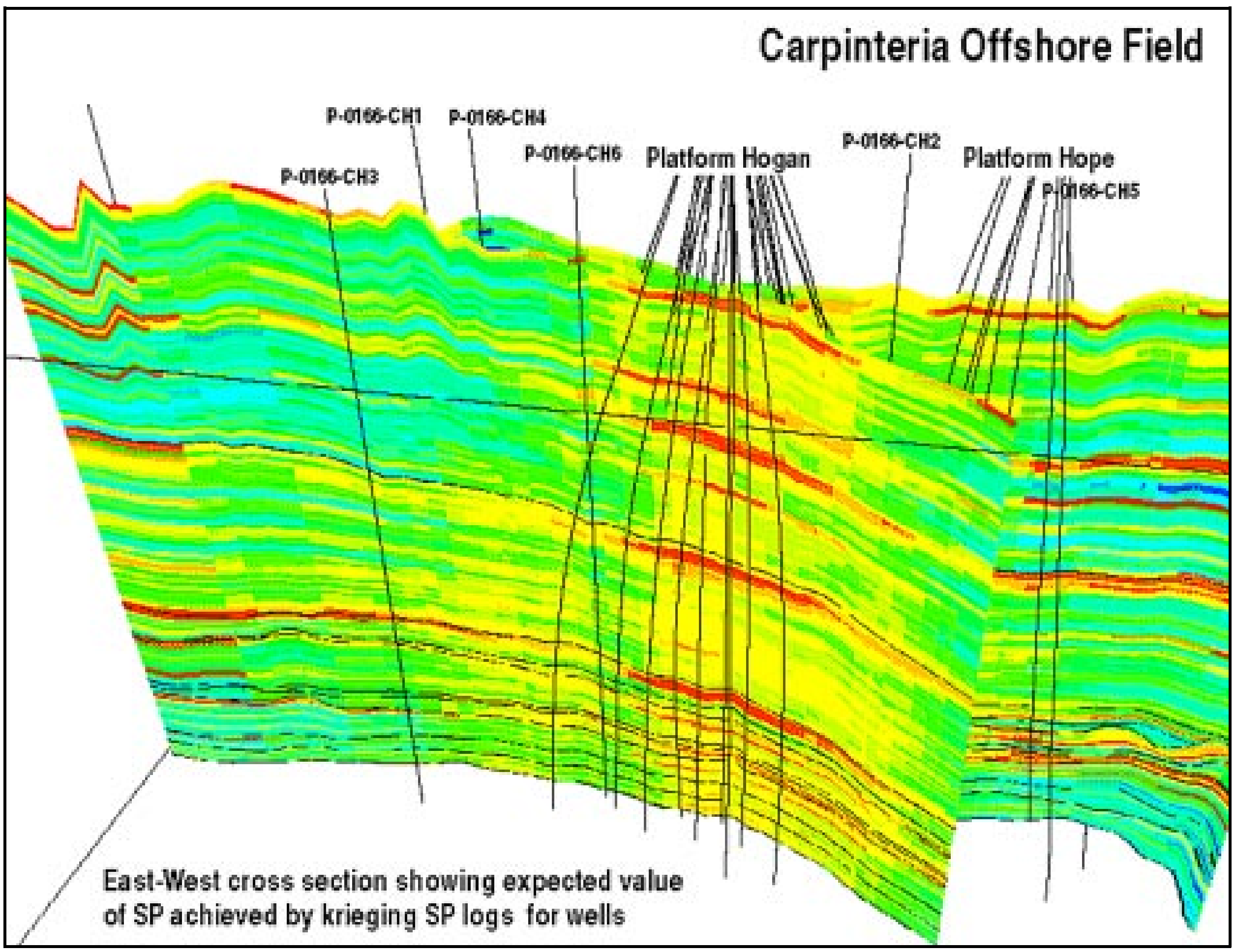
OCS Report
MMS 96-0060

Estimated Oil and Gas Reserves
Pacific Outer Continental Shelf

(as of December 31, 1995)



U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region

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770 Paseo Camarillo
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COVER ILLUSTRATION: An East-West cross section through the Carpinteria Offshore Field showing expected values of Spontaneous Potential (SP) achieved by krieging SP logs for the 200+ wells in the field. This cross section is part of a comprehensive geologic model developed in close collaboration by Pacific Operators Offshore, Inc., Los Alamos National Laboratory, Minerals Management Service, and the California State Lands Commission. The Carpinteria Offshore Field has been producing oil and gas since 1966 and is located in the eastern Santa Barbara Channel, about 4 miles south of Carpinteria, California. The field covers parts of Federal Leases OCS-P 0166 and 0240, and former State Leases PRC 3133, 3150 and 4000.

More information about this project is available on Internet at http://ees-www.lanl.gov/EES5/arm/pooi/description.html

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by

Scott B. Sorensen
James M. Galloway
Harold E. Syms
Armen Voskanian

U.S. Department of the Interior
Minerals Management Service
Pacific OCS Region

Camarillo, CA
November 1996

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Abbreviations

ACT ...... Actively Drilling
APD ...... Application for Permit to Drill
API .... American Petroleum Institute
°API ...... Oil Gravity
bbl .... Barrel of Oil (42 gallons)
Bcf .... Billion Cubic Feet of Gas
BOE ...... Barrels of Oil Equivalent
bpd .... Barrels per Day
cf .... Cubic Feet
CFR ...... Code of Federal Regulations
COM ...... Completion
CRPNTR .. Carpinteria Offshore Field
DPP ...... Development and Production Plan
DSCDRS .. Dos Cuadras Field
DSI .... Drilling Shut-In
°F .... Degrees Fahrenheit
GIW ...... Gas Injection Well
GLO ...... Gas Lift Oil Well
GSI .... Gas Well Shut-in
HUENEM . Hueneme Field
Mbbl ...... Thousand Barrels of Oil
Mcf .... Thousand Cubic Feet of Gas
Mcfpd ..... Thousand Cubic Feet of Gas per Day
MMbbl .... Million Barrels of Oil
MMcf ..... Million Cubic Feet of Gas
MMS ..... Minerals Management Service
OCS ...... Outer Continental Shelf
OFR ...... Open File Report
OSI .... Oil Well Shut-in
PA .... Plugged and Abandoned
PESCDO .. Pescado Field
PGW ...... Producing Gas Well
PITSPT ... Pitas Point Field
POW ...... Producing Oil Well
psia .... Pounds per Square Inch Absolute
PTARGL .. Point Arguello Field
PTPDNS .. Point Pedernales Field
SNTCLR .. Santa Clara Field
SOCKEY .. Sockeye Field
SPE ...... Society of Petroleum Engineers
ST ..... Side Track
TA .... Temporarily Abandoned
USGS ..... U.S. Geological Survey
WDW ..... Water Disposal Well
WIW ...... Water Injection Well
WSW ..... Water Source Well

