35,502,977
9/80	0	1313059	0	0	0 00	0	36,816,036
10/80	0	1331678	0	0	0 00	0	38,147,714
11/80	0	1381200	0	0	0 00	0	39,528,914
12/80	0	1453116	11500	0	0 00	0	40,982,030
TOT/80	0	15947560	11500	0		0	40,982,030
1/81	0	1326096	0	0	0 00	0	42,308,126
2/81	0	1247196	0	0	0 00	0	43,555 322
3/81	0	1285923	0	0	0 00	0	44,841,245
4/81	0	1088406	0	0	0 00	0	45,929,651
5/81	0	989693	0	0	0 00	0	46,919,344
6/81	0	1147409	0	0	0 00	0	48,066,753
7/81	0	1066431	0	0	0 00	0	49,133,184
8/81	0	1173966	0	0	0 00	0	50,307,150
9/81	0	1130181	0	0	0 00	0	51,437,331
10/81	0	1154592	682	0	0 00	0	52,591 923
11/81	0	1072785	743	0	0 00	0	53,664,708
12/81	0	1085210	823	0	0 00	0	54,749,918
TOT/81	0	13767888	2248	0		0	54,749,918
TOTAL	0	54749918	13748	0		0	54,749,918

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P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	0	54749918	13748	0	0 00	0	54 749 918
1/82	0	997752	770	0	0 00	0	55,747,670
2/82	0	997025	694	0	0 00	0	56,744 695
3/82	0	1243140	765	0	0 00	0	57 987,835
4/82	0	1151102	646	0	0 00	0	59,138 937
5/82	0	1089454	1483	0	0 00	0	60,228,391
6/82	0	762255	1674	0	0 00	0	60 990,646
7/82	0	367138	470	0	0 00	0	61,357,784
8/82	0	970849	503	0	0 00	0	62,328,633
9/82	0	830592	440	0	0 00	0	63,159 225
10/82	0	983404	728	0	0 00	0	64 142 629
11/82	0	1111708	702	0	0 00	0	65,254,337
12/82	0	1086591	651	0	0 00	0	66,340,928
TOT/82	0	11591010	9526	0		0	66 340,928
1/83	0	1061023	837	0	0 00	0	67 401,951
2/83	0	873098	847	0	0 00	0	68,275 049
3/83	0	873472	594	0	0 00	0	69,148,521
4/83	0	719994	474	0	0 00	0	69,868 515
5/83	0	646114	374	0	0 00	0	70,514,629
6/83	0	818787	397	0	0 00	0	71,333,416
7/83	0	846793	485	0	0 00	0	72,180,209
8/83	0	821593	430	0	0 00	0	73,001 802
9/83	0	765041	299	0	0 00	0	73,766,843
10/83	0	964363	369	0	0 00	0	74,731,206
11/83	0	877226	856	0	0 00	0	75,608 432
12/83	0	859153	759	0	0 00	0	76 467,585
TOT/83	0	10126657	6721	0		0	76,467,585
1/84	0	871469	649	0	0 00	0	77,339,054
2/84	0	795431	642	0	0 00	0	78,134,485
3/84	0	818326	529	0	0 00	0	78,952,811
4/84	0	801671	847	0	0 00	0	79,754,482
5/84	0	847935	503	0	0 00	0	80,602,417
6/84	0	721894	540	0	0 00	0	81,324,311
7/84	0	671872	314	0	0 00	0	81,996,183
8/84	0	592251	191	0	0 00	0	82,588,434
9/84	0	661630	577	0	0 00	0	83,250,064
10/84	0	787223	490	0	0 00	0	84,037,287
11/84	0	875709	552	0	0 00	0	84,912,996
12/84	0	940183	656	0	0 00	0	85,853,179
TOT/84	0	9385594	6490	0		0	85,853,179
1/85	0	916860	578	0	0 00	0	86,770,039
2/85	0	962186	669	0	0 00	0	87,732,225
3/85	0	1149838	740	0	0 00	0	88,882,063
4/85	0	986608	759	0	0 00	0	89,868,671
5/85	0	1113554	955	0	0 00	0	90,982,225
6/85	0	1028659	664	0	0 00	0	92,010,884
7/85	0	1034427	670	0	0 00	0	93,045,311
8/85	0	1086400	419	0	0 00	0	94,131,711
9/85	0	1022411	675	0	0 00	0	95,154,122
10/85	0	1081238	577	0	0 00	0	96,235,360
11/85	0	1046738	926	0	0 00	0	97,282,098
12/85	0	867189	579	0	0 00	0	98,149,287
TOT/85	0	12296108	8211	0		0	98,149,287
TOTAL	0	98149287	44696	0		0	98,149,287

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	98149287	44696	0	0 00	0	98 149 287
1/86	0	961822	609	0	0 00	0	99,111 109
2/86	0	842588	1106	0	0 00	0	99 953 697
3/86	0	809732	1092	0	0 00	0	100,763 429
4/86	0	786844	662	0	0 00	0	101,550 273
5/86	0	994701	1058	0	0 00	0	102,544 97[illegible]
6/86	0	829564	816	0	0 00	0	103 374 538
7/86	0	817088	767	0	0 00	0	104,191,626
8/86	0	785156	845	0	0 00	0	104 976,782
9/86	0	831500	1033	0	0 00	0	105,808,282
10/86	0	870183	759	0	0 00	0	106,678,465
11/86	0	913891	765	0	0 00	0	107,592,356
12/86	0	876094	814	0	0 00	0	108,468 450
TOT/86	0	10319163	10326	0		0	108 468,450
1/87	0	963828	483	0	0 00	0	109,432,278
2/87	0	880881	989	0	0 00	0	110,313,159
3/87	0	918880	1581	0	0 00	0	111,232,039
4/87	0	732725	1220	0	0 00	0	111,964,764
5/87	0	758442	1465	0	0 00	0	112 723,206
6/87	0	715519	1434	0	0 00	0	113,438,725
7/87	0	829659	367	0	0 00	0	114,268,384
8/87	0	859887	914	0	0 00	0	115,128,271
9/87	0	674412	538	0	0 00	0	115,802,683
10/87	0	831492	862	0	0 00	0	116,634,175
11/87	0	917064	1340	0	0 00	0	117,551,239
12/87	0	899501	484	0	0 00	0	118,450,740
TOT/87	0	9982290	11677	0		0	118,450,740
1/88	0	858079	1233	0	0 00	0	119,308,819
2/88	0	794226	1612	0	0 00	0	120,103,045
3/88	0	744555	1294	0	0 00	0	120,847 600
4/88	0	684856	1035	0	0 00	0	121,532,456
5/88	0	512889	768	0	0 00	0	122,045,345
6/88	0	661427	1294	0	0 00	0	122,706,772
7/88	0	666673	751	0	0 00	0	123,373,445
8/88	0	512789	677	0	0 00	0	123,886,234
9/88	0	548799	1119	0	0 00	0	124,435,033
10/88	0	756858	1697	0	0 00	0	125,191,891
11/88	0	691764	1886	0	0 00	0	125,883,655
12/88	0	682609	1801	0	0 00	0	126,566,264
TOT/88	0	8115524	15167	0		0	126,566,264
1/89	0	591498	1290	0	0 00	0	127,157,762
2/89	0	572027	1783	0	0 00	0	127,729,789
3/89	0	647449	1199	0	0 00	0	128,377,238
4/89	0	589700	1198	0	0 00	0	128,966,938
5/89	0	494263	1131	0	0 00	0	129,461,201
6/89	0	491375	796	0	0 00	0	129,952,576
7/89	0	488534	790	0	0 00	0	130,441,110
8/89	0	491972	875	0	0 00	0	130,933,082
9/89	0	488772	1418	0	0 00	0	131,421,854
10/89	0	581889	1233	0	0 00	0	132,003,743
11/89	0	561659	944	0	0 00	0	132,565,402
12/89	0	466867	287	0	0 00	0	133,032,269
TOT/89	0	6466005	12944	0		0	133,032,269
TOTAL	0	133032269	94810	0		0	133,032,269

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PRODUCTION LEDGER

DATE	OIL BBL	GAS, MCF	WATER BBL	GOR CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS, MCF
PRIOR	0	133032269	94810	0	0 00	0	133,032 269
1/90	0	404024	482	0	0 00	0	133 436 293
2/90	0	367530	220	0	0 00	0	133,803,823
3/90	0	258992	256	0	0 00	0	134 062,815
4/90	0	228873	180	0	0 00	0	134 291 688
5/90	0	194899	244	0	0 00	0	134,486 587
6/90	0	241639	762	0	0 00	0	134,728 226
7/90	0	249149	475	0	0 00	0	134,977 375
8/90	0	228027	178	0	0 00	0	135,205,402
9/90	0	248867	1012	0	0 00	0	135 454,269
10/90	0	281181	760	0	0 00	0	135,735 450
11/90	0	293996	1013	0	0 00	0	136,029,446
12/90	0	270275	109	0	0 00	0	136,299,721
TOT/90	0	3267452	5691	0		0	136,299 721
1/91	0	221567	187	0	0 00	0	136,521,288
2/91	0	242031	616	0	0 00	0	136,763 319
3/91	0	263607	914	0	0 00	0	137,026,926
4/91	0	235398	285	0	0 00	0	137,262,324
5/91	0	187777	16	0	0 00	0	137,450,101
6/91	0	188309	431	0	0 00	0	137,638,410
7/91	0	185039	308	0	0 00	0	137,823 449
8/91	0	170294	568	0	0 00	0	137,993,743
9/91	0	140306	150	0	0 00	0	138,134,049
10/91	0	253310	779	0	0 00	0	138,387,359
11/91	0	200677	120	0	0 00	0	138,588,036
12/91	0	177321	244	0	0 00	0	138,765,357
TOT/91	0	2465636	4618	0		0	138,765,357
1/92	0	207596	509	0	0 00	0	138,972,953
2/92	0	200310	579	0	0 00	0	139,173,263
3/92	0	215411	634	0	0 00	0	139,388,674
4/92	0	184132	608	0	0 00	0	139,572,806
5/92	0	170814	487	0	0 00	0	139,743,620
6/92	0	146215	257	0	0 00	0	139,889,835
7/92	0	141585	240	0	0 00	0	140,031,420
8/92	0	159271	248	0	0 00	0	140,190,691
9/92	0	150140	438	0	0 00	0	140,340,831
10/92	0	174227	695	0	0 00	0	140,515,058
11/92	0	233304	678	0	0 00	0	140,748,362
12/92	0	239144	782	0	0 00	0	140,987,506
TOT/92	0	2222149	6155	0		0	140,987,506
1/93	0	206647	561	0	0 00	0	141,194,153
2/93	0	191837	929	0	0 00	0	141,385,990
3/93	0	225269	544	0	0 00	0	141,611,259
4/93	0	223405	631	0	0 00	0	141,834,664
5/93	0	224008	127	0	0 00	0	142,058,672
6/93	0	225244	271	0	0 00	0	142,283,916
7/93	0	238081	76	0	0 00	0	142,521,997
8/93	0	184411	419	0	0 00	0	142,706,408
9/93	0	215627	680	0	0 00	0	142,922,035
10/93	0	210151	155	0	0 00	0	143,132,186
11/93	0	228881	359	0	0 00	0	143,361,067
12/93	0	217441	720	0	0 00	0	143,578,508
TOT/93	0	2591002	5472	0		0	143,578,508
TOTAL	0	143578508	116746	0		0	143,578,508

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DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	143578508	116746	0	0 00	0	143 578,508
1/94	0	212538	486	0	0 00	0	143,791 046
2/94	0	181448	241	0	0 00	0	143 972,494
3/94	0	200928	579	0	0 00	0	144,173,422
4/94	0	169260	645	0	0 00	0	144 342 682
5/94	0	161476	420	0	0 00	0	144 504 158
6/94	0	142008	355	0	0 00	0	144 646 166
7/94	0	165239	508	0	0 00	0	144,811 405
8/94	0	153648	527	0	0 00	0	144 965,053
9/94	0	173879	494	0	0 00	0	145,138 932
10/94	0	178730	686	0	0 00	0	145,317,662
11/94	0	178598	363	0	0 00	0	145,496 260
12/94	0	152496	407	0	0 00	0	145,648,756
TOT/94	0	2070248	5711	0		0	145,648 756
1/95	0	155669	369	0	0 00	0	145,804,425
2/95	0	143412	37	0	0 00	0	145,947 837
3/95	0	162956	56	0	0 00	0	146,110,793
4/95	0	186424	51	0	0 00	0	146,297,217
5/95	0	156302	64	0	0 00	0	146,453,519
6/95	0	137688	831	0	0 00	0	146,591 207
7/95	0	106718	544	0	0 00	0	146,697,925
8/95	0	137120	212	0	0 00	0	146,835 045
9/95	0	136807	508	0	0 00	0	146,971,852
10/95							
11/95							
12/95							
TOT/95	0	1323096	2672	0		0	146,971,852
TOTAL	0	146971852	125129	0		0	146,971,852

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P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	0	0	0	0 00	0	0
1/67	0	0	0	0	0 00	0	0
2/67	0	0	0	0	0 00	0	0
3/67	0	0	0	0	0 00	0	0
4/67	0	0	0	0	0 00	0	0
5/67	0	0	0	0	0 00	0	0
6/67	0	0	0	0	0 00	0	0
7/67	0	0	0	0	0 00	0	0
8/67	0	0	0	0	0 00	0	0
9/67	0	0	0	0	0 00	0	0
10/67	0	0	0	0	0 00	0	0
11/67	0	0	0	0	0 00	0	0
12/67	0	8000	0	0	0 00	0	8,000
TOT/67	0	8000	0	0		0	8,000
1/68	0	0	0	0	0 00	0	8,000
2/68	0	0	0	0	0 00	0	8,000
3/68	0	257618	0	0	0 00	0	265,618
4/68	0	310717	0	0	0 00	0	576,335
5/68	0	24219	0	0	0 00	0	600,554
6/68	0	392915	0	0	0 00	0	993,469
7/68	0	211380	0	0	0 00	0	1,204,849
8/68	0	295774	0	0	0 00	0	1,500,623
9/68	0	43112	0	0	0 00	0	1 543,735
10/68	0	751978	0	0	0 00	0	2,295,713
11/68	0	474298	0	0	0 00	0	2,770,011
12/68	0	753614	0	0	0 00	0	3,523,625
TOT/68	0	3515625	0	0		0	3,523,625
1/69	789	834146	0	1057219	0 00	789	4,357,771
2/69	248	626392	0	2525774	0 00	1,037	4,984,163
3/69	71	560263	0	7891028	0 00	1,108	5,544,426
4/69	308	947566	0	3076513	0 00	1,416	6,491,992
5/69	130	956466	0	7357431	0 00	1,546	7,448,458
6/69	317	917229	0	2893467	0 00	1,863	8,365,687
7/69	180	503484	0	2797133	0 00	2,043	8,869,171
8/69	120	497908	0	4149233	0 00	2,163	9,367,079
9/69	0	556208	0	0	0 00	2,163	9,923,287
10/69	154	1088117	0	7065695	0 00	2,317	11,011,404
11/69	0	1397473	0	0	0 00	2,317	12,408,877
12/69	180	1557267	0	8651483	0 00	2,497	13,966,144
TOT/69	2497	10442519	0	4182026		2,497	13,966,144
1/70	183	1159657	0	6336923	0 00	2,680	15,125,801
2/70	197	1219484	0	6190274	0 00	2,877	16,345,285
3/70	389	1467286	0	3771943	0 00	3,266	17,812,571
4/70	0	1268106	0	0	0 00	3,266	19,080,677
5/70	249	361684	0	1452546	0 00	3,515	19,442,361
6/70	0	1058458	0	0	0 00	3,515	20,500,819
7/70	471	1210018	0	2569040	0 00	3,986	21,710,837
8/70	0	1106143	0	0	0 00	3,986	22,816,980
9/70	0	1658435	0	0	0 00	3,986	24,475 415
10/70	315	1164828	0	3697867	0 00	4,301	25,640 243
11/70	0	1685414	0	0	0 00	4,301	27,325,657
12/70	425	2057261	0	4840614	0 00	4,726	29,382,918
TOT/70	2229	15416774	0	6916453		4,726	29,382,918
TOTAL	4726	29382918	0	6217291		4,726	29,382,918

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DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	4726	29382918	0	6217291	0 00	4,726	29 382 918
1/71	246	1866484	0	7587333	0 00	4 972	31,249,402
2/71	0	1742394	0	0	0 00	4,972	32 99[illegible],796
3/71	162	1958518	0	12089617	0 00	5 134	34 950 314
4/71	319	1231685	0	3861082	0 00	5,453	36 18[illegible],999
5/71	0	14904	0	0	0 00	5,453	36 19[illegible] 903
6/71	0	277685	0	0	0 00	5,453	36,474 586
7/71	0	0	0	0	0 00	5,453	36,474 588
8/71	0	13203	0	0	0 00	5,453	36 487,791
9/71	99	527744	0	5330747	0 00	5,552	37 015,535
10/71	0	1094594	0	0	0 00	5,552	38,110 129
11/71	293	674036	0	2300464	0 00	5,845	38,784 165
12/71	0	1615897	0	0	0 00	5,845	40,400,062
TOT/71	1119	11017144	0	9845526		5,845	40,400 062
1/72	0	1830340	0	0	0 00	5,845	42,230,402
2/72	341	1713151	0	5023903	0 00	6,186	43,943,553
3/72	0	1907778	0	0	0 00	6 186	45 851,331
4/72	320	1779971	0	5562409	0 00	6 506	47,631,302
5/72	0	1041391	0	0	0 00	6,506	48 672,693
6/72	0	741254	0	0	0 00	6 506	49,413 947
7/72	298	573611	0	1924869	0 00	6,804	49,987 558
8/72	159	752965	0	4735629	0 00	6,963	50,740,523
9/72	0	600669	0	0	0 00	6 963	51 341 192
10/72	241	1669788	0	6928581	0 00	7,204	53 010,980
11/72	0	1552718	0	0	0 00	7,204	54,563,698
12/72	440	1397699	0	3176589	0 00	7,644	55,961,397
TOT/72	1799	15561335	0	8649992		7,644	55,961,397
1/73	0	1765105	0	0	0 00	7,644	57,726,502
2/73	150	1502622	0	10017480	0 00	7 794	59,229 124
3/73	207	1197639	0	5785696	0 00	8,001	60,426,763
4/73	0	714705	0	0	0 00	8,001	61,141,468
5/73	90	782079	0	8689767	0 00	8 091	61,923,547
6/73	0	764136	0	0	0 00	8,091	62,687,683
7/73	0	511264	0	0	0 00	8,091	63,198,947
8/73	299	1276279	0	4268492	0 00	8,390	64,475,226
9/73	0	1142719	0	0	0 00	8,390	65,617,945
10/73	290	1053764	0	3633669	0 00	8,680	66,671,709
11/73	0	1100223	0	0	0 00	8,680	67,771,932
12/73	0	1391444	0	0	0 00	8,680	69,163,376
TOT/73	1036	13201979	0	12743223		8,680	69,163,376
1/74	265	1714273	0	6468955	0 00	8,945	70,877,649
2/74	0	1646217	0	0	0 00	8,945	72 523,866
3/74	0	902983	0	0	0 00	8,945	73,426,849
4/74	66	384878	0	5831485	0 00	9,011	73,811,727
5/74	0	1162803	0	0	0 00	9 011	74,974,530
6/74	0	957669	0	0	0 00	9,011	75 932,199
7/74	0	1203732	0	0	0 00	9,011	77,135 931
8/74	0	922904	0	0	0 00	9,011	78,058,835
9/74	0	568033	0	0	0 00	9,011	78 626,868
10/74	0	397491	0	0	0 00	9,011	79,024,359
11/74	0	574675	0	0	0 00	9 011	79,599,034
12/74	0	881361	0	0	0 00	9,011	80,480,395
TOT/74	331	11317019	0	34190390		9,011	80,480,395
TOTAL	9011	80480395	0	8931350		9,011	80,480,395

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DATE	OIL, BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	9011	80480395	0	8931350	0 00	9 011	80,480 395
1/75	64	533542	0	8336594	0 00	9 075	8[illegible] 013,937
2/75	67	461848	0	6893254	0 00	9 142	81,475 785
3/75	0	593131	0	0	0 00	9 142	82 068 9[illegible]6
4/75	88	355890	0	4044205	0 00	9 230	82 42[illegible] 80[illegible]
5/75	0	254703	0	0	0 00	9 230	82 679 50[illegible]
6/75	80	1088942	0	13611775	0 00	9 310	83 768 451
7/75	0	1270735	0	0	0 00	9,310	85,039 186
8/75	90	1118785	0	12430944	0 00	9 400	86 157,971
9/75	0	1417906	0	0	0 00	9 400	87,575,877
10/75	148	1604306	0	10839905	0 00	9,548	89 180 183
11/75	80	1886265	0	23578313	0 00	9 628	91,066 448
12/75	260	1642645	0	6317865	0 00	9,888	92,709 093
TOT/75	877	12228698	0	13943783		9,888	92,709 093
1/76	0	1188777	0	0	0 00	9,888	93,897 870
2/76	80	582425	0	7280313	0 00	9,968	94 480,295
3/76	0	69483	0	0	0 00	9,968	94,549,778
4/76	100	63623	0	636230	0 00	10,068	94 613 401
5/76	0	1005544	0	0	0 00	10,068	95,618 945
6/76	0	1345284	0	0	0 00	10,068	96,964 229
7/76	58	269568	0	4647724	0 00	10,126	97,233,797
8/76	0	1243477	0	0	0 00	10 126	98,477 274
9/76	0	1031680	0	0	0 00	10,126	99,508,954
10/76	70	1412425	0	20177500	0 00	10,196	100,921,379
11/76	36	1101375	0	30593750	0 00	10,232	102,022,754
12/76	203	1226013	0	6039473	0 00	10,435	103 248,767
TOT/76	547	10539674	0	19268143		10,435	103,248,767
1/77	70	1573238	0	22474829	0 00	10,505	104,822,005
2/77	0	1307777	0	0	0 00	10,505	106,129,782
3/77	180	1576834	0	8760189	0 00	10,685	107,706,616
4/77	0	1139762	0	0	0 00	10,685	108,846,378
5/77	0	357951	0	0	0 00	10,685	109 204 329
6/77	0	0	0	0	0 00	10,685	109,204,329
7/77	0	0	0	0	0 00	10,685	109,204,329
8/77	0	115336	0	0	0 00	10,685	109,319,665
9/77	0	723378	0	0	0 00	10,685	110,043,043
10/77	0	1365343	0	0	0 00	10,685	111,408,386
11/77	180	1704011	0	9466728	0 00	10,865	113,112,397
12/77	0	1862042	0	0	0 00	10,865	114,974,439
TOT/77	430	11725672	0	27269005		10,865	114,974,439
1/78	80	1882366	0	23529575	0 00	10,945	116,856,805
2/78	158	1527577	0	9668209	0 00	11,103	118,384,382
3/78	89	1705665	0	19164775	0 00	11,192	120,090,047
4/78	64	1343288	0	20988875	0 00	11,256	121,433,335
5/78	0	1491796	0	0	0 00	11,256	122,925,131
6/78	0	1513455	0	0	0 00	11,256	124,438,586
7/78	0	796346	0	0	0 00	11,256	125,234,932
8/78	0	718042	0	0	0 00	11,256	125,952,974
9/78	0	1351389	0	0	0 00	11,256	127,304,363
10/78	0	1634419	0	0	0 00	11,256	128,938,782
11/78	196	1577002	0	8045929	0 00	11,452	130,515,784
12/78	38	1508093	0	39686658	0 00	11,490	132,023,877
TOT/78	625	17049438	0	27279101		11,490	132,023,877
TOTAL	11490	132023877	0	11490329		11,490	132,023,877

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PRIOR	11490	132023877	0	11490329	0 00	11,490	132 023 877
1/79	75	1887055	0	25160733	0 00	11,565	133,910 932
2/79	149	2159101	0	14490611	0 00	11,714	136,070 033
3/79	0	1574798	0	0	0 00	11,714	137,644 831
4/79	60	964151	0	16069183	0 00	11,774	138,608,982
5/79	0	853423	0	0	0 00	11 774	139 462,405
6/79	0	472093	0	0	0 00	11,774	139,934,498
7/79	0	520805	0	0	0 00	11,774	140,455,303
8/79	0	1574631	0	0	0 00	11,774	142,029,934
9/79	0	1317012	0	0	0 00	11,774	143,346 946
10/79	0	786317	0	0	0 00	11,774	144,133 263
11/79	70	929669	0	13280986	0 00	11,844	145 062,932
12/79	33	1240259	0	37583606	0 00	11,877	146,303,191
TOT/79	387	14279314	0	36897452		11,877	146,303,191
1/80	0	1305145	0	0	0 00	11,877	147,608,336
2/80	0	1171924	0	0	0 00	11,877	148,780,260
3/80	0	1320402	0	0	0 00	11,877	150,100,662
4/80	0	1215212	0	0	0 00	11,877	151,315,874
5/80	0	1225960	0	0	0 00	11,877	152,541,834
6/80	0	1125466	0	0	0 00	11,877	153,667,300
7/80	0	827353	0	0	0 00	11,877	154,494,653
8/80	0	819682	0	0	0 00	11,877	155 314,335
9/80	0	1016617	0	0	0 00	11,877	156,330,952
10/80	0	1043885	0	0	0 00	11,877	157,374,837
11/80	0	1164972	0	0	0 00	11,877	158,539,809
12/80	0	1199965	17000	0	0 00	11,877	159,739,774
TOT/80	0	13436583	17000	0		11,877	159,739,774
1/81	0	1129842	0	0	0 00	11,877	160,869,616
2/81	0	953806	0	0	0 00	11,877	161,823,422
3/81	0	903271	0	0	0 00	11,877	162,726,693
4/81	0	860538	0	0	0 00	11,877	163,587,231
5/81	0	758528	0	0	0 00	11,877	164,345,759
6/81	0	897200	0	0	0 00	11,877	165,242,959
7/81	0	869170	0	0	0 00	11,877	166,112,129
8/81	0	974118	0	0	0 00	11,877	167,086,247
9/81	0	864771	0	0	0 00	11,877	167,951,018
10/81	0	890277	155	0	0 00	11,877	168,841,295
11/81	0	826315	364	0	0 00	11,877	169,667,610
12/81	0	854661	353	0	0 00	11,877	170,522,271
TOT/81	0	10782497	872	0		11,877	170,522,271
1/82	0	842757	223	0	0 00	11,877	171,365,028
2/82	0	788671	206	0	0 00	11,877	172,153,699
3/82	0	849171	241	0	0 00	11,877	173,002,870
4/82	0	797970	216	0	0 00	11,877	173,800,840
5/82	0	401738	123	0	0 00	11,877	174,202,578
6/82	0	333357	140	0	0 00	11,877	174,535,935
7/82	0	238105	149	0	0 00	11,877	174,774,040
8/82	0	197640	165	0	0 00	11,877	174,971,680
9/82	0	330271	107	0	0 00	11,877	175,301 951
10/82	0	623356	193	0	0 00	11,877	175,925 307
11/82	0	618704	161	0	0 00	11,877	176,544,011
12/82	0	640624	217	0	0 00	11,877	177,184,635
TOT/82	0	6662364	2141	0		11,877	177,184,635
TOTAL	11877	177184635	20013	14918299		11,877	177,184,635

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DATE	OIL BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	11877	177184635	20013	14918299	62 76	11,877	177,184 635
1/83	0	665186	258	0	0 00	11,877	177,849 821
2/83	0	591069	271	0	0 00	11,877	178 440 890
3/83	0	631091	236	0	0 00	11 877	179,071 981
4/83	0	450660	168	0	0 00	11 877	179 522 641
5/83	0	524770	95	0	0 00	11,877	180 047,411
6/83	0	606846	128	0	0 00	11,877	180,654 257
7/83	0	649115	152	0	0 00	11 877	181 303 372
8/83	0	600824	157	0	0 00	11,877	181,904,196
9/83	0	640541	148	0	0 00	11,877	182 544,737
10/83	0	723731	176	0	0 00	11,877	183,268 468
11/83	0	665496	321	0	0 00	11,877	183,933 964
12/83	0	625156	242	0	0 00	11,877	184,559 120
TOT/83	0	7374485	2352	0		11,877	184,559,120
1/84	0	568304	113	0	0 00	11,877	185,127,424
2/84	0	554786	113	0	0 00	11,877	185,682,210
3/84	0	609366	308	0	0 00	11,877	186,291,576
4/84	0	557324	201	0	0 00	11,877	186,848,900
5/84	0	599260	320	0	0 00	11,877	187,448,160
6/84	0	555446	48	0	0 00	11,877	188,003,606
7/84	0	570104	63	0	0 00	11,877	188,573 710
8/84	0	552053	171	0	0 00	11,877	189,125,763
9/84	0	556218	428	0	0 00	11,877	189,681,981
10/84	0	561796	391	0	0 00	11,877	190,243,777
11/84	0	542505	34	0	0 00	11,877	190 786,282
12/84	0	589266	70	0	0 00	11,877	191,375,548
TOT/84	0	6816428	2260	0		11,877	191,375,548
1/85	0	560640	69	0	0 00	11,877	191,936,188
2/85	0	539505	92	0	0 00	11,877	192,475,693
3/85	0	576572	94	0	0 00	11,877	193,052,265
4/85	0	535849	59	0	0 00	11,877	193,588,114
5/85	0	531116	106	0	0 00	11,877	194,119,230
6/85	0	552381	116	0	0 00	11,877	194,671,611
7/85	0	587290	320	0	0 00	11,877	195,258,901
8/85	0	555540	327	0	0 00	11,877	195,814,441
9/85	0	543499	319	0	0 00	11,877	196,357,940
10/85	0	561965	327	0	0 00	11,877	196,919,905
11/85	0	534177	118	0	0 00	11,877	197,454,082
12/85	0	516347	138	0	0 00	11,877	197,970,429
TOT/85	0	6594881	2085	0		11,877	197,970,429
1/86	0	501891	235	0	0 00	11,877	198,472,320
2/86	0	456951	276	0	0 00	11,877	198,929,271
3/86	0	501854	391	0	0 00	11,877	199,431,125
4/86	0	395059	257	0	0 00	11,877	199,826,184
5/86	0	472913	324	0	0 00	11,877	200,299,097
6/86	0	421158	204	0	0 00	11,877	200,720,255
7/86	0	404574	244	0	0 00	11,877	201,124,829
8/86	0	417747	286	0	0 00	11,877	201,542,576
9/86	0	437231	68	0	0 00	11,877	201,979,807
10/86	0	455902	195	0	0 00	11,877	202,435,709
11/86	0	453817	234	0	0 00	11,877	202,889,526
12/86	0	446951	415	0	0 00	11,877	203,336,477
TOT/86	0	5366048	3129	0		11,877	203,336,477
TOTAL	11877	203336477	29839	17120188		11,877	203,336,477

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PRIOR	11877	203336477	29839	17120188	71 53	11 877	203 336 477
1/87	0	480085	468	0	0 00	11,877	203 816,562
2/87	0	440367	234	0	0 00	11,877	204 256 929
3/87	0	488743	391	0	0 00	11 877	204 745 672
4/87	0	415822	408	0	0 00	11,877	205 161 494
5/87	0	449660	429	0	0 00	11,877	205,61[illegible] 154
6/87	0	414706	361	0	0 00	11,877	206,025,860
7/87	0	450373	221	0	0 00	11,877	206,476 233
8/87	0	470110	312	0	0 00	11,877	206,946,343
9/87	0	359647	263	0	0 00	11,877	207 305 990
10/87	0	511183	402	0	0 00	11,877	207,817 [illegible]73
11/87	0	505078	361	0	0 00	11,877	208,322,251
12/87	0	496860	324	0	0 00	11,877	208,819,111
TOT/87	0	5482634	4174	0		11,877	208,819 111
1/88	0	493657	504	0	0 00	11 877	209,312 768
2/88	0	438772	216	0	0 00	11,877	209,751,540
3/88	0	390565	138	0	0 00	11,877	210,142,105
4/88	0	262470	192	0	0 00	11,877	210,404,575
5/88	0	301531	54	0	0 00	11,877	210,706,106
6/88	0	314477	83	0	0 00	11 877	211,020,583
7/88	0	282734	176	0	0 00	11,877	211,303,317
8/88	0	310605	80	0	0 00	11,877	211,613,922
9/88	0	337545	63	0	0 00	11,877	211,951,467
10/88	0	358518	99	0	0 00	11,877	212,309 985
11/88	0	328684	83	0	0 00	11,877	212,638,669
12/88	0	332982	64	0	0 00	11,877	212,971,651
TOT/88	0	4152540	1752	0		11,877	212,971,651
1/89	0	339130	102	0	0 00	11,877	213,310,781
2/89	0	295116	163	0	0 00	11,877	213,605,897
3/89	0	323902	107	0	0 00	11,877	213,929,799
4/89	0	255682	14	0	0 00	11,877	214,185,481
5/89	0	198682	57	0	0 00	11,877	214,384,163
6/89	0	297297	190	0	0 00	11,877	214 681,460
7/89	0	288620	177	0	0 00	11,877	214,970,080
8/89	0	279991	155	0	0 00	11,877	215,250,071
9/89	0	269331	90	0	0 00	11,877	215,519,402
10/89	0	264853	170	0	0 00	11,877	215,784,255
11/89	0	282731	199	0	0 00	11,877	216,066,986
12/89	0	289964	354	0	0 00	11,877	216,356 950
TOT/89	0	3385299	1778	0		11,877	216,356,950
1/90	0	269055	39	0	0 00	11,877	216,626,005
2/90	0	248719	71	0	0 00	11,877	216,874,724
3/90	0	197126	0	0	0 00	11,877	217,071,850
4/90	0	236310	102	0	0 00	11,877	217,308,160
5/90	0	212483	18	0	0 00	11,877	217,520,643
6/90	0	250817	190	0	0 00	11,877	217,771,460
7/90	0	221139	101	0	0 00	11,877	217,992,599
8/90	0	156382	120	0	0 00	11,877	218,148,981
9/90	0	254706	289	0	0 00	11,877	218,403,687
10/90	0	243652	411	0	0 00	11,877	218,647,339
11/90	0	247822	130	0	0 00	11,877	218,895,161
12/90	0	224879	111	0	0 00	11,877	219,120,040
TOT/90	0	2763090	1582	0		11,877	219,120,040
TOTAL	11877	219120040	39125	18449107		11,877	219,120,040

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P R O D U C T I O N   L E D G E R

DATE	OIL BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT %	CUM OIL, BBL	CUM GAS MCF
PRIOR	11877	219120040	39125	18449107	76 71	11,877	219 120,040
1/91	0	207341	99	0	0 00	11 877	219 327,381
2/91	0	174145	224	0	0 00	11,877	219 501,526
3/91	0	167849	164	0	0 00	11,877	219 669,375
4/91	0	170922	120	0	0 00	11,877	219 840,297
5/91	0	205164	33	0	0 00	11,877	220 045 461
6/91	0	228736	371	0	0 00	11,877	220,274,197
7/91	0	225015	227	0	0 00	11,877	220,499 212
8/91	0	244212	83	0	0 00	11 877	220 743 42[illegible]
9/91	0	189054	286	0	0 00	11,877	220 932 478
10/91	0	205710	283	0	0 00	11,877	221 138 188
11/91	0	192756	51	0	0 00	11,877	221,330 944
12/91	0	197474	273	0	0 00	11,877	221,528 418
TOT/91	0	2408378	2214	0		11,877	221,528,418
1/92	0	205685	141	0	0 00	11,877	221,734,103
2/92	0	205444	130	0	0 00	11,877	221,939 547
3/92	0	221263	291	0	0 00	11,877	222,160,810
4/92	0	204231	77	0	0 00	11,877	222,365,041
5/92	0	201707	304	0	0 00	11,877	222,566,748
6/92	0	195132	600	0	0 00	11,877	222,761,880
7/92	0	129528	239	0	0 00	11,877	222,891,408
8/92	0	160589	147	0	0 00	11,877	223,051,997
9/92	0	152952	205	0	0 00	11,877	223,204,949
10/92	0	158986	75	0	0 00	11,877	223 363,935
11/92	0	163388	91	0	0 00	11,877	223,527,323
12/92	0	162113	109	0	0 00	11,877	223,689,436
TOT/92	0	2161018	2409	0		11,877	223,689,436
1/93	0	163913	228	0	0 00	11,877	223,853,349
2/93	0	150584	127	0	0 00	11,877	224,003,933
3/93	0	170927	58	0	0 00	11,877	224,174,860
4/93	0	164444	149	0	0 00	11,877	224,339,304
5/93	0	171733	308	0	0 00	11,877	224,511,037
6/93	0	202864	493	0	0 00	11,877	224,713,901
7/93	0	218800	1013	0	0 00	11,877	224,932 701
8/93	0	178409	337	0	0 00	11,877	225,111,110
9/93	0	192041	81	0	0 00	11,877	225,303,151
10/93	0	217726	147	0	0 00	11,877	225,520,877
11/93	0	222265	266	0	0 00	11 877	225,743 142
12/93	0	214261	209	0	0 00	11,877	225,957,403
TOT/93	0	2267967	3416	0		11,877	225,957,403
1/94	0	208025	195	0	0 00	11,877	226,165,428
2/94	0	164337	68	0	0 00	11,877	226,329,765
3/94	0	207216	199	0	0 00	11,877	226,536,981
4/94	0	202237	121	0	0 00	11,877	226,739,218
5/94	0	176364	238	0	0 00	11,877	226,915,582
6/94	0	193399	327	0	0 00	11,877	227,108,981
7/94	0	205579	209	0	0 00	11,877	227,314,560
8/94	0	208623	237	0	0 00	11,877	227,523,183
9/94	0	144739	128	0	0 00	11,877	227,667,922
10/94	0	182856	373	0	0 00	11,877	227,850,778
11/94	0	195666	391	0	0 00	11,877	228,046,444
12/94	0	211105	296	0	0 00	11,877	228 257,549
TOT/94	0	2300146	2782	0		11,877	228,257,549
TOTAL	11877	228257549	49946	19218452		11,877	228,257,549

ARIES SEQUENCE NUMBER 14
FIELD RESERVOIR KENAI TYONEK
COUNTY KENAI , STATE AK

DATE 03/06/96
TIME 13 30 44
PAGE 80
COOKINLT DBS

P R O D U C T I O N   L E D G E R

DATE	OIL BBL	GAS MCF	WATER, BBL	GOR CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	11877	228257549	49946	19218452	80 79	11,877	228 257 549
1/95	0	209420	269	0	0 00	11,877	228 466 969
2/95	0	193089	411	0	0 00	11,877	228 660 058
3/95	0	212956	590	0	0 00	11,877	228 873 014
4/95	0	210282	535	0	0 00	11 877	229,083 296
5/95	0	222562	712	0	0 00	11,877	229 305 858
6/95	0	217984	304	0	0 00	11,877	229 523,842
7/95	0	219122	254	0	0 00	11,877	229,742 964
8/95	0	205520	591	0	0 00	11,877	229,948,484
9/95	0	219229	1481	0	0 00	11,877	230,167 713
10/95							
11/95							
12/95							
TOT/95	0	1910164	5147	0		11,877	230,167 713
TOTAL	11877	230167713	55093	19379280		11,877	230,167 713

McARTHUR RIVER

McArthur River Field

Proved Developed

The McArthur River Field began gas production in 1968 for the purpose of supplying fuel for oil operations Gas development, for gas sales, was initiated in 1988 with the installation of a platform

Material balance calculations were used in the determination of proved developed gas reserves for McArthur River Pressures were available from the AOGCC on both individual producing sands and groups of individual producing sands Utilizing an abandonment suction pressure of 300 psi, the individual p/z plots indicate a total of 591.0 Bcf of remaining gas as of January 1, 1996

The production data used in the above calculations were obtained from the AOGCC Although production was available from Dwight's Energydata, the pool names and production could not be reconciled to the AOGCC data It was assumed that the pool allocations may be in error due to some co-mingled production, and the AOGCC's data was honored over Dwight's

Proved Undeveloped

Proved undeveloped reserves were assigned to behind-pipe sands on the basis of performance of analogous wells and volumetric parameters These sands are similar in character to currently producing sands and appear to be gas-bearing These Tyonek sands are multiple in nature and span an interval over 2000' thick The unperforated sands are assumed to have the same drainage area as the B-1 interval, whose structure map follows. Well logs of the M-7 and a M-25 wells are also included and present the potential productive intervals Relying on the logs and the AOGCC 1994 Statistical Report, the volumetric parameters presented on the reserve worksheet were obtained Ultimate recovery of 98 1 Bcf was risked by 33% to account for reservoir uncertainties Remaining undeveloped gas reserves attributable to these sands is 64 7 Bcf

All data used in the analysis follows this discussion in the form of maps, plots and spreadsheets

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	McArthur River
Location	Kenai County, Alaska
Operator	Unocal
Reserve Basis:	Material Balance
Reserve Classification:	Proved Developed

Material Balance
Source AOGCC

Pressures (psi) Initial * ; Current * ; Abandonment 300

Remarks *Pressures vary by sand body See individual plots for details Some co-mingling, production allocations may be in error Total remaining gas = 591 0 Bcf

Production Parameters
Source Dwight's

		Bcf
a	Recorded Prod Through ______	
b	______ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks Cannot reconcile Dwight's production nomenclature to nomenclature/pool names or groups used by AOGCC Production allocations may be in error.