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Abstract

Proved reserves of oil[1] and gas[2] in the Pacific Outer Continental Shelf, offshore California, are estimated to be 662 million barrels and 1,657 billion cubic feet, respectively, as of December 31, 1995. These reserves are attributed to 12 fields. Original recoverable oil and gas reserves for these fields are estimated to be 1,412 million barrels and 2,360 billion cubic feet, respectively. Unproved reserves are estimated to be 643 million barrels of oil and 776 billion cubic feet of gas, in 26 fields.

Reserve estimates for 31 of the 38 Pacific OCS fields were calculated using individual reservoir volumetric studies. Both decline-curve and volumetric analyses were used for the remaining 7 fields. Approximately two-thirds of the original recoverable oil and gas reserves and three-fourths of the remaining reserves are attributed to reservoirs in the Monterey Formation. Over one-half of the remaining oil reserves are contained within fields that have not yet been developed.

Eleven of the 38 fields were producing at yearend. Oil production during 1995 exceeded 72 million barrels, far exceeding previous records for the Pacific OCS. Net gas production reached 51 billion cubic feet. To date, approximately 750 million barrels of oil and 703 billion cubic feet of gas have been produced from 11 fields.

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[1] *Oil*, as used in this report, includes crude oil and condensate.

[2] *Gas*, as used in this report, includes associated and nonassociated dry gas.

Introduction

This report, which in part supersedes OCS Report MMS 95-0062 (Sorensen and others, 1995), presents estimates of original recoverable oil and gas reserves, cumulative production through 1995, and estimates of remaining reserves as of December 31, 1995, for the Pacific Outer Continental Shelf (OCS), offshore California. These estimates were completed in August 1996. Detailed reserves estimates are included in the annual update of this report as part of a Minerals Management Service (MMS) continuing program to provide a current inventory of oil and gas reserves for the Pacific OCS.

The estimates presented here were prepared by petroleum engineers, geologists, geophysicists, and other personnel from the MMS Pacific OCS Regional Office, Camarillo, California. Previous reports were used as a basis for parts of this update. Contributions by the members of the Production and Development Section were particularly important, and this report would not have been as comprehensive without their assistance.

Definition of Resource and Reserve Terminology

The MMS has standardized its definitions of resources (*Estimates of Undiscovered Conventional Oil and Gas Resources in the United States—A Part of the Nation's Energy Endowment*, U.S. Geological Survey (USGS) and MMS, 1989). The Society of Petroleum Engineers (SPE) has also adopted a standardized set of reserve categories and definitions (SPE 1987, p. 577-578). The definitions used within this report conform with both these sources. Figure 1 shows how resource and reserve definitions are related.

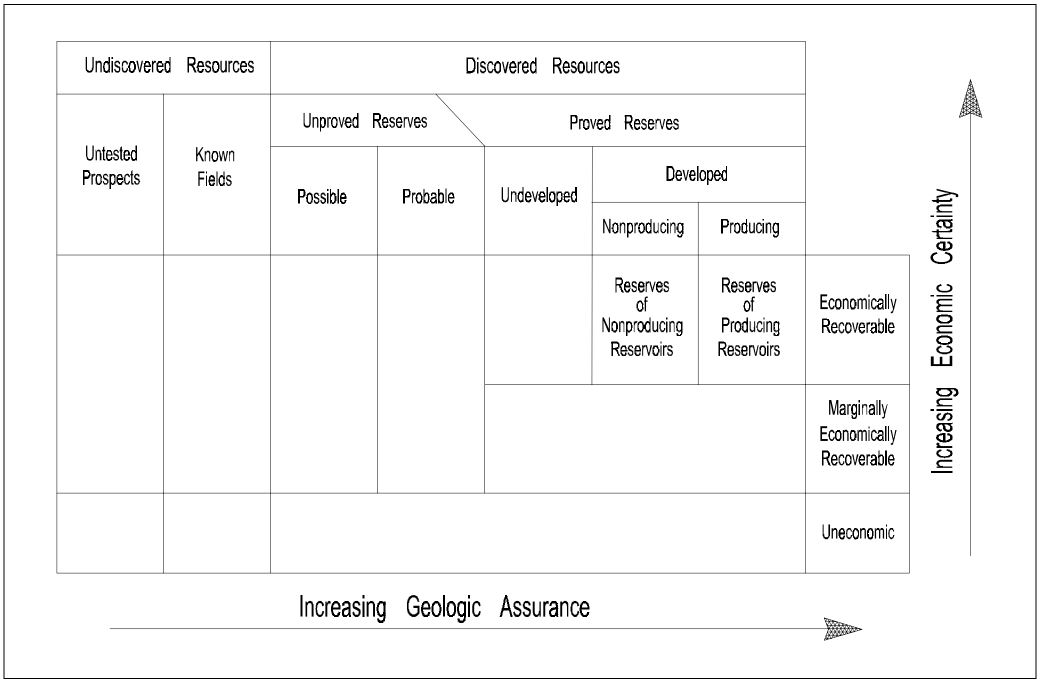
Undiscovered Resources

Resources estimated from broad geologic knowledge or theory and existing outside of known fields or known accumulations are undiscovered resources. Undiscovered resources can exist in untested prospects on unleased acreage, or on undrilled leased acreage, or in known fields. In known fields, undiscovered resources occur in undiscovered pools that are controlled by distinctly separate structural features or stratigraphic conditions (USGS and MMS, 1989).

Discovered Resources

Once leased acreage is drilled and is determined to contain oil or gas under Code of Federal Regulations (CFR) Title 30, Part 250, Subpart A, Section 11, Determination of Well Producibility (hereinafter referred to as 30 CFR 250.11), the lease is considered to have discovered resources. Discovered resources are the equivalent of identified resources as reported by Dolton and others (1981). Identified resources are resources whose location and quantity are known or are estimated from specific geologic or engineering

Figure 1. MMS petroleum reserves classification (modified from USGS and MMS, 1989; and SPE, 1987).



evidence and include economic, marginally economic, and subeconomic components. Discovered resources can be further characterized as unproved or proved reserves, depending upon evidence of economic and geologic viability. Changing economic conditions and new geologic data and interpretations can result in reclassification of resources. Figure 2 shows the number of Pacific OCS wells determined to be producible in accordance with 30 CFR 250.11.

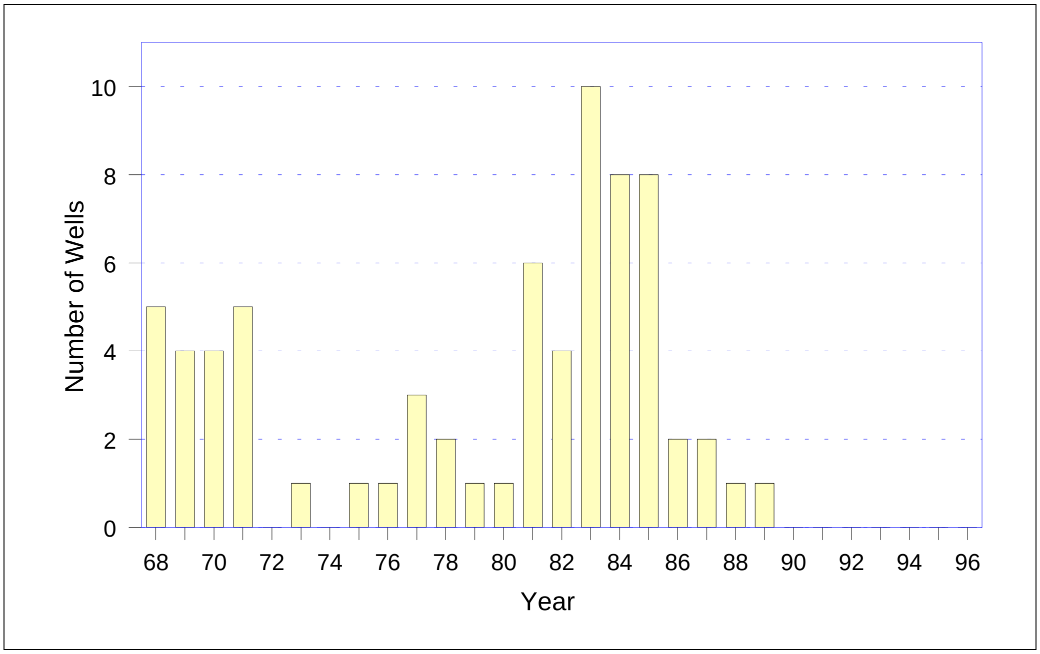
Unproved Reserves

After a lease qualifies under 30 CFR 250.11, the MMS Field Naming Committee reviews the new producible lease to assign it to an existing field or, if the lease is not associated with an established geologic structure, to a new field. Regardless of where the lease is assigned, the reserves associated with the lease are initially considered to be unproved reserves. Unproved reserves are based on geologic or engineering information similar to that used in estimates of proved reserves, but technical, contractual, economic, or regulatory uncertainties preclude such reserves being classified as proved.

Unproved reserves may be subdivided into possible and probable reserves, which are similarly based on the level of uncertainty.

"*Unproved possible reserves* are less certain than unproved probable reserves and can be estimated with a low degree of certainty, which is insufficient to indicate whether they are more likely to be recovered than not. Reservoir characteristics are such that a reasonable doubt exists that

Figure 2.
Wells determined to be producible in accordance with 30 CFR 250.11, Pacific OCS.



the project will be commercial" (SPE, 1987). After a lease qualifies under 30 CFR 250.11, the reserves associated with the lease are initially classified as unproved possible.

"*Unproved probable reserves* are less certain than proved reserves and can be estimated with a degree of certainty sufficient to indicate they are more likely to be recovered than not" (SPE, 1987). Reserves in fields for which a schedule leading to a Development and Production Plan (DPP) has been submitted to the MMS have been classified as unproved probable.

Proved Reserves

"Proved reserves can be estimated with reasonable certainty to be recoverable under current economic conditions, such as prices and costs prevailing at the time of the estimate. Proved reserves must either have facilities that are operational at the time of the estimate to process and transport those reserves to market or a commitment or reasonable expectation to install such facilities in the future" (SPE, 1987). Proved reserves can be subdivided into undeveloped and developed.

Reserves are classified as *proved undeveloped reserves* when a relatively large expenditure is required to install production/transportation facilities, a commitment by the operator is made, and a timeframe to begin production is established. Proved undeveloped reserves are reserves expected to be recovered from (1) yet undrilled wells, (2) deepening existing wells, or (3) existing wells for which relatively large expenditures are required for recompletion.

“Reserves that are expected to be recovered from existing wells (including reserves behind pipe) are classified as *proved developed reserves*. Reserves are considered developed only after necessary production and transportation equipment have been installed or when the installation costs are relatively minor. Proved developed reserves are subcategorized as producing or non-producing” (SPE, 1987). This distinction is made at the reservoir level and not at the field level.

Once the first reservoir in a field begins production, the reservoir is considered to contain *proved developed producing reserves*, and the field is considered on production. If a reservoir had sustained production during the last year, it is considered to contain proved developed producing reserves.