Reservoir Parameters
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	McArthur River
Location	Kenai County, Alaska
Operator	Unocal
Reserve Basis:	Volumetrics/Analogy
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________, Current ________, Abandonment ________

Remarks ________

Production Parameters
Source

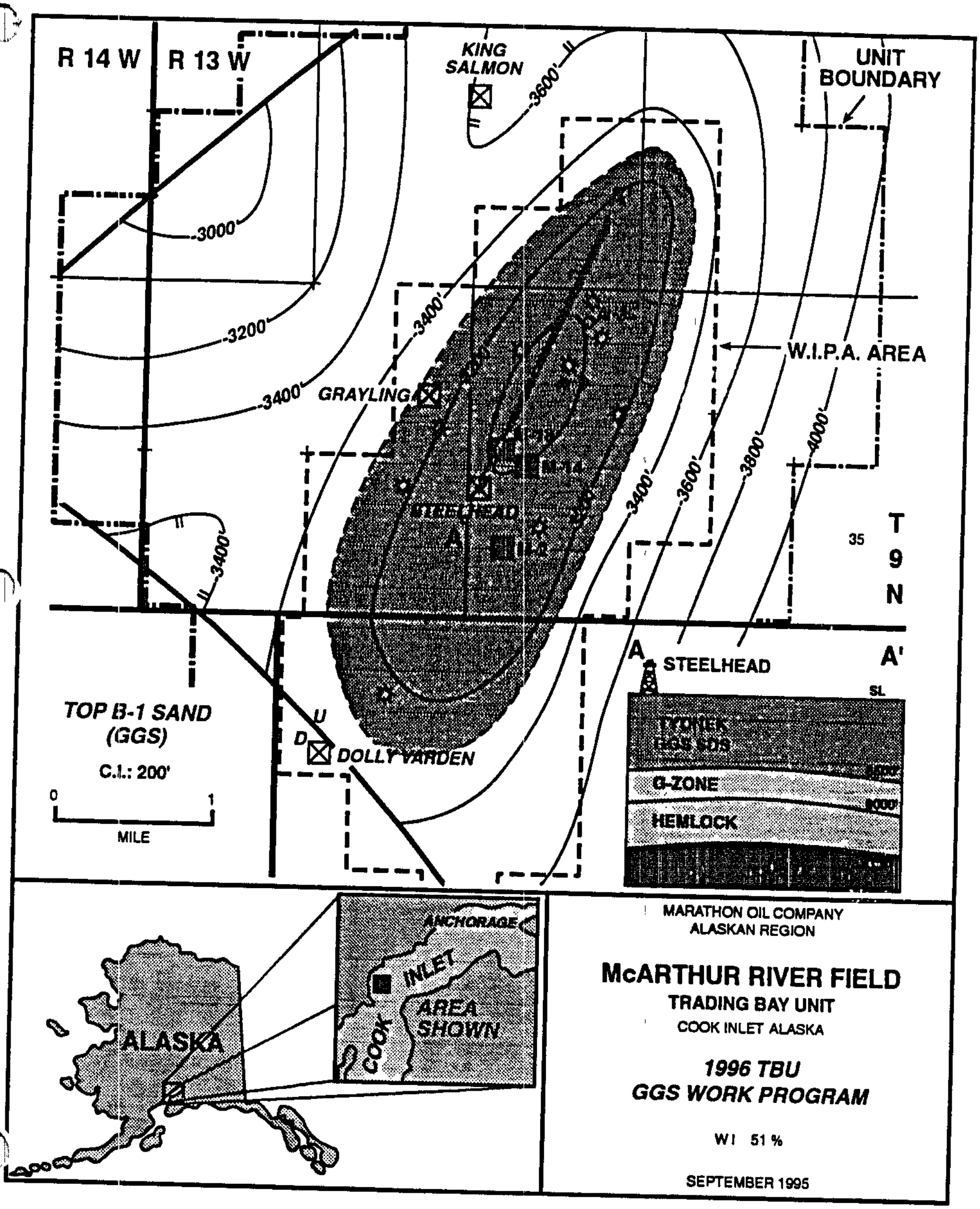
		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks ________

Reservoir Parameters
Source AOGCC/Marathon

a	Net Thickness	150'
b	Porosity	20%
c	Water Saturation	35%
d	Hydrocarbon Thickness	19.5
e	Volume Factor	161 scf/rcf
f	Drainage Area	800
g	Original Volume in Place	109 Bcf
h	Recovery Efficiency	90%
i	Ultimate Recovery	*98.1 Bcf
j	Cumulative Recovery	--
k	Remaining Recovery	64.7 Bcf

Remarks Behind-pipe sands similar in character to currently producing sands. Assumed drainage from B-1 structure map. *Risked by 33% to account for uncertainties in sand continuity.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R 13 W
KING SALMON
UNIT BOUNDARY
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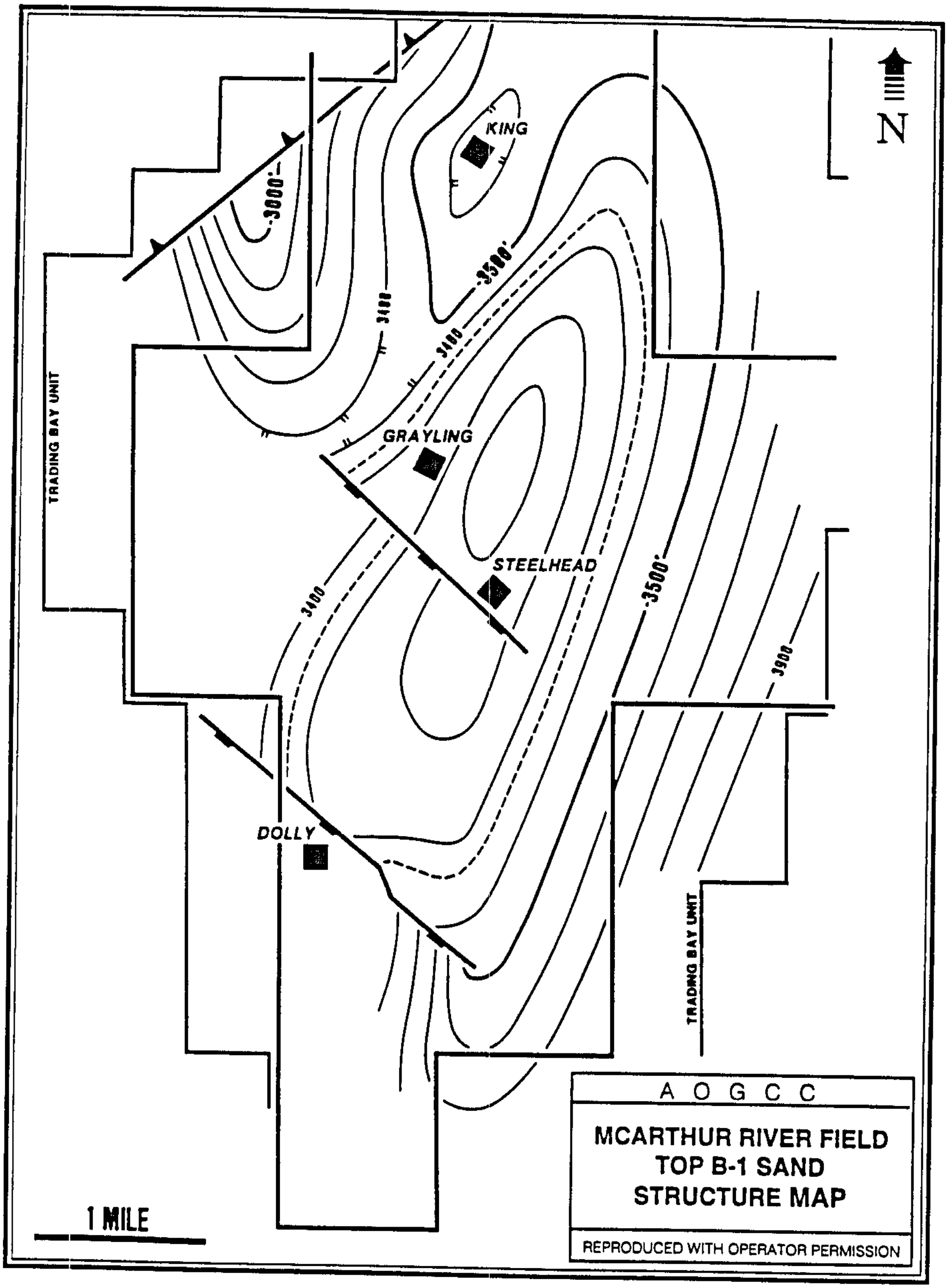
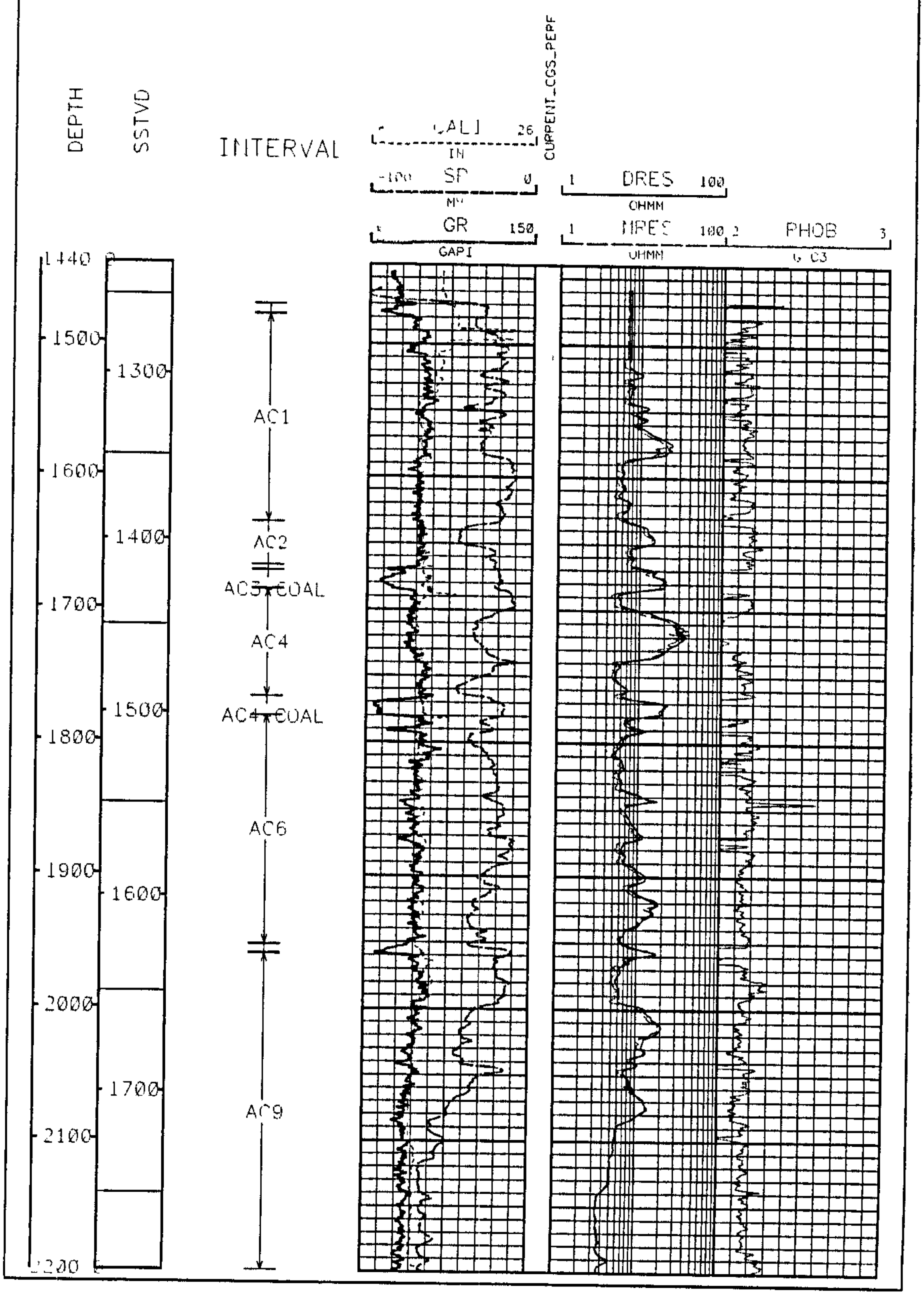
-3000'
-3200'
-3400'
GRAYLING
W.I.P.A. AREA
M-14
STEELHEAD
A
3400'
3600'
3800'
4000'
35
T 9 N
A
STEELHEAD
A'
SL
TOP B-1 SAND (GGS)
C.I.: 200'
0
1
MILE
U
D
DOLLY VARDEN
TYONEK GGS SDS
G-ZONE
HEMLOCK
ANCHORAGE
INLET
AREA SHOWN
COOK
ALASKA
MARATHON OIL COMPANY
ALASKAN REGION
McARTHUR RIVER FIELD
TRADING BAY UNIT
COOK INLET ALASKA
1996 TBU
GGS WORK PROGRAM
WI 51 %
SEPTEMBER 1995


KING
GRAYLING
STEELHEAD
DOLLY
-3000'
-3500'
3400
3900
TRADING BAY UNIT
TRADING BAY UNIT
N
1 MILE
A O G C C
MCARTHUR RIVER FIELD
TOP B-1 SAND
STRUCTURE MAP
REPRODUCED WITH OPERATOR PERMISSION

M-7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OHMM
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MRES
100
OHMM
PHOB
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G C3
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1500
1600
1700
1800
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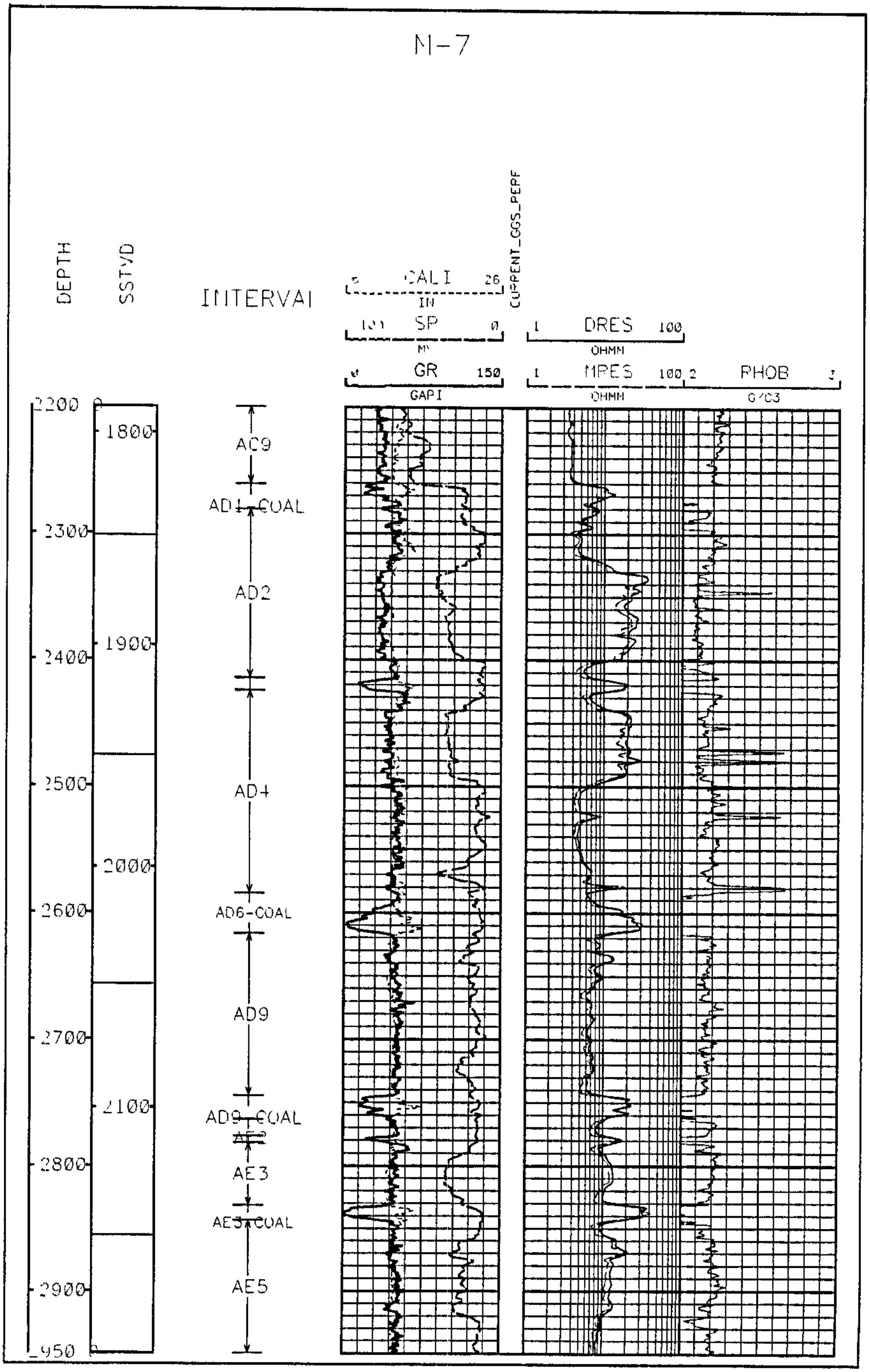
AC6
AC9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SP
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DRES
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OHMM
MRES
OHMM
PHOB
2200
2300
2400
2500
2600
2700
2800
2900
2950
1800
1900
2000
2100
AC9
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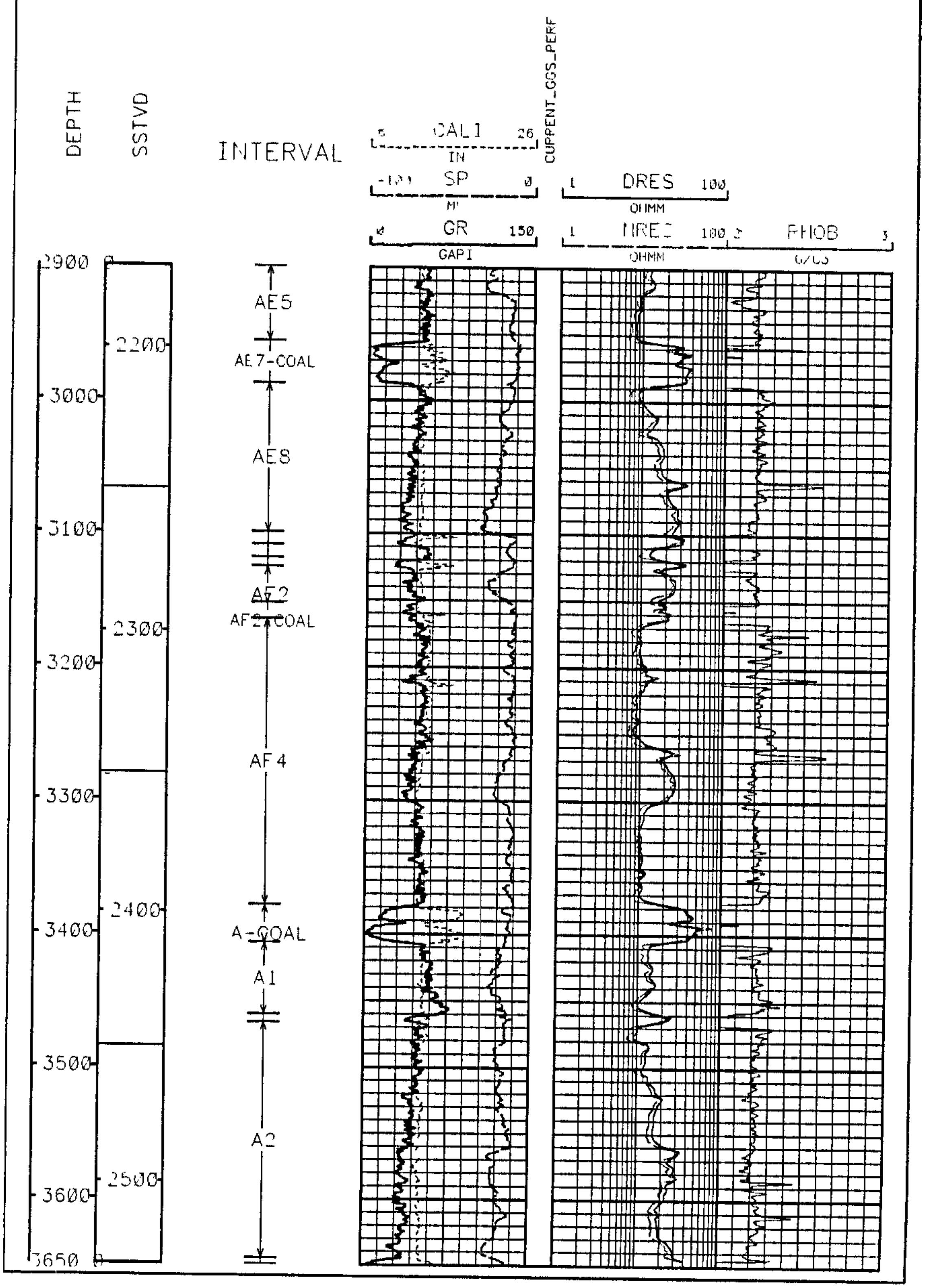
AD2
AD4
AD6-COAL
AD9
AD9-COAL
AE3
AE3-COAL
AE5

M-7



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SSTVD
INTERVAL
CALI
26
IN
CURRENT_GGS_PERF
SP
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DRES
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OHMM
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OHMM
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2900
3000
3100
3200
3300
3400
3500
3600
3650
2200
2300
2400
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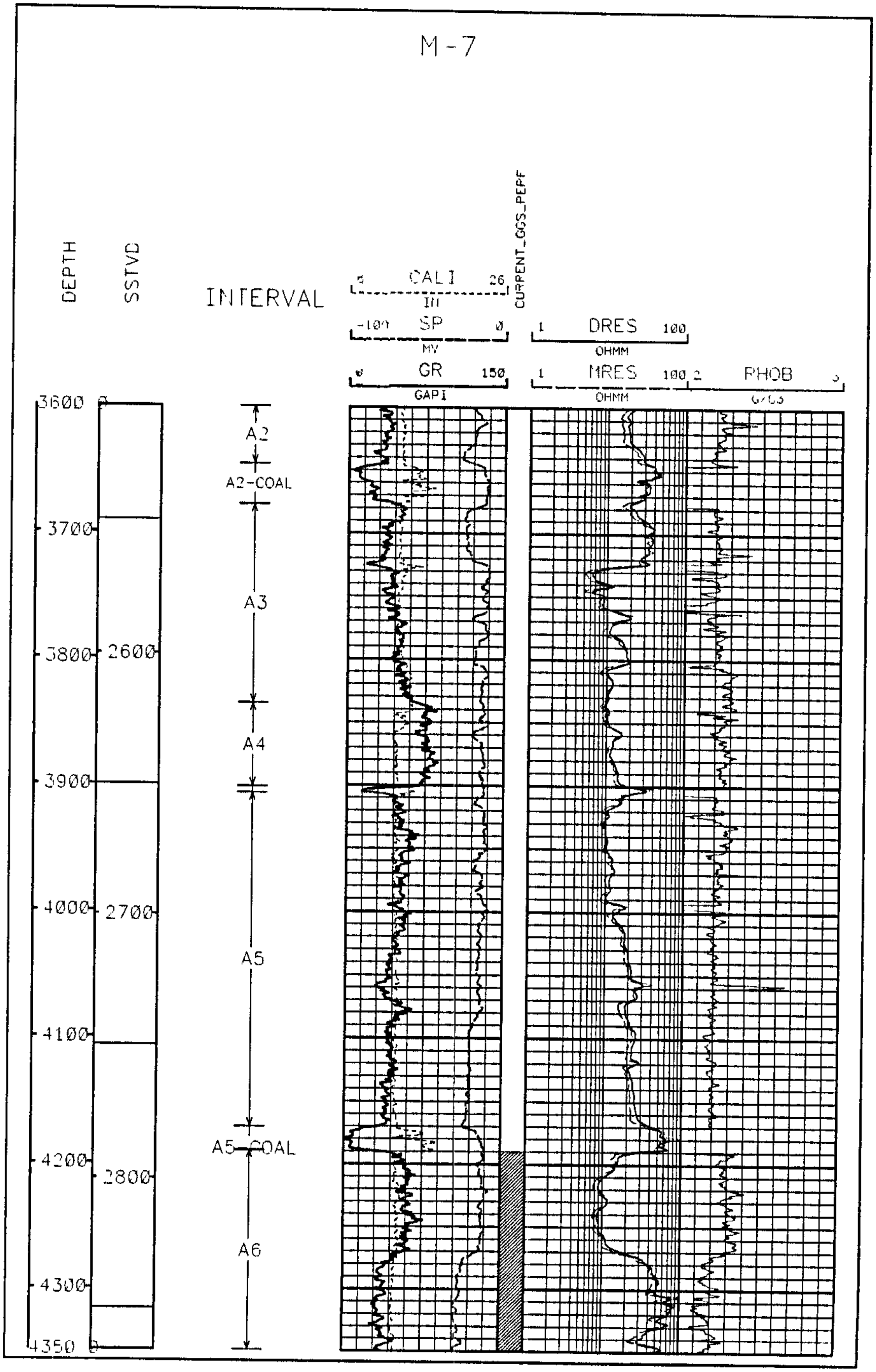
AE8
AF2
AF2-COAL
AF4
A-COAL
A1
A2

M-7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4000
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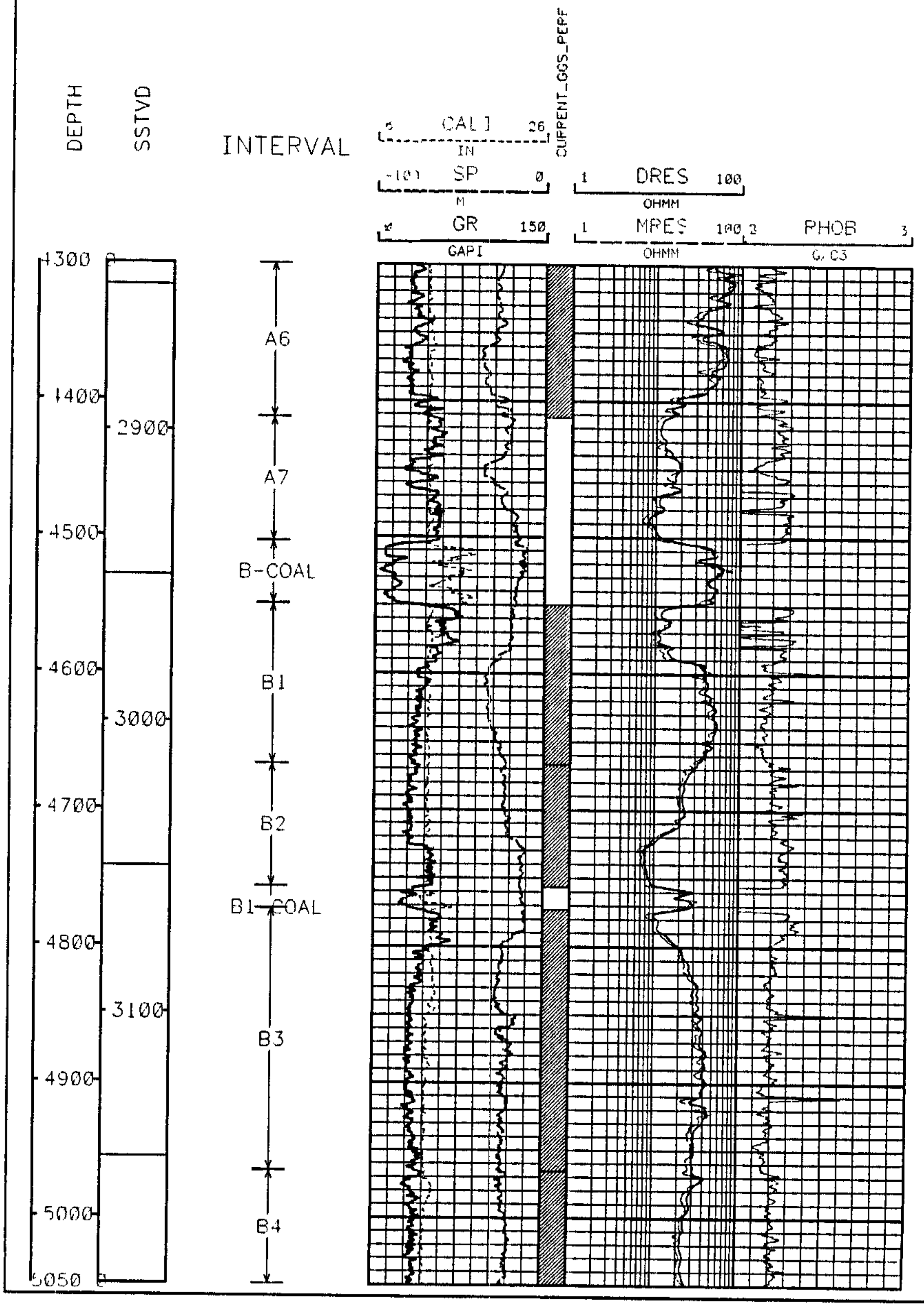
M-7



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SSTVD
INTERVAL
CALI
IN
SP
M
GR
GAPI
CURRENT_GGS_PERF
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OHMM
MRES
OHMM
PHOB
G/C3
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4400
4500
4600
4700
4800
4900
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2900
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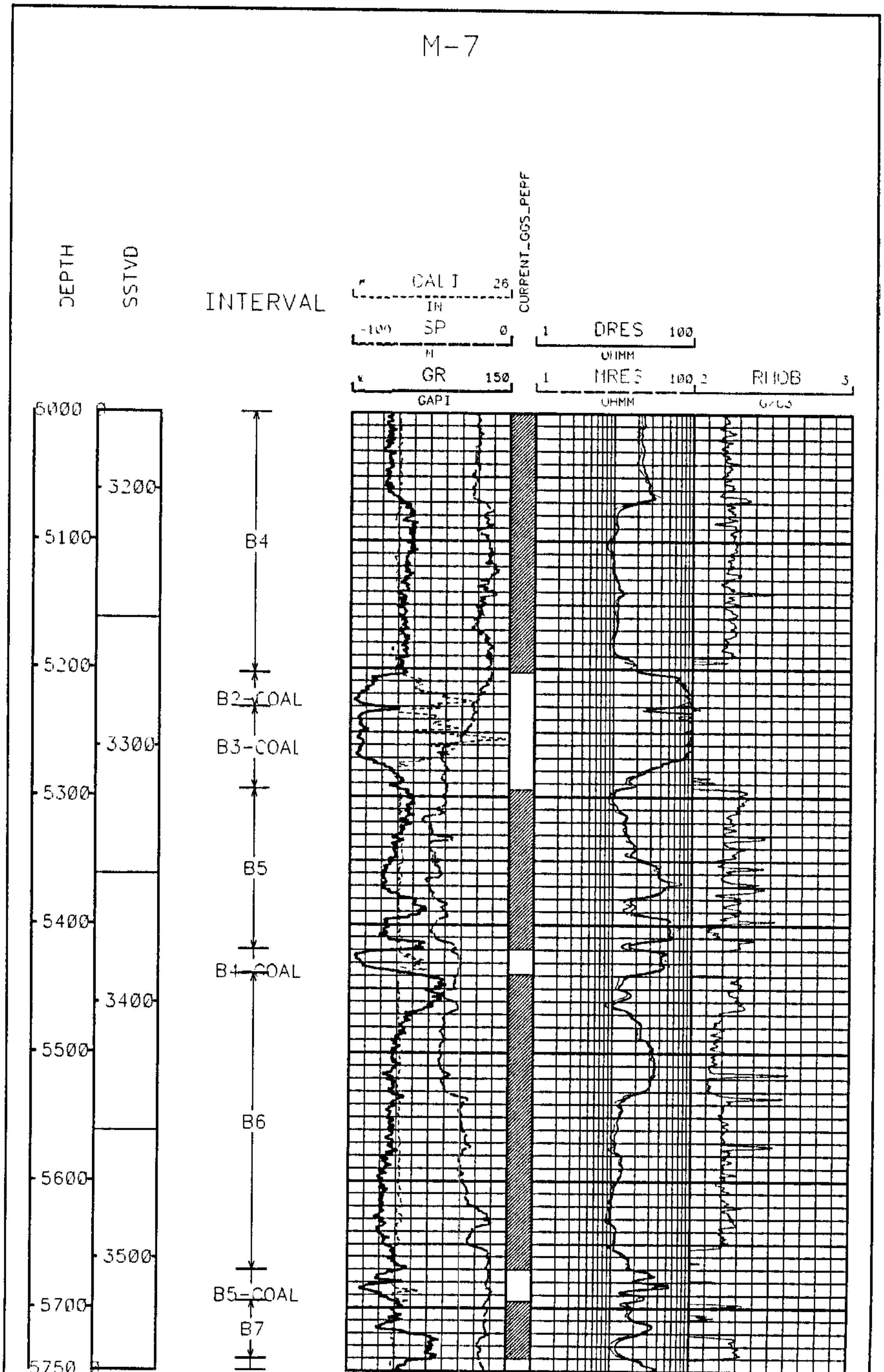
B1-COAL
B3
B4



M-7
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CALI
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IN
CURRENT_GGS_PERF
SP
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DRES
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100
OHMM
GR
150
GAPI
MRES
1
100
OHMM
RHOB
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3
5000
5100
5200
5300
5400
5500
5600
5700
5750
3200
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3500
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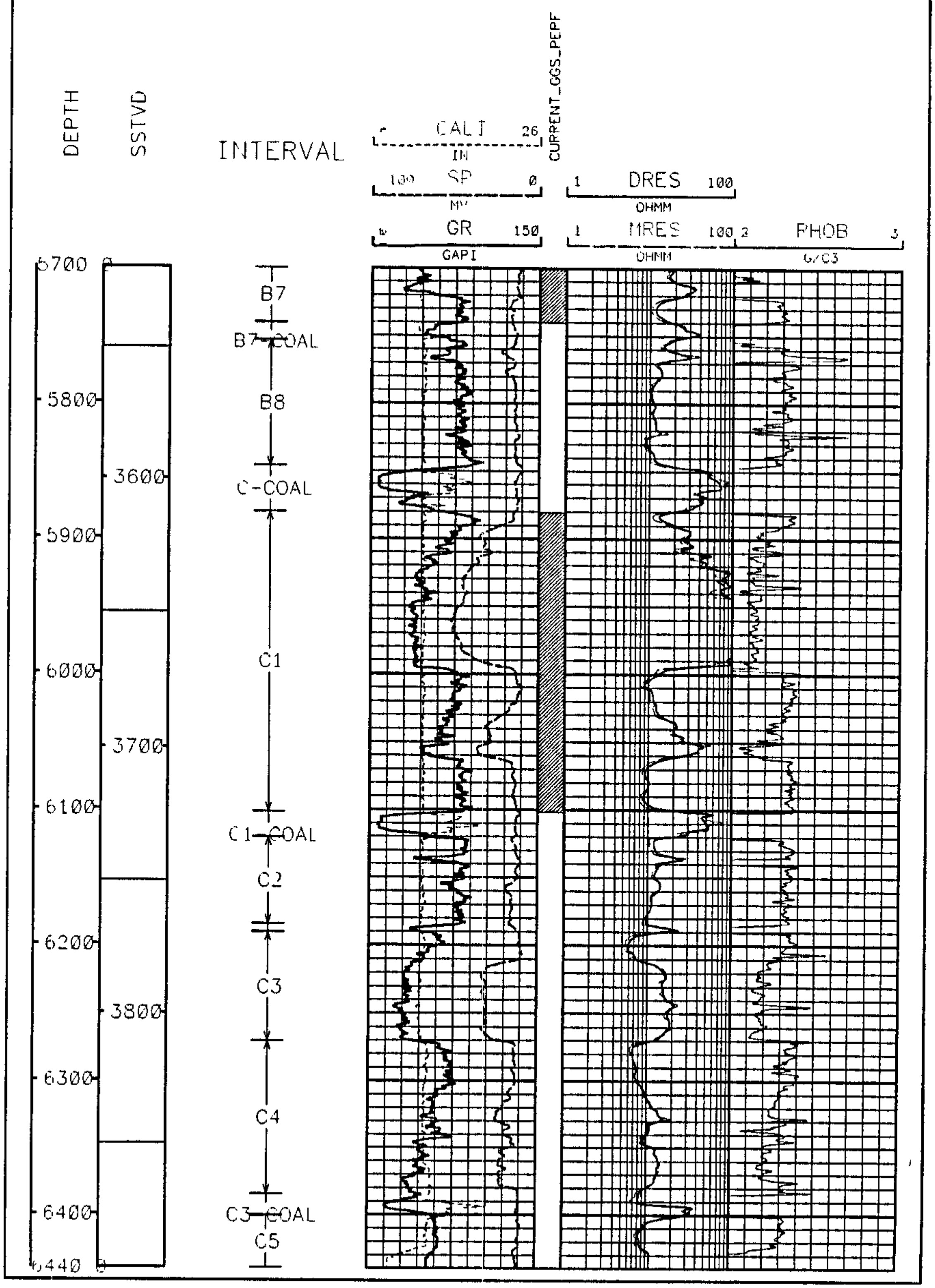
B2-COAL
B3-COAL
B5
B6
B5-COAL
B7