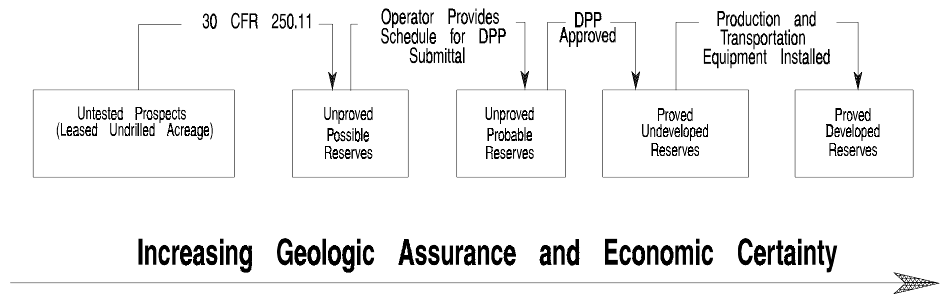
Any developed reservoir in a developed field that has not produced or has not had sustained production during the past year is considered to contain *proved developed nonproducing reserves*. This category includes reserves contained in nonproducing reservoirs, reserves contained behind-pipe, and reservoirs awaiting well workovers or transportation facilities. The reserves classification procedure is shown in figure 3.

Total reserves are the sum of proved and unproved reserves.

The amount of oil and gas expected to be recovered from the original oil in place or the amount equal to the sum of cumulative production and remaining reserves is considered to be the *original recoverable reserves*.

The term *production data* means the measured volumes of gross hydrocarbons reported to the MMS by Federal lessees and operators. Oil and gas volume measurements and reserves are corrected to reference standard conditions of 60 °F and 14.73 psia. Continuously measured volumes from production platforms or leases are allocated to individual wells and reservoirs on the basis of periodic well tests. These procedures introduce approximations in both production and reserves data by reservoirs and by fields.

Figure 3.
MMS Pacific OCS reserves classification procedure.



Methods Used for Estimating Reserves

Volumetric Calculation

For the volumetric calculation of reserves, the amounts of original oil and gas in place are estimated from the bulk volume of the reservoir as mapped using data from boreholes and seismic profiles. Maps of net oil and gas sand thicknesses are generated with the aid of a computer mapping system, and the results are converted to bulk reservoir volume using the appropriate equations. Rock porosities and the amounts of water, oil, and gas in the pore space are derived from well log interpretations and core analyses. The estimated original amounts of oil and gas in place are converted to standard conditions through analyses of pressure, volume, and temperature relationships and by the use of standard correlations. The amounts of the original oil and gas in place that can be recovered are estimated from information about the reservoir drive mechanism, well spacing, analog field recovery factors, and American Petroleum Institute (API) recovery factor equations (Arps and others, 1967, p. 19-20).

Decline Curve Analysis

In the decline-curve analysis method, future production is estimated by extrapolating plots of production rates and fluid percentages versus time. The ultimate production is determined by adding cumulative past production to predicted future production.

Fields Reported

As of December 31, 1995, there are 38 fields in the Pacific OCS that are recognized as containing reserves under the established criteria. Two of these fields are gas fields, 27 are oil fields, and 9 are combination oil and gas fields (fig. 4).

Twelve fields were determined to have proved reserves of oil/gas. These 12 fields are Point Pedernales, Point Arguello, Pescado, Sacate, Hondo, Dos Cuadras, Pitas Point, Carpinteria Offshore, Santa Clara, Sockeye, Hueneme, and Beta (fig. 4, fields 7, 11, 20, 21, 23, 29, 30, 31, 33, 34, 36, and 38). All of these fields, with the exception of Sacate, were producing at yearend. The remaining 26 fields were determined to have unproved reserves of oil/gas.

Reserve estimates for seven of the producing fields were obtained from volumetric calculations and decline-curve analyses: Hondo, Dos Cuadras, Pitas Point, Carpinteria Offshore, Santa Clara, Hueneme, and Beta (fig. 4, fields 23, 29, 30, 31, 33, 36, and 38). Individual reservoirs in each field were grouped for volumetric calculations, while decline-curve analyses were made on lease-by-lease and platform bases. The 31 remaining fields (4 producing and 27 nonproducing) were studied on a reservoir-by-reservoir basis, and the reserve estimates were determined solely by the volumetric calculation method.

Estimated Oil and Gas Reserves

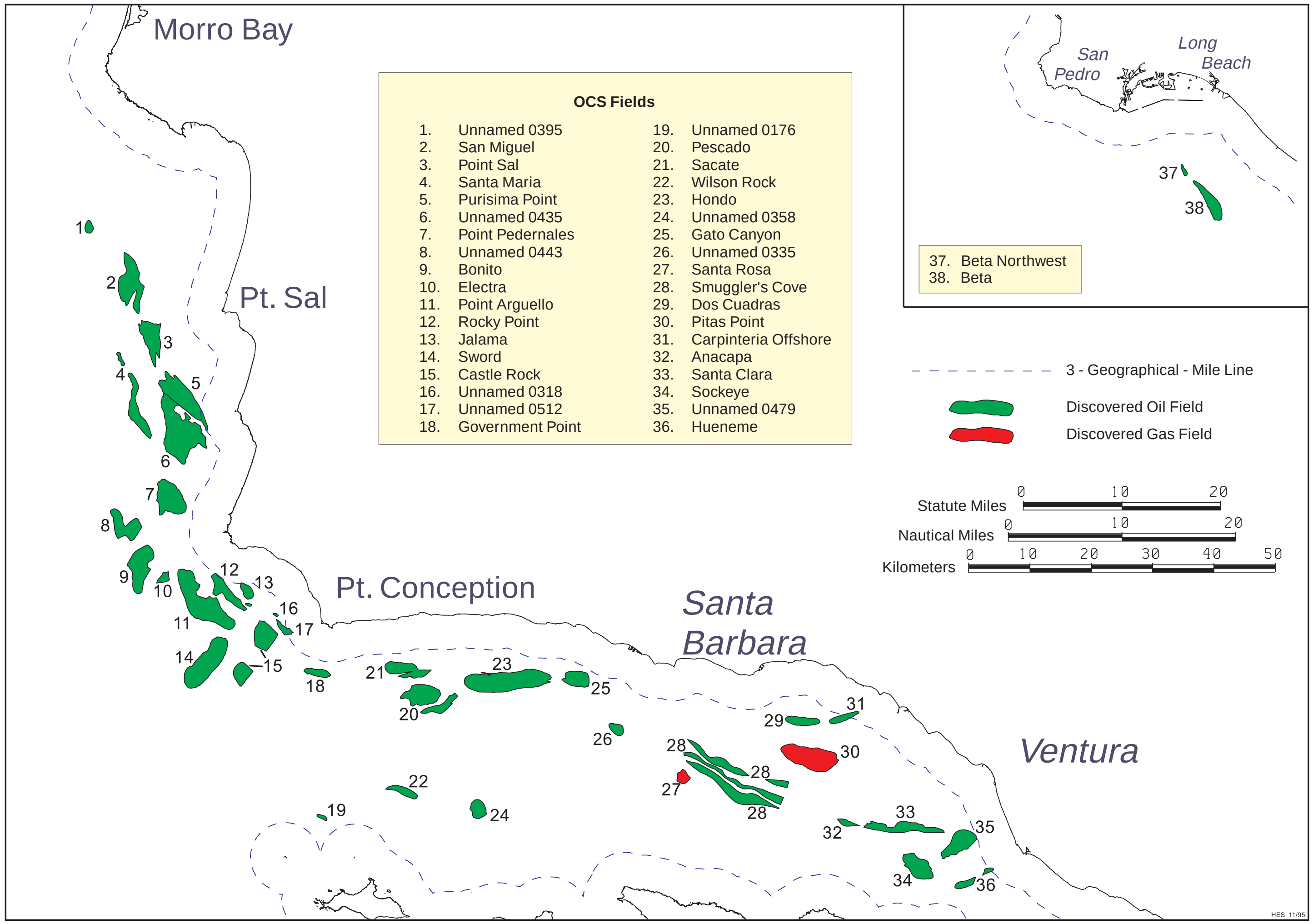
As of December 31, 1995, total original recoverable oil and gas reserves in the Pacific OCS are estimated to be 2,055 million barrels (MMbbl) and 3,136 billion cubic feet (Bcf), respectively. Total remaining reserves are estimated to be 1,305 MMbbl of oil and 2,434 Bcf of gas.