M-7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OHMM
2 PHOB 3
G/C3
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5800
5900
6000
6100
6200
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3600
3700
3800
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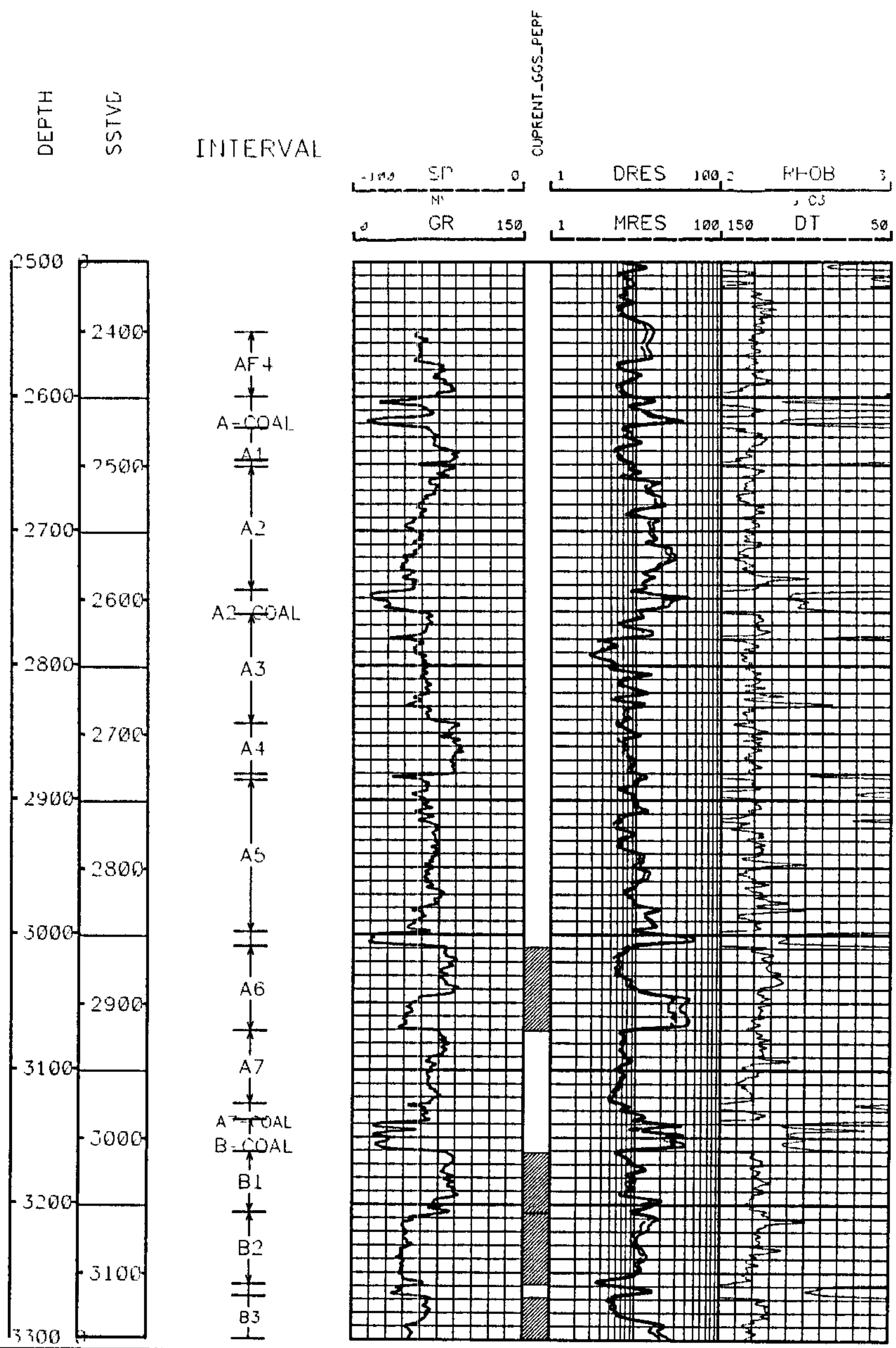
C5

M-25



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2700
2800
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2400
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3000
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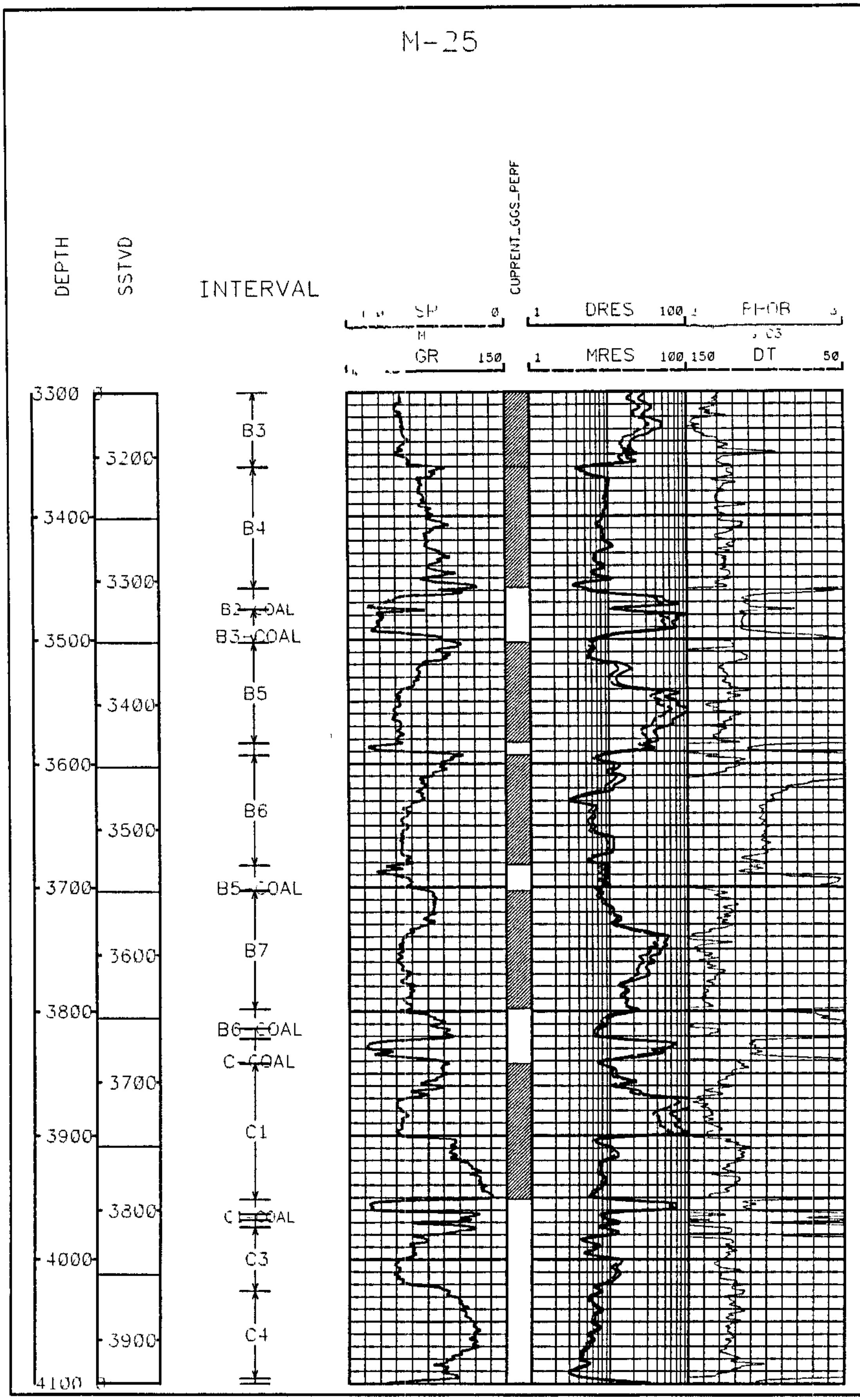
B2
B3



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3200 3300 3400 3500 3600 3700 3800 3900
B3
B4
B2-COAL
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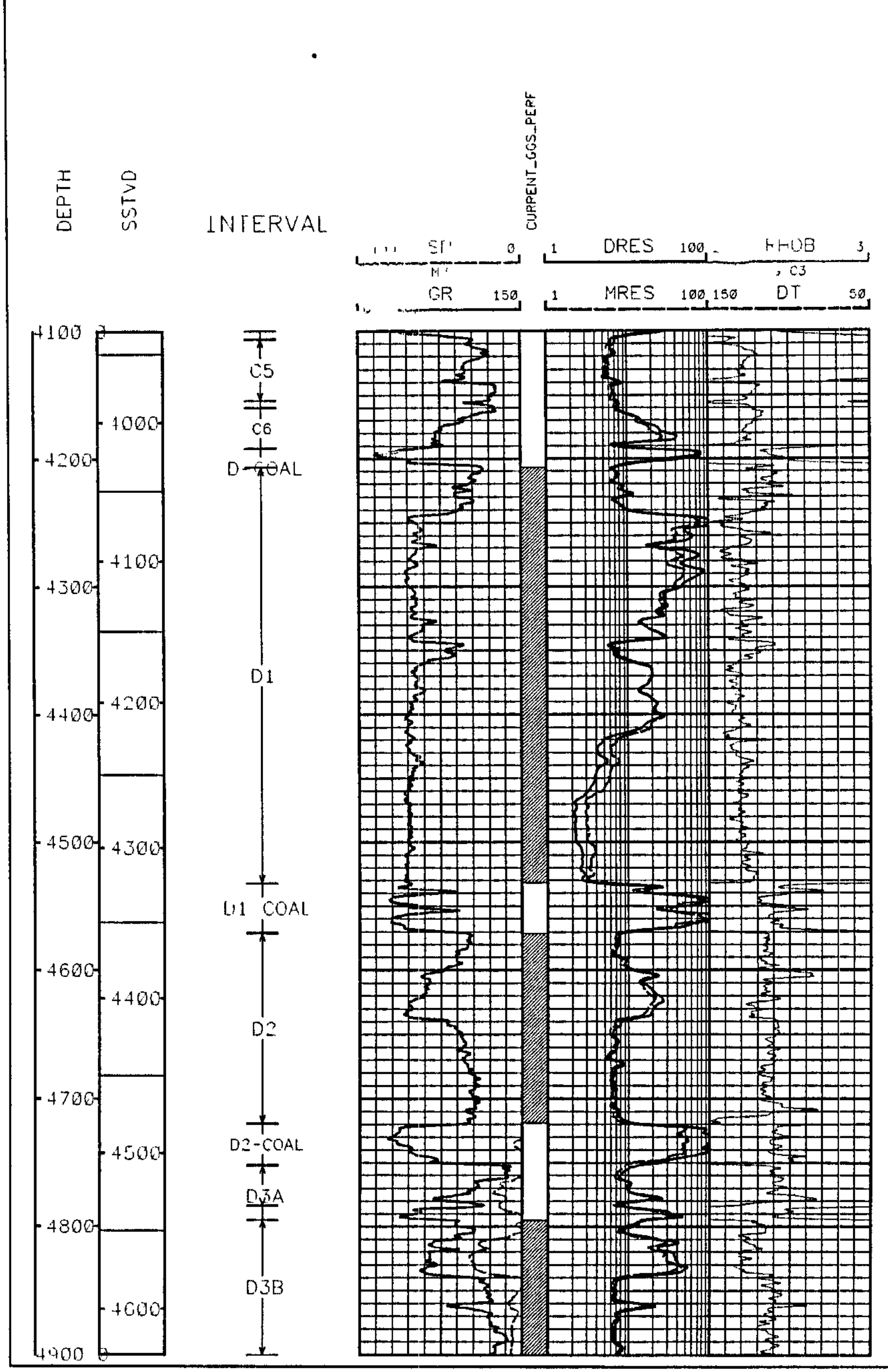
C3
C4

M-25



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4200
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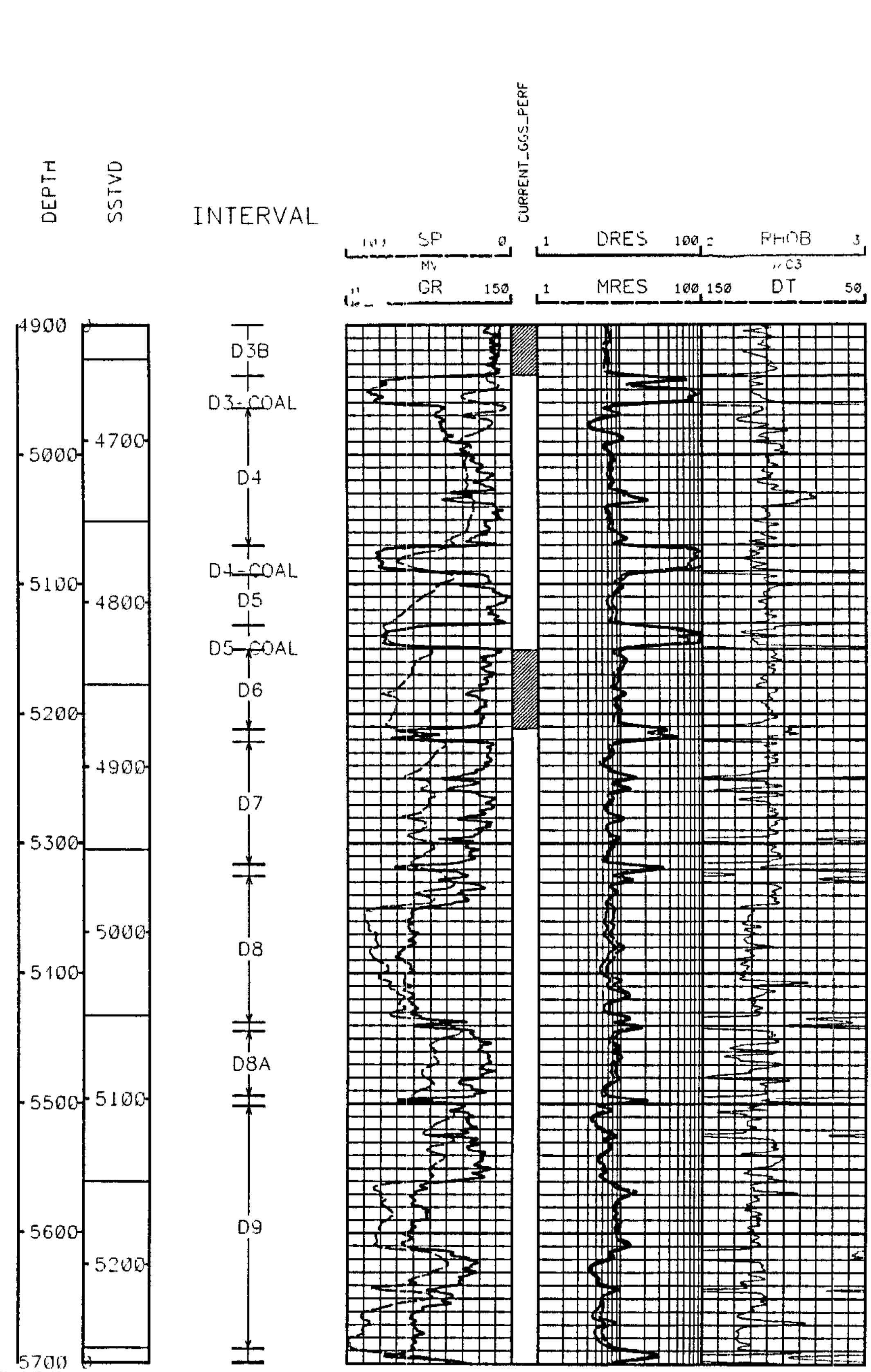

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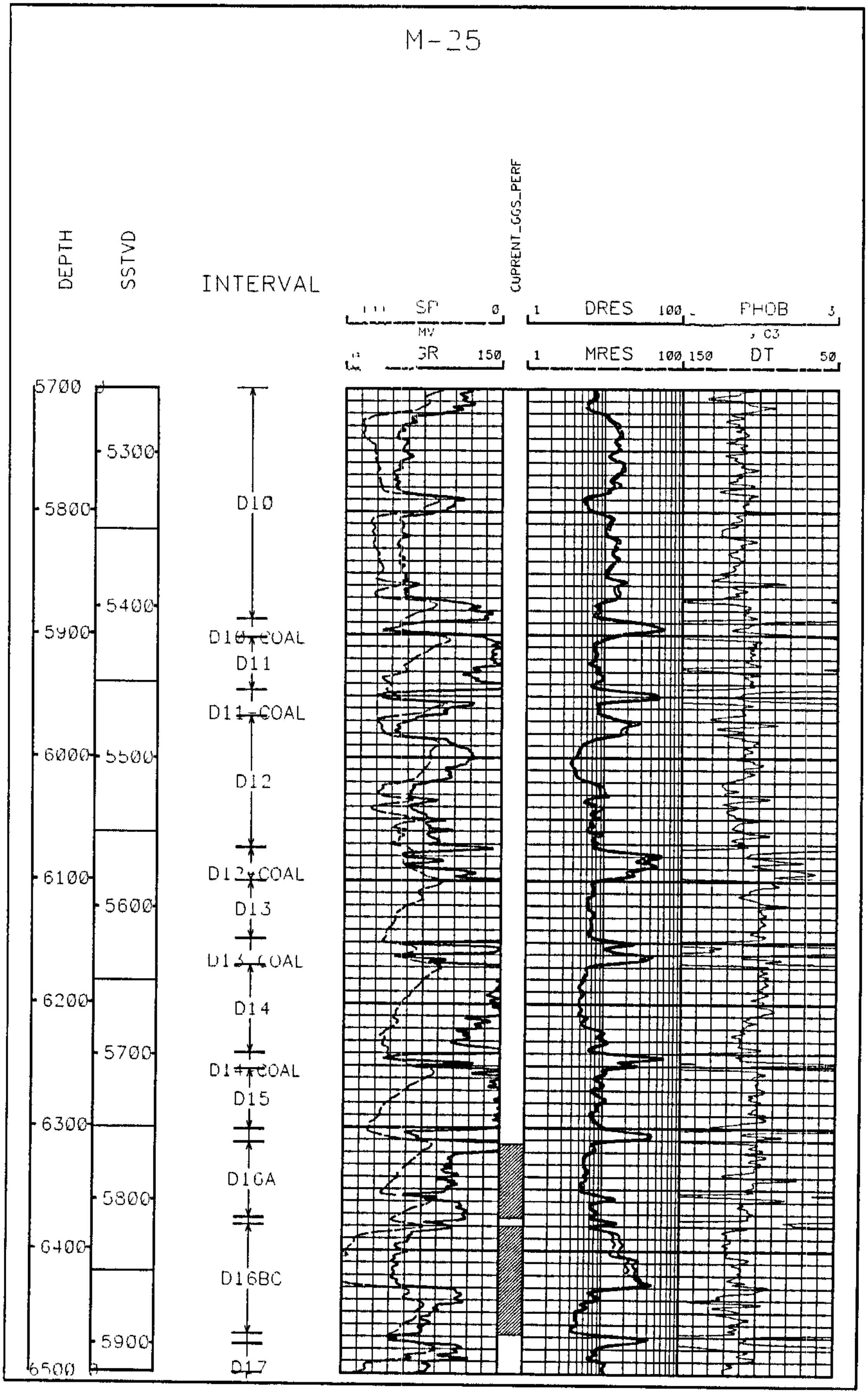
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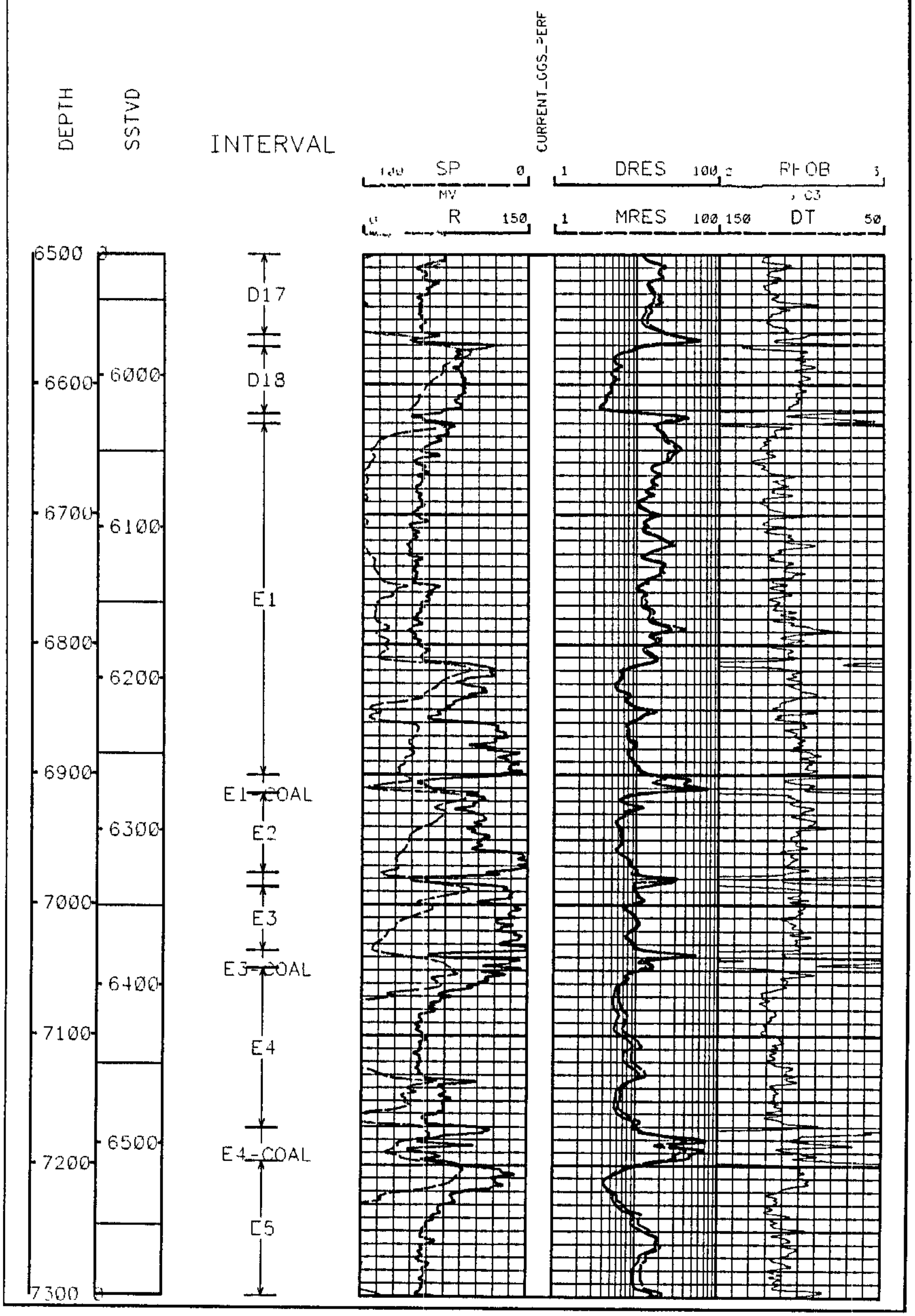

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RHOB
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MRES
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DT
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6500
6600
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6100
6200
6300
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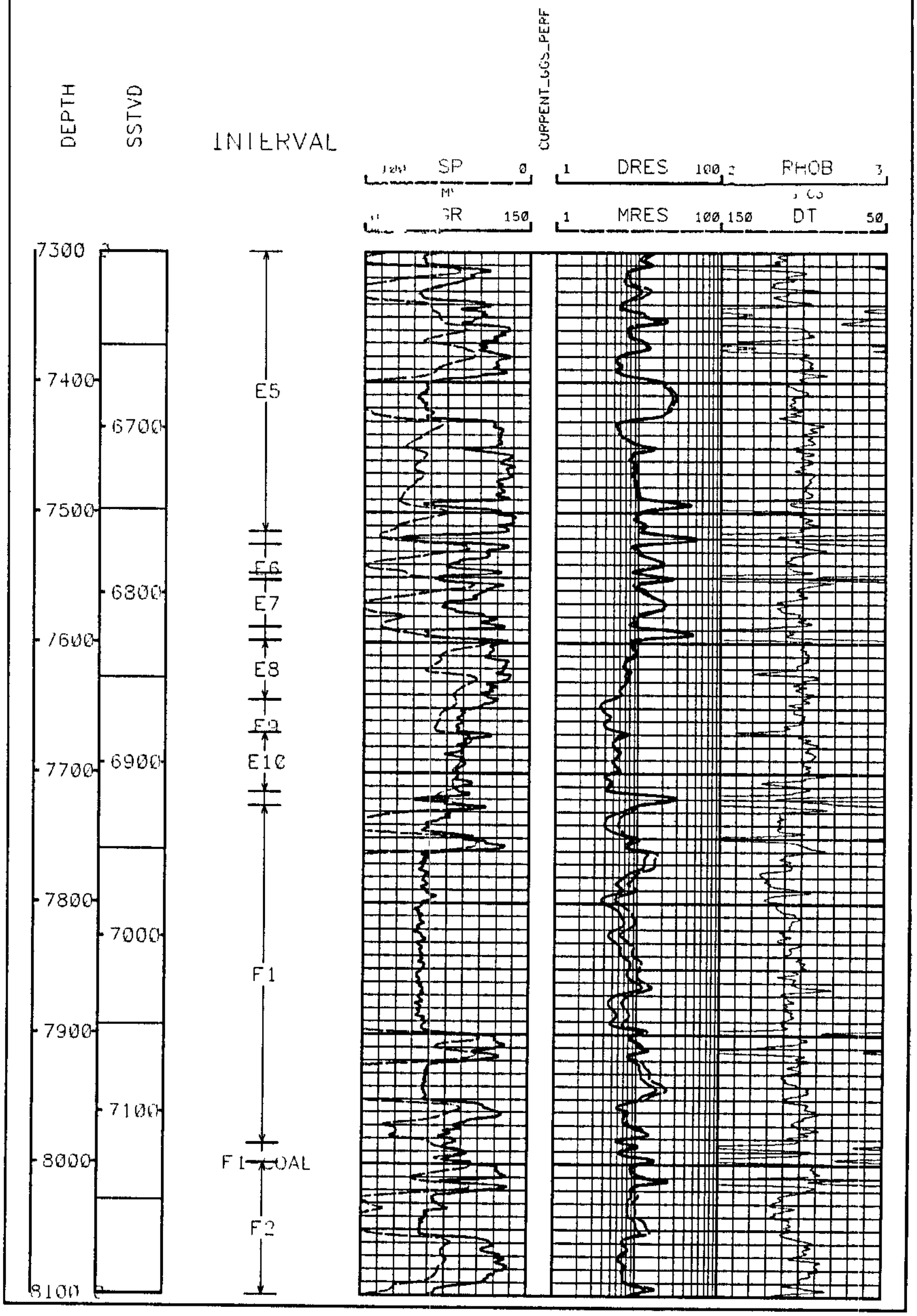
E4
E4-COAL
E5

M-25



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8000
8100
6700
6800
6900
7000
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E6
E7
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E10
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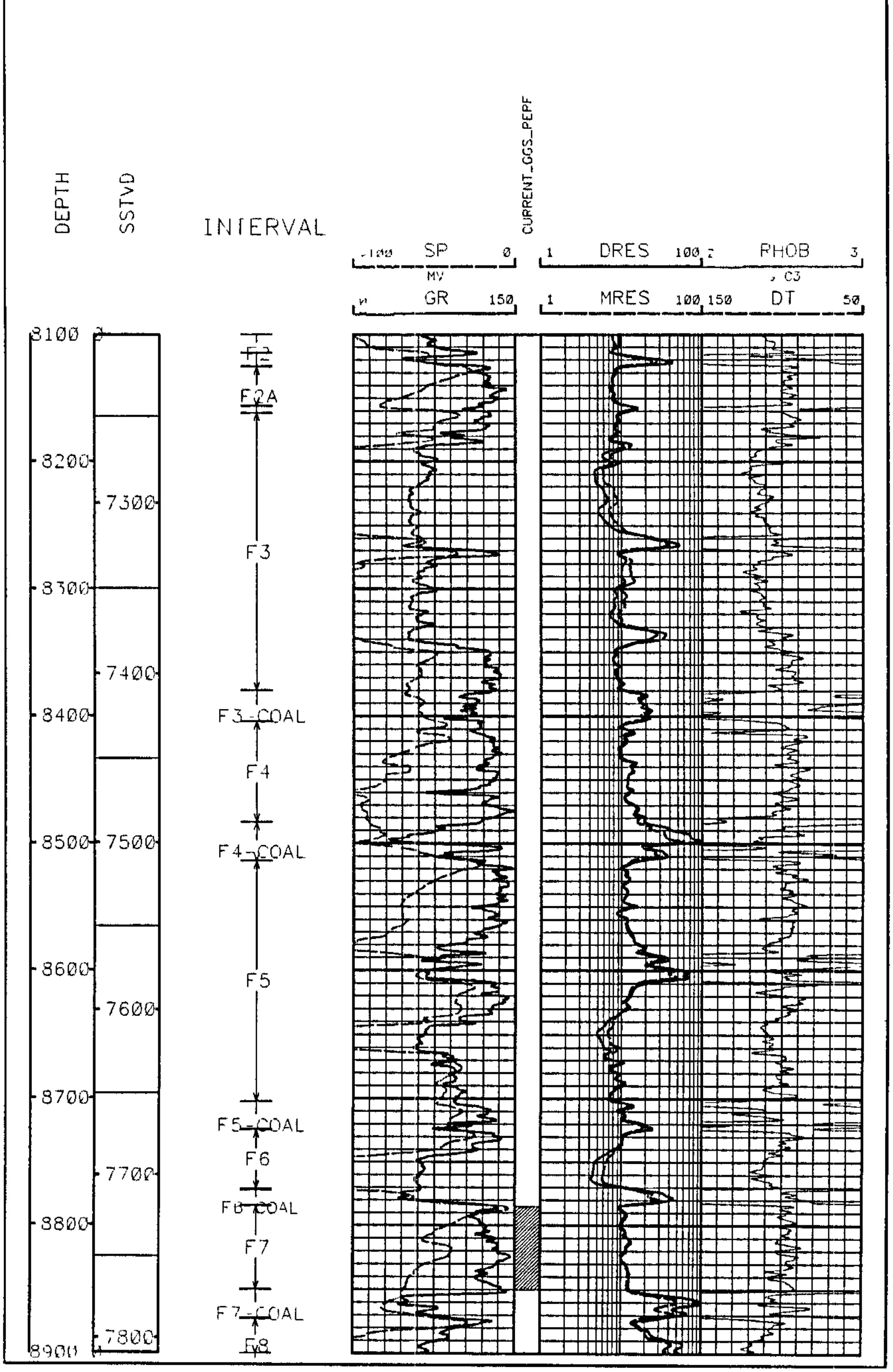
F1-COAL
F2

M-25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G/C3
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8500
8600
8700
8800
8900
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7400
7500
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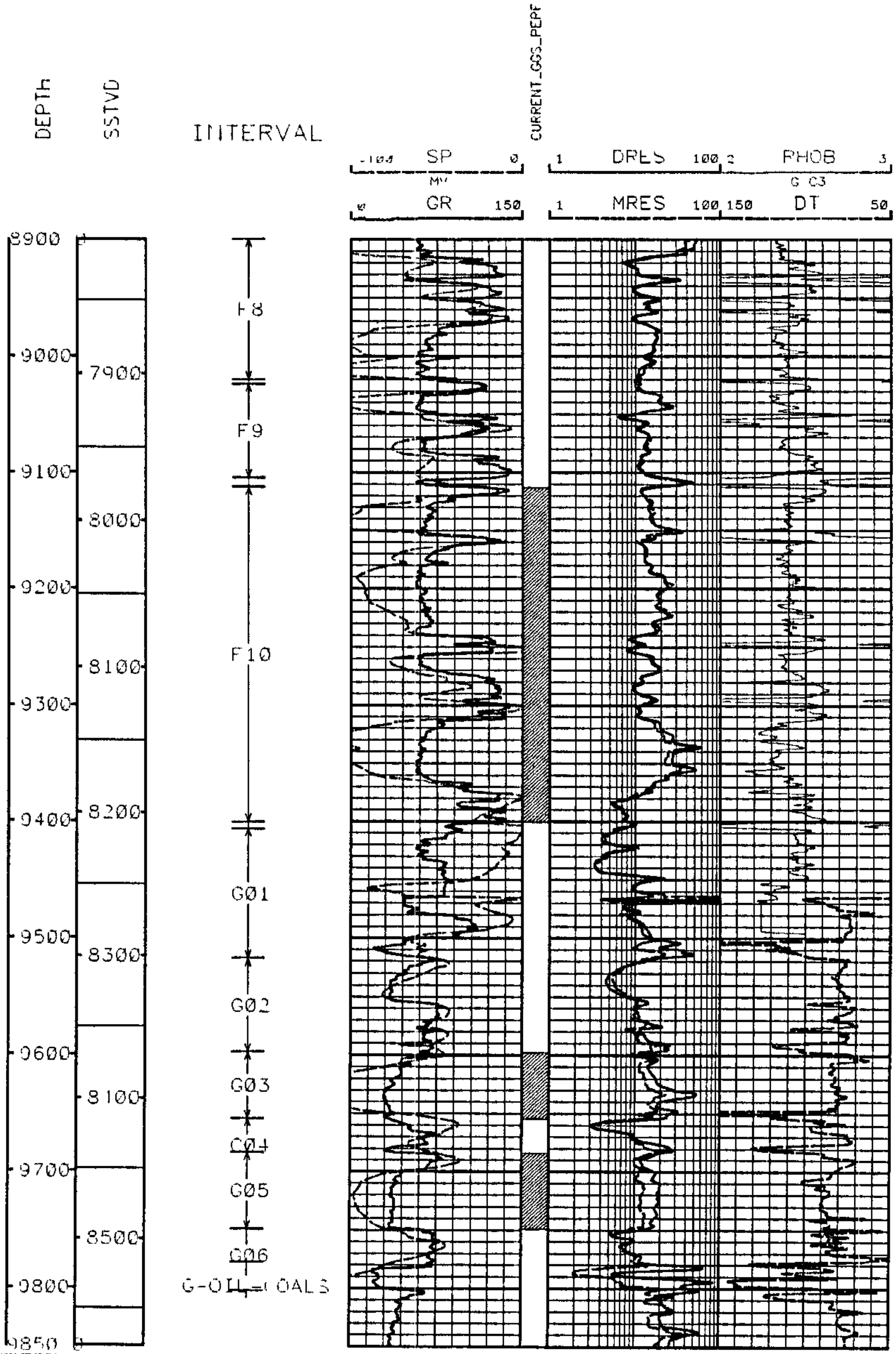
M-25



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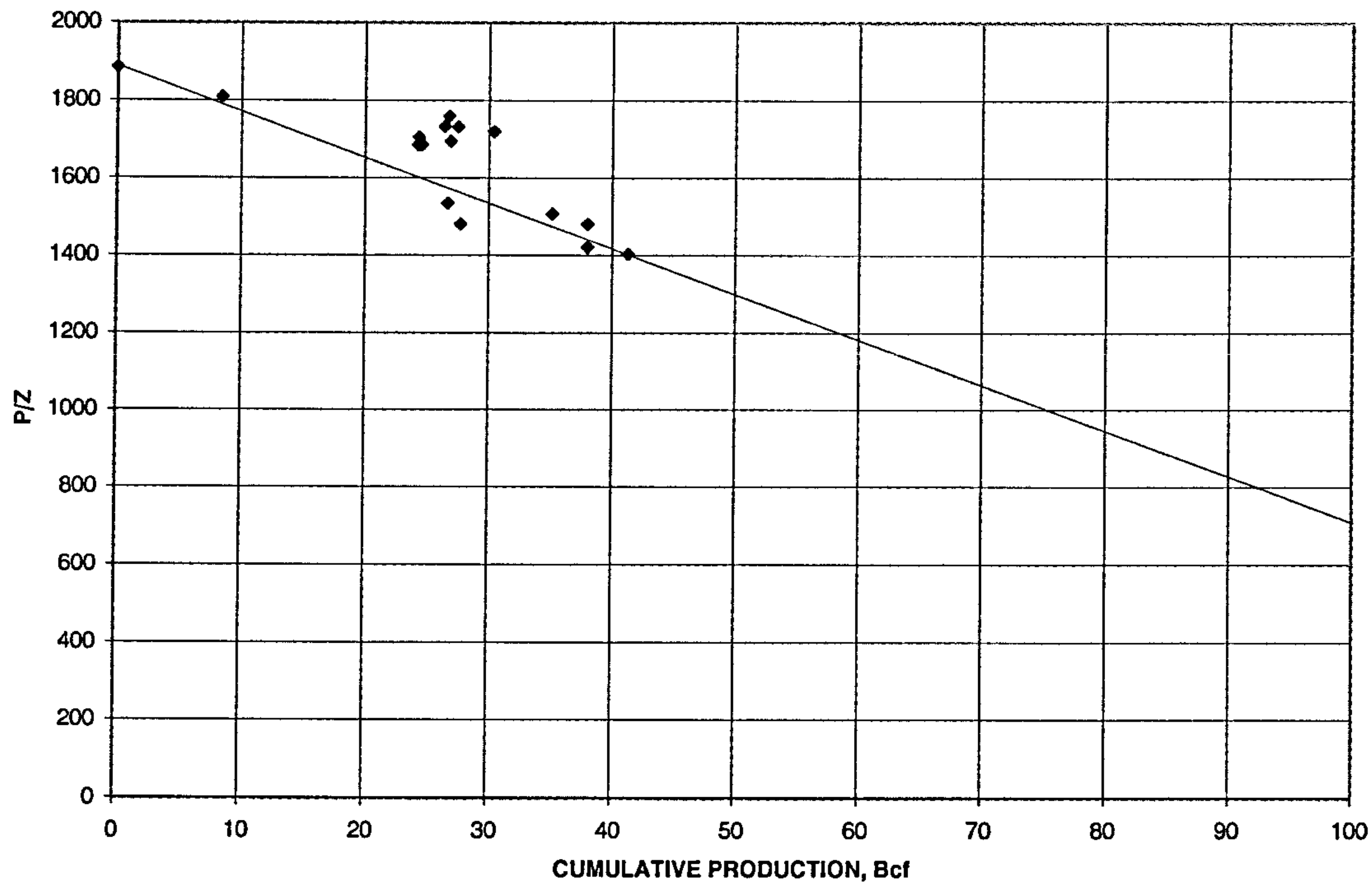
1 DRES 100
1 MRES 100
2 RHOB 3
G C3
150 DT 50
8900
9000
9100
9200
9300
9400
9500
9600
9700
9800
9850
7900
8000
8100
8200
8300
8100
8500
F8
F9
F10
G01
G02
G03
G04
G05
G06
G-OIL = COALS