The current aggregated estimates of Pacific OCS oil and gas reserves are shown in table 1, by SPE reserves category, for both original recoverable and remaining reserves. Nonaggregated estimates of the original recoverable and remaining reserves for each of the 11 producing oil and gas fields are presented in figures 5 and 6 and table 2.

These estimates have been updated annually as additional information has become available. Past updates have caused both increases and decreases in estimates of original recoverable and remaining oil and gas reserves. Previous reserves estimates for the Pacific OCS are presented in appendix A.

The current estimate of original recoverable oil reserves has increased by about 2 MMbbl, as compared with the most recent previous estimate.

Figure 4. Recognized discoveries of federally controlled oil and gas fields in the Pacific OCS. (Dashed lines indicate 3-geographic mile boundary between State and Federal waters.)



The estimate of original recoverable gas reserves has also increased slightly. In addition, remaining recoverable gas reserve estimates have been adjusted to reflect gas injection volumes for the region. Changes in reported reserves and production in the Pacific OCS are displayed in table 3.

Table 1. Estimated reserves of oil and gas by SPE category, Pacific OCS, December 31, 1995.

Reserves Category	Number of Fields	Original Recoverable Reserves		Cumulative Production		Annual Production		Remaining Reserves	
		Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)
Proved Developed Reserves	11	1,341	2,152	750	703	72	51	591	1,450
Proved Undeveloped Reserves	1	71	208	0	0	0	0	71	208
Unproved Probable Reserves	9	418	368	0	0	0	0	418	368
Unproved Possible Reserves	17	225	408	0	0	0	0	225	408
Total	38	2,055	3,136	750	703	72	51	1,305	2,434

Table 2. Production and estimated reserves of oil and gas for producing fields, Pacific OCS, December 31, 1995.

Field	Original Recoverable Reserves		Cumulative Production		1995 Annual Production		Remaining Reserves	
	Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)
Beta	116.50	32.25	69.87	19.72	3.08	0.80	46.63	12.53
Carpinteria	65.20	55.00	60.67	46.56	0.86	0.61	4.53	8.44
Dos Cuadras	256.80	137.60	236.32	119.77	3.03	3.00	20.48	17.83
Hondo	278.90	834.02	154.26	153.77	14.90	16.68	124.64	680.25
Hueneme	10.57	4.05	9.17	3.21	0.36	0.39	1.40	0.84
Pescado	110.79	222.32	24.19	1.27	18.70	0.96	86.60	221.06
Pitas Point	0.27	239.22	0.19	190.92	0.01	6.52	0.08	48.30
Point Arguello	283.88	336.84	97.98	46.72	21.68	12.63	185.90	290.11
Point Pedernales	77.30	17.00	47.49	10.96	5.52	1.84	29.81	6.04
Santa Clara	70.13	109.37	31.79	58.37	1.37	1.13	38.34	51.00
Sockeye	70.73	164.78	18.04	51.26	2.93	6.50	52.69	113.53
Total	1,341.07	2,152.45	749.96	702.54	72.44	51.06	591.10	1,449.91

Table 3. Changes in reported reserves and production, Pacific OCS, December 31, 1995.

***Note:** Gas volumes for 1995 have been adjusted to account for reinjected gas.

Production and Reserves	Oil (MMbbl)	Gas (Bcf)*
Original Recoverable Reserves:		
Estimated as of 12/31/95 (This Report)	2,055	3,136
Estimated as of 12/31/94 (MMS 95-0062)	2,053	3,132
Change	+2	+4
Cumulative Production:		
Through 1995	750	703*
Through 1994	678	738
Proved Reserves:		
Estimated as of 12/31/95 (This Report)	662	1,657*
Estimated as of 12/31/94 (MMS 95-0062)	733	1,619
Change	-71	+38
Total Reserves:		
Estimated as of 12/31/95 (This Report)	1,305	2,434*
Estimated as of 12/31/94 (MMS 95-0062)	1,376	2,394
Change	-71	+40

Figure 5. Production and estimated reserves of oil for producing fields, Pacific OCS.