McARTHUR FIELD - A 6



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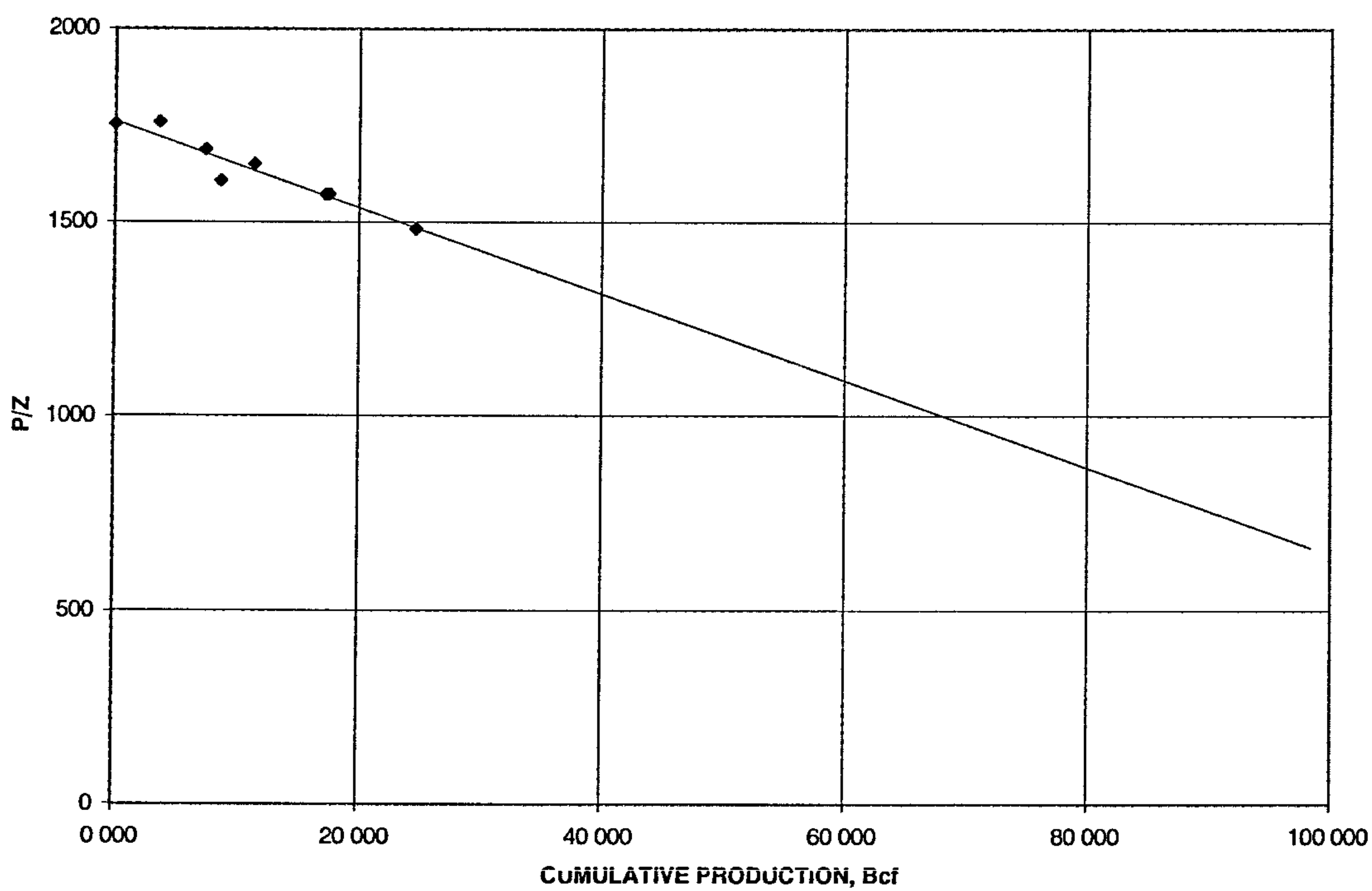

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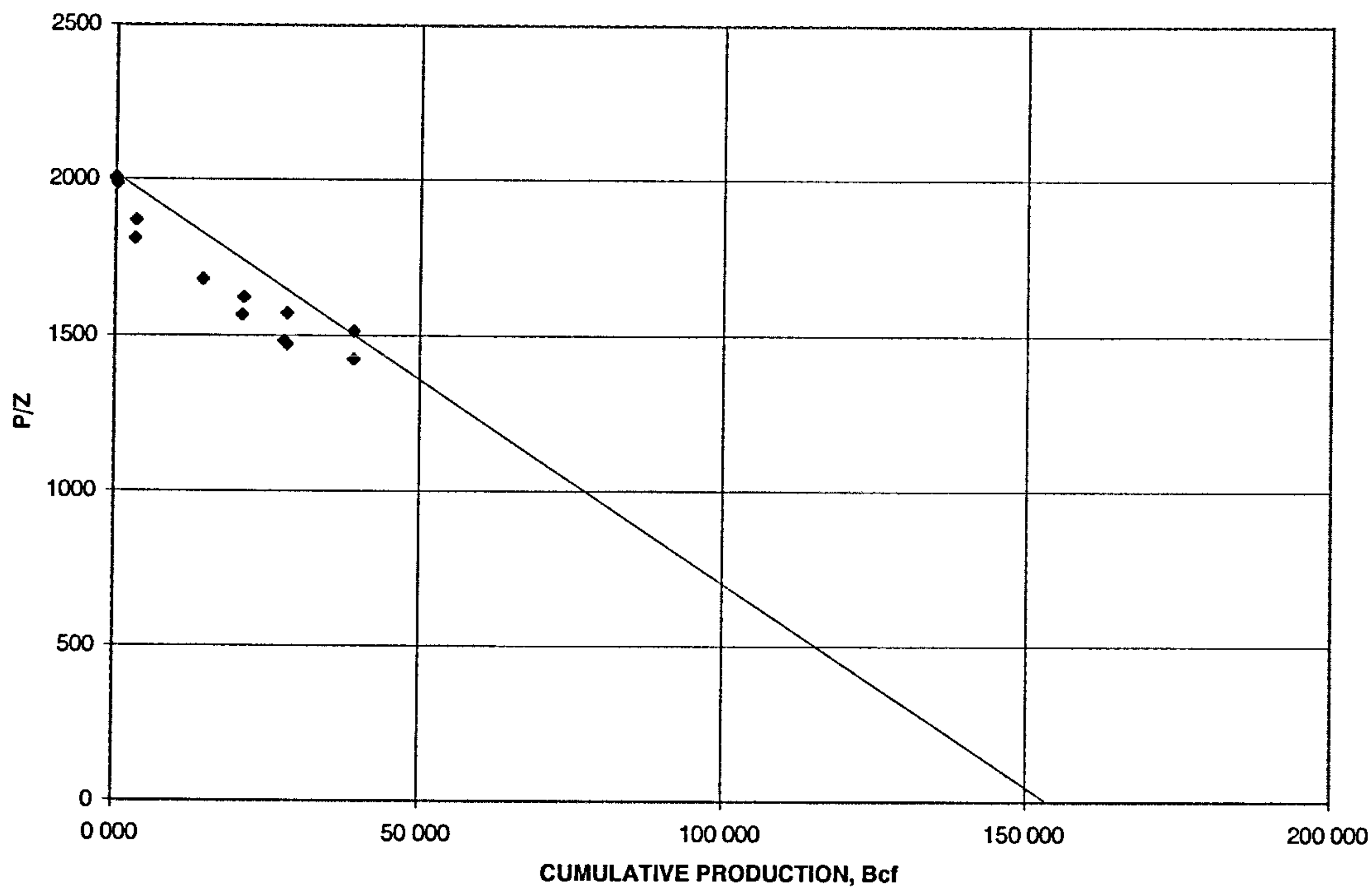

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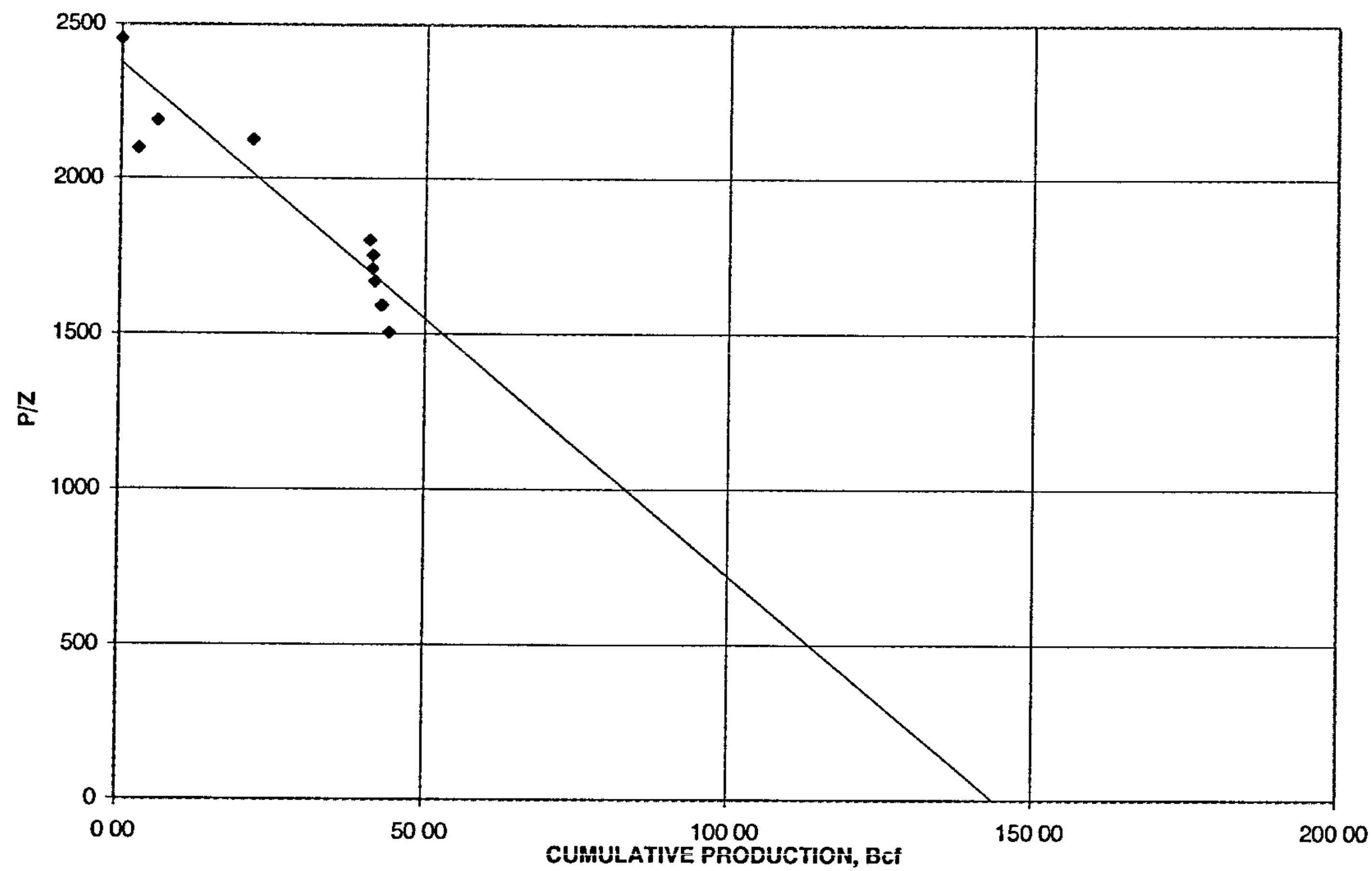
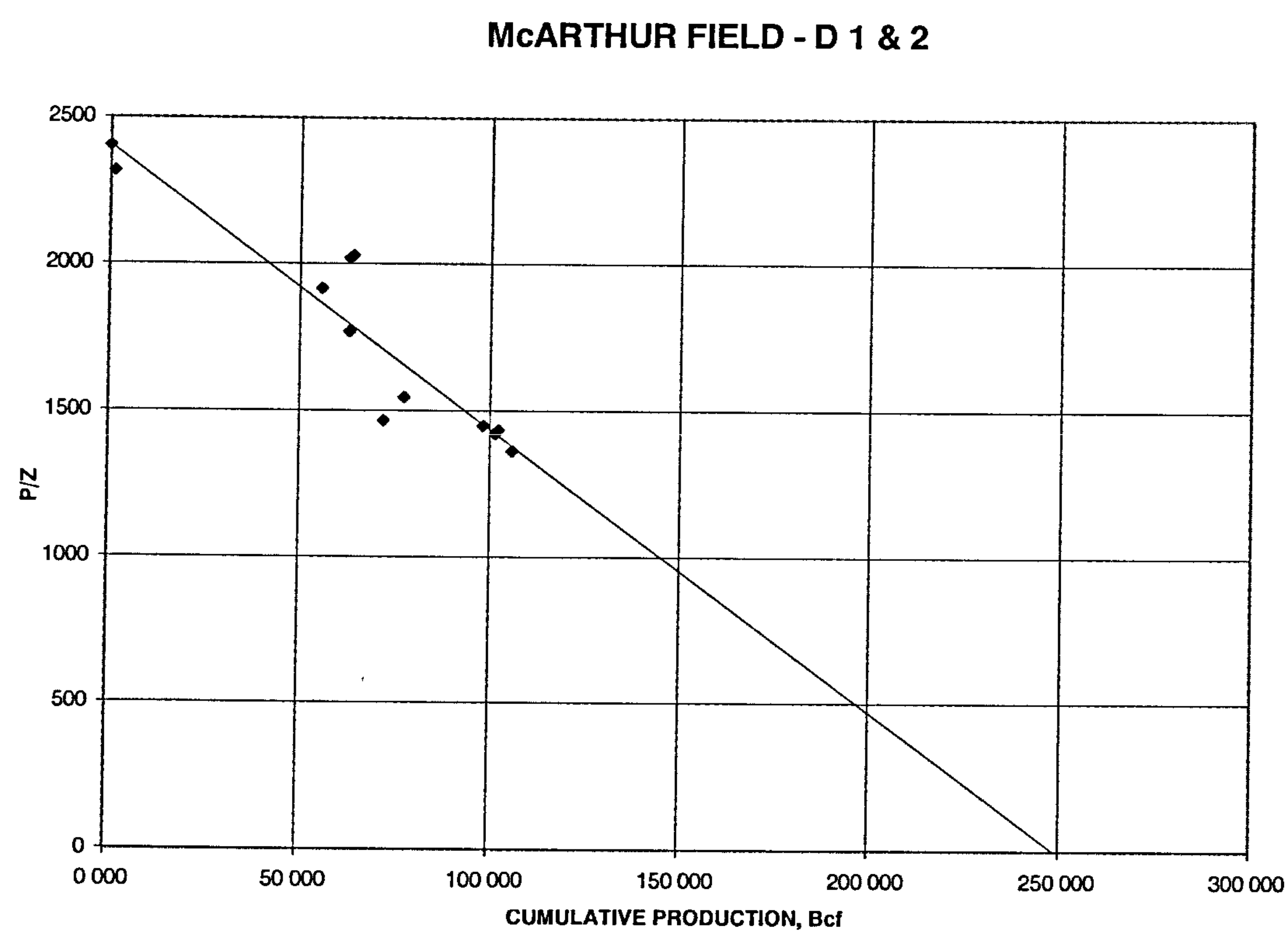
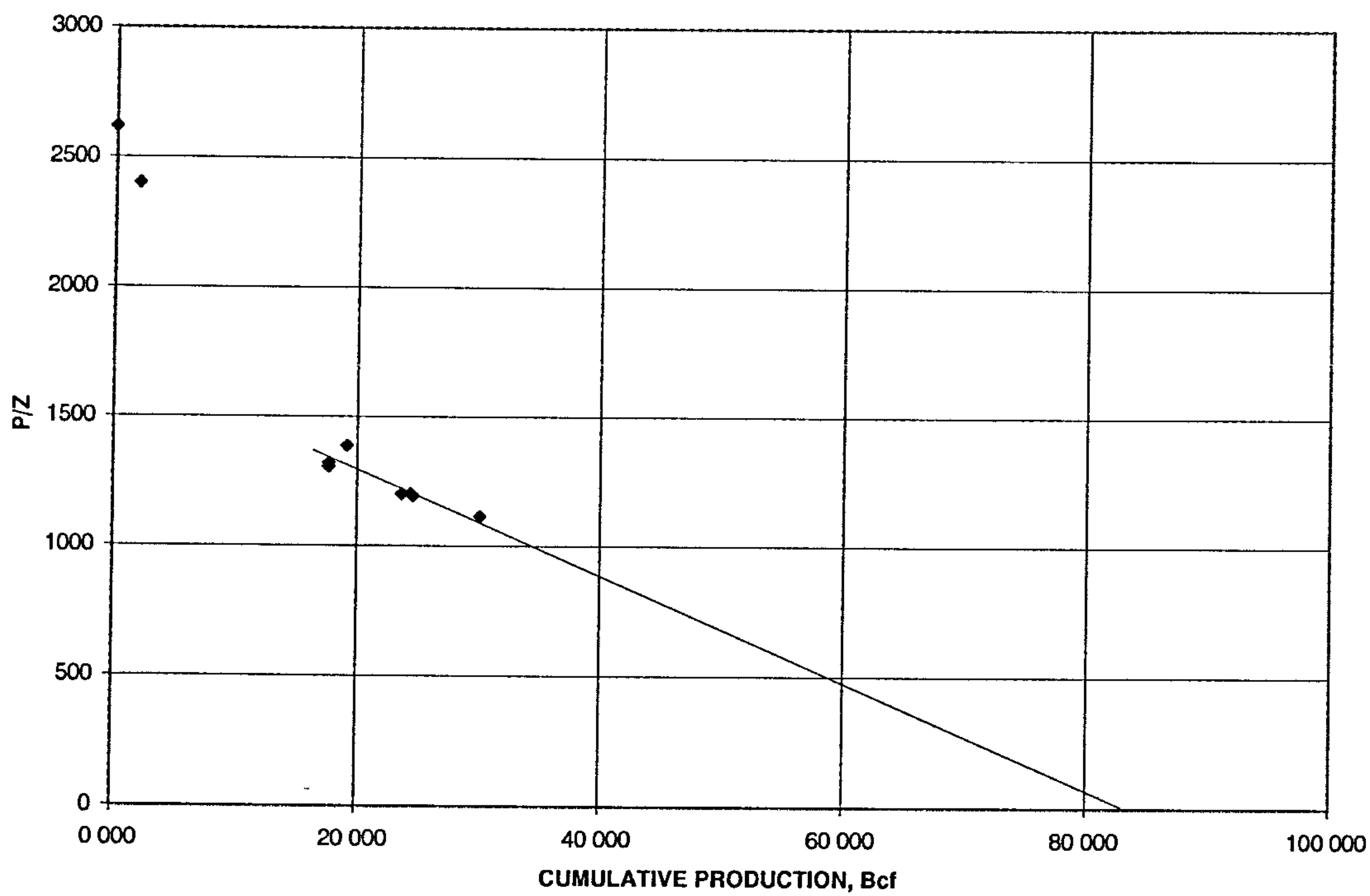



McARTHUR FIELD - D 1 & 2
2500
2000
1500
1000
500
0
P/Z
0 000
50 000
100 000
150 000
200 000
250 000
300 000
CUMULATIVE PRODUCTION, Bcf

McARTHUR FIELD - D 3



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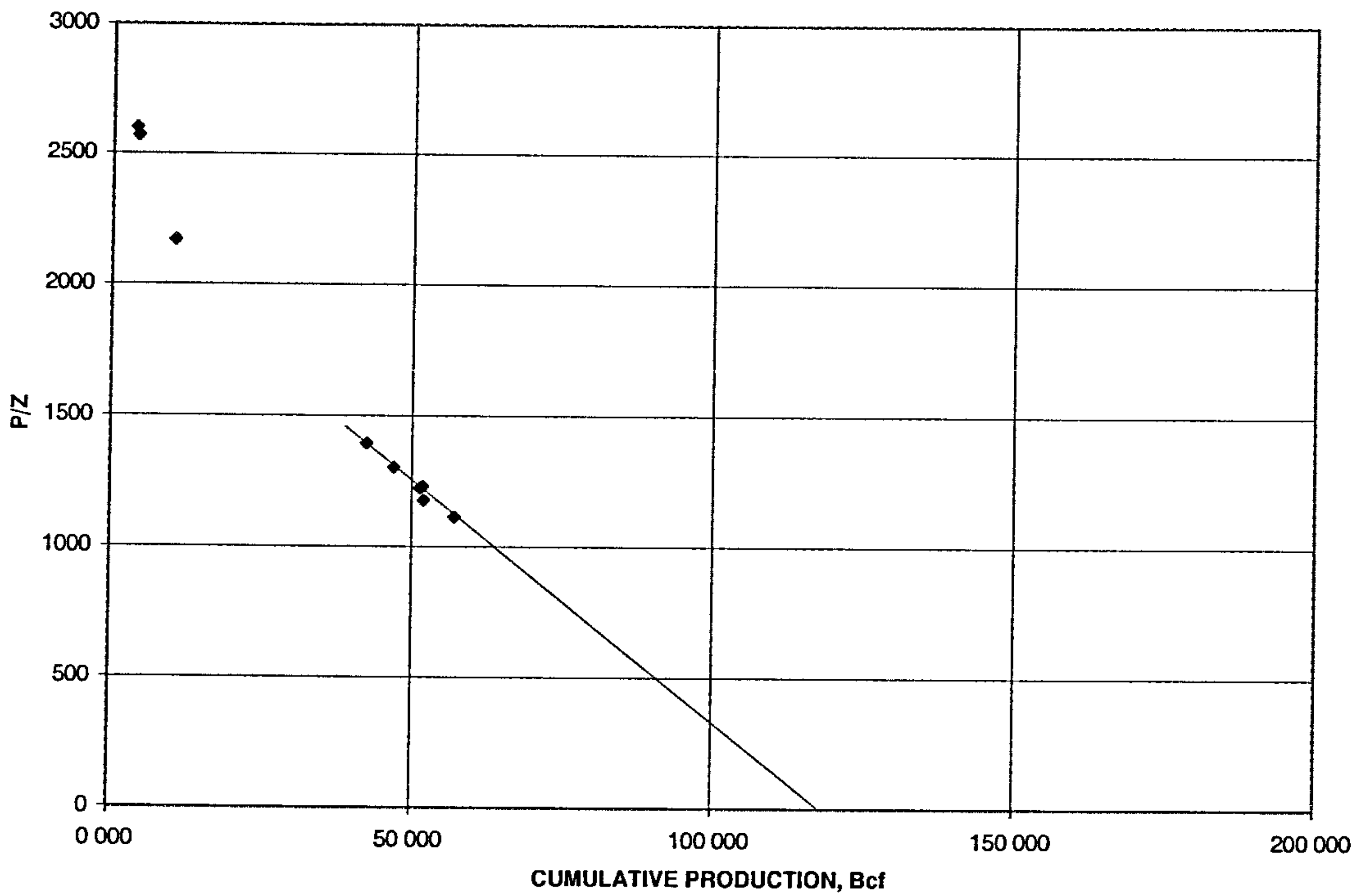
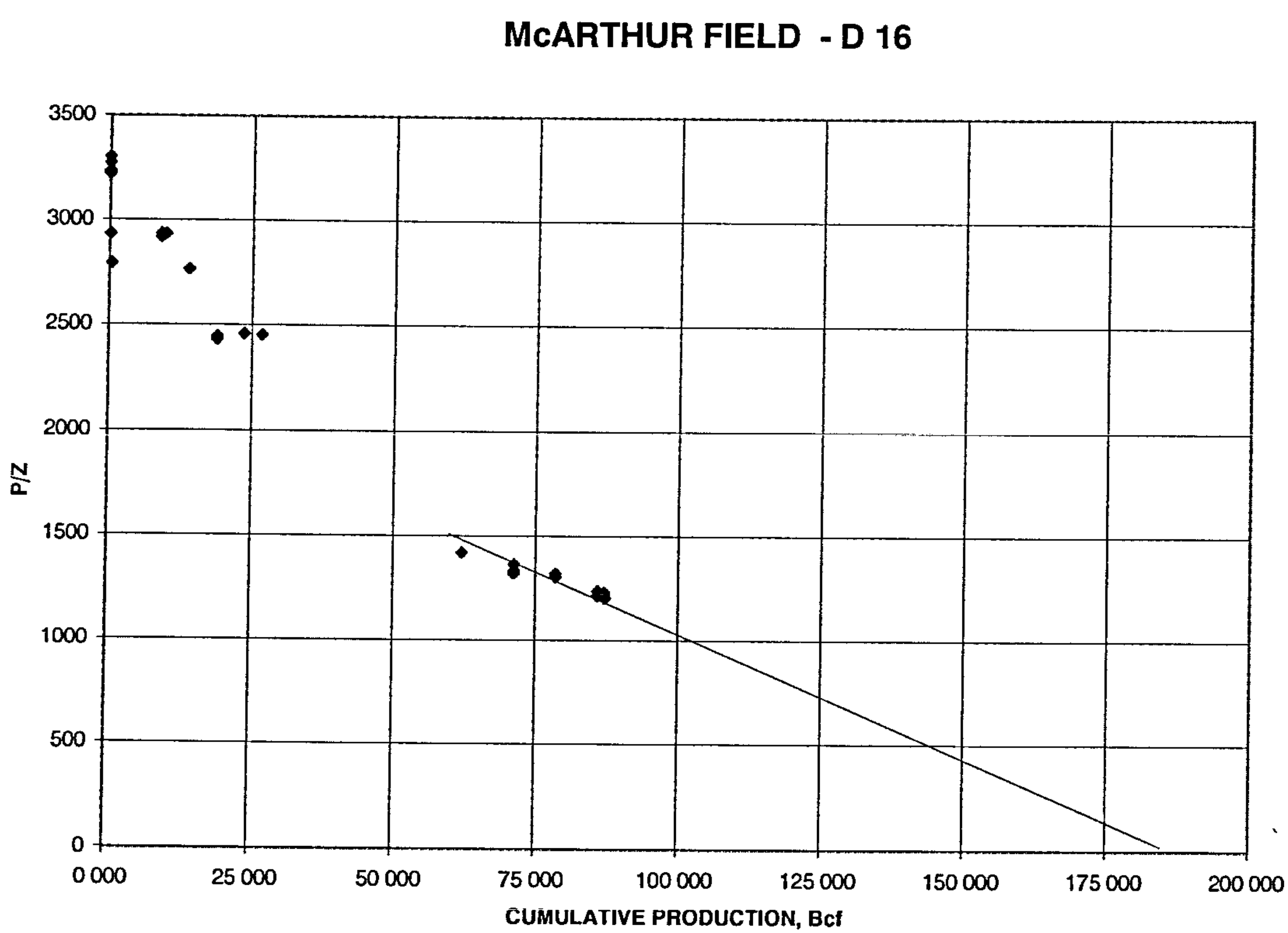



McARTHUR FIELD - D 16
P/Z
3500
3000
2500
2000
1500
1000
500
0
0 000
25 000
50 000
75 000
100 000
125 000
150 000
175 000
200 000
CUMULATIVE PRODUCTION, Bcf

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
8/14/74	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1537	0 66	0 00	0 815	1886
8/15/79	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1482	0 66	8 43	0 819	1810
7/2/87	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1428	0 66	26 41	0 824	1733
8/25/87	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1446	0 66	26 75	0 822	1759
10/3/87	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1401	0 66	26 92	0 826	1696
12/12/87	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1427	0 66	27 52	0 824	1732
7/27/90	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1420	0 66	30 41	0 825	1721
8/29/92	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1409	0 66	24 32	0 826	1706
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1395	0 66	24 57	0 827	1687
8/26/93	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1395	0 66	24 30	0 827	1687
10/3/93	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1265	0 66	35 14	0 839	1508
3/11/94	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1285	0 66	26 67	0 837	1535
5/18/94	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1246	0 66	27 73	0 841	1482
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1202	0 66	38 00	0 845	1422
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1246	0 66	38 00	0 841	1482
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	A6	1189	0 66	41 29	0 847	1404

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
7/27/90	UNOCAL	UNION OIL CO G-18	12/2/68	B2	1443	0 66	0 000	0 823	1753
8//92	UNOCAL	UNION OIL CO G-18	12/2/68	B3A	1446	0 66	3 632	0 822	1759
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	B-3A	1396	0 66	7 436	0 827	1688
3/30/93	UNOCAL	UNION OIL CO G-18	12/2/68	B-3A	1338	0 66	8 692	0 832	1608
8/26/93	UNOCAL	UNION OIL CO G-18	12/2/68	B-3A	1368	0 66	11 432	0 829	1650
5/18/94	UNOCAL	UNION OIL CO G-18	12/2/68	B-3A	1312	0 66	17 281	0 834	1573
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	B-3A	1312	0 66	17 598	0 834	1573
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	B-3A	1247	0 66	24 693	0 841	1483

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
12/4/73	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1624	0 66	0 000	0 809	2007
12/28/73	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1619	0 66	0 014	0 809	2001
5/25/74	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1609	0 66	0 290	0 810	1986
5/30/85	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1482	0 66	3 204	0 819	1810
10/9/90	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1525	0 66	3 356	0 816	1869
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1390	0 66	14 440	0 827	1681
10/12/93	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1309	0 66	20 812	0 835	1568
10/25/93	UNOCAL	UNION OIL CO G-18	12/2/68	B7	1348	0 66	21 113	0 831	1622
5/18/94	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1246	0 66	27 700	0 840	1483
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1240	0 66	28 245	0 841	1474
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	B7	1312	0 66	28 245	0 834	1573
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1204	0 66	39 180	0 845	1425
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	B5	1270	0 66	39 180	0 838	1516

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
2/24/69	UNOCAL	UNION OIL CO G-18	12/2/68	C3	1945	0 66	0 00	0 793	2453
4/14/71	UNOCAL	UNION OIL CO G-18	12/2/68	C3	1690	0 66	2 88	0 805	2099
8/11/74	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1753	0 66	6 01	0 801	2189
8/20/79	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1709	0 66	21 71	0 804	2126
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1411	0 66	41 39	0 825	1710
3/30/93	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1442	0 66	41 46	0 823	1752
8/26/93	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1383	0 66	41 84	0 828	1670
5/18/94	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1327	0 66	42 84	0 833	1593
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1327	0 66	43 03	0 833	1593
7/28/92	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1477	0 66	40 89	0 820	1801
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	C1	1264	0 66	44 19	0 839	1507

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
12/4/68	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1958	0 66	0 000	0 815	2402
8/28/69	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1893	0 66	1 250	0 817	2317
10/30/83	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1595	0 66	55 690	0 832	1917
7/2/87	UNOCAL	UNION OIL CO G-18	12/2/68	D-1B	1485	0 66	63 040	0 839	1770
7/2/87	UNOCAL	UNION OIL CO G-18	12/2/68	D-2B	1672	0 66	63 040	0 827	2022
7/13/87	UNOCAL	UNION OIL CO G-18	12/2/68	D-2A	1679	0 66	63 940	0 827	2030
8/12/89	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1441	0 66	72 150	0 982	1467
5/24/90	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1318	0 66	77 500	0 852	1547
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1245	0 66	98 350	0 858	1451
8/26/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1223	0 66	101 450	0 860	1422
10/19/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1234	0 66	102 320	0 859	1437
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-1A	1178	0 66	105 900	0 864	1363

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
3/10/90	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	2123	0 66	0 000	0 811	2618
7/27/90	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1958	0 66	1 940	0 815	2402
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1134	0 66	17 740	0 868	1306
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1145	0 66	17 740	0 867	1321
8/26/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1111	0 66	19 200	0 800	1389
4/1/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1053	0 66	23 700	0 876	1202
5/19/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1053	0 66	24 400	0 876	1202
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	1047	0 66	24 620	0 877	1194
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	D-3B	984	0 66	30 080	0 883	1114

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
8/12/89	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	2112	0 66	3 800	0 812	2601
10/19/89	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	2087	0 66	4 200	0 812	2570
5/19/90	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	1779	0 66	10 500	0 820	2170
2/1/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	1203	0 66	42 450	0 862	1396
8/26/93	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	1133	0 66	47 040	0 868	1305
4/1/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	1070	0 66	51 410	0 874	1224
5/18/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	1076	0 66	51 850	0 874	1231
6/17/94	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	1035	0 66	51 987	0 878	1179
5/1/95	UNOCAL	UNION OIL CO G-18	12/2/68	D-6	984	0 66	57 070	0 883	1114

McARTHUR GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	Pc	S G	CUM PROD	Zc	P/Z
7/2/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2630	0 66	0 000	0 813	3235
7/1/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2622	0 66	0 000	0 812	3229
8/25/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2688	0 66	0 000	0 814	3302
9/4/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2660	0 66	0 030	0 813	3272
9/4/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2614	0 66	0 030	0 812	3219
10/3/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2377	0 66	0 140	0 810	2935
12/12/87	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2262	0 66	0 480	0 810	2793
8/12/89	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2378	0 66	9 060	0 810	2936
8/1/89	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2364	0 66	9 060	0 810	2919
10/16/89	UNOCAL	UNION OIL CO G-15	12/2/68	D-16A	2376	0 66	9 900	0 810	2933
10/16/89	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2376	0 66	9 900	0 810	2933
1/10/90	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2241	0 66	14 000	0 810	2767
5/18/90	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1991	0 66	19 000	0 814	2446
5/22/90	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1991	0 66	19 000	0 814	2446
5/25/90	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1982	0 66	19 000	0 815	2432
7/27/90	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	2001	0 66	23 700	0 814	2458
10/9/90	UNOCAL	UNION OIL CO G-15	12/2/68	D-16A	1998	0 66	26 800	0 814	2455
7/6/92	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1222	0 66	62 100	0 860	1421
2/1/93	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1156	0 66	71 260	0 866	1335
2/1/93	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1145	0 66	71 260	0 867	1321
2/1/93	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1180	0 66	71 260	0 864	1366
8/26/93	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1145	0 66	78 500	0 867	1321
8/26/93	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1133	0 66	78 500	0 868	1305
4/1/94	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1082	0 66	85 970	0 873	1239
4/1/94	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1064	0 66	85 970	0 875	1216
5/18/94	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1076	0 66	87 050	0 874	1231
5/18/94	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1064	0 66	87 050	0 875	1216
6/17/94	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1053	0 66	87 250	0 876	1202
Jun-94	UNOCAL	UNION OIL CO G-15	12/2/68	D-16BC	1053	0 66	87 250	0 876	1202

NORTH COOK INLET UNIT

North Cook Inlet Unit

Proved Developed

The North Cook Inlet Unit currently has 13 producing wells and has produced approximately 1,196 0 Bcf through December 1995 Proved developed gas reserves of 1,049 0 Bcf are assigned to NCIU based on material balance calculations and an abandonment suction pressure of 400 psia Yearly pressures used in the p/z plots are derived from the arithmetic average of all pressures recorded for each year These pressures were obtained from the AOGCC and represent 10 to 11 measurements each year from individual wells The reserve worksheet, p/z plot, and pressure tabulations follow this discussion, along with the production history of the unit

Proved Undeveloped

Proved undeveloped reserves are to be realized from the installation of additional compression to reduce abandonment pressure These incremental reserves are 115 0 Bcf of undeveloped gas remaining as of January 1, 1996

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	North Cook Inlet Unit
Location	Tyonek County, Alaska
Operator.	Phillips
Reserve Basis:	Material Balance
Reserve Classification:	Proved Developed

Material Balance
Source AOGCC

Pressures (psi) Initial ~2300 ; Current ~1170 ; Abandonment ~400

Remarks Yearly pressures derived from average of all pressures recorded
P/Z indicates OGIP = 2650 Bcf
EUR = 2245 Bcf
Remaining = 1049 Bcf

Production Parameters

Source	Dwight's	Bcf
a	Recorded Prod. Through 9/95	1,183.0
b	3 Months Est Production	13.0
c	Cumulative Production Through 12/95	1,196.0
d	Current Rate/Month	4.0
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	1,049.0
i	Ultimate Recovery	2,245.0

Remarks

Reservoir Parameters
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	North Cook Inlet Unit
Location	Tyonek County, Alaska
Operator	Phillips
Reserve Basis:	Analogy
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________, Current ________; Abandonment ________

Remarks ________________________________

Production Parameters
Source Dwight's

		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	115 0

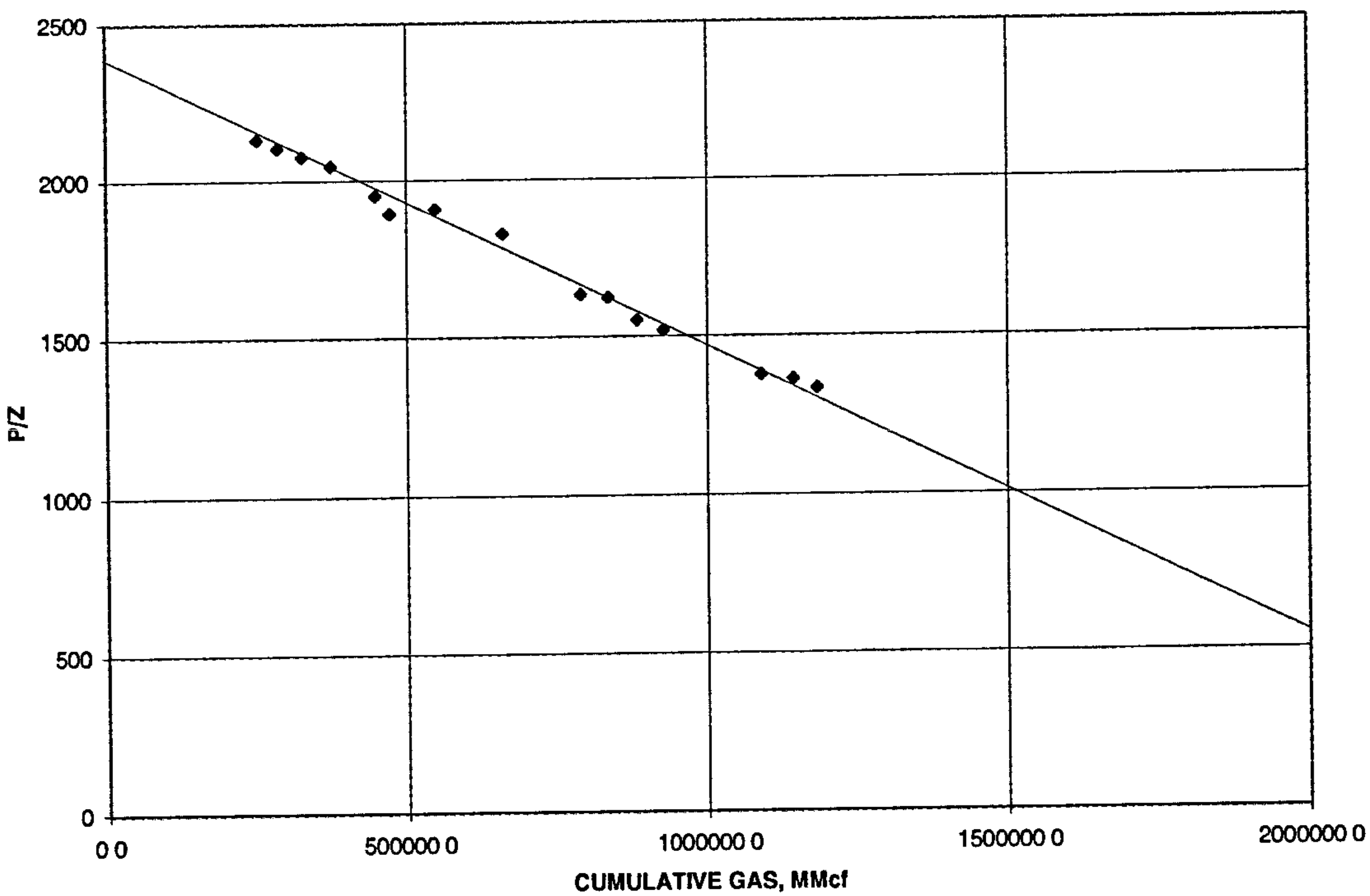
Remarks Incremental reserves attributed to installation of additional compression