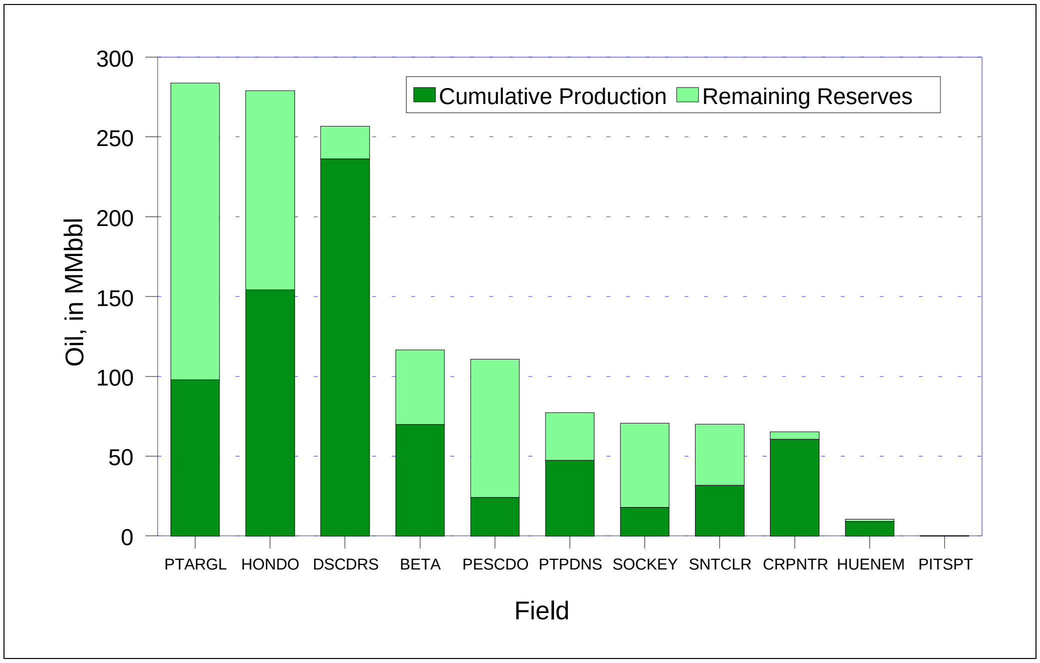
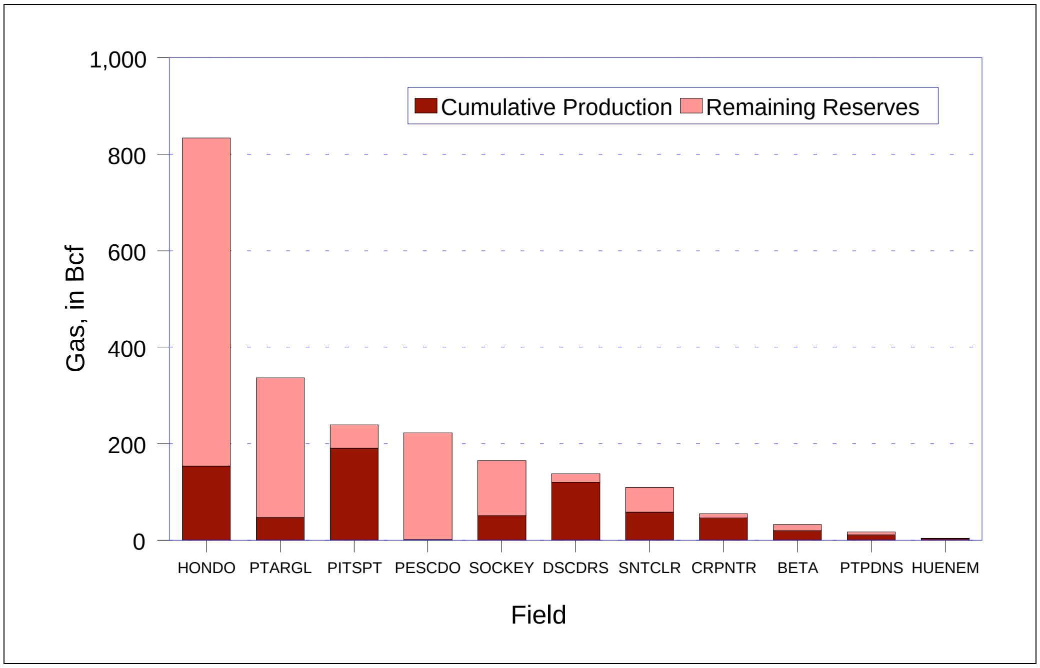


Figure 6. Production and estimated reserves of gas for producing fields, Pacific OCS.



Distribution of Reserves

The field size distribution based on current estimated original recoverable reserves for 27 oil fields, 9 combination oil and gas fields, and 2 gas fields in the Pacific OCS is shown in figure 7. These 38 fields are located in three basins, offshore California. For comparison purposes, gas reserves are expressed in terms of barrels of oil equivalent on the basis of equivalent heating values (5,620 cubic feet of gas has the approximate heating value of 1 bbl of oil), hereinafter referred to as BOE. Producing fields are distinguished from nonproducing fields in this figure. Appendix B contains field size distributions for all fields in the Santa Barbara-Ventura and Santa Maria basins.

Approximately two-thirds of the original recoverable oil and gas reserves in the Pacific OCS are attributable to the 11 proved developed fields. These 11 producing fields also contain about one-half of the remaining recoverable reserves.

Gas reserves in the Pacific OCS are located in both oil and gas reservoirs. Less than one-sixth of the original recoverable and remaining gas reserves occurs as nonassociated gas contained in natural gas reservoirs. The remaining gas reserves are associated gas contained within oil reservoirs (fig. 8 and table 4).

Oil and gas reserves in the Pacific OCS are further categorized on the basis of the age of the reservoir rocks in which they exist (table 5). The three age groups of reservoir rocks are (1) Pre-Monterey, rocks older than the Monterey Formation (early Miocene age and older); (2) Monterey, rocks of the Monterey Formation (Miocene age); and (3) Post-Monterey, rocks younger than the Monterey Formation (late Miocene age and younger). The distribution of estimated original recoverable and remaining oil and gas reserves by reservoir age group is illustrated in figures 9 and 10.

Seven of the 11 producing fields in the Pacific OCS have substantial reserves attributed to the Monterey Formation, as do 21 of the 27 nonproducing fields. In 18 of the 27 nonproducing fields, all identified reserves are attributed to this formation. Over two-thirds of the original recoverable oil reserves and over three-fourths of the remaining oil reserves are in Monterey Formation reservoirs. The Monterey Formation also contains approximately two-thirds of all gas reserves in the Pacific OCS.

Status of Field Development

As of December 31, 1995, 11 of the 38 recognized fields in the Pacific OCS were producing: Point Pedernales, Point Arguello, Pescado, Hondo, Dos

Cuadras, Pitas Point, Carpinteria Offshore, Santa Clara, Sockeye, Hueneme, and Beta (fig. 4, fields 7, 11, 20, 23, 29, 30, 31, 33, 34, 36, and 38). Pescado Field became the eleventh producing field in the Pacific OCS when production began from Platform Heritage in December 1993.

Development drilling occurred at 5 of the 11 producing fields during 1995: Point Pedernales, Point Arguello, Pescado, Hondo, and Beta (fig. 4, fields 7, 11, 20, 23, and 38). The development of Pescado Field and the western portion of Hondo Field continued in 1995 with the drilling of development wells from Platforms Heritage and Harmony. A summary of Pacific OCS development activities during 1995 is presented in appendix C.

Eight producing oil and gas fields in the Pacific OCS are undergoing fluid injection: Point Pedernales, Pescado, Hondo, Dos Cuadras, Carpinteria Offshore, Santa Clara, Sockeye, and Beta (fig. 4, fields 7, 20, 23, 29, 31, 33, 34, and 38). Recovery beyond primary production is occurring or can be anticipated. Four fields— Point Pedernales, Pescado, Hondo, and Carpinteria Offshore (fig. 4, fields 7, 20, 23, and 31)— are undergoing gas injection for reservoir pressure maintenance. Approximately one-fifth of the natural gas produced in the region is reinjected. Table 6 shows water and gas injection volumes and rates for each of the eight fields undergoing injection.

Figure 7. Size distribution of Pacific OCS oil and gas fields.

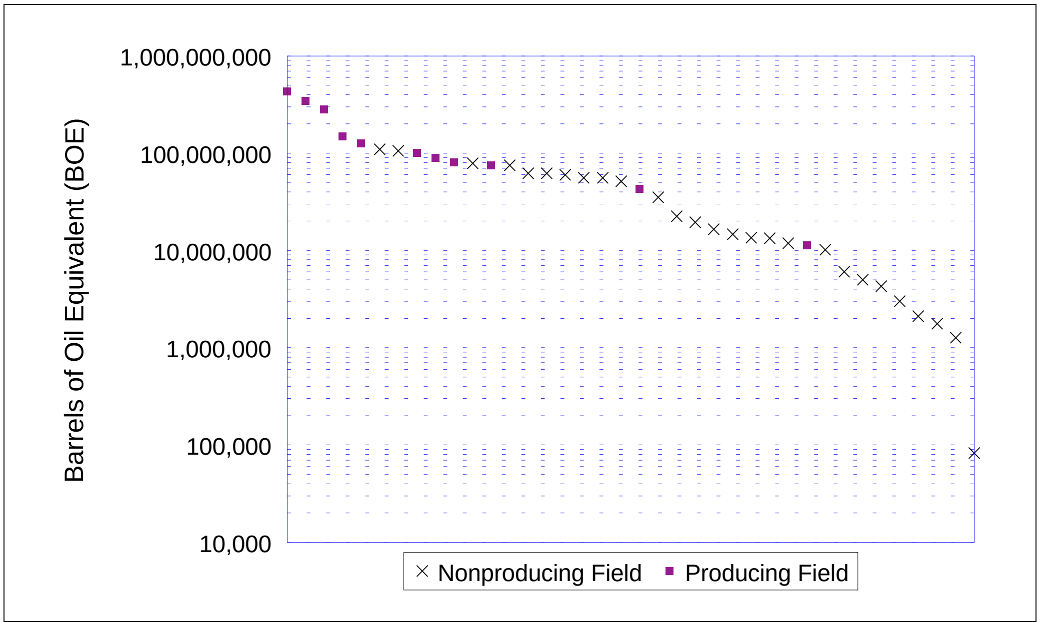


Figure 8.
Production and estimated reserves of gas by type of occurrence, Pacific OCS.

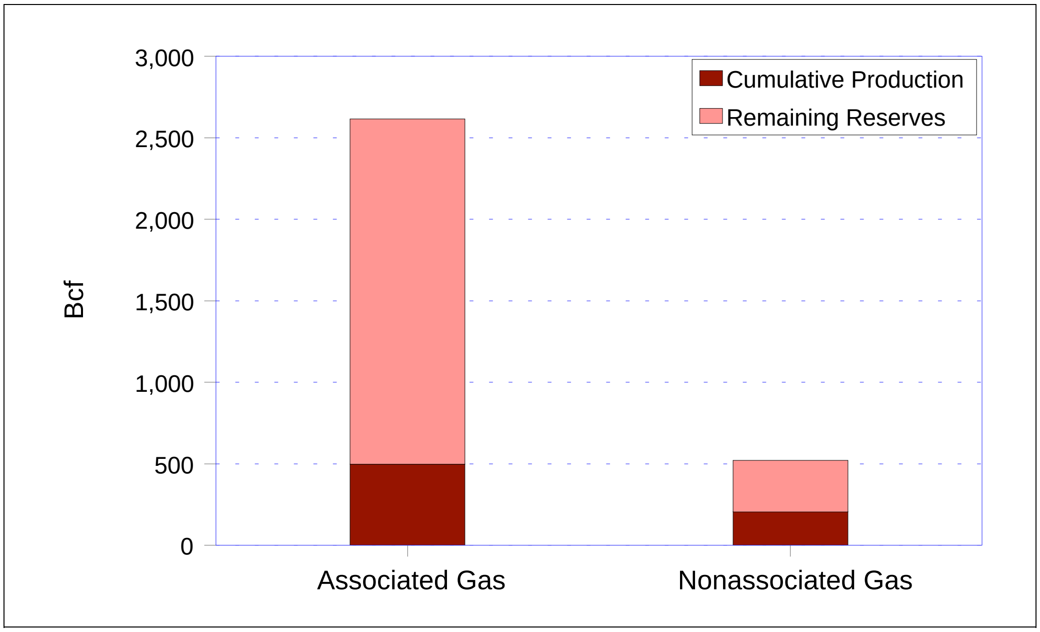


Table 4.
Production and estimated reserves of gas by type of occurrence, Pacific OCS, December 31, 1995.