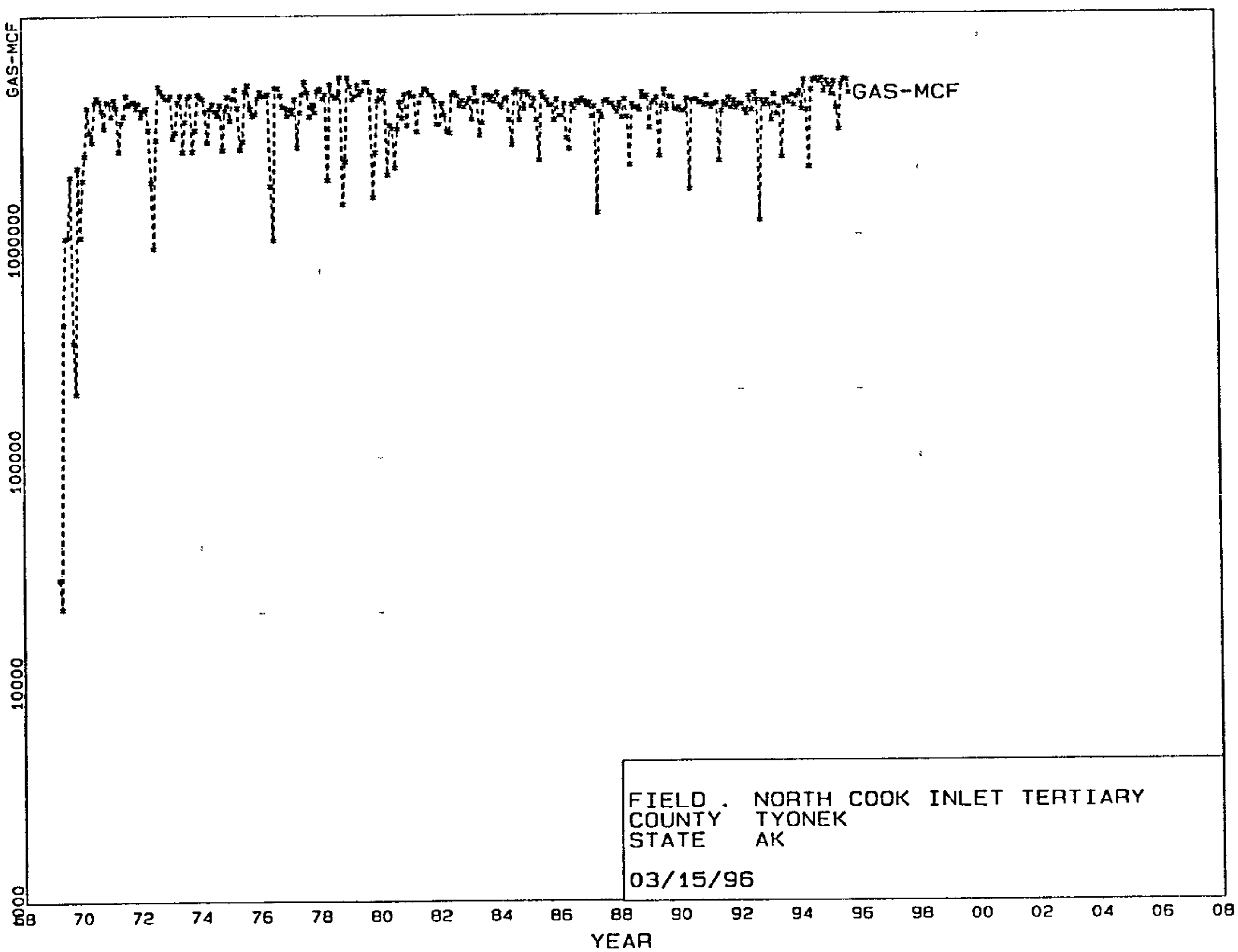
Reservoir Parameters
Source

a	Net Thickness	
b	Porosity	
c	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks ________________________________

NORTH COOK INLET UNIT





GROSS PRODUCTION PLOT

NORTH COOK INLET UNIT

YEAR	OPERATOR	PRODUCING FM	Pc	S G	TEMP	CUM PROD	Zc	P/Z
1975	PHILLIPS	BELUGA	1790	0 56	103	252904 8	0 84	2131
1976	PHILLIPS	BELUGA	1769	0 56	103	287229 2	0 841	2104
1977	PHILLIPS	BELUGA	1748	0 56	103	327169 0	0 842	2077
1978	PHILLIPS	BELUGA	1724	0 56	103	375315 8	0 843	2046
1979	PHILLIPS	BELUGA	1651	0 56	103	448507 5	0 846	1951
1980	PHILLIPS	BELUGA	1607	0 56	103	471693 4	0 849	1894
1981	PHILLIPS	BELUGA	1618	0 56	103	547525 6	0 848	1908
1984	PHILLIPS	BELUGA	1556	0 56	103	660171 5	0 851	1828
1987	PHILLIPS	BELUGA	1406	0 56	103	789949 7	0 861	1633
1988	PHILLIPS	BELUGA	1398	0 56	103	835226 4	0 861	1623
1989	PHILLIPS	BELUGA	1343	0 56	103	882787 4	0 865	1552
1990	PHILLIPS	BELUGA	1318	0 56	103	927356 8	0 867	1520
1993	PHILLIPS	BELUGA	1206	0 56	103	1090221 8	0 876	1377
1994	PHILLIPS	BELUGA	1195	0 56	103	1142911 1	0 876	1364
1995	PHILLIPS	BELUGA	1172	0 56	103	1182669 6	0 878	1334

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DATE	OIL BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	0	0	0	0 00	0	0
1/69	0	0	0	0	0 00	0	0
2/69	0	0	0	0	0 00	0	0
3/69	0	28297	0	0	0 00	0	28 297
4/69	0	20884	0	0	0 00	0	49 181
5/69	0	401125	0	0	0 00	0	450 306
6/69	0	990204	0	0	0 00	0	1,440,510
7/69	0	997543	0	0	0 00	0	2,438 053
8/69	0	1868406	0	0	0 00	0	4,306,459
9/69	0	332260	0	0	0 00	0	4,638 719
10/69	0	195514	0	0	0 00	0	4 834,233
11/69	0	2052338	0	0	0 00	0	6 886,571
12/69	0	994753	0	0	0 00	0	7 881,324
TOT/69	0	7881324	0	0		0	7,881,324
1/70	0	1803257	0	0	0 00	0	9,684 581
2/70	0	2327699	0	0	0 00	0	12,012,280
3/70	0	3823719	0	0	0 00	0	15,835,999
4/70	0	2963351	0	0	0 00	0	18,799,350
5/70	0	2687495	0	0	0 00	0	21 486 845
6/70	0	4038627	0	0	0 00	0	25,525,472
7/70	0	4256243	0	0	0 00	0	29,781,715
8/70	0	4110156	0	0	0 00	0	33,891,871
9/70	0	3724971	0	0	0 00	0	37,616,842
10/70	0	3106297	0	0	0 00	0	40,723 139
11/70	0	4068432	0	0	0 00	0	44,791,571
12/70	0	4037222	0	0	0 00	0	48,828 793
TOT/70	0	40947469	0	0		0	48,828,793
1/71	0	3516680	0	0	0 00	0	52,345 473
2/71	0	4164035	0	0	0 00	0	56,509,508
3/71	0	3844639	0	0	0 00	0	60,354 147
4/71	0	2436696	0	0	0 00	0	62,790,843
5/71	0	3290614	0	0	0 00	0	66,081 457
6/71	0	3512586	0	0	0 00	0	69,594,043
7/71	0	4347976	0	0	0 00	0	73,942,019
8/71	0	3950361	0	0	0 00	0	77,892,380
9/71	0	4033788	0	0	0 00	0	81,926,168
10/71	0	4103879	0	0	0 00	0	86,030,047
11/71	0	3816377	0	0	0 00	0	89,846,424
12/71	0	4006668	0	0	0 00	0	93,853,092
TOT/71	0	45024299	0	0		0	93,853,092
1/72	0	3498495	0	0	0 00	0	97,351,587
2/72	0	3725582	0	0	0 00	0	101,077,169
3/72	0	3808349	0	0	0 00	0	104,885,518
4/72	0	3055376	0	0	0 00	0	107,940,894
5/72	0	1761794	0	0	0 00	0	109,702,688
6/72	0	885977	0	0	0 00	0	110,588,665
7/72	0	2735819	0	0	0 00	0	113,324,484
8/72	0	4780894	620	0	0 00	0	118,105,378
9/72	0	4565936	657	0	0 00	0	122,671,314
10/72	0	4355767	636	0	0 00	0	127,027,081
11/72	0	4217789	582	0	0 00	0	131,244,870
12/72	0	4187989	519	0	0 00	0	135,432,859
TOT/72	0	41579767	3014	0		0	135,432,859
TOTAL	0	135432859	3014	0		0	135,432,859

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DATE	OIL BBL	GAS, MCF	WATER, BBL	GOR CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	135432859	3014	0	0 00	0	135 432,859
1/73	0	4341802	0	0	0 00	0	139 774,66.
2/73	0	2799724	222	0	0 00	0	142 574 385
3/73	0	2961444	223	0	0 00	0	145 535,829
4/73	0	4075070	334	0	0 00	0	149 610 899
5/73	0	4348030	360	0	0 00	0	153,958 929
6/73	0	2423565	109	0	0 00	0	156,382,49.
7/73	0	3320712	143	0	0 00	0	159 703 20c
8/73	0	4237444	187	0	0 00	0	163,940 650
9/73	0	4358454	381	0	0 00	0	168,299 104
10/73	0	2429734	171	0	0 00	0	170 728,838
11/73	0	3039229	272	0	0 00	0	173 768,067
12/73	0	4373968	398	0	0 00	0	178 142,035
TOT/73	0	42709176	2800	0		0	178 142,035
1/74	0	4272911	133	0	0 00	0	182 414 946
2/74	0	4192305	132	0	0 00	0	186,607,251
3/74	0	3694482	116	0	0 00	0	190 301,733
4/74	0	2678909	236	0	0 00	0	192,980,642
5/74	0	3779786	343	0	0 00	0	196 760 428
6/74	0	3972920	357	0	0 00	0	200,733,348
7/74	0	3689761	337	0	0 00	0	204,423,109
8/74	0	3532530	326	0	0 00	0	207,955 639
9/74	0	3945335	359	0	0 00	0	211 900,974
10/74	0	2471093	131	0	0 00	0	214,372 067
11/74	0	3712368	226	0	0 00	0	218,084,435
12/74	0	4295873	264	0	0 00	0	222 380,308
TOT/74	0	44238273	2960	0		0	222,380,308
1/75	0	3349290	221	0	0 00	0	225,729,598
2/75	0	4194850	269	0	0 00	0	229,924,448
3/75	0	4621105	287	0	0 00	0	234,545,553
4/75	0	3824131	254	0	0 00	0	238,369,684
5/75	0	2481491	171	0	0 00	0	240,851,175
6/75	0	2697998	188	0	0 00	0	243,549 173
7/75	0	4531918	282	0	0 00	0	248,081,091
8/75	0	4823716	303	0	0 00	0	252,904,807
9/75	0	3792921	233	0	0 00	0	256,697,728
10/75	0	3511527	217	0	0 00	0	260,209,255
11/75	0	3579139	220	0	0 00	0	263,788,394
12/75	0	4213587	258	0	0 00	0	268,001,981
TOT/75	0	45621673	2903	0		0	268,001,981
1/76	0	4497546	264	0	0 00	0	272,499,527
2/76	0	4307934	255	0	0 00	0	276,807,461
3/76	0	4329431	256	0	0 00	0	281,136,892
4/76	0	4400834	260	0	0 00	0	285,537,726
5/76	0	1691475	98	0	0 00	0	287,229 201
6/76	0	961364	48	0	0 00	0	288,190,565
7/76	0	4698079	273	0	0 00	0	292,888 644
8/76	0	4686386	274	0	0 00	0	297,575,030
9/76	0	4342219	254	0	0 00	0	301,917,249
10/76	0	3846660	233	0	0 00	0	305,763,909
11/76	0	3819923	225	0	0 00	0	309,583,832
12/76	0	3509404	224	0	0 00	0	313,093,236
TOT/76	0	45091255	2664	0		0	313,093,236
TOTAL	0	313093236	14341	0		0	313,093,236

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DATE	OIL BBL	GAS MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	313093236	14341	0	0 00	0	313 093,236
1/77	0	3767729	222	0	0 00	0	316 860 965
2/77	0	3597835	219	0	0 00	0	320,456,800
3/77	0	4178738	240	0	0 00	0	324 637,539
4/77	0	2531487	147	0	0 00	0	327,169 025
5/77	0	3635647	188	0	0 00	0	330,804 672
6/77	0	4374579	249	0	0 00	0	335 179 25.
7/77	0	5018776	275	0	0 00	0	340,198 027
8/77	0	4481126	243	0	0 00	0	344 679 153
9/77	0	3475853	187	0	0 00	0	348,155 006
10/77	0	3955205	228	0	0 00	0	352,110 211
11/77	0	3643367	454	0	0 00	0	355 753,578
12/77	0	4540586	556	0	0 00	0	360,294 164
TOT/77	0	47200928	3208	0		0	360,294,164
1/78	0	4638217	583	0	0 00	0	364,932 381
2/78	0	4192723	523	0	0 00	0	369,125,104
3/78	0	4391621	523	0	0 00	0	373,516,725
4/78	0	1799123	200	0	0 00	0	375,315,848
5/78	0	4854592	578	0	0 00	0	380,170,440
6/78	0	4351316	526	0	0 00	0	384,521,756
7/78	0	4225163	513	0	0 00	0	388,746 919
8/78	0	4281781	528	0	0 00	0	393,028,700
9/78	0	5232927	653	0	0 00	0	398,261 627
10/78	0	1395712	144	0	0 00	0	399,657 339
11/78	0	2174990	265	0	0 00	0	401,832 329
12/78	0	5218967	472	0	0 00	0	407,051,296
TOT/78	0	46757132	5508	0		0	407,051,296
1/79	0	4756811	410	0	0 00	0	411,808,107
2/79	0	4149174	350	0	0 00	0	415,957,281
3/79	0	4302908	373	0	0 00	0	420,260 189
4/79	0	4833425	440	0	0 00	0	425,093,614
5/79	0	4370467	302	0	0 00	0	429,464,081
6/79	0	4557365	321	0	0 00	0	434,021,446
7/79	0	4998864	381	0	0 00	0	439,020,310
8/79	0	4984172	368	0	0 00	0	444,004,482
9/79	0	4503062	311	0	0 00	0	448,507,544
10/79	0	1501067	101	0	0 00	0	450,008,611
11/79	0	2395271	167	0	0 00	0	452,403,882
12/79	0	4095072	302	0	0 00	0	456,498 954
TOT/79	0	49447658	3826	0		0	456,498,954
1/80	0	4573172	336	0	0 00	0	461,072,126
2/80	0	4164845	320	0	0 00	0	465,236,971
3/80	0	4558782	337	0	0 00	0	469,795,753
4/80	0	1897693	147	0	0 00	0	471,693,446
5/80	0	3168884	215	0	0 00	0	474,862,330
6/80	0	3068570	323	0	0 00	0	477,930,900
7/80	0	2037788	119	0	0 00	0	479,968,688
8/80	0	3050671	184	0	0 00	0	483,019,359
9/80	0	4045373	273	0	0 00	0	487,064,732
10/80	0	3422292	254	0	0 00	0	490,487,024
11/80	0	4385305	292	0	0 00	0	494,872,329
12/80	0	3166808	214	0	0 00	0	498,039,137
TOT/80	0	41540183	3014	0		0	498,039,137
TOTAL	0	498039137	29897	0		0	498,039,137

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DATE	OIL BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT %	CUM OIL BBL	CUM GAS MCF
PRIOR	0	498039137	29897	0	0 00	0	498 039 137
1/81	0	4439884	312	0	0 00	0	502,479,021
2/81	0	4277161	298	0	0 00	0	506 756 182
3/81	0	4292187	333	0	0 00	0	511,048,369
4/81	0	2965112	259	0	0 00	0	514 013,481
5/81	0	4010276	343	0	0 00	0	518,023,757
6/81	0	4338308	327	0	0 00	0	522,362,065
7/81	0	4630977	347	0	0 00	0	526 993,042
8/81	0	4577350	185	0	0 00	0	531,570 392
9/81	0	4346134	178	0	0 00	0	535,916 526
10/81	0	4321240	174	0	0 00	0	540,237 766
11/81	0	4083704	170	0	0 00	0	544,321 470
12/81	0	3204098	147	0	0 00	0	547,525,568
TOT/81	0	49486431	3073	0		0	547,525,568
1/82	0	3196622	163	0	0 00	0	550 722 190
2/82	0	3958830	200	0	0 00	0	554,681 020
3/82	0	3526529	837	0	0 00	0	558,207,549
4/82	0	2970345	660	0	0 00	0	561,177 894
5/82	0	2919878	648	0	0 00	0	564,097,772
6/82	0	4326181	1370	0	0 00	0	568,423,953
7/82	0	4432586	1349	0	0 00	0	572,856,539
8/82	0	4282528	1282	0	0 00	0	577,139 067
9/82	0	3863235	1593	0	0 00	0	581,002,302
10/82	0	4091753	2415	0	0 00	0	585,094,055
11/82	0	3815719	2439	0	0 00	0	588 909 774
12/82	0	3983416	2630	0	0 00	0	592,893,190
TOT/82	0	45367622	15586	0		0	592,893,190
1/83	0	4195521	3324	0	0 00	0	597,088,711
2/83	0	3376242	2104	0	0 00	0	600,464,953
3/83	0	4667656	2494	0	0 00	0	605 132,609
4/83	0	4068040	2658	0	0 00	0	609,200 649
5/83	0	2855255	2820	0	0 00	0	612,055,904
6/83	0	3250185	1324	0	0 00	0	615,306,089
7/83	0	4292434	611	0	0 00	0	619,598,523
8/83	0	4334177	341	0	0 00	0	623,932,700
9/83	0	4103275	296	0	0 00	0	628,035,975
10/83	0	4269378	306	0	0 00	0	632,305,353
11/83	0	4032821	293	0	0 00	0	636,338,174
12/83	0	4432231	328	0	0 00	0	640,770,405
TOT/83	0	47877215	16899	0		0	640,770,405
1/84	0	3915058	265	0	0 00	0	644,685,463
2/84	0	3793356	286	0	0 00	0	648,478,819
3/84	0	4141410	322	0	0 00	0	652,620,229
4/84	0	4200996	326	0	0 00	0	656,821,225
5/84	0	3350251	164	0	0 00	0	660,171 476
6/84	0	2584667	335	0	0 00	0	662,756,143
7/84	0	4441458	556	0	0 00	0	667,197,601
8/84	0	4566227	675	0	0 00	0	671,763,828
9/84	0	3334294	523	0	0 00	0	675,098,122
10/84	0	4459252	636	0	0 00	0	679,557,374
11/84	0	3735232	502	0	0 00	0	683,292,606
12/84	0	4458676	468	0	0 00	0	687,751,282
TOT/84	0	46980877	5058	0		0	687,751,282
TOTAL	0	687751282	70513	0		0	687,751,282

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DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	687751282	70513	0	0 00	0	687,75_,282
1/85	0	4324368	511	0	0 00	0	692,075 650
2/85	0	3855932	503	0	0 00	0	695 93_,582
3/85	0	4168974	463	0	0 00	0	700,100 556
4/85	0	3339964	507	0	0 00	0	703,440 520
5/85	0	2195780	241	0	0 00	0	705 636 300
6/85	0	4424159	322	0	0 00	0	710 060 459
7/85	0	4212402	508	0	0 00	0	714 272 861
8/85	0	4083204	483	0	0 00	0	718,356 065
9/85	0	3871359	379	0	0 00	0	722,227 424
10/85	0	3883185	472	0	0 00	0	726,110 609
11/85	0	3325734	393	0	0 00	0	729,436,343
12/85	0	4134351	405	0	0 00	0	733 570,694
TOT/85	0	45819412	5187	0		0	733,570,694
1/86	0	3482336	928	0	0 00	0	737,053,030
2/86	0	3491089	756	0	0 00	0	740,544,119
3/86	0	3933501	1010	0	0 00	0	744,477 620
4/86	0	2770372	646	0	0 00	0	747,247,992
5/86	0	2469472	122	0	0 00	0	749,717,464
6/86	0	3905211	228	0	0 00	0	753,622,675
7/86	0	3742113	145	0	0 00	0	757,364,788
8/86	0	4053210	149	0	0 00	0	761 417,998
9/86	0	3938710	185	0	0 00	0	765,356,708
10/86	0	4154890	164	0	0 00	0	769,511,598
11/86	0	4038861	210	0	0 00	0	773,550,459
12/86	0	3858389	186	0	0 00	0	777,408,848
TOT/86	0	43838154	4729	0		0	777,408,848
1/87	0	3982682	753	0	0 00	0	781,391,530
2/87	0	3448907	944	0	0 00	0	784,840 437
3/87	0	3839442	1339	0	0 00	0	788,679,879
4/87	0	1269850	604	0	0 00	0	789 949 729
5/87	0	3623310	1486	0	0 00	0	793 573,039
6/87	0	3402754	1599	0	0 00	0	796,975,793
7/87	0	4015834	2698	0	0 00	0	800,991,627
8/87	0	4083541	2630	0	0 00	0	805,075,168
9/87	0	3943200	1942	0	0 00	0	809,018,368
10/87	0	3942052	2154	0	0 00	0	812,960,420
11/87	0	3742856	1943	0	0 00	0	816,703 276
12/87	0	3594280	2093	0	0 00	0	820,297,556
TOT/87	0	42888708	20185	0		0	820,297,556
1/88	0	3966366	3157	0	0 00	0	824,263,922
2/88	0	3405062	3254	0	0 00	0	827,668,984
3/88	0	4117407	3439	0	0 00	0	831,786,391
4/88	0	3439977	2768	0	0 00	0	835,226,368
5/88	0	2079407	2372	0	0 00	0	837,305,775
6/88	0	3902597	4098	0	0 00	0	841,208,372
7/88	0	3737081	2082	0	0 00	0	844,945,453
8/88	0	3797149	2792	0	0 00	0	848,742,602
9/88	0	3674065	2945	0	0 00	0	852,416,667
10/88	0	4423443	3339	0	0 00	0	856,840,110
11/88	0	4171321	3648	0	0 00	0	861,011,431
12/88	0	4274829	3610	0	0 00	0	865,286,260
TOT/88	0	44988704	37504	0		0	865,286,260
TOTAL	0	865286260	138118	0		0	865,286,260

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DATE	OIL, BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	865286260	138118	0	0 00	0	865 286,260
1/89	0	3062210	2678	0	0 00	0	868,348 470
2/89	0	3941951	2870	0	0 00	0	872 290,421
3/89	0	4033219	2133	0	0 00	0	876,323,640
4/89	0	4177264	3193	0	0 00	0	880,500 904
5/89	0	2286527	1383	0	0 00	0	882,787 431
6/89	0	3812399	2597	0	0 00	0	886 599 830
7/89	0	4528314	2624	0	0 00	0	891,128 144
8/89	0	3678808	3525	0	0 00	0	894,806 952
9/89	0	4216183	3115	0	0 00	0	899,023,135
10/89	0	4176515	3133	0	0 00	0	903 199 650
11/89	0	3708458	3724	0	0 00	0	906 908,108
12/89	0	3664684	3791	0	0 00	0	910,572 792
TOT/89	0	45286532	34766	0		0	910,572 792
1/90	0	3776263	2608	0	0 00	0	914,349,055
2/90	0	3634136	984	0	0 00	0	917,983,191
3/90	0	3634045	3097	0	0 00	0	921,617,236
4/90	0	4129239	4023	0	0 00	0	925,746,475
5/90	0	1610307	1928	0	0 00	0	927,356,782
6/90	0	4054608	4300	0	0 00	0	931,411,390
7/90	0	4082085	2545	0	0 00	0	935,493,475
8/90	0	4084100	5414	0	0 00	0	939,577 575
9/90	0	3945671	5316	0	0 00	0	943,523,246
10/90	0	3967172	5470	0	0 00	0	947,490 418
11/90	0	3834998	5707	0	0 00	0	951,325,416
12/90	0	4261381	5774	0	0 00	0	955,586,797
TOT/90	0	45014005	47166	0		0	955,586,797
1/91	0	3879442	5484	0	0 00	0	959,466,239
2/91	0	3762421	5414	0	0 00	0	963,228,660
3/91	0	3874085	5987	0	0 00	0	967,102,745
4/91	0	3936003	6182	0	0 00	0	971,038,748
5/91	0	2160638	2784	0	0 00	0	973,199,386
6/91	0	3625146	4821	0	0 00	0	976,824,532
7/91	0	3960904	4405	0	0 00	0	980,785,436
8/91	0	3826361	5722	0	0 00	0	984,611,797
9/91	0	4155047	5896	0	0 00	0	988,766,844
10/91	0	3758491	7203	0	0 00	0	992,525 335
11/91	0	4046954	8083	0	0 00	0	996,572,289
12/91	0	3709725	7013	0	0 00	0	1,000,282,014
TOT/91	0	44695217	68994	0		0	1 000,282,014
1/92	0	3915794	8968	0	0 00	0	1,004,197,808
2/92	0	3875910	8216	0	0 00	0	1,008 073,718
3/92	0	3654056	6950	0	0 00	0	1,011,727,774
4/92	0	3521963	6044	0	0 00	0	1,015,249,737
5/92	0	4243396	4927	0	0 00	0	1 019,493 133
6/92	0	3658259	1812	0	0 00	0	1,023,151,392
7/92	0	4390296	2150	0	0 00	0	1,027,541,688
8/92	0	4072261	2787	0	0 00	0	1,031,613,949
9/92	0	1165463	612	0	0 00	0	1,032,779,412
10/92	0	4038885	2074	0	0 00	0	1,036,818,297
11/92	0	3835935	3158	0	0 00	0	1,040,654,232
12/92	0	4038503	3235	0	0 00	0	1,044,692,735
TOT/92	0	44410721	50933	0		0	1,044,692,735
TOTAL	0	1044692735	339977	0		0	1,044,692,735

ARIES SEQUENCE NUMBER 21
FIELD RESERVOIR NORTH COOK INLET TERTIARY
COUNTY TYONEK , STATE AK

DATE 03/0[illegible]/9[illegible]
TIME 13 3[illegible] 22
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PRODUCTION LEDGER

DATE	OIL BBL	GAS, MCF	WATER BBL	GOR CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	1044692735	339977	0	0 00	0	[illegible] 04[illegible] 692 735
1/93	0	3858582	3363	0	0 00	0	1,048 55[illegible] 317
2/93	0	3301118	1328	0	0 00	0	1,051 852 435
3/93	0	4302675	1879	0	0 00	0	[illegible] 056 155 1[illegible]
4/93	0	3501277	1275	0	0 00	0	[illegible] 059,656 387
5/93	0	3797070	2240	0	0 00	0	[illegible],063,453 457
6/93	0	2244535	1376	0	0 00	0	1,065,697 992
7/93	0	4098083	3098	0	0 00	0	1,069 796 075
8/93	0	4127592	2151	0	0 00	0	1,073,923 667
9/93	0	3963295	2593	0	0 00	0	1 077 886,962
10/93	0	4276021	2903	0	0 00	0	1,082 162,983
11/93	0	3850749	5183	0	0 00	0	1,086 013,732
12/93	0	4208034	4541	0	0 00	0	1,090,221,766
TOT/93	0	45529031	31930	0		0	1,090,221,766
1/94	0	4429122	5074	0	0 00	0	1 094 650,888
2/94	0	3685504	6480	0	0 00	0	1,098,336,392
3/94	0	4999610	4644	0	0 00	0	1,103 336 002
4/94	0	3653633	4513	0	0 00	0	1,106,989 635
5/94	0	2017549	4692	0	0 00	0	1 109,007,184
6/94	0	4514532	4252	0	0 00	0	1,113 521,716
7/94	0	5004670	1733	0	0 00	0	1,118,526,386
8/94	0	5059584	1157	0	0 00	0	1,123,585,970
9/94	0	4894443	235	0	0 00	0	1 128,480,413
10/94	0	5063669	1153	0	0 00	0	1 133 544,082
11/94	0	4438218	1818	0	0 00	0	1,137,982 300
12/94	0	4928806	3047	0	0 00	0	1,142,911,106
TOT/94	0	52689340	38798	0		0	1,142 911 106
1/95	0	4697700	1780	0	0 00	0	1,147,608,806
2/95	0	4298497	1685	0	0 00	0	1,151 907,303
3/95	0	4887228	1918	0	0 00	0	1,156,794,531
4/95	0	3735307	1508	0	0 00	0	1,160,529,838
5/95	0	2984270	205	0	0 00	0	1,163,514,108
6/95	0	4759391	319	0	0 00	0	1,168,273,499
7/95	0	5034452	1289	0	0 00	0	1,173,307,951
8/95	0	5000197	918	0	0 00	0	1,178,308,148
9/95	0	4361462	931	0	0 00	0	1,182,669,610
10/95							
11/95							
12/95							
TOT/95	0	39758504	10553	0		0	1,182,669,610
TOTAL	0	1182669610	421258	0		0	1,182,669,610

SWANSON RIVER GAS FIELD

Swanson River Gas Field

Proved Developed

The Swanson River Gas Field has produced 29 Bcf of gas through 1995 and currently has only two active wells which are completed in the Sterling formation Proved developed gas reserves in the Sterling formation were estimated from rate vs cumulative gas performance curves Although pressure data was available, p/z plots indicate less gas-in-place than has been produced The attached production plots presents the extrapolated decline rate of 5%. Using an abandonment rate of 1 MMcf/day results in a remaining gas reserve of 22 0 Bcf

Proved Undeveloped

Proved undeveloped reserves in Swanson River were estimated from volumetrics, analogy, and well tests The enclosed map outlines the productive areas, in particular, the "B" sands, lying within the yellow area The "B" sands are located in the lower Sterling and Beluga formations Two wells, the Chevron #212-10 and #211-15, have both tested commercial volumes of gas from these sands In addition to these two wells, several others to the south of the area have tested gas in the "B" A review of the logs from wells lying within the prospect area and south into the Swanson River Oil Field, indicate continuity of these "B" sands Volumetric parameters were obtained from the logs, mapped area, and data supplied by the AOGCC and are summarized in the reserve worksheet. Original gas-in-place is estimated to be 88.6 Bcf Ultimate gas recovery of 79 7 Bcf was reduced 33% to account for uncertainties in reservoir size and continuity. Remaining undeveloped gas reserves from the "B" sands are determined to be 50 0 Bcf

All data used in the analysis follows this discussion

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Swanson River Gas
Location	Kenai County, Alaska
Operator	Unocal
Reserve Basis:	Production Performance
Reserve Classification:	Proved Developed

Material Balance

Source AOGCC

Pressures (psi) Initial 2678, Current ____; Abandonment ____

Remarks P/Z plots invalid. Pressure data poor - indicates gas-in-place less than gas produced to date.

Production Parameters

Source Dwight's		Bcf
a	Recorded Prod Through 9/95	29.0
b	3 Months Est Production	0.3
c	Cumulative Production Through 12/95	29.3
d	Current Rate/Month	115 MMcf
e	Abandonment Rate/Month	30 MMcf
f	Decline Characteristic (di)	5%
g	Decline Exponent (n)	0
h	Remaining Recovery	21.5
i	Ultimate Recovery	50.8

Remarks Utilized production rate vs. cumulative production to extrapolate remaining reserves.

Reservoir Parameters

Source

a	Net Thickness	
b	Porosity	
c.	Water Saturation	
d	Hydrocarbon Thickness	
e	Volume Factor	
f	Drainage Area	
g	Original Volume in Place	
h	Recovery Efficiency	
i	Ultimate Recovery	
j	Cumulative Recovery	
k	Remaining Recovery	

Remarks

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Swanson River Gas
Location	Kenai County, Alaska
Operator	Unocal
Reserve Basis:	Volumetrics/Production Performance
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ________, Current ________, Abandonment ________

Remarks ________________________________

Production Parameters
Source Dwight's

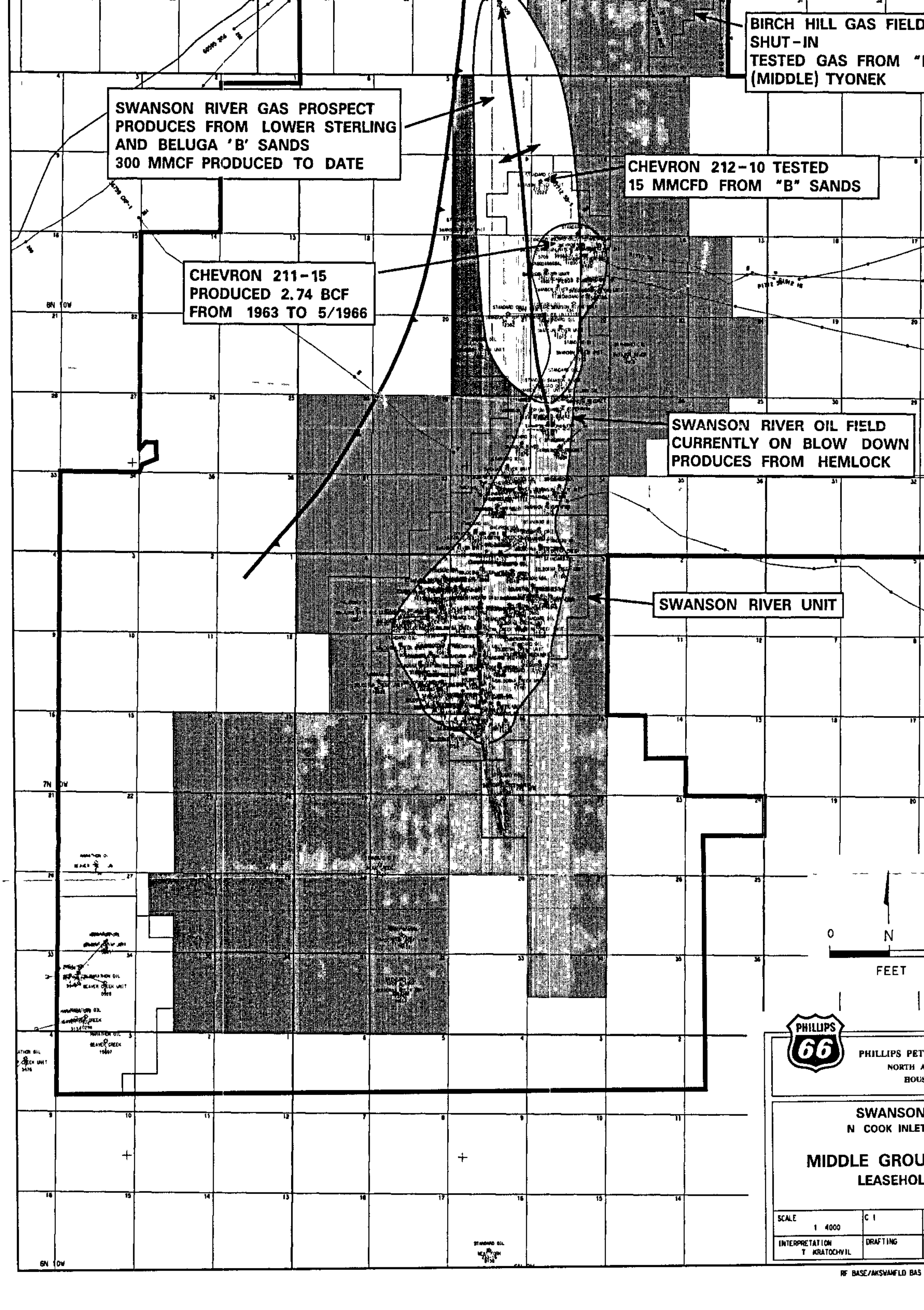
		"B" Sands Bcf
a	Recorded Prod Through 12/95	2.60
b	______ Months Est Production	--
c	Cumulative Production Through 12/95	2.60
d	Current Rate/Month	5-8 MM/d
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	50.0
i	Ultimate Recovery	52.6

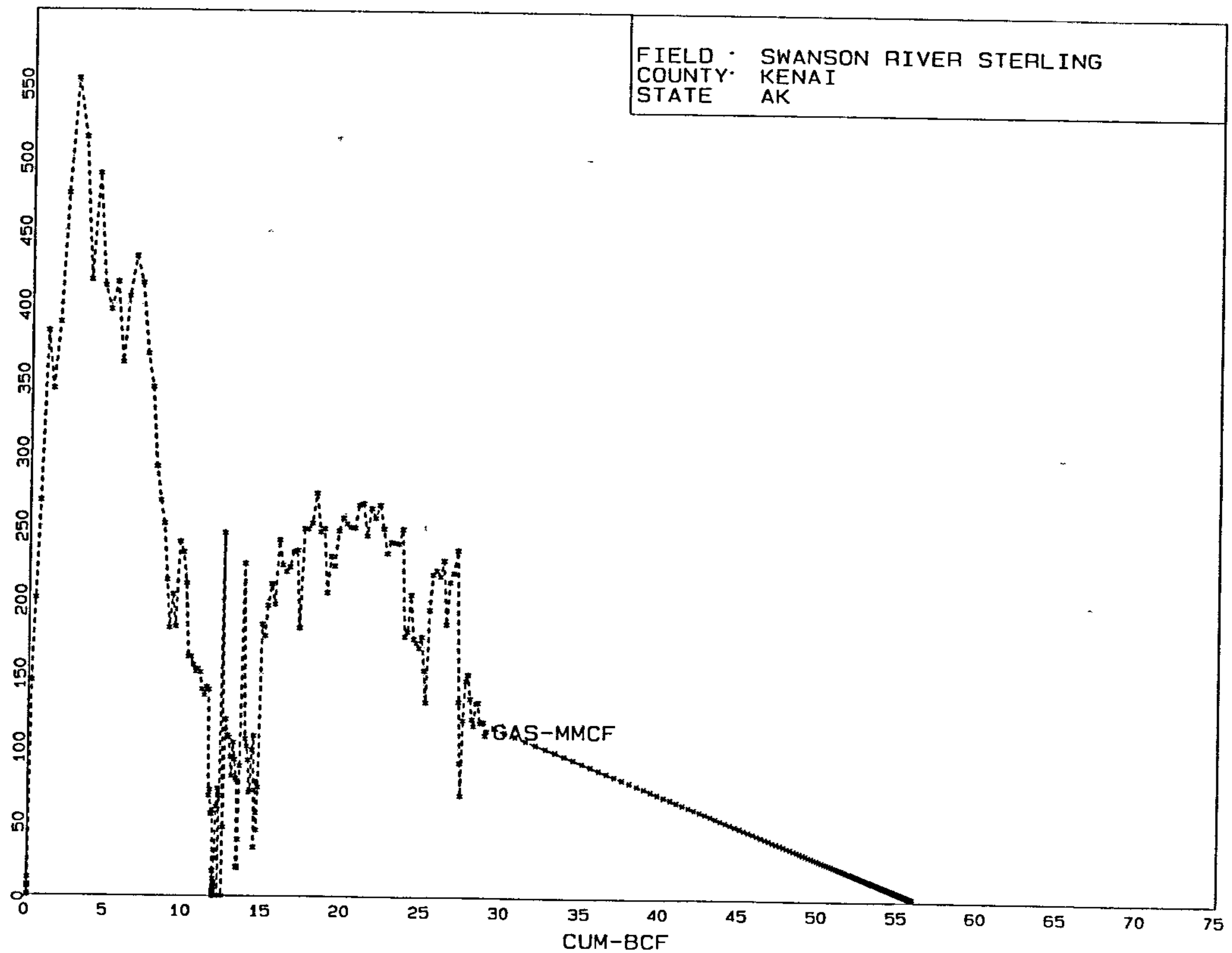
Remarks Wells #212-10 and 211-15 have both produced from the "B" sands for primarily fuel gas resources.

Reservoir Parameters
Source AOGCC/Phillips/Marathon

		"B" Sands
a	Net Thickness	40'
b	Porosity	30%
c	Water Saturation	45%
d	Hydrocarbon Thickness	6.6
e	Volume Factor	107 Scf/rcf
f	Drainage Area	2880
g	Original Volume in Place	88.6 Bcf
h	Recovery Efficiency	90%
i	Ultimate Recovery	*79.7 Bcf
j	Cumulative Recovery	2.6 Bcf
k	Remaining Recovery	50.0 Bcf

Remarks *Risked by 33% to account for discontinuities.


BIRCH HILL GAS FIELD
SHUT-IN
TESTED GAS FROM "
(MIDDLE) TYONEK
SWANSON RIVER GAS PROSPECT
PRODUCES FROM LOWER STERLING
AND BELUGA 'B' SANDS
300 MMCF PRODUCED TO DATE
CHEVRON 212-10 TESTED
15 MMCFD FROM "B" SANDS
CHEVRON 211-15
PRODUCED 2.74 BCF
FROM 1963 TO 5/1966
SWANSON RIVER OIL FIELD
CURRENTLY ON BLOW DOWN
PRODUCES FROM HEMLOCK
SWANSON RIVER UNIT
8N 10W
7N 10W
6N 10W
0
N
FEET
PHILLIPS
66
PHILLIPS PET
NORTH A
HOUS
SWANSON
N COOK INLET
MIDDLE GROU
LEASEHOL
SCALE
1 4000
C I
INTERPRETATION
T KRATOCHVIL
DRAFTING
RF BASE/AKSWANFLD BAS


FIELD · SWANSON RIVER STERLING
COUNTY· KENAI
STATE AK
GAS-MMCF
CUM-BCF
0
50
100
150
200
250
300
350
400
450
500
550
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75

SWANSON RIVER GAS FIELD

YEAR	OPERATOR	DISCOVERY WELL	DISCOVERY DATE	PRODUCING FM	# WELLS	Pi	Pc	S G	TEMP	CUM PROD	Zi	Zc	P/Z
1971	SOCAL	SRU 34-10	8/24/57	STERLING	6 SI	2678	NA	0 60	123	0 0	0 83		5232
1972	SOCAL	SRU 34-10	8/24/57	STERLING	6 SI	2678	NA	0 60	123	11839 4	0 83		3211 031
1974	SOCAL	SRU 34-10	8/24/57	STERLING	6 SI	2678	NA	0 60	123	11859 9	0 83		3211 031
1977	CHEVRON	SRU 34-10	8/24/57	STERLING	6 SI	2678	NA	0 60	123	11918 0	0 83		3211 031
1983	CHEVRON	SRU 32-10	5/18/60	STERLING B D E	4 SI	1335-4500	1128-2566	0 60	123	12428 5	86- 93	88- 832	3084
1984	CHEVRON	SRU 32-10	5/18/60	STERLING B,D E	4 SI	1335-4500	1128-2566	0 60	123	12428 5	86- 93	88- 832	
1990	ARCO	SRU 32-10	5/18/60	STERLING B D E	2 FLWG	1335-4500	NA	0 60	123	17918 8	86- 93		
1991	ARCO	SRU 32-10	5/18/60	STERLING B D E	2 FLWG	1335-4500	NA	0 60	123	20862 7	86- 93		
1992	UNOCAL	SRU 32-10	5/18/60	STERLING B D E	1 FLWG	1335-4500	NA	0 60	123	23777 3	86- 93		
1994	UNOCAL	SRU 32-10	5/18/60	STERLING B D E	1 FLWG	1335-4500	NA	0 60	123	27901 7	86- 93		

A=640 PHI=30% Sw=35%, H=?

ARIES SEQUENCE NUMBER 23
FIELD RESERVOIR SWANSON RIVER STERLING
COUNTY KENAI , STATE AK

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS, MCF
PRIOR	0	0	0	0	0 00	0	0
1/60	0	0	0	0	0 00	0	0
2/60	0	0	0	0	0 00	0	0
3/60	0	0	0	0	0 00	0	0
4/60	0	0	0	0	0 00	0	0
5/60	0	0	0	0	0 00	0	0
6/60	0	0	0	0	0 00	0	0
7/60	0	880	0	0	0 00	0	880
8/60	0	6347	0	0	0 00	0	7 227
9/60	0	5784	0	0	0 00	0	13,011
10/60	0	7254	0	0	0 00	0	20 265
11/60							
12/60							
TOT/60	0	20265	0	0		0	20 265
1/62	0	0	0	0	0 00	0	20,265
2/62	0	0	0	0	0 00	0	20 265
3/62	0	0	0	0	0 00	0	20,265
4/62	0	0	0	0	0 00	0	20 265
5/62	0	0	0	0	0 00	0	20 265
6/62	0	0	0	0	0 00	0	20,265
7/62	0	0	0	0	0 00	0	20,265
8/62	0	0	0	0	0 00	0	20,265
9/62	0	0	0	0	0 00	0	20,265
10/62	0	0	0	0	0 00	0	20,265
11/62	0	11972	0	0	0 00	0	32 237
12/62	0	145162	0	0	0 00	0	177 399
TOT/62	0	157134	0	0		0	177,399
1/63	0	200951	0	0	0 00	0	378,350
2/63	0	266993	0	0	0 00	0	645,343
3/63	0	381974	0	0	0 00	0	1,027,317
4/63	0	342982	0	0	0 00	0	1,370,299
5/63	0	387945	0	0	0 00	0	1,758 244
6/63	0	475362	0	0	0 00	0	2,233,606
7/63	0	553171	0	0	0 00	0	2,786,777
8/63	0	513381	0	0	0 00	0	3,300,158
9/63	0	416756	0	0	0 00	0	3,716 914
10/63	0	488700	0	0	0 00	0	4,205,614
11/63	0	412717	0	0	0 00	0	4,618,331
12/63	0	396575	0	0	0 00	0	5,014,906
TOT/63	0	4837507	0	0		0	5,014,906
1/64	0	415394	0	0	0 00	0	5,430,300
2/64	0	360844	0	0	0 00	0	5,791,144
3/64	0	405421	0	0	0 00	0	6,196,565
4/64	0	432534	0	0	0 00	0	6,629,099
5/64	0	414425	0	0	0 00	0	7,043,524
6/64	0	366764	0	0	0 00	0	7,410,288
7/64	0	343985	0	0	0 00	0	7,754,273
8/64	0	290253	0	0	0 00	0	8,044,526
9/64	0	267204	0	0	0 00	0	8,311,730
10/64	0	251748	0	0	0 00	0	8,563,478
11/64	0	213480	0	0	0 00	0	8,776,958
12/64	0	181027	0	0	0 00	0	8,957,985
TOT/64	0	3943079	0	0		0	8,957,985
TOTAL	0	8957985	0	0		0	8,957,985

ARIES SEQUENCE NUMBER 23
FIELD RESERVOIR SWANSON RIVER STERLING
COUNTY KENAI , STATE AK

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COOKINLT DBS

PRODUCTION LEDGER

DATE	OIL, BBL	GAS MCF	WATER, BBL	GOR, CF/BBL	WATER CUT %	CUM OIL, BBL	CUM GAS MCF
PRIOR	0	8957985	0	0	0 00	0	8 957 985
1/65	0	203510	0	0	0 00	0	9 161 495
2/65	0	181896	0	0	0 00	0	9 343 391
3/65	0	239137	0	0	0 00	0	9 582,528
4/65	0	232071	0	0	0 00	0	9 814,599
5/65	0	211025	0	0	0 00	0	10 025 624
6/65	0	161438	0	0	0 00	0	10,187 062
7/65	0	161421	0	0	0 00	0	10 348 483
8/65	0	156009	0	0	0 00	0	10 504,492
9/65	0	151282	0	0	0 00	0	10 655,774
10/65	0	153186	0	0	0 00	0	10 808 960
11/65	0	150932	0	0	0 00	0	10 959 892
12/65	0	139335	0	0	0 00	0	11,099,227
TOT/65	0	2141242	0	0		0	11,099 227
1/66	0	135288	0	0	0 00	0	11 234 515
2/66	0	140908	0	0	0 00	0	11,375,423
3/66	0	139274	0	0	0 00	0	11,514,697
4/66	0	67624	0	0	0 00	0	11,582,321
5/66	0	71683	0	0	0 00	0	11,654,004
6/66	0	55795	0	0	0 00	0	11,709,799
7/66	0	54883	0	0	0 00	0	11,764,682
8/66	0	57872	0	0	0 00	0	11,822,554
9/66	0	16799	0	0	0 00	0	11,839,353
10/66							
11/66							
12/66							
TOT/66	0	740126	0	0		0	11,839 353
1/74	0	0	0	0	0 00	0	11,839 353
2/74	0	0	0	0	0 00	0	11,839,353
3/74	0	0	0	0	0 00	0	11,839 353
4/74	0	0	0	0	0 00	0	11,839,353
5/74	0	0	0	0	0 00	0	11,839,353
6/74	0	0	0	0	0 00	0	11,839 353
7/74	0	0	0	0	0 00	0	11,839,353
8/74	821	3623	34	4413	3 98	821	11,842,976
9/74	4603	16961	352	3685	7 10	5,424	11,859,937
10/74							
11/74							
12/74							
TOT/74	5424	20584	386	3795		5,424	11,859,937
1/75	0	0	0	0	0 00	5,424	11,859,937
2/75	0	0	0	0	0 00	5,424	11,859 937
3/75	0	0	0	0	0 00	5,424	11 859 937
4/75	0	0	0	0	0 00	5,424	11,859,937
5/75	5176	5769	48	1115	0 92	10,600	11,865,706
6/75	6276	2335	80	372	1 26	16,876	11,868,041
7/75	5465	11418	348	2089	5 99	22,341	11,879,459
8/75	6589	3130	120	475	1 79	28,930	11,882,589
9/75	4784	4044	38	845	0 79	33,714	11,886,633
10/75	1576	2839	26	1801	1 62	35,290	11,889,472
11/75	3541	5339	26	1508	0 73	38,831	11,894,811
12/75	394	624	3	1584	0 76	39,225	11,895,435
TOT/75	33801	35498	689	1050		39,225	11,895,435
TOTAL	39225	11895435	1075	303262		39,225	11,895,435

ARIES SEQUENCE NUMBER 23
FIELD RESERVOIR SWANSON RIVER STERLING
COUNTY KENAI , STATE AK

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	39225	11895435	1075	303262	2 67	39,225	11 895,435
1/76	0	0	0	0	0 00	39,225	11 895 435
2/76	0	0	0	0	0 00	39,225	11 895 435
3/76	0	0	0	0	0 00	39 225	11,895 435
4/76	0	0	0	0	0 00	39,225	11,895 435
5/76	0	0	0	0	0 00	39 225	11,895 435
6/76	0	0	0	0	0 00	39,225	11,895 435
7/76	0	0	0	0	0 00	39 225	11 895,435
8/76	2182	3388	23	1553	1 04	41,407	11 898,823
9/76	2140	4316	28	2017	1 29	43,547	11,903 139
10/76	1777	6258	60	3522	3 27	45 324	11,909 397
11/76	1682	8003	120	4758	6 66	47 006	11 917 400
12/76	108	558	8	5167	6 90	47 114	11,917,958
TOT/76	7889	22523	239	2855		47,114	11 917,958
1/79	0	0	0	0	0 00	47,114	11,917,958
2/79	0	0	0	0	0 00	47,114	11,917,958
3/79	0	0	0	0	0 00	47,114	11 917,958
4/79	0	0	0	0	0 00	47,114	11,917,958
5/79	0	0	0	0	0 00	47,114	11,917,958
6/79	0	0	0	0	0 00	47,114	11,917,958
7/79	0	0	0	0	0 00	47,114	11,917,958
8/79	0	9166	0	0	0 00	47 114	11,927,124
9/79	0	25329	0	0	0 00	47,114	11,952,453
10/79	0	30695	0	0	0 00	47,114	11,983,148
11/79	0	60184	0	0	0 00	47,114	12,043,332
12/79	0	72377	0	0	0 00	47,114	12,115 709
TOT/79	0	197751	0	0		47,114	12,115,709
1/80	0	67536	0	0	0 00	47,114	12,183,245
2/80	0	0	0	0	0 00	47,114	12,183,245
3/80	4125	245283	2856	59463	40 91	51,239	12 428,528
4/80							
5/80							
6/80							
7/80							
8/80							
9/80							
10/80							
11/80							
12/80							
TOT/80	4125	312819	2856	75835		51,239	12,428 528
1/87	0	0	0	0	0 00	51,239	12,428,528
2/87	0	0	0	0	0 00	51,239	12,428 528
3/87	0	0	0	0	0 00	51,239	12,428,528
4/87	0	0	0	0	0 00	51,239	12,428,528
5/87	0	0	0	0	0 00	51,239	12,428,528
6/87	0	0	0	0	0 00	51,239	12,428,528
7/87	0	46081	0	0	0 00	51,239	12,474,609
8/87	0	119256	0	0	0 00	51,239	12,593,865
9/87	0	108267	0	0	0 00	51,239	12,702,132
10/87	0	106779	0	0	0 00	51,239	12,808,911
11/87	0	93697	0	0	0 00	51,239	12,902,608
12/87	0	80833	0	0	0 00	51,239	12,983,441
TOT/87	0	554913	0	0		51,239	12,983,441
TOTAL	51239	12983441	4170	253390		51,239	12,983,441

ARIES SEQUENCE NUMBER 23
FIELD RESERVOIR SWANSON RIVER STERLING
COUNTY KENAI , STATE AK

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P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS, MCF
PRIOR	51239	12983441	4170	253390	7 53	51,239	12 983,441
1/88	0	103542	0	0	0 00	5.,239	13,086,983
2/88	0	91883	0	0	0 00	51,239	13,178 866
3/88	0	79237	0	0	0 00	51,239	13 258 103
4/88	0	77840	0	0	0 00	51,239	13 335 943
5/88	0	19997	0	0	0 00	51,239	13 355 940
6/88	0	18858	0	0	0 00	51,239	13 37.,798
7/88	0	37896	0	0	0 00	51,239	13 412,69.
8/88	0	87676	0	0	0 00	51 239	13 500,370
9/88	0	224476	0	0	0 00	51,239	13,724,846
10/88	0	105799	0	0	0 00	51,239	13,830 645
11/88	0	100860	0	0	0 00	51,239	13 931,505
12/88	0	91525	0	0	0 00	51,239	14,023,030
TOT/88	0	1039589	0	0		51,239	14,023,030
1/89	0	69856	0	0	0 00	51,239	14,092 886
2/89	0	71095	0	0	0 00	51,239	14 163 981
3/89	0	98254	0	0	0 00	51,239	14 262,235
4/89	0	108040	0	0	0 00	51,239	14,370,275
5/89	0	32788	0	0	0 00	51,239	14,403,063
6/89	0	77036	0	0	0 00	51,239	14,480,099
7/89	0	56036	0	0	0 00	51,239	14,536 135
8/89	0	44173	0	0	0 00	51,239	14,580,308
9/89	0	73276	0	c	0 00	51,239	14,653,584
10/89	25	183473	18630	733892C	99 87	51,264	14,837,057
11/89	22	175657	13606	7984409	99 84	51,286	15,012,714
12/89	10	196306	12858	19630600	99 92	51,296	15,209,020
TOT/89	57	1185990	45094	20806842		51,296	15,209,020
1/90	0	210786	12679	0	0 00	51,296	15,419,806
2/90	0	197160	11750	0	0 00	51,296	15,616,966
3/90	0	240511	23063	0	0 00	51,296	15,857,477
4/90	0	223766	11182	0	0 00	51,296	16,081,243
5/90	0	219248	12490	0	0 00	51,296	16,300,491
6/90	0	222331	17632	0	0 00	51,296	16,522,822
7/90	0	232463	21551	0	0 00	51,296	16,755,285
8/90	0	233704	17886	0	0 00	51,296	16,988,989
9/90	0	181237	2949	0	0 00	51,296	17,170 226
10/90	0	248208	24916	0	0 00	51,296	17,418,434
11/90	0	248216	21645	0	0 00	51 296	17,666,650
12/90	0	252172	23309	0	0 00	51,296	17,918,822
TOT/90	0	2709802	201052	0		51,296	17,918,822
1/91	0	272565	21578	0	0 00	51,296	18,191,387
2/91	0	246326	19544	0	0 00	51,296	18,437,713
3/91	0	248455	20360	0	0 00	51,296	18,686,168
4/91	0	205122	9542	0	0 00	51,296	18,891,290
5/91	0	229710	18677	0	0 00	51,296	19,121,000
6/91	0	223228	17532	0	0 00	51,296	19,344,228
7/91	0	247155	3665	0	0 00	51,296	19,591,383
8/91	0	255938	295	0	0 00	51,296	19,847,321
9/91	0	252011	90	0	0 00	51,296	20,099,332
10/91	0	249628	431	0	0 00	51,296	20,348,960
11/91	0	249144	480	0	0 00	51,296	20,598,104
12/91	0	264634	806	0	0 00	51,296	20,862,738
TOT/91	0	2943916	113000	0		51,296	20,862,738
TOTAL	51296	20862738	363316	406713		51,296	20,862,738

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FIELD RESERVOIR SWANSON RIVER STERLING
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P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	51296	20862738	363316	406713	87 63	51,296	20,862,738
1/92	0	265843	199	0	0 00	51,296	21,128,581
2/92	0	243864	20	0	0 00	51,296	21 372 445
3/92	0	262508	15435	0	0 00	51,296	21,634 953
4/92	0	255918	19765	0	0 00	51 296	21 890,871
5/92	0	264724	15619	0	0 00	51 296	22 155 595
6/92	0	248689	13263	0	0 00	51,296	22,404 284
7/92	0	231855	2080	0	0 00	51,296	22,636 139
8/92	0	239614	7115	0	0 00	51,296	22,875,753
9/92	0	239035	1681	0	0 00	51,296	23,114,788
10/92	0	238453	0	0	0 00	51,296	23,353,241
11/92	0	248361	2593	0	0 00	51,296	23,601 602
12/92	0	175691	0	0	0 00	51,296	23 777,293
TOT/92	0	2914555	77770	0		51,296	23,777,293
1/93	0	178859	0	0	0 00	51,296	23,956,152
2/93	0	203820	0	0	0 00	51,296	24,159,972
3/93	0	174173	0	0	0 00	51,296	24,334,145
4/93	0	171643	0	0	0 00	51,296	24,505,788
5/93	0	168211	0	0	0 00	51,296	24,673 999
6/93	0	175723	0	0	0 00	51,296	24,849,722
7/93	0	152959	0	0	0 00	51,296	25 002,681
8/93	0	131400	0	0	0 00	51,296	25,134,081
9/93	0	194020	0	0	0 00	51,296	25 328,101
10/93	0	217772	0	0	0 00	51 296	25,545 873
11/93	0	220525	0	0	0 00	51,296	25,766,398
12/93	0	216593	0	0	0 00	51,296	25,982,991
TOT/93	0	2205698	0	0		51,296	25,982 991
1/94	0	227259	0	0	0 00	51,296	26,210,250
2/94	0	184262	0	0	0 00	51,296	26,394,512
3/94	0	212651	0	0	0 00	51,296	26,607,163
4/94	0	218963	0	0	0 00	51,296	26,826,126
5/94	0	234398	0	0	0 00	51,296	27,060 524
6/94	0	131937	0	0	0 00	51,296	27,192,461
7/94	0	90621	4204	0	0 00	51,296	27,283,082
8/94	0	68469	4622	0	0 00	51,296	27,351,551
9/94	0	119537	13500	0	0 00	51,296	27,471,088
10/94	0	146270	12478	0	0 00	51,296	27,617,358
11/94	0	150274	16022	0	0 00	51,296	27,767,632
12/94	0	134034	20564	0	0 00	51,296	27,901,666
TOT/94	0	1918675	71390	0		51,296	27,901,666
1/95	0	120393	24008	0	0 00	51,296	28,022,059
2/95	0	115707	24600	0	0 00	51,296	28,137,766
3/95	0	131098	31127	0	0 00	51,296	28,268,864
4/95	0	131633	4076	0	0 00	51,296	28,400,497
5/95	0	117627	0	0	0 00	51,296	28,518,124
6/95	0	118558	75	0	0 00	51,296	28 636,682
7/95	0	118488	68	0	0 00	51,296	28,755,170
8/95	0	109457	74	0	0 00	51,296	28,864,627
9/95	0	112353	218	0	0 00	51,296	28,976,980
10/95							
11/95							
12/95							
TOT/95	0	1075314	84246	0		51,296	28,976,980
TOTAL	51296	28976980	596722	564897		51,296	28,976,980

SWANSON RIVER HEMLOCK GAS

Swanson River Hemlock Gas

Proved Developed

The Swanson River Field has produced over 222 MMBbls of oil and over 2 Tcf of gas since 1958 There are currently 42 active wells in the field Oil production in Swanson River has been enhanced by both water and gas injection programs The field is nearing depletion and is going through the blowdown phase of production Proved developed reserves from gas associated with the oil production from the Hemlock formation was determined from volumetric and material balance calculations

Oil-in-place of approximately 519 MMBbls was determined through volumetric calculations Values for porosity, water saturation, net pay, and the oil formation volume factor were supplied by the AOGCC These were used in the calculation of OOIP and are summarized in the attached reserve worksheet

An initial dissolved gas-oil ratio of 350 scf/STB indicates total original gas of 182 Bcf Total injected gas is 2700 Bcf, total produced gas is 2516 Bcf, and total gas remaining in the reservoir at abandonment is estimated to be 126 Bcf. Gas remaining in the reservoir consists of 36 Bcf in solution and 90 Bcf free gas The result is 240 Bcf of proved developed gas remains to be produced during the blowdown phase All data used in the analysis is included and follows this discussion

Produced Undeveloped

No undeveloped gas reserves are assigned to the Hemlock formation

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Swanson River (Hemlock)
Location	Kenai County, Alaska
Operator	Unocal, Chevron, Arco
Reserve Basis:	Material Balance/Volumetrics
Reserve Classification:	Proved Developed

Material Balance
Source AOGCC

Pressures (psi) Initial 5700, Bubble Point 1350; Abandonment 600

Remarks Initial GIP=NR_{si} = 519 (10^6) x 350 = 182 Bcf
Total injected gas = 2700 Bcf
Total produced gas = 2516 Bcf
Gas remaining at abandonment = 36 Bcf in solution, 90 Bcf free gas (S_g=27%)
Remaining gas to be produced = 240 Bcf

Production Parameters
Source Dwight's

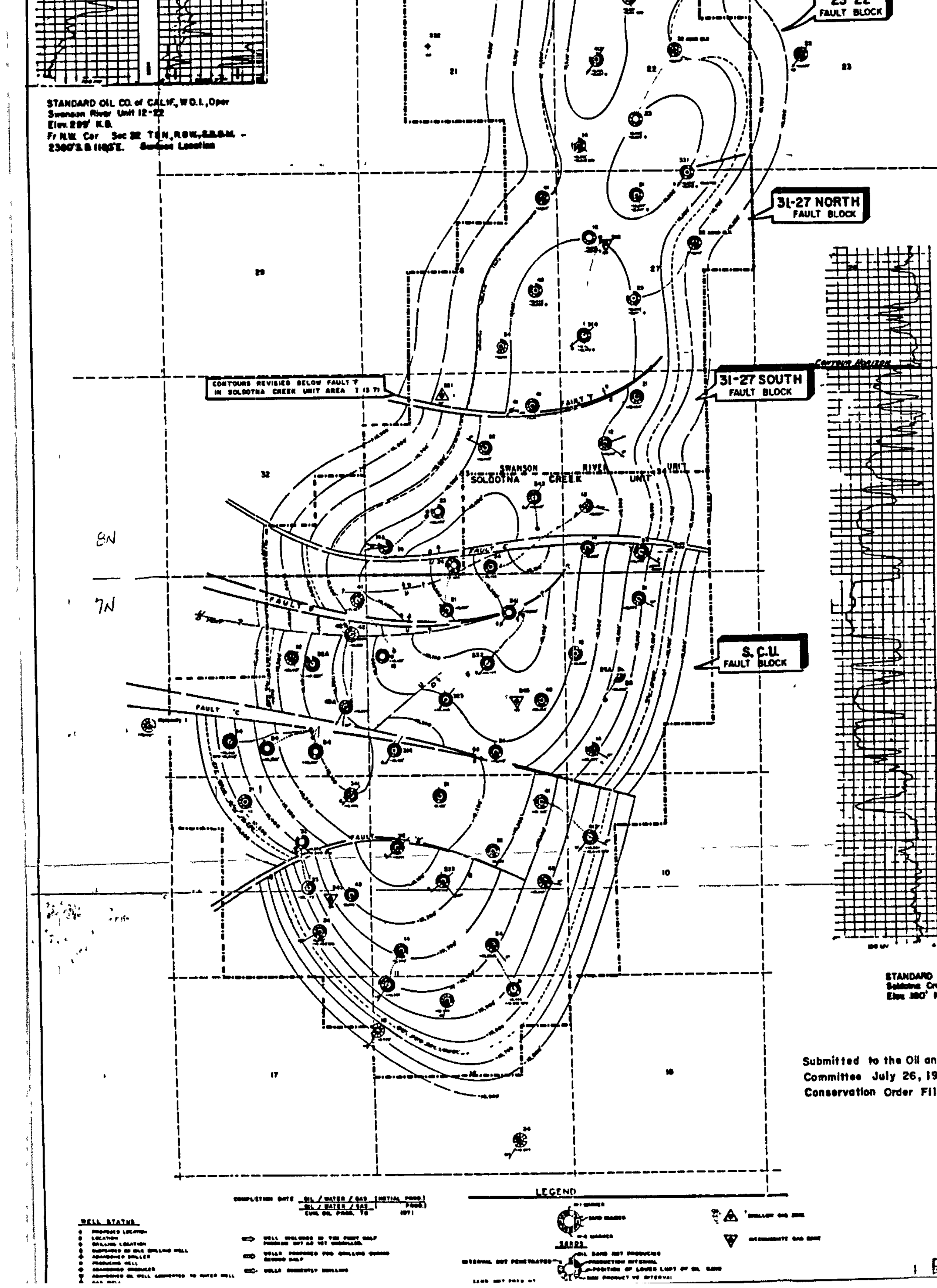
		MMBbls
a	Recorded Prod Through 9/95	222 0
b	3 Months Est Production	0 4
c	Cumulative Production Through 12/95	222 4
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks

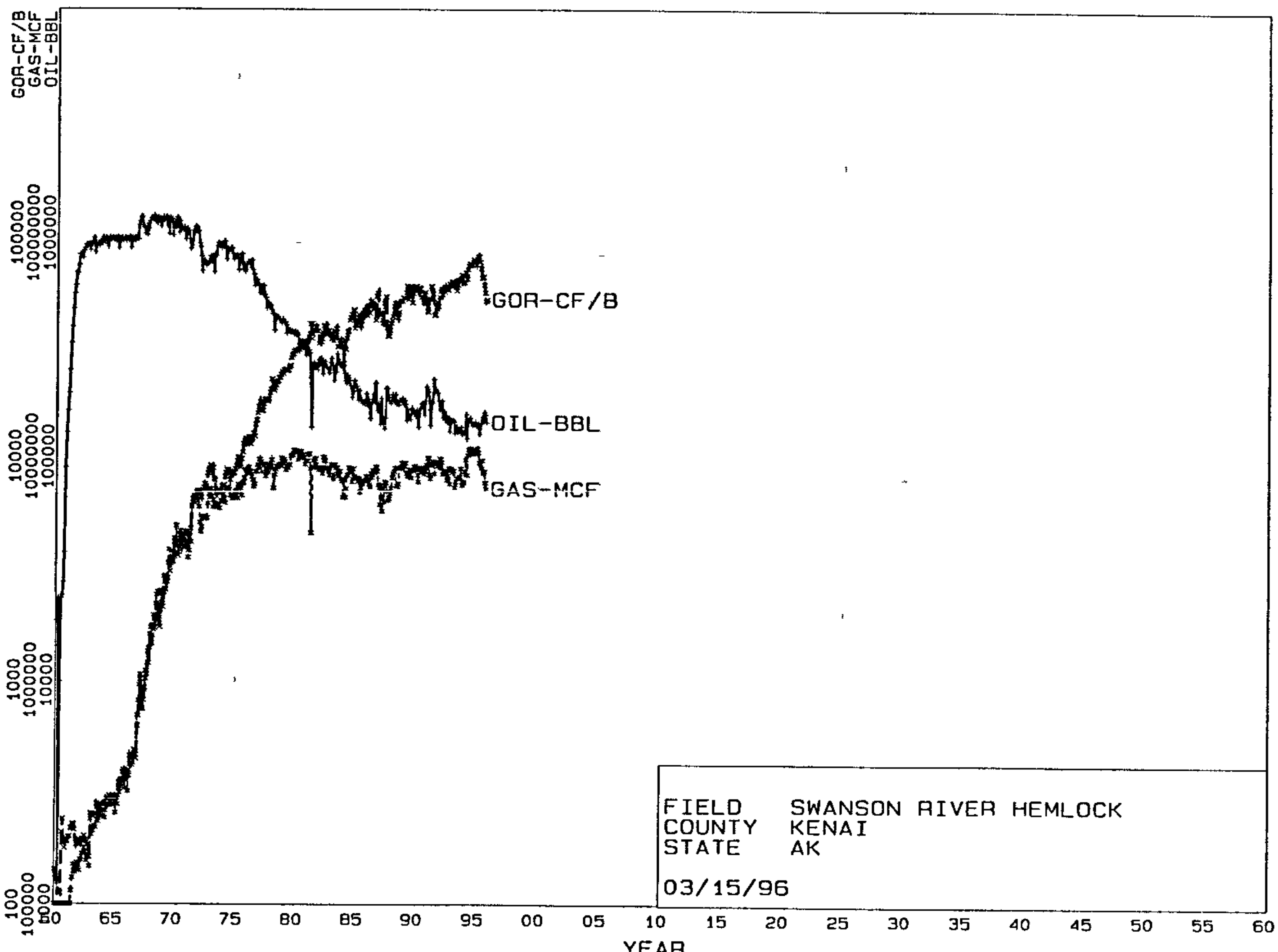
Reservoir Parameters
Source AOGCC

		Soldotna	34-10 Block	Center Block
a	Net Thickness	220	75	70
b	Porosity	22%	21%	20%
c	Water Saturation	40%	40%	40%
d	Hydrocarbon Thickness	29 04	9 45	8 40
e	Volume Factor	1 295	1.173	1 235
f	Drainage Area	2660	478	493
g	Original Volume in Place	463 MMBbls	30 MMBbls	26 MMBbls
h	Recovery Efficiency			
i	Ultimate Recovery			
j	Cumulative Recovery			
k.	Remaining Recovery			

Remarks Total OOIP ~ 519 MMBbls Assume recovery ~50%



STANDARD OIL CO. of CALIF, W.O.I., Oper
Swanson River Unit 12-22
FAULT BLOCK
31-27 NORTH
FAULT BLOCK
CONTOURS REVISED BELOW FAULT 'I'
IN SOLDOTNA CREEK UNIT AREA
31-27 SOUTH
FAULT BLOCK
SWANSON RIVER UNIT
SOLDOTNA CREEK
S.C.U.
FAULT BLOCK
FAULT
8N
7N
Contour Horizon
STANDARD
Submitted to the Oil an
Committee July 26, 19
Conservation Order Fil
LEGEND
WELL STATUS
SANDS



GROSS PRODUCTION PLOT

ARIES SEQUENCE NUMBER 22
FIELD RESERVOIR SWANSON RIVER HEMLOCK
COUNTY KENAI , STATE AK

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PRODUCTION LEDGER

DATE	OIL, BBL	GAS MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS, MCF
PRIOR	222344	32939	0	148	0 00	222,344	32,939
1/60	18282	2609	1238	143	6 34	240,626	35 548
2/60	19662	2642	1083	134	5 22	260,288	38 190
3/60	23059	2965	452	129	1 92	283 347	41 155
4/60	1227	157	10	128	0 81	284,574	41,312
5/60	9790	1098	101	112	1 02	294 364	42,410
6/60	23062	2637	238	114	1 02	317 426	45 047
7/60	23684	2647	676	112	2 78	341,110	47 694
8/60	27182	5676	269	209	0 98	368 292	53 370
9/60	36933	8836	382	239	1 02	405 225	62 206
10/60	88557	17057	872	193	0 98	493 782	79 263
11/60	127113	22561	2172	177	1 68	620 895	10[illegible],82[illegible]
12/60	159448	30291	4015	190	2 46	780 343	132,115
TOT/60	557999	99176	11508	178		780,343	132,115
1/61	191601	36131	5047	189	2 57	971,944	168 246
2/61	242799	46319	5887	191	2.37	1,214,743	214 565
3/61	319593	63677	9725	199	2 95	1,534,336	278,242
4/61	378605	75750	10143	200	2 61	1,912 941	353 992
5/61	456026	99251	11526	218	2 47	2,368,967	453,243
6/61	531910	114601	12485	215	2 29	2,900 877	567,844
7/61	578548	131191	13267	227	2 24	3 479,425	699,035
8/61	664326	149708	16775	225	2 46	4,143,751	848,743
9/61	654979	139772	17316	213	2 58	4,798 730	988 515
10/61	715466	138290	19095	193	2 60	5,514 196	1 126,805
11/61	795226	145829	18970	183	2 33	6 309 422	1,272,634
12/61	797422	152740	18179	192	2 23	7,106,844	1 425 374
TOT/61	6326501	1293259	158415	204		7,106,844	1,425 374
1/62	808752	148434	19047	184	2 30	7,915,596	1,573,808
2/62	768203	140871	17968	183	2 29	8,683,799	1,714 679
3/62	824760	158042	19545	192	2 31	9 508,559	1,872,721
4/62	848253	156431	20483	184	2 36	10,356,812	2,029,152
5/62	877642	167372	26147	191	2 89	11,234,454	2,196,524
6/62	860969	167396	23647	194	2 67	12 095,423	2,363,920
7/62	882674	177476	27238	201	2 99	12,978,097	2,541,396
8/62	883754	169833	27768	192	3 05	13 861,851	2,711,229
9/62	830246	155812	27485	188	3 20	14,692,097	2,867,041
10/62	890016	163686	27221	184	2 97	15,582,113	3,030,727
11/62	878220	161447	32622	184	3 58	16,460,333	3,192,174
12/62	905621	147255	24962	163	2 68	17,365 954	3,339 429
TOT/62	10259110	1914055	294133	187		17,365,954	3,339,429
1/63	943558	238467	24714	253	2 55	18,309,512	3,577,896
2/63	812837	203967	20430	251	2 45	19,122,349	3,781,863
3/63	894241	219029	22915	245	2 50	20,016,590	4,000,892
4/63	862546	211413	26294	245	2 96	20,879,136	4,212,305
5/63	892244	223033	22893	250	2 50	21,771,380	4,435,338
6/63	866712	219182	27051	253	3 03	22,638,092	4,654,520
7/63	907343	253016	34957	279	3 71	23,545,435	4,907,536
8/63	896308	244695	42204	273	4 50	24,441,743	5,152,231
9/63	888777	232264	48231	261	5 15	25,330,520	5,384,495
10/63	945016	261732	59501	277	5 92	26,275,536	5,646,227
11/63	903311	244919	56341	271	5 87	27,178,847	5 891 146
12/63	927071	256290	73250	276	7 32	28,105,918	6,147,436
TOT/63	10739964	2808007	458781	261		28 105,918	6,147,436
TOTAL	28105918	6147436	922837	219		28,105,918	6,147,436

ARIES SEQUENCE NUMBER 22
FIELD RESERVOIR SWANSON RIVER HEMLOCK
COUNTY KENAI , STATE AK

P R O D U C T I O N   L E D G E R

DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	28105918	6147436	922837	219	3 18	28 105 918	6 147 436
1/64	945348	261354	76092	276	7 45	29,051,266	6 408 790
2/64	883858	246033	82442	278	8 53	29,935,124	6 654 823
3/64	858811	241835	89298	282	9 42	30 793,935	6 896 658
4/64	912185	259268	78698	284	7 94	31 706 120	7 155 926
5/64	948770	278921	91637	294	8 81	32,654 890	7 434 847
6/64	915204	272602	84832	298	8 48	33 570,094	7 707 449
7/64	941565	275973	106866	293	10 19	34,511 659	7 983 422
8/64	940175	285420	114631	304	10 87	35 451,834	8 268,842
9/64	914025	273308	121027	299	11 69	36 365 859	8 542 150
10/64	944743	277343	123608	294	11 57	37 310 602	8 819 493
11/64	908956	276697	138523	304	13 22	38 219 558	9 096 190
12/64	940232	284478	145505	303	13 40	39,159,790	9,380 668
TOT/64	11053872	3233232	1253159	292		39,159,790	9 380 668
1/65	944032	284772	149197	302	13 65	40,103,822	9,665,440
2/65	849306	254380	119967	300	12 38	40,953,128	9,919 820
3/65	940920	286152	126993	304	11 89	41,894 048	10,205,972
4/65	911939	277704	124246	305	11 99	42,805,987	10 483,676
5/65	942537	326977	112103	347	10 63	43 748,524	10,810,653
6/65	914046	311767	131061	341	12 54	44,662 570	11,122,420
7/65	930389	330592	119463	355	11 38	45,592 959	11,453 012
8/65	946856	340920	139118	360	12 81	46,539,815	11 793 932
9/65	912001	352437	146729	386	13 86	47,451,816	12 146 369
10/65	942602	372214	171506	395	15 39	48 394 418	12,518 583
11/65	914089	326313	168187	357	15 54	49 308,507	12,844 896
12/65	950687	367219	173968	386	15 47	50,259,194	13 212,115
TOT/65	11099404	3831447	1682538	345		50,259 194	13,212,115
1/66	943027	366384	158108	389	14 36	51,202,221	13 578,499
2/66	854246	317035	144247	371	14 45	52,056,467	13 895,534
3/66	944497	372664	140980	395	12 99	53,000,964	14,268,198
4/66	915799	418673	165153	457	15 28	53,916,763	14,686,871
5/66	944597	417458	163527	442	14 76	54 861,360	15 104,329
6/66	912806	414689	196510	454	17 71	55 774,166	15 519,018
7/66	941873	424014	184279	450	16 36	56,716,039	15,943,032
8/66	960439	465573	177931	485	15 63	57,676,478	16,408,605
9/66	929940	450584	177279	485	16 01	58,606 418	16,859 189
10/66	1076526	477333	207591	443	16 17	59,682,944	17,336,522
11/66	1116210	694128	178518	622	13 79	60,799,154	18,030,650
12/66	1171784	803956	173585	686	12 90	61,970,938	18,834,606
TOT/66	11711744	5622491	2067708	480		61,970,938	18 834,606
1/67	1170384	945685	184694	808	13 63	63,141,322	19,780,291
2/67	1051231	1051524	175673	1000	14 32	64,192,553	20,831,815
3/67	1054505	883551	182246	838	14 74	65,247 058	21,715,366
4/67	985111	733863	169364	745	14 67	66,232,169	22,449,229
5/67	1042237	843462	188837	809	15 34	67,274 406	23,292,691
6/67	974398	894029	179460	918	15 55	68,248,804	24,186,720
7/67	1090528	1096773	197228	1006	15 32	69,339,332	25,283,493
8/67	1034760	1093471	205842	1057	16 59	70,374,092	26,376,964
9/67	1121772	1331159	211003	1187	15 83	71,495,864	27,708,123
10/67	1159636	1369045	206401	1181	15 11	72 655,500	29 077,168
11/67	1149681	1592627	180102	1385	13 54	73,805,181	30,669,795
12/67	1146239	1705838	177054	1488	13 38	74,951 420	32,375,633
TOT/67	12980482	13541027	2257904	1043		74,951,420	32,375,633
TOTAL	74951420	32375633	8184146	432		74,951,420	32,375,633

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FIELD RESERVOIR SWANSON RIVER HEMLOCK
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DATE	OIL BBL	GAS, MCF	WATER BBL	GOR CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	74951420	32375633	8184146	432	9 84	74 951 420	32 375 633
1/68	1186397	1721815	186560	1451	13 59	76,137,817	34 097 448
2/68	1108057	1743831	155406	1574	12 30	77 245 874	35 841 279
3/68	1161226	1937954	177415	1669	13 25	78 407 100	37 779 233
4/68	1090921	1848152	162427	1694	12 96	79 498,021	39 627,385
5/68	1163595	2176124	162358	1870	12 24	80 661,616	4_ 803 509
6/68	1127009	2385513	161147	2117	12 51	81 788,625	44 189 022
7/68	1154034	2460060	183670	2132	13 73	82 942,659	46 649 082
8/68	1060039	1950475	192183	1840	15 35	84 002 698	48,599 557
9/68	1105805	1893344	181263	1712	14 08	85,108 503	50 492 901
10/68	1172640	2393495	205733	2041	14 93	86,281 143	52 886 396
11/68	1136320	2499119	198075	2199	14 84	87,417 463	55,385 515
12/68	1153415	2424446	219185	2102	15 97	88,570 878	57 809 961
TOT/68	13619458	25434328	2185422	1867		88,570,878	57,809 961
1/69	1173559	2885448	218265	2459	15 68	89,744,437	60,695,409
2/69	1066497	2715533	187372	2546	14 94	90,810 934	63,410 942
3/69	1156714	2909163	188357	2515	14 00	91,967,648	66 320 105
4/69	983817	2713366	143937	2758	12 76	92,951,465	69,033,471
5/69	1160507	3302769	191257	2846	14 15	94,111,972	72,336 240
6/69	1137639	3800525	182649	3341	13 83	95,249,611	76,136,765
7/69	1146660	3493489	214361	3047	15 75	96,396,271	79,630 254
8/69	970962	3280819	231460	3379	19 25	97,367,233	82,911 073
9/69	1036966	3539256	222890	3413	17 69	98,404 199	86 450,329
10/69	1111254	3735983	223390	3362	16 74	99,515,453	90,186,312
11/69	1039499	4272075	235305	4110	18 46	100,554,952	94,458 387
12/69	1166803	4107937	273367	3521	18 98	101,721,755	98 566,324
TOT/69	13150877	40756363	2512610	3099		101,721,755	98,566,324
1/70	1140000	4859888	236098	4263	17 16	102,861,755	103,426 212
2/70	995578	3907314	255724	3925	20 44	103,857,333	107,333,526
3/70	1120642	4005554	242221	3574	17 77	104,977,975	111,339 080
4/70	1020242	4051231	234029	3971	18 66	105,998,217	115,390,311
5/70	1049708	4612101	278169	4394	20 95	107 047,925	120 002,412
6/70	1023299	4421735	256005	4321	20 01	108,071,224	124 424 147
7/70	1055102	4016475	214728	3807	16 91	109,126,326	128,440,622
8/70	1025735	4029002	214853	3928	17 32	110 152,061	132 469,624
9/70	931893	4064145	172671	4361	15 63	111,083,954	136,533,769
10/70	1038622	4590648	182004	4420	14 91	112,122,576	141,124 417
11/70	990138	3906528	197524	3945	16 63	113,112,714	145,030 945
12/70	1016930	3931212	232843	3866	18 63	114,129,644	148 962 157
TOT/70	12407889	50395833	2716869	4062		114 129 644	148 962,157
1/71	933773	3506248	254066	3755	21 39	115,063,417	152,468,405
2/71	845938	3775723	238218	4463	21 97	115,909,355	156,244,128
3/71	913703	4134439	245338	4525	21 17	116,823,058	160,378,567
4/71	872970	4125718	228750	4726	20 76	117,696,028	164,504,285
5/71	1018288	6016799	252810	5909	19 89	118,714,316	170,521,084
6/71	990875	6380819	318932	6440	24 35	119,705,191	176,901,903
7/71	1059927	6576677	292508	6205	21 63	120 765,118	183,478,580
8/71	1052959	6437871	374355	6114	26 23	121,818,077	189,916,451
9/71	1006258	6561313	373765	6521	27 08	122,824,335	196 477,764
10/71	1014410	6875137	428343	6777	29 69	123,838,745	203 352,901
11/71	895370	6256678	372959	6988	29 41	124 734,115	209,609 579
12/71	861885	5921294	422759	6870	32 91	125,596,000	215,530,873
TOT/71	11466356	66568716	3802803	5806		125,596,000	215,530,873
TOTAL	125596000	215530873	19401850	1716		125,596,000	215,530,873

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DATE	OIL, BBL	GAS MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	125596000	215530873	19401850	1716	13 38	125 596 000	215 530,873
1/72	782283	5036210	259651	6438	24 92	126 378 283	220 567 083
2/72	672781	4582214	224088	6811	24 99	127,051 064	225,149 297
3/72	739051	4811507	252108	6510	25 44	127,790 115	229 960 804
4/72	750393	5305143	323046	7070	30 09	128,540,508	235 265 947
5/72	739181	5336805	371952	7220	33 48	129 279,689	240 602 752
6/72	711705	5323559	300488	7480	29 69	129 991 394	245 926 311
7/72	719972	5223515	297561	7255	29 24	130,711 366	251,149 826
8/72	743362	5284125	312698	7108	29 61	131 454 728	256 433 951
9/72	732169	6131215	251379	8374	25 56	132,186 897	262,565 166
10/72	784863	6775034	297726	8632	27 50	132,971,760	269 340 200
11/72	736145	6505497	327678	8837	30 80	133 707,905	275 845 697
12/72	784293	7126280	288917	9086	26 92	134,492 198	282,971 977
TOT/72	8896198	67441104	3507292	7581		134 492,198	282 971 977
1/73	767980	6586987	241552	8577	23 93	135 260,178	289 558,964
2/73	665674	5888333	240055	8846	26 50	135,925,852	295 447 297
3/73	805808	6354786	258950	7886	24 32	136,731,660	301,802,083
4/73	787813	6131356	264240	7783	25 12	137 519,473	307,933,439
5/73	870014	5987206	313973	6882	26 52	138,389 487	313,920,645
6/73	899101	5896972	275547	6559	23 46	139 288 588	319 817,617
7/73	867032	6056951	277997	6986	24 28	140 155,620	325 874 568
8/73	885235	6039685	281501	6823	24 13	141,040 855	331 914 253
9/73	847849	5828377	250466	6874	22 80	141,888,704	337,742,630
10/73	899799	6254679	276522	6951	23 51	142 788 503	343 997,309
11/73	856747	6288869	209109	7340	19 62	143 645,250	350,286 178
12/73	911447	6752380	284276	7408	23 77	144 556,697	357,038 558
TOT/73	10064499	74066581	3174188	7359		144 556,697	357,038 558
1/74	866890	6436584	260505	7425	23 11	145,423,587	363,475,142
2/74	760118	6153035	219742	8095	22 43	146,183,705	369,628,177
3/74	850836	7152152	266580	8406	23 86	147,034,541	376,780 329
4/74	821320	7113764	277589	8661	25 26	147,855,861	383,894,093
5/74	835699	7220457	300669	8640	26 46	148,691,560	391,114,550
6/74	853320	7064903	362823	8279	29 83	149,544,880	398,179 453
7/74	850988	6665929	342342	7833	28 69	150,395,868	404,845,382
8/74	802810	6599379	334028	8220	29 38	151,198,678	411,444,761
9/74	758408	6436229	273833	8486	26 53	151,957,086	417,880,990
10/74	785349	6511292	313513	8291	28 53	152,742,435	424 392,282
11/74	780484	6555946	305585	8400	28 14	153,522 919	430,948,228
12/74	793756	6939201	268476	8742	25 27	154,316,675	437,887,429
TOT/74	9759978	80848871	3525685	8284		154 316,675	437,887,429
1/75	775941	7021801	259025	9049	25 03	155,092,616	444,909,230
2/75	679299	6466003	232525	9519	25 50	155,771 915	451,375,233
3/75	753490	7450838	292127	9888	27 94	156,525,405	458,826 071
4/75	743831	7306769	360475	9823	32 64	157,269,236	466,132,840
5/75	803763	7148752	332328	8894	29 25	158,072,999	473,281,592
6/75	684881	6659986	303525	9724	30 71	158,757,880	479,941,578
7/75	724299	7529178	308003	10395	29 84	159 482,179	487,470,756
8/75	667414	7602367	328343	11391	32 97	160,149 593	495,073,123
9/75	681309	7974517	314940	11705	31 61	160,830,902	503 047,640
10/75	725053	8704931	384603	12006	34 66	161 555 955	511,752,571
11/75	741001	8319775	375029	11228	33 60	162,296 956	520,072,346
12/75	739714	8444331	356867	11416	32 54	163,036 670	528,516,677
TOT/75	8719995	90629248	3847790	10393		163,036,670	528 516,677
TOTAL	163036670	528516677	33456805	3242		163,036,670	528,516,677

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DATE	OIL BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT %	CUM OIL, BBL	CUM GAS MCF
PRIOR	163036670	528516677	33456805	3242	17 03	163,036 670	528 516,677
1/76	735276	8917135	376218	12128	33 85	163 771,946	537 433 812
2/76	699090	8552526	342335	12234	32 87	164 471 036	545 986 338
3/76	751798	8494362	355051	11299	32 08	165 222 834	554 480 700
4/76	680299	8071051	280134	11864	29 17	165,903 133	562 551 751
5/76	650636	7821056	294345	12021	31 15	166 553 769	570 372,807
6/76	577786	7299450	298645	12633	34 08	167 131,555	577 672 257
7/76	610818	7498702	309076	12276	33 60	167 742 373	585 170 959
8/76	613771	8502483	344622	13853	35 96	168 356,144	593 673 442
9/76	588904	8533925	323434	14491	35 45	168,945 048	602 207 367
10/76	586754	9140058	323247	15577	35 52	169 531,802	611,347 425
11/76	535992	8918961	254655	16640	32 21	170,067,794	620 266 386
12/76	552283	9654321	229749	17481	29 38	170,620,077	629 920 707
TOT/76	7583407	101404030	3731511	13372		170,620 077	629,920 707
1/77	577167	9434771	303485	16347	34 46	171,197,244	639 355,478
2/77	527092	8501590	265375	16129	33 49	171,724,336	647 857 068
3/77	578713	9215162	321207	15924	35 69	172,303,049	657,072,230
4/77	527778	9041921	258898	17132	32 91	172,830,827	666,114,151
5/77	512415	9201211	256623	17957	33 37	173 343,242	675 315 362
6/77	458491	8115156	241874	17700	34 54	173,801,733	683,430,518
7/77	486198	8716854	272109	17929	35 88	174,287 931	692,147 372
8/77	486626	8564887	233912	17601	32 46	174 774,557	700 712,259
9/77	467786	8438788	225484	18040	32 52	175 242,343	709,151,047
10/77	472828	9115950	242903	19280	33 94	175,715,171	718 266,997
11/77	452168	8982786	238791	19866	34 56	176,167,339	727,249 783
12/77	433329	9581879	188549	22112	30 32	176 600,668	736,831,662
TOT/77	5980591	106910955	3049210	17876		176,600,668	736 831,662
1/78	435096	8768045	236954	20152	35 26	177,035 764	745 599,707
2/78	366735	7208631	195563	19656	34 78	177,402,499	752,808 338
3/78	408074	8251648	218529	20221	34 88	177,810,573	761,059 986
4/78	420196	8738342	227725	20796	35 15	178,230,769	769,798,328
5/78	420110	9018924	219752	21468	34 34	178,650 879	778,817,252
6/78	409897	8882144	212543	21669	34 15	179 060,776	787,699 396
7/78	410440	9185461	180298	22380	30 52	179,471 216	796,884,857
8/78	400769	9026313	189768	22522	32 13	179,871,985	805 911,170
9/78	394472	9132892	197405	23152	33 35	180,266 457	815,044,062
10/78	409378	9778491	209596	23886	33 86	180,675,835	824,822 553
11/78	397331	9292411	221150	23387	35 76	181,073,166	834,114 964
12/78	397310	9650612	226760	24290	36 34	181,470 476	843 765,576
TOT/78	4869808	106933914	2536043	21959		181,470,476	843,765,576
1/79	387345	9452260	239209	24403	38 18	181,857,821	853,217,836
2/79	354218	8688366	219538	24528	38 26	182,212,039	861,906,202
3/79	374302	9011001	263983	24074	41 36	182,586,341	870,917 203
4/79	364762	8862270	233355	24296	39 01	182,951,103	879,779,473
5/79	367090	9170621	238500	24982	39 38	183,318,193	888,950,094
6/79	357230	9092147	233141	25452	39 49	183,675,423	898 042,241
7/79	363282	10006891	231617	27546	38 93	184,038,705	908,049,132
8/79	357409	10111791	237569	28292	39 93	184,396,114	918,160,923
9/79	351406	10091157	234555	28717	40 03	184,747 520	928,252,080
10/79	360864	10617331	227929	29422	38 71	185,108,384	938,869 411
11/79	349154	10407826	248538	29809	41 58	185,457,538	949,277,237
12/79	356766	10556508	259324	29589	42 09	185,814,304	959,833,745
TOT/79	4343828	116068169	2867258	26720		185,814,304	959,833,745
TOTAL	185814304	959833745	45640827	5166		185,814,304	959,833,745

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DATE	OIL, BBL	GAS, MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL, BBL	CUM GAS MCF
PRIOR	185814304	959833745	45640827	5166	19 72	185,814 304	959 833 745
1/80	349214	10510067	259623	30096	42 64	186 163,518	970,343 812
2/80	307776	9618629	212009	31252	40 79	186,471,294	979 962 441
3/80	329208	9878755	249135	30008	43 08	186 800,502	989 8[illegible] 196
4/80	319203	9962778	320127	31211	50 07	187 119,705	999 803 97[illegible]
5/80	327952	10470694	322697	31928	49 60	187 447,657	1 010 27[illegible] 668
6/80	300875	9746928	210848	32395	41 20	187,748 532	[illegible] 020 021 59[illegible]
7/80	311698	10143816	265375	32544	45 99	188,060,230	1,030 165 412
8/80	301552	9887321	234728	32788	43 77	188,361 782	1 040 052 733
9/80	282381	9188372	259699	32539	47 91	188 644,163	1,049,241 105
10/80	304181	9523201	249725	31308	45 08	188,948 344	1,058,764 306
11/80	286300	9464246	281481	33057	49 58	189,234,644	1,068,228,552
12/80	299050	10147354	256984	33932	46 22	189,533,694	1,078,375,906
TOT/80	3719390	118542161	3122431	31871		189,533,694	1,078,375,906
1/81	290067	10235112	245850	35285	45 87	189,823 761	1 088 611,018
2/81	224236	8767980	212306	39102	48 63	190,047,997	1,097 378 998
3/81	134778	4530367	105466	33614	43 90	190,182 775	1,101,909,365
4/81	255241	8975291	211845	35164	45 35	190,438,016	1,110 884 656
5/81	262746	9561152	238963	36389	47 63	190 700,762	1 120,445 808
6/81	244094	8900172	264326	36462	51 99	190 944,856	1 129,345,980
7/81	257100	9719513	267498	37804	50 99	191,201 956	1 139 065,493
8/81	253323	9187168	284369	36267	52 89	191,455 279	1 148 252,661
9/81	242897	8839397	297996	36392	55 09	191,698,176	1,157 092 058
10/81	271208	8661426	266054	31936	49 52	191,969,384	1,165,753,484
11/81	255288	8786504	279913	34418	52 30	192,224,672	1 174 539 988
12/81	273360	8865290	258591	32431	48 61	192,498,032	1 183,405,278
TOT/81	2964338	105029372	2933177	35431		192,498,032	1 183,405,278
1/82	264817	8856549	293408	33444	52 56	192,762,849	1,192,261,827
2/82	233723	8354103	276812	35744	54 22	192,996,572	1,200,615,930
3/82	257361	9878761	275373	38385	51 69	193,253,933	1 210,494,691
4/82	265308	9619586	319684	36258	54 65	193,519,241	1,220,114,277
5/82	250848	9533831	280449	38006	52 79	193 770,089	1 229 648,108
6/82	251677	8772234	263915	34855	51 19	194,021 766	1 238,420,342
7/82	245465	8869410	167205	36133	40 52	194,267,231	1,247,289 752
8/82	235680	8585477	290461	36429	55 21	194 502,911	1,255,875,229
9/82	236138	8213860	349407	34784	59 67	194,739,049	1,264,089 089
10/82	262730	8740207	329889	33267	55 67	195,001,779	1 272,829 296
11/82	273355	9187783	306973	33611	52 90	195,275,134	1,282,017,079
12/82	255522	9031322	255548	35345	50 00	195,530,656	1,291,048,401
TOT/82	3032624	107643123	3409124	35495		195,530,656	1,291,048,401
1/83	242540	7984015	292423	32918	54 66	195,773,196	1,299,032,416
2/83	218565	7847993	284407	35907	56 55	195,991,761	1,306,880,409
3/83	255156	9144826	326525	35840	56 13	196,246 917	1,316,025,235
4/83	237658	8832593	358615	37165	60 14	196,484,575	1,324,857 828
5/83	287377	8871557	324067	30871	53 00	196,771,952	1,333,729 385
6/83	270438	8346984	288900	30865	51 65	197 042,390	1,342,076,369
7/83	255987	8177188	289735	31944	53 09	197,298,377	1,350,253,557
8/83	259288	8558344	287852	33007	52 61	197,557,665	1,358,811,901
9/83	255654	7886274	280676	30847	52 33	197,813,319	1,366,698,175
10/83	247398	7732032	303432	31253	55 09	198,060,717	1,374,430,207
11/83	251560	6536314	334438	25983	57 07	198 312 277	1,380,966,521
12/83	235288	7781613	274049	33073	53 81	198,547,565	1,388,748,134
TOT/83	3016909	97699733	3645119	32384		198 547,565	1,388,748,134
TOTAL	198547565	1388748134	58750678	6995		198,547,565	1,388,748,134

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P R O D U C T I O N   L E D G E R

DATE	OIL BBL	GAS, MCF	WATER BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	198547565	1388748134	58750678	6995	22 83	198,547,565	1 386 748,134
1/84	217494	6536856	228903	30055	51 28	198 765 059	1 395,284 990
2/84	211644	7144248	244707	33756	53 62	198,976,703	- 402 429 238
3/84	230310	8268838	193042	35903	45 60	199 207 013	1 410,698 076
4/84	224648	8169289	195329	36365	46 51	199 431 661	- 418,867 365
5/84	218378	8859560	244848	40570	52 86	199 650 039	- 427 726 925
6/84	207141	8616722	186415	41598	47 37	199 857 180	- 436 343 647
7/84	200343	8626081	233690	43057	53 84	200,057 523	1 444,969 728
8/84	182928	7664620	206222	41900	52 99	200,240,451	1,452 634 348
9/84	194483	8766165	257255	45074	56 95	200 434,934	1 461 400 513
10/84	217742	8116801	241636	37277	52 60	200 652 676	1 469,517,314
11/84	206193	8018964	210437	38891	50 51	200,858 869	1 477 536,278
12/84	206095	7921832	187520	38438	47 64	201,064,964	1 485 458,110
TOT/84	2517399	96709976	2630004	38417		201,064,964	1 485,458,110
1/85	196428	7974284	178152	40596	47 56	201,261,392	1 493,432 394
2/85	178241	7684763	151657	43114	45 97	201,439,633	1 501 117,157
3/85	196628	7930774	198892	40334	50 29	201,636,261	1,509,047,931
4/85	179630	6906310	205113	38447	53 31	201,815,891	1 515,954,241
5/85	178565	7203471	215313	40341	54 66	201 994,456	1,523 157,712
6/85	172861	7536277	203379	43597	54 06	202,167,317	1,530,693,989
7/85	176751	7530942	188348	42608	51 59	202 344,068	1,538,224 931
8/85	171880	7770042	194212	45206	53 05	202,515,948	1 545,994 973
9/85	175871	7686564	198863	43706	53 07	202,691,819	1,553 681 537
10/85	190494	8125472	202621	42655	51 54	202,882 313	1 561,807 009
11/85	167804	7879225	159954	46955	48 80	203,050,117	1 569,686,234
12/85	180655	7888619	207980	43667	53 52	203 230,772	1,577 574 853
TOT/85	2165808	92116743	2304484	42532		203,230,772	1 577,574,853
1/86	171251	7451281	171184	43511	49 99	203,402,023	1,585,026,134
2/86	147635	7289153	101099	49373	40 65	203 549,658	1,592 315,287
3/86	172849	8383670	158008	48503	47 76	203 722,507	1,600,698,957
4/86	174801	8008472	216945	45815	55 38	203,897,308	1 608,707 429
5/86	190387	8634649	204580	45353	51 80	204,087,695	1 617,342 078
6/86	178258	8428937	130848	47285	42 33	204,265,953	1,625 771,015
7/86	212946	8652824	165457	40634	43 73	204,478,899	1,634 423,839
8/86	171648	8938957	155981	52077	47 61	204,650 547	1,643,362,796
9/86	159664	8558719	152609	53605	48 87	204,810,211	1 651,921,515
10/86	172941	7462448	153599	43150	47 04	204,983 152	1,659,383 963
11/86	163664	7196055	117877	43968	41 87	205,146,816	1 666,580,018
12/86	139405	6077869	132461	43599	48 72	205,286 221	1,672,657,887
TOT/86	2055449	95083034	1860648	46259		205,286,221	1,672,657,887
1/87	181798	7414874	147545	40786	44 80	205,468,019	1,680,072,761
2/87	144425	5693219	128651	39420	47 11	205,612,444	1,685,765,980
3/87	147638	7164265	125486	48526	45 94	205,760,082	1,692,930,245
4/87	133501	6236927	116566	46718	46 61	205,893,583	1,699,167,172
5/87	148592	7673972	131175	51645	46 89	206 042,175	1,706,841,144
6/87	201998	7578836	148466	37519	42 36	206 244,173	1,714,419,980
7/87	201373	6952488	171000	34525	45 92	206,445 546	1,721,372,468
8/87	184192	6350020	185633	34475	50 19	206,629,738	1,727,722,488
9/87	176428	6464251	165132	36640	48 35	206,806,166	1,734,186,739
10/87	172316	6804679	148972	39490	46 37	206,978,482	1,740,991,418
11/87	177559	7188923	175965	40488	49 77	207 156,041	1,748,180,341
12/87	189332	7985792	249185	42179	56 82	207,345,373	1,756,166,133
TOT/87	2059152	83508246	1893776	40555		207,345,373	1,756,166,133
TOTAL	207345373	1756166133	67439590	8470		207,345,373	1,756,166,133

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PRODUCTION LEDGER

DATE	OIL BBL	GAS, MCF	WATER, BBL	GOR CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	207345373	1756166133	67439590	8470	24 54	207 345 373	_ 756 166 133
1/88	178011	8351642	201380	46916	53 08	207 523 384	1,764 517 775
2/88	176625	8531521	184890	48303	51 14	207,700 009	_ 773 049 29_
3/88	189216	8864359	195604	46848	50 83	207 889 225	1 781 913 655
4/88	170428	7400745	173465	43424	50 44	208 059 653	1 789 314 400
5/88	175722	7321190	195051	41663	52 61	208,235,375	_ 796 635 590
6/88	169520	7511240	197287	44309	53 78	208 404 895	1 804 146 830
7/88	179117	8833728	209320	49318	53 89	208 584,012	1 812 980 558
8/88	178577	8905573	190040	49870	51 55	208,762 589	1,821,886 131
9/88	178545	8844508	207397	49537	53 74	208 941,134	1 830,730 639
10/88	181458	9323945	195866	51383	51 91	209 122 592	1,840 054 584
11/88	170932	8752805	205955	51206	54 65	209 293,524	1 848 807 389
12/88	178500	9044230	209065	50668	53 94	209,472,024	1 857 851,619
TOT/88	2126651	101685486	2365320	47815		209 472,024	1 857,851 619
1/89	171854	9309172	198147	54169	53 55	209 643 878	1,867 160 791
2/89	144544	8372338	163894	57922	53 14	209 788 422	1 875 533 129
3/89	162355	8175789	200272	50357	55 23	209,950 777	1 883,708 918
4/89	150529	8106900	184609	53856	55 08	210,101,306	1,891 815 818
5/89	151305	8729055	186949	57692	55 27	210,252,611	1 900,544,873
6/89	146186	8318820	153239	56906	51 18	210,398,797	1,908,863,693
7/89	164544	8004712	147066	48648	47 20	210,563,341	1,916 868 405
8/89	161097	8650823	131137	53699	44 87	210 724,438	1,925,519,228
9/89	154256	8634561	160335	55976	50 97	210 878,694	1 934,153 789
10/89	156226	9008447	160885	57663	50 73	211,034,920	1 943,162 236
11/89	150700	8709859	167800	57796	52 68	211,185,620	1 951 872,095
12/89	161606	8901726	184051	55083	53 25	211,347,226	1,960,773 821
TOT/89	1875202	102922202	2038384	54886		211,347,226	1,960,773 821
1/90	153160	8233046	194478	53755	55 94	211,500,386	1,969,006,867
2/90	135516	7705129	153620	56858	53 13	211,635,902	1,976,711,996
3/90	156183	8813966	178907	56434	53 39	211,792,085	1 985,525,962
4/90	164331	8501239	187400	51732	53 28	211,956,416	1,994,027,201
5/90	172284	8908903	164967	51711	48 92	212,128 700	2,002 936,104
6/90	173902	8483319	152304	48782	46 69	212,302,602	2,011,419 423
7/90	163817	8763353	156747	53495	48 90	212,466,419	2 020,182,776
8/90	152873	8311474	150359	54368	49 59	212,619,292	2,028 494,250
9/90	177861	8607752	114557	48396	39 18	212,797,153	2 037,102,002
10/90	205334	9191959	179662	44766	46 67	213,002,487	2,046,293,961
11/90	201100	8877767	198921	44146	49 73	213,203 587	2,055,171,728
12/90	195208	9833404	166043	50374	45 96	213,398,795	2,065,005,132
TOT/90	2051569	104231311	1997965	50806		213,398,795	2,065,005 132
1/91	162231	8251635	189411	50863	53 86	213,561,026	2,073,256,767
2/91	137845	7959662	155955	57744	53 08	213,698,871	2,081,216,429
3/91	177364	9130923	192105	51481	51 99	213,876,235	2 090,347,352
4/91	174158	9317911	193678	53503	52 65	214 050,393	2,099 665,263
5/91	221639	9497547	243906	42851	52 39	214,272 032	2,109,162 810
6/91	194258	8360739	210792	43039	52 04	214,466,290	2,117,523,549
7/91	200651	9402639	220100	46861	52 31	214,666 941	2 126,926,188
8/91	192232	9454786	221906	49184	53 58	214 859,173	2,136,380,974
9/91	193029	9034904	232247	46806	54 61	215,052 202	2 145,415 878
10/91	177091	9177844	218420	51826	55 22	215,229 293	2 154,593,722
11/91	161120	8834587	199077	54832	55 27	215,390,413	2,163,428,309
12/91	172997	9710139	195112	56129	53 00	215,563,410	2,173 138,448
TOT/91	2164615	108133316	2472709	49955		215,563,410	2,173,138,448
TOTAL	215563410	2173138448	76313968	10081		215,563,410	2 173,138 448

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FIELD RESERVOIR SWANSON RIVER HEMLOCK
COUNTY KENAI , STATE AK

P R O D U C T I O N L E D G E R

DATE	OIL, BBL	GAS MCF	WATER, BBL	GOR, CF/BBL	WATER CUT, %	CUM OIL BBL	CUM GAS MCF
PRIOR	215563410	2173138448	76313968	10081	26 15	215 563 410	2 173 138 448
1/92	177538	9419441	246573	53056	58 14	215 740 948	2 182 557 889
2/92	149060	8332413	208996	55900	58 37	215 890 008	2 190 890 302
3/92	159258	8651735	198208	54325	55 45	216,049 266	2 199 542 037
4/92	145942	8399506	156321	57554	51 72	216 195 208	2 207,94[illegible] 543
5/92	152792	8565396	174034	56059	53 25	216 348 000	2 216 506 939
6/92	141226	7836745	193917	55491	57 86	216,489,226	2 224 343,684
7/92	147360	8208579	218340	55704	59 70	216,636,586	2,232,552 263
8/92	149470	8858441	224917	59266	60 08	216,786 056	2 241 410 704
9/92	129500	7529688	186507	58144	59 02	216,915 556	2 248 940,392
10/92	145515	8759603	207872	60197	58 82	217,061 071	2 257,699 995
11/92	142813	8665209	218689	60675	60 49	217,203 884	2 266 365,204
12/92	145932	8467687	177821	58025	54 92	217,349,816	2,274 832,891
TOT/92	1786406	101694443	2412195	56927		217,349 816	2 274 832 891
1/93	143745	8639686	271854	60104	65 41	217,493,561	2 283,472 577
2/93	126752	7260735	226625	57283	64 13	217,620,313	2 290,733,312
3/93	135436	7465890	229950	55125	62 93	217,755,749	2,298 199 202
4/93	136170	7972036	249400	58545	64 68	217,891,919	2 306,171,238
5/93	128687	7957248	238207	61834	64 93	218,020,606	2 314,128 486
6/93	129992	7931648	238457	61016	64 72	218,150 598	2 322,060 134
7/93	130340	8123185	204442	62323	61 07	218,280 938	2 330,183 319
8/93	135640	8819638	218380	65022	61 69	218,416 578	2 339 002,957
9/93	124967	7434802	236971	59494	65 47	218,541,545	2,346,437 759
10/93	128225	7716667	268877	60181	67 71	218,669,770	2,354,154,426
11/93	126807	7584949	239367	59815	65 37	218,796 577	2,361,739 375
12/93	128888	8588802	245006	66638	65 53	218,925,465	2 370,328 177
TOT/93	1575649	95495286	2867536	60607		218,925,465	2,370,328,177
1/94	154771	9639913	260296	62285	62 71	219,080,236	2,379 968 090
2/94	120230	8256366	219198	68671	64 58	219,200,466	2 388,224,456
3/94	142021	10124475	300268	71289	67 89	219,342 487	2,398 348,931
4/94	146899	10717186	285381	72956	66 02	219,489,386	2,409,066,117
5/94	149296	10867543	269946	72792	64 39	219,638,682	2,419,933,660
6/94	143485	10283721	269082	71671	65 22	219,782,167	2 430,217 381
7/94	137239	10221705	269061	74481	66 22	219,919,406	2,440,439,086
8/94	140810	10717724	265271	76115	65 32	220 060,216	2,451 156,810
9/94	138560	10373290	263598	74865	65 55	220,198,776	2 461,530,100
10/94	143030	10334503	268144	72254	65 21	220,341,806	2 471,864 603
11/94	136395	10473715	258198	76790	65 43	220,478,201	2,482 338,318
12/94	138216	10847883	288436	78485	67 60	220 616,417	2,493,186,201
TOT/94	1690952	122858024	3216879	72656		220,616,417	2 493,186,201
1/95	140293	10424284	291155	74304	67 48	220,756,710	2,503,610,485
2/95	126273	9397313	239213	74421	65 45	220,882,983	2 513,007 798
3/95	134038	9288180	278598	69295	67 52	221,017,021	2,522,295,978
4/95	140468	8866019	288432	63118	67 25	221,157,489	2,531,161,997
5/95	150315	9580630	333301	63737	68 92	221,307,804	2,540,742,627
6/95	143652	8414298	331305	58574	69 75	221,451,456	2,549,156,925
7/95	157938	8553815	337088	54159	68 10	221,609,394	2,557,710,740
8/95	153720	7624596	333061	49601	68 42	221,763,114	2,565 335,336
9/95	141951	7164709	330390	50473	69 95	221,905,065	2,572,500,045
10/95							
11/95							
12/95							
TOT/95	1288648	79313844	2762543	61548		221,905,065	2 572,500 045
TOTAL	221905065	2572500045	87573121	11593		221,905,065	2,572,500 045

SUNFISH FIELD

Sunfish Field

Proved Undeveloped

The Sunfish Field is an oil reservoir delineated by three wells that have been drilled and tested successfully in the Sunfish sand The Sunfish #1 was drilled in 1991 and is located approximately 32 miles west of Anchorage The Sunfish sand was perforated, tested, and flowed 1,100 BOPD and 1 MMcfpd on a 24/64" choke Two additional wells were drilled, the Sunfish #3 and North Forelands #1, which further delineated the limits of the Sunfish sand Both of these wells tested commercial volumes of oil and gas from the sand

Log analysis indicates 103 0 million barrels OOIP which is summarized in the reserve worksheet Gas reserves were assigned on the basis of a producing gas-oil ratio of 900 scf/STB and oil recovery representing 35% of OOIP The reservoir limits were determined by a total of six wells drilled and tested, of which three were dry holes The sand correlates across an area of approximately 4 sections

Proved undeveloped gas reserves of 32 4 Bcf were assigned on the basis of volumetric parameters and well tests

RESERVE EVALUATION WORKSHEET
Effective Date: January 1, 1996

Field	Sunfish Prospect
Location	Cook Inlet
Operator	Phillips
Reserve Basis:	Volumetrics
Reserve Classification:	Proved Undeveloped

Material Balance
Source

Pressures (psi) Initial ____________, Current ____________, Abandonment ____________

Remarks ____________________

Production Parameters
Source

		Bcf
a	Recorded Prod Through ________	
b	________ Months Est Production	
c	Cumulative Production Through 12/95	
d	Current Rate/Month	
e	Abandonment Rate/Month	
f	Decline Characteristic (di)	
g	Decline Exponent (n)	
h	Remaining Recovery	
i	Ultimate Recovery	

Remarks ____________________

Reservoir Parameters
Source

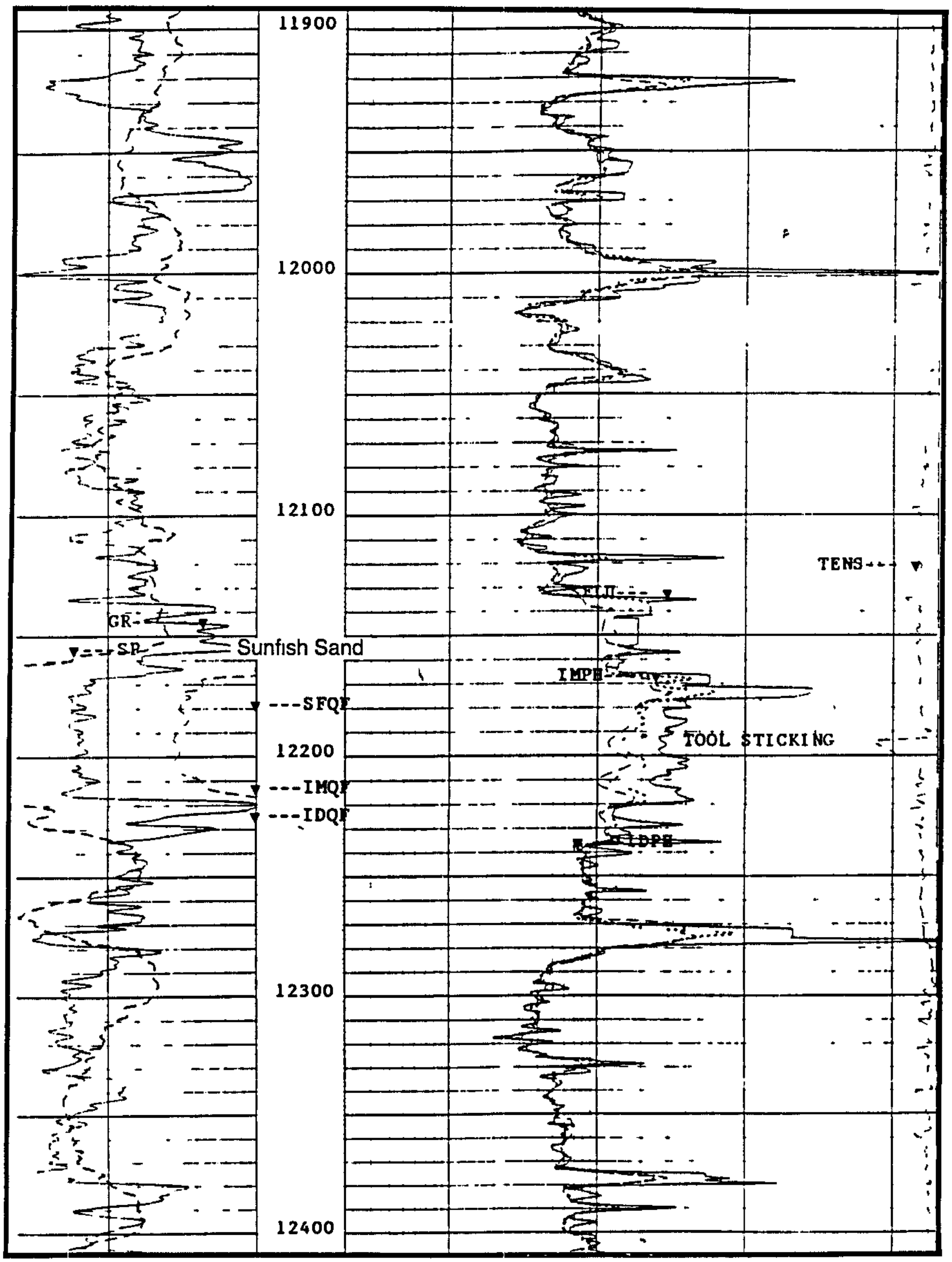
a	Net Thickness	50'
b	Porosity	15%
c	Water Saturation	45%
d	Hydrocarbon Thickness	4.13
e	Volume Factor	1.3
f	Drainage Area	4160
g	Original Volume in Place	103 MMBO
h	Recovery Efficiency	35%
i	Ultimate Recovery	36 MMBO
j	Cumulative Recovery	--
k	Remaining Recovery	36 MMBO/32.4 Bcf*

Remarks: Three wells drilled and tested hydrocarbons in the Sunfish Sand — sand correlates well across 4+ sections. *Gas reserves based upon a producing gas-oil ratio of 900 scf/bbl.

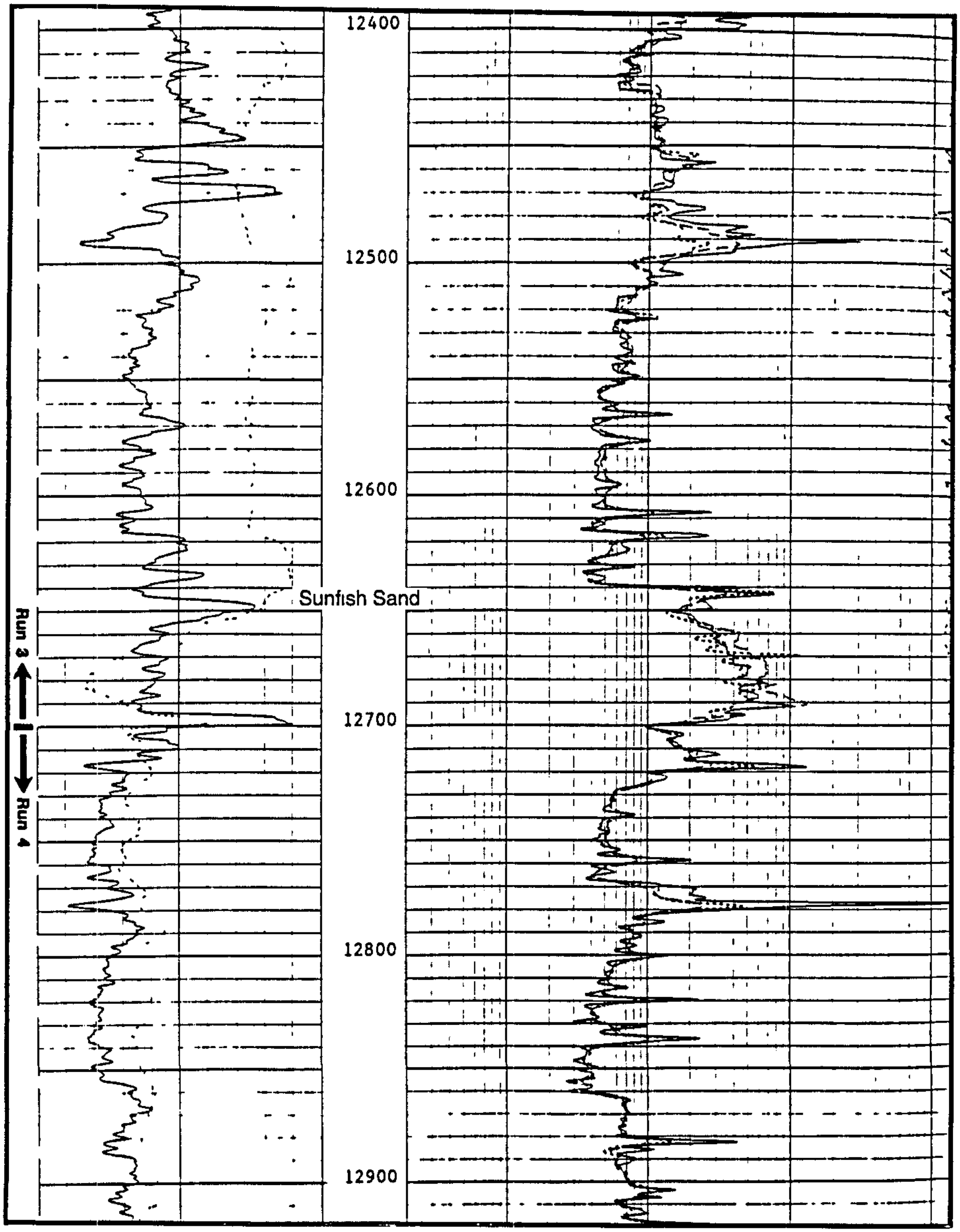
Summary of Sunfish Prospect

Date	Name of Well	Operator	Depth	Results
October 1991	Sunfish #1	Arco	12,160 feet	42 API oil 1,100 BOPD 24/64" choke
January 1993	N Foreland #1	Arco	17,800 feet	3,610 BOPD composite from two tests
October 1993	Sunfish #2	Phillips	17,318 feet	No Hydrocarbons encountered
December 1993	S Cook Inlet #2	Arco	15,189 feet	No commercial quantities of hydrocarbons encountered
December 1993	S Cook Inlet #3	Arco	16,100 feet	No commercial quanitities of hydrocarbons encountered
April 1994	Sunfish #3	Phillips	14,705 feet	412 BOPD, zone capable of producing two to three times the test rate under normal development and producing conditions

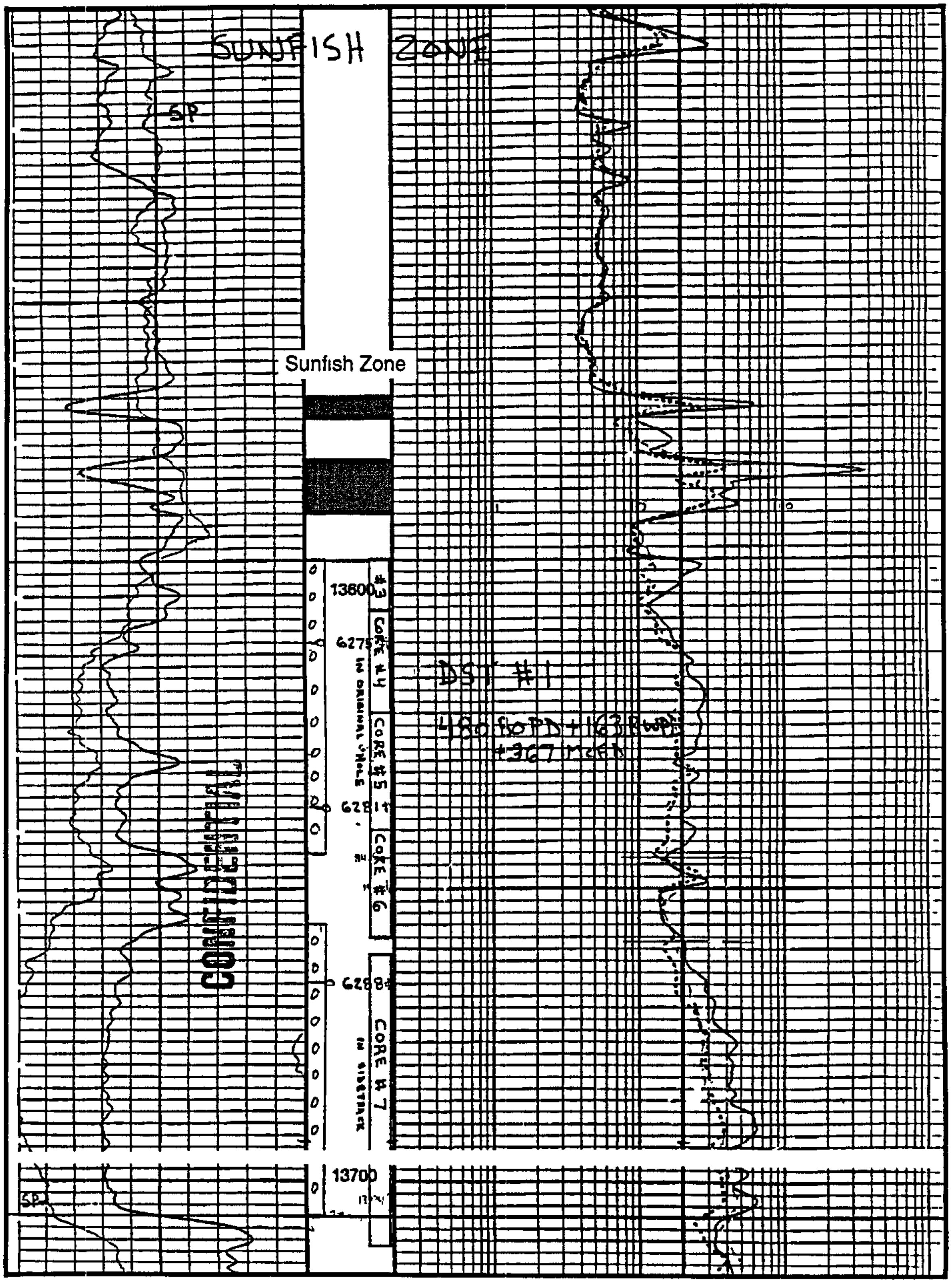
Sunfish #1

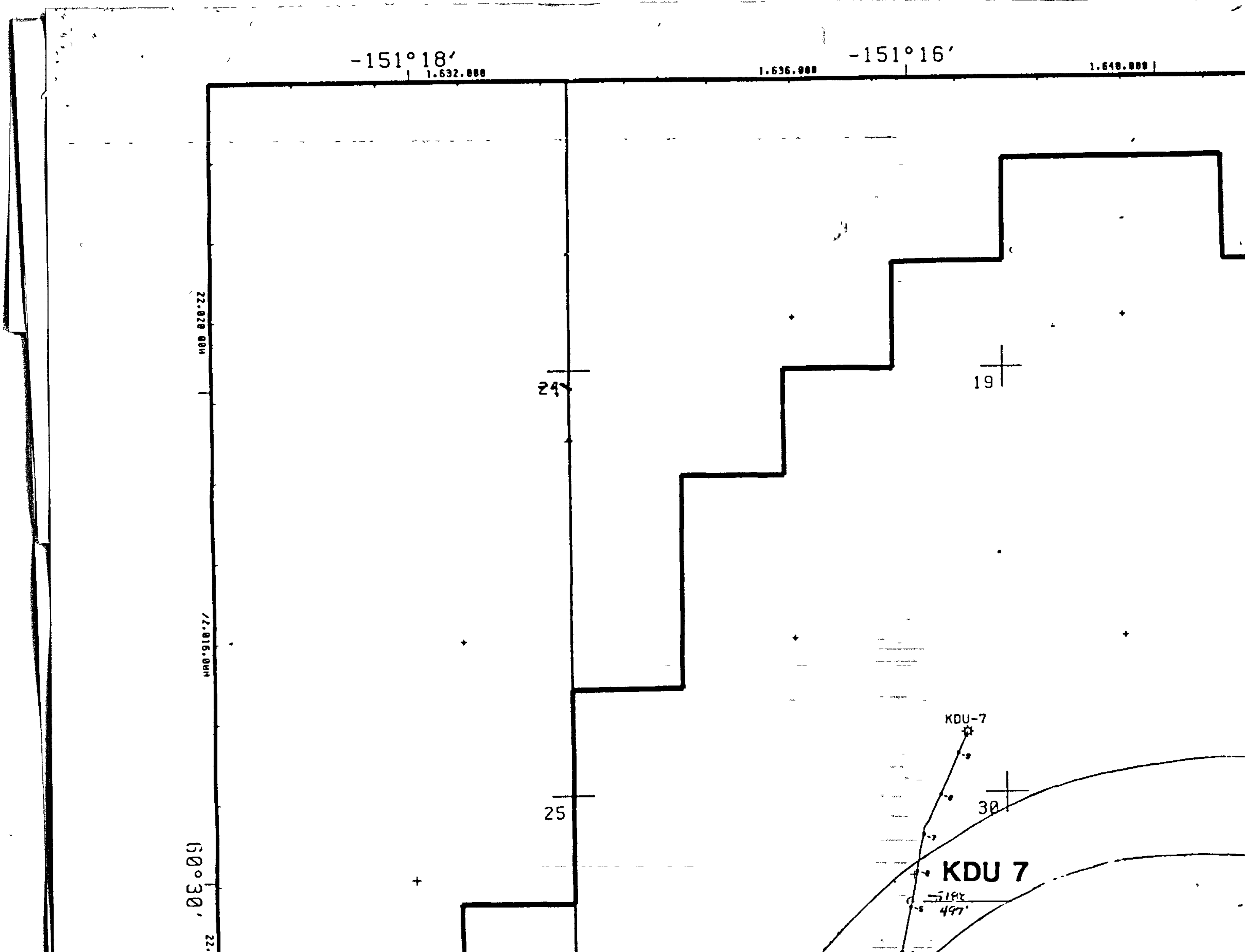

11900
12000
12100
12200
12300
12400
GR
SP
Sunfish Sand
SFQF
IMQF
IDQF
IMPH
IDPH
TENS
TOOL STICKING

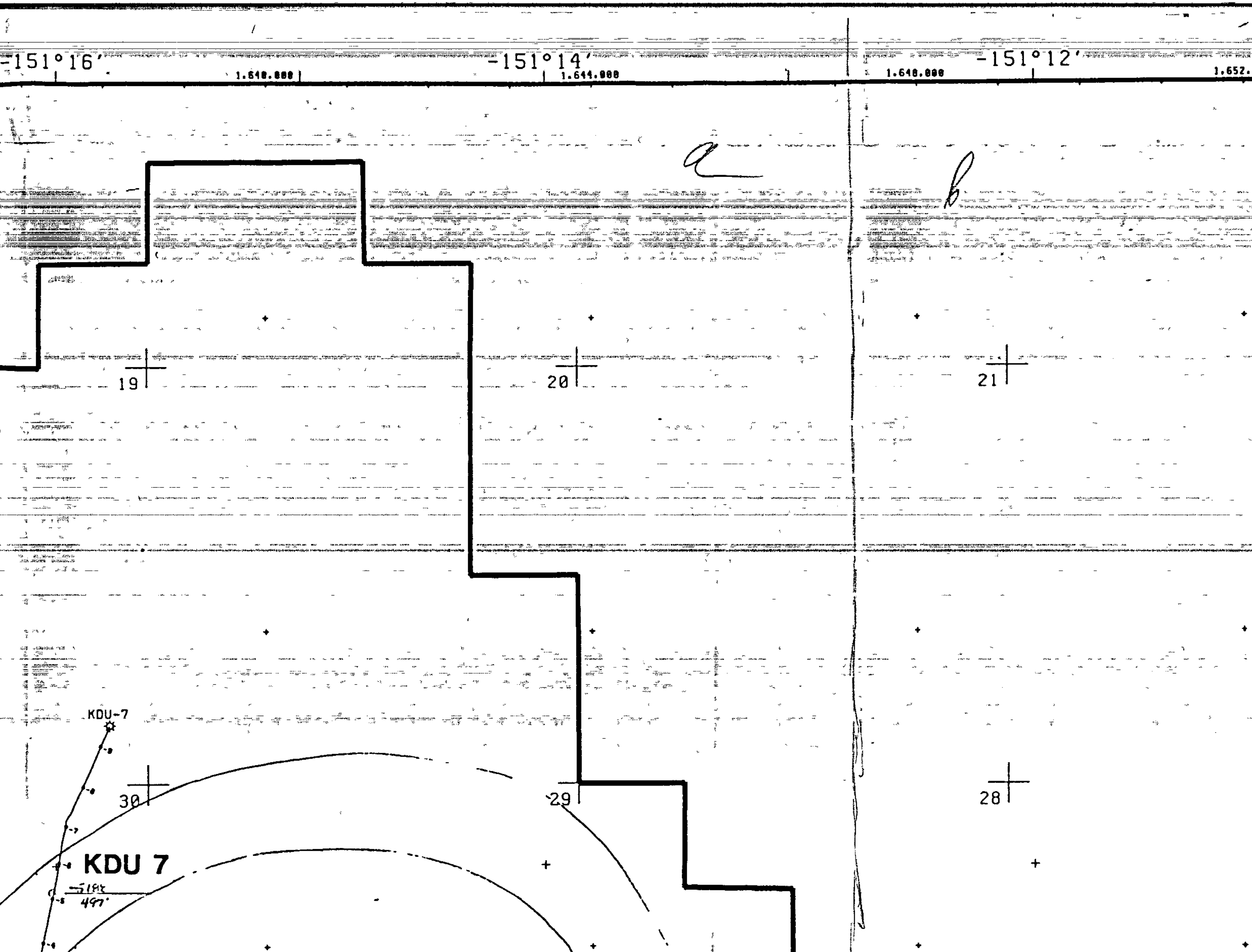
N. Forelands #1

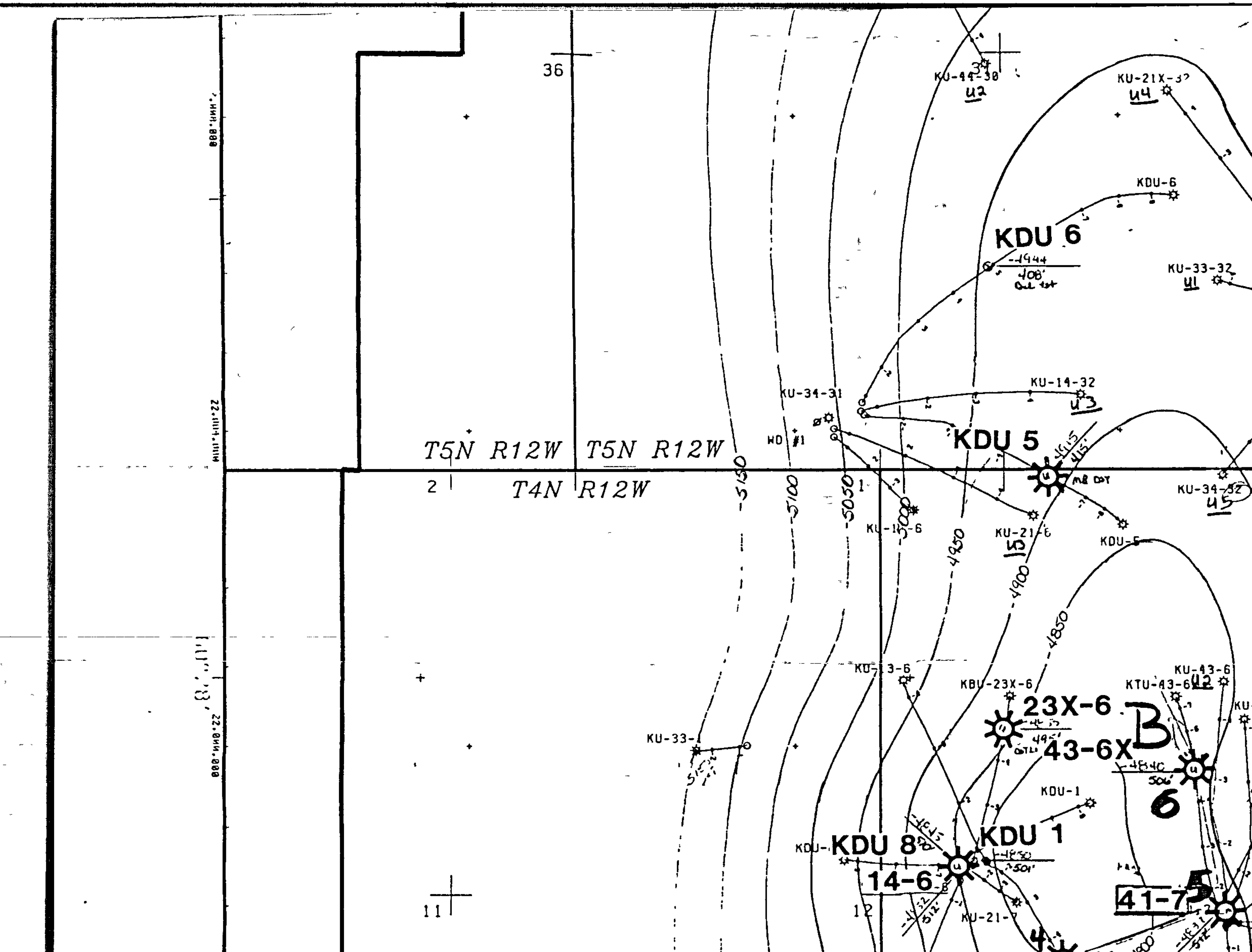


Sunfish #3

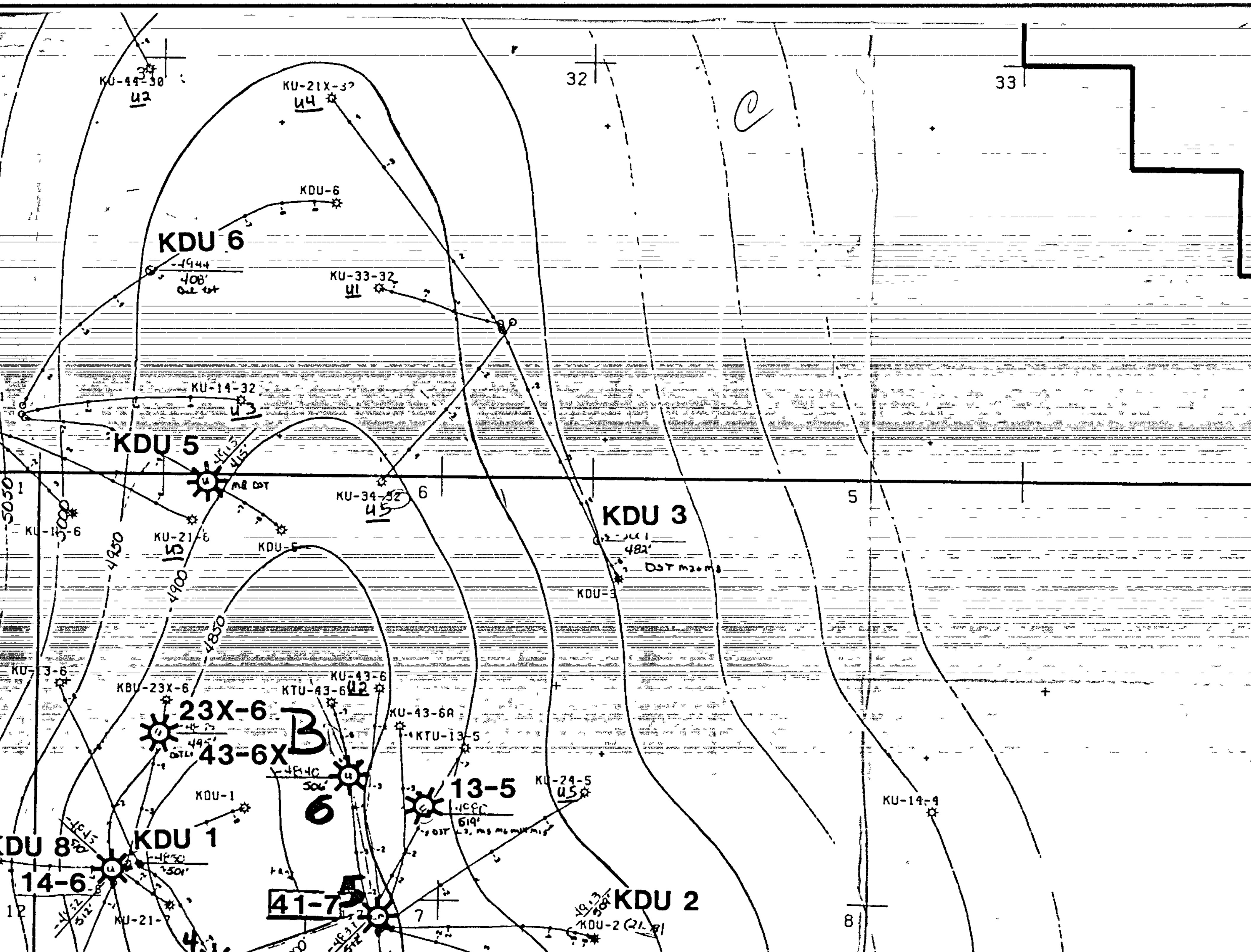

SUNFISH ZONE
SP
Sunfish Zone
13600
6275
CORE #4
IN ORIGINAL HOLE
CORE #5
6281
CORE #6
6288
CORE #7
IN SIDETRACK
13700
CONFIDENTIAL
DST #1
480 BOPD + 163 BWPD
+367 MCFD
SP

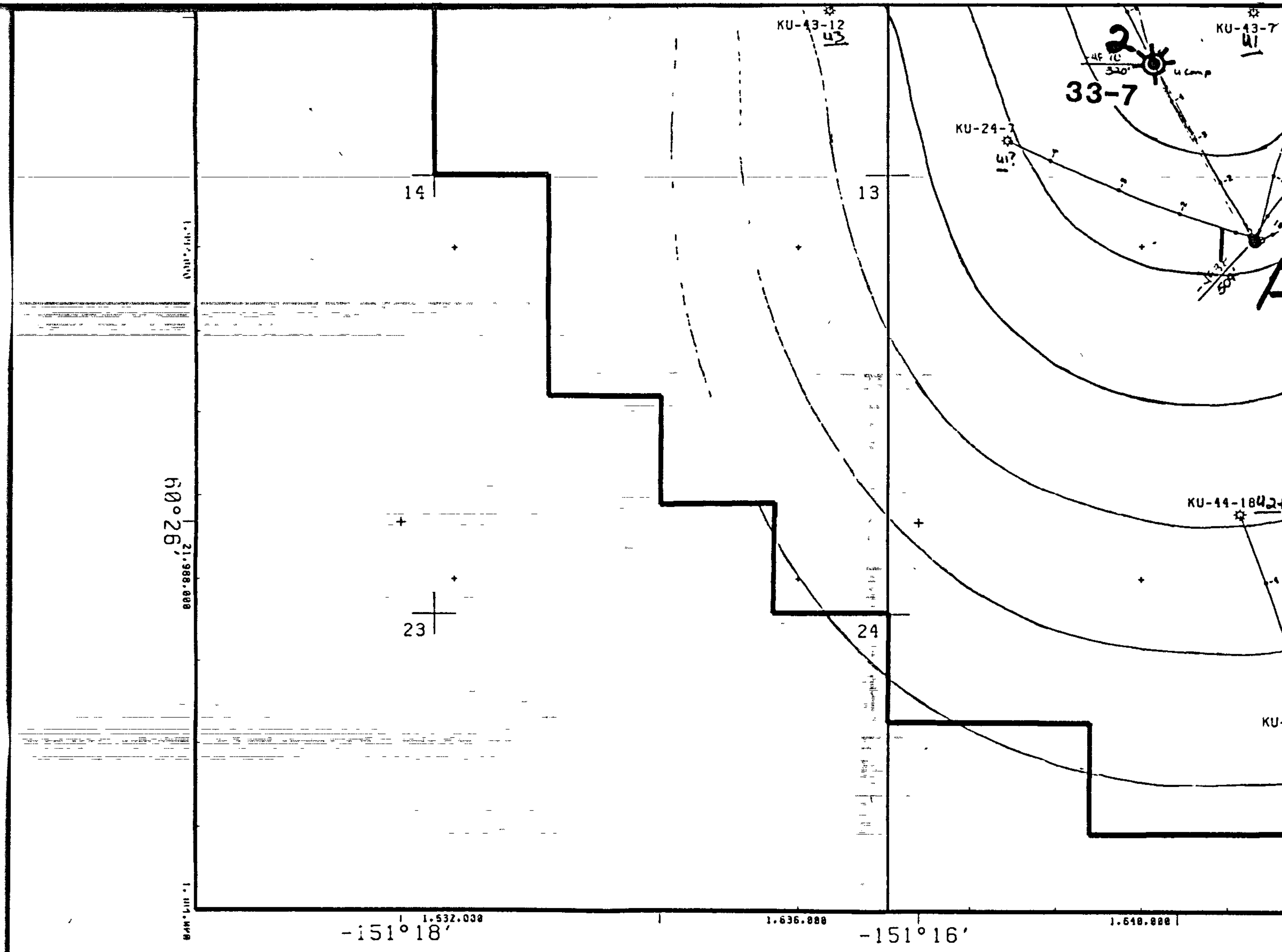

-151°18'
1.632.000
-151°16'
1.636.000
1.640.000
22.020 000N
22.016.000N
60°30'
24
25
19
30
KDU-7
KDU 7
5182
497'


-151°16'
1.640.000
-151°14'
1.644.000
1.648.000
-151°12'
1.652.
a
b
19
20
21
KDU-7
30
29
28
KDU 7

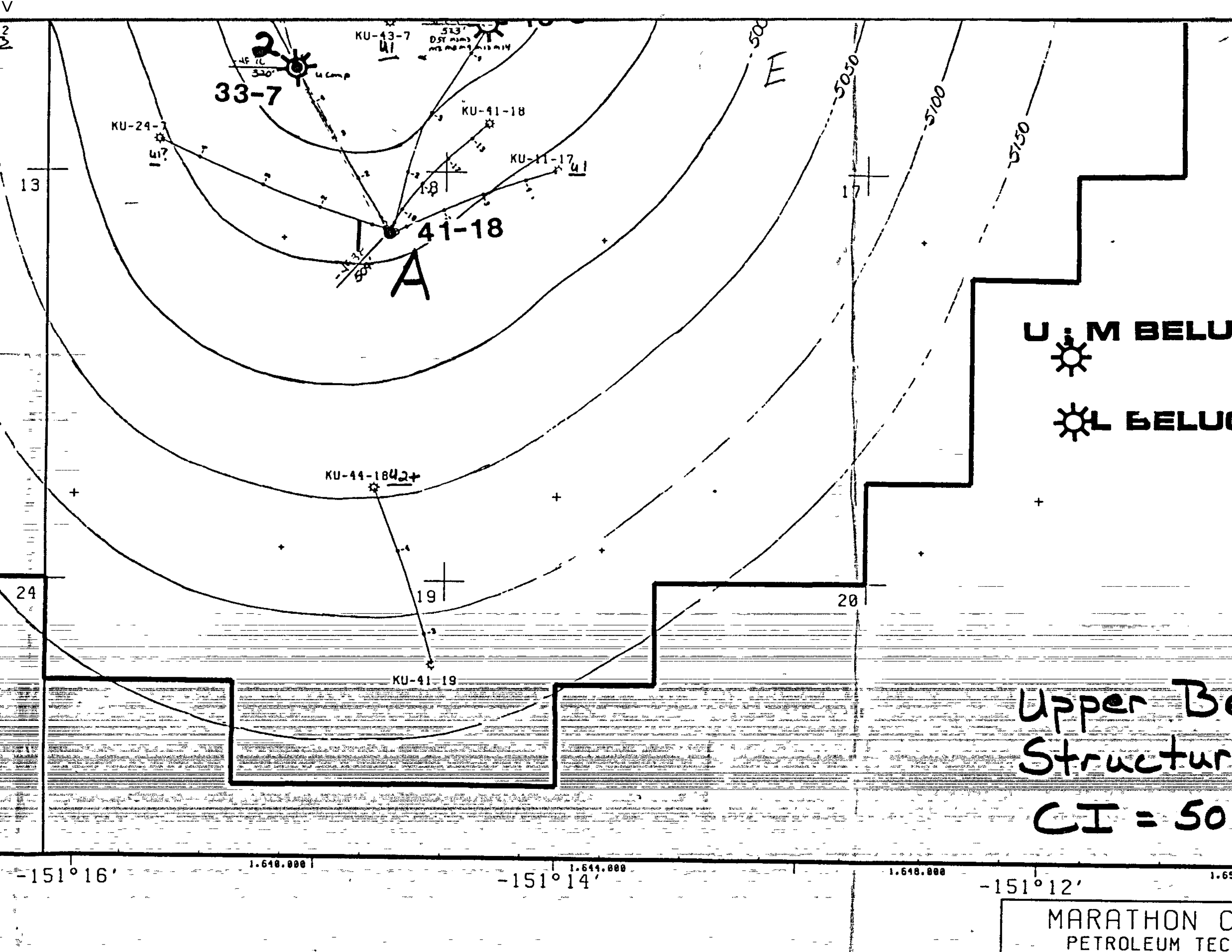


36
KU-44-30
KU-21X-32
KDU-6
KDU 6
-4944
408'
KU-33-32
KU-14-32
KU-34-31
WD #1
KDU 5
T5N R12W
T5N R12W
T4N R12W
2
1
5150
5100
5050
5000
4950
4900
4850
KU-21-6
KDU-5
KU-34-32
KU-33-
KBU-23X-6
23X-6
43-6X
KU-43-6
KTU-43-6
B
6
KDU-1
KDU 8
KDU 1
14-6
KU-21-
41-7
5
11
12
22,000,000


KDU 6
KDU 5
KDU 3
KDU 1
KDU 2
KDU 8
23X-6
43-6X
13-5
41-7
14-6
KU-44-30
KU-21X-32
KDU-6
KU-33-32
KU-14-32
KU-34-32
KU-21-6
KDU-5
KDU-3
KBU-23X-6
KTU-43-6
KU-43-6
KU-43-6A
KTU-13-5
KU-24-5
KU-14-4
KDU-1
KDU-2
KU-21-7
4850
4900
4950
5050
32
33
5
6
7
8
1
12



PROJECTION INFORMATION

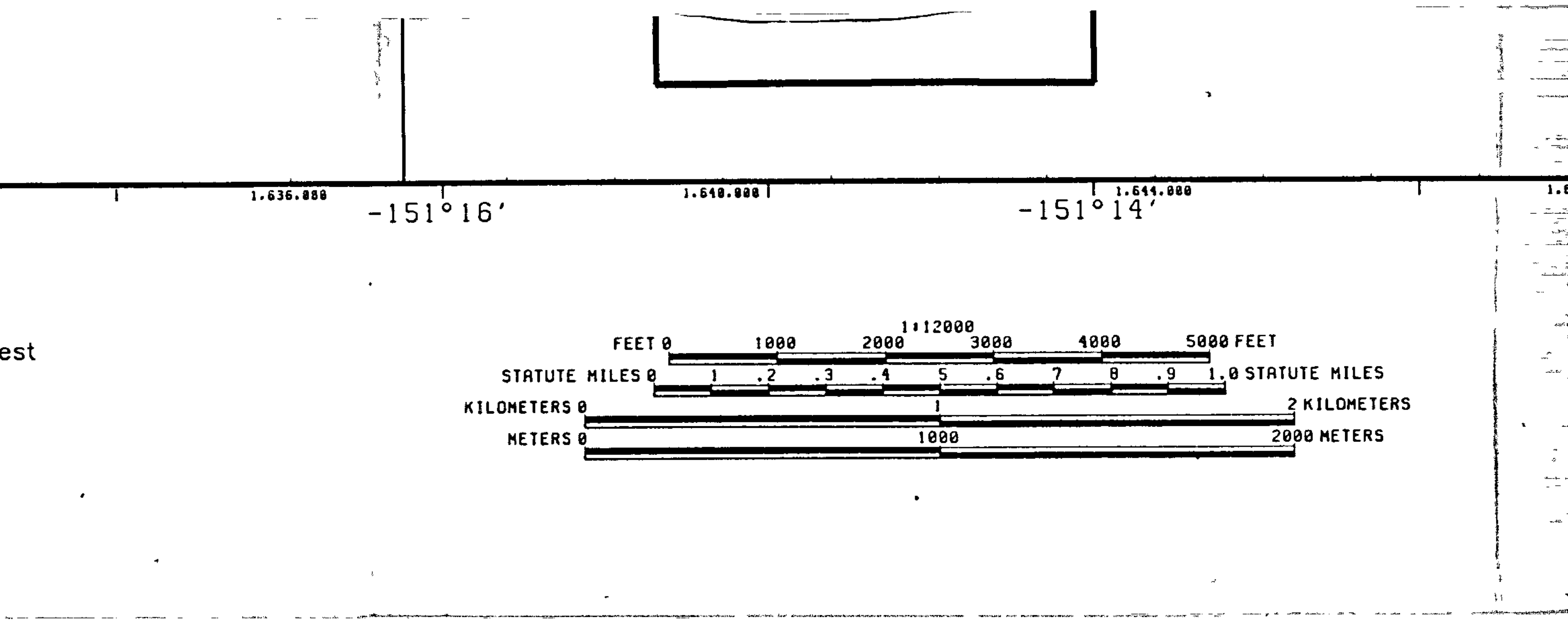


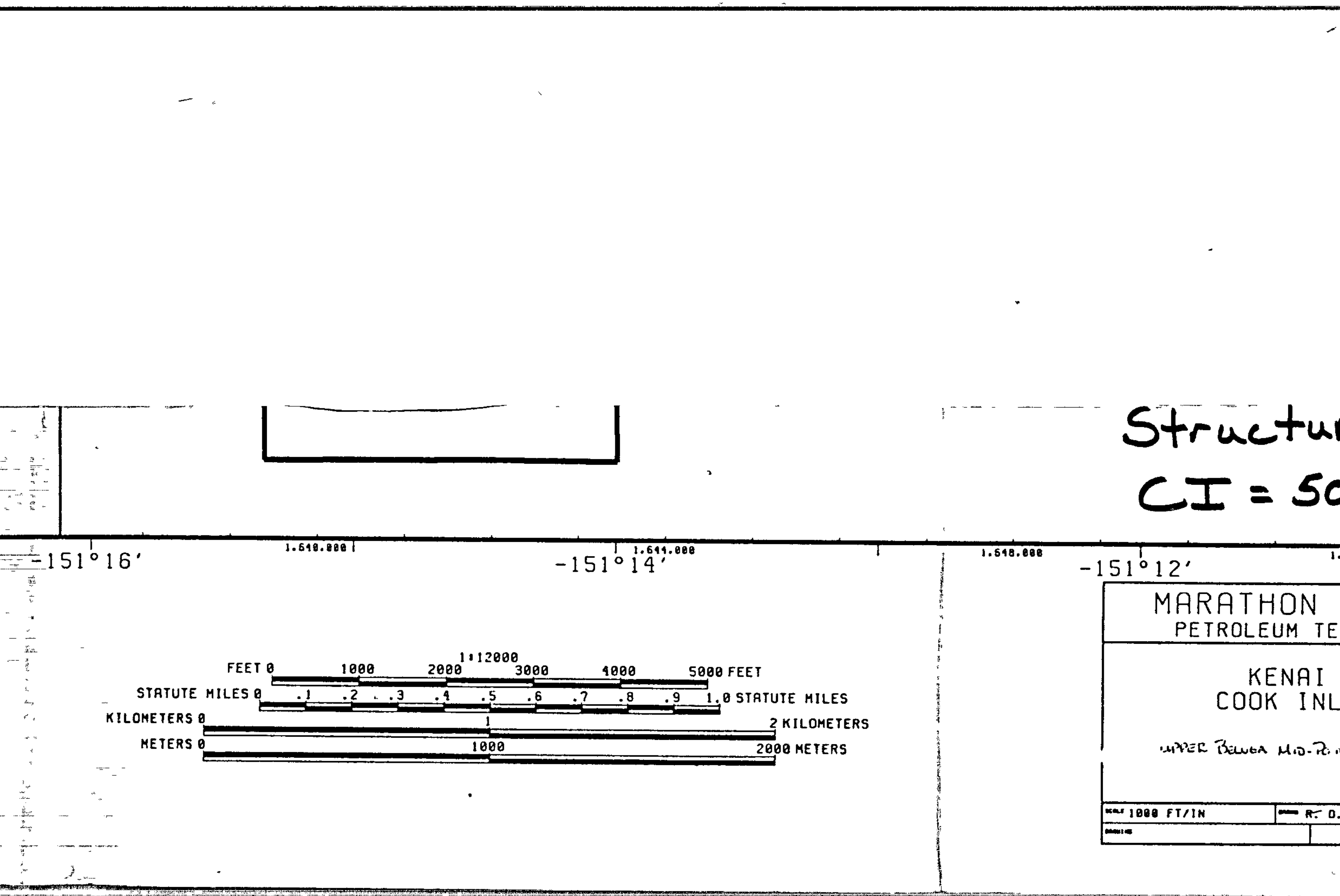
33-7
KU-43-7
KU-24-7
KU-41-18
KU-11-17
41-18
A
E
5050
5100
5150
13
17
18
19
20
24
KU-44-18
KU-41-19
U M BELU
L BELU
Upper Be
Structur
CI = 50
-151°16'
-151°14'
-151°12'
MARATHON O
PETROLEUM TEC

N

00″ West

0 Feet




Structur
CI = 50
-151°16'
1,640,000
-151°14'
1,644,000
1,648,000
-151°12'
1:12000
FEET 0 1000 2000 3000 4000 5000 FEET
STATUTE MILES 0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 STATUTE MILES
KILOMETERS 0 1 2 KILOMETERS
METERS 0 1000 2000 METERS
MARATHON
PETROLEUM TE
KENAI
COOK INL
UPPER BELUGA MID-
1000 FT/IN
R. D.