Type of Occurrence	Original Recoverable Reserves (Bcf)	Cumulative Production (Bcf)	1995 Annual Production (Bcf)	Remaining Reserves (Bcf)
Associated	2,615	497	45	2,118
Nonassociated	521	205	7	316
Total	3,136	703	51	2,434

Table 5.
Estimated reserves of oil and gas by reservoir age group, Pacific OCS, December 31, 1995.

Reservoir Age Group	Geologic Formations	Original Recoverable Reserves		Remaining Reserves	
		Oil (MMbbl)	Gas (Bcf)	Oil (MMbbl)	Gas (Bcf)
Post-Monterey	Pico, Puente, "Repetto," Santa Margarita, Sisquoc	515	555	128	144
Monterey	Monterey	1,403	1,946	1,072	1,716
Pre-Monterey	Point Sal, Vaqueros, Topanga, Hueneme, Sespe/ Alegria, Gaviota, Matilija, Sacate, Juncal (Camino Cielo), Jalama	137	635	106	574

Figure 9. Estimated original recoverable and remaining oil reserves by reservoir age group, Pacific OCS.

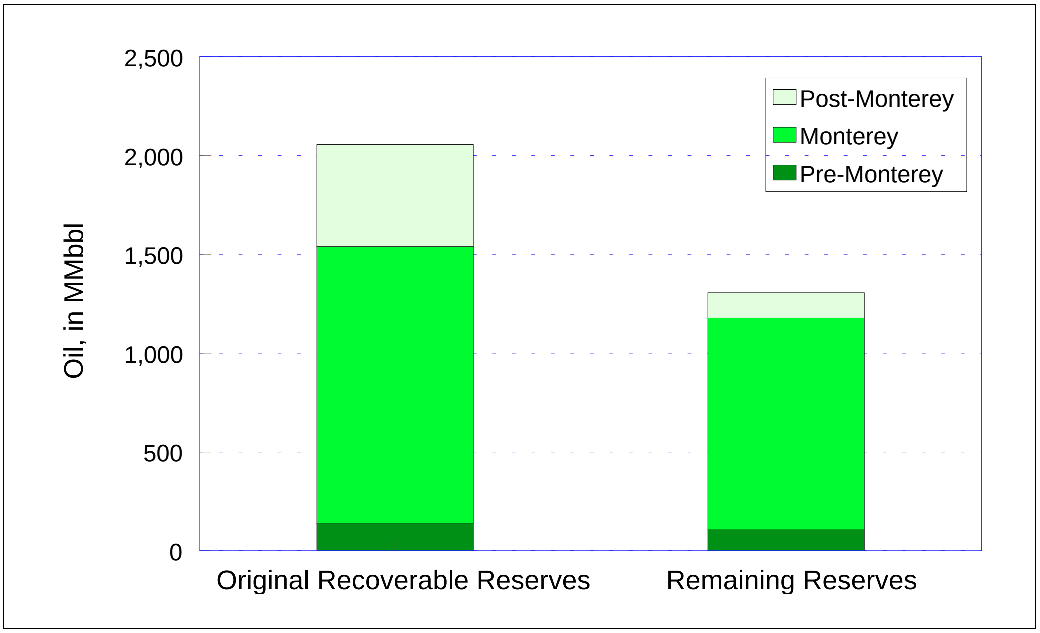


Figure 10. Estimated original recoverable and remaining gas reserves by reservoir age group, Pacific OCS.

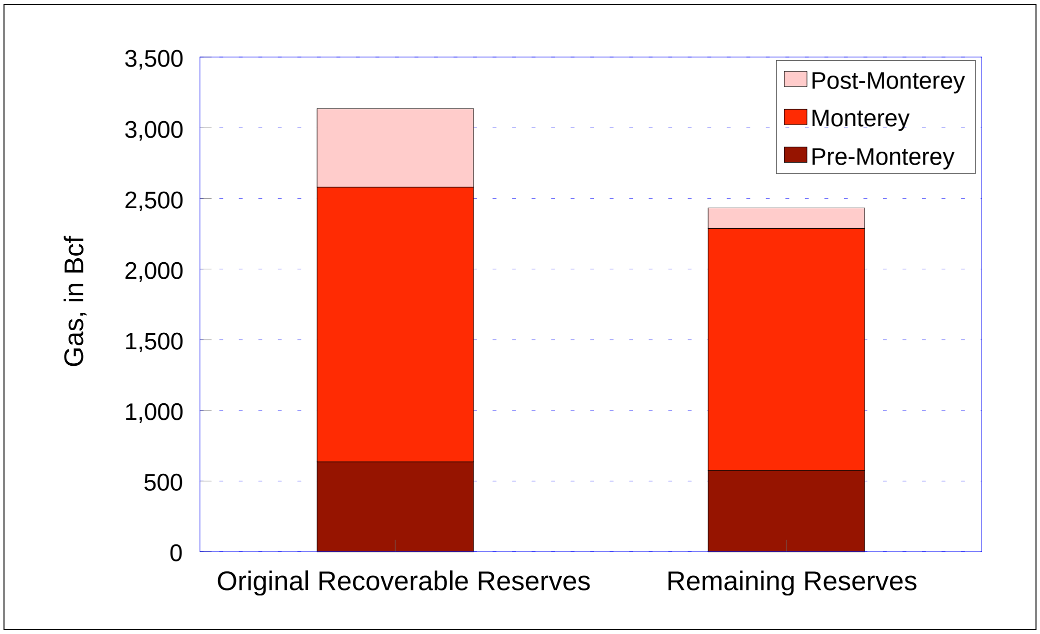


Table 6.
Gas and water injection volumes and rates, Pacific OCS, December 31, 1995.

Field	Gas Injection Volume (Mcf)	Average Gas Injection Rate (Mcfpd)	Water Injection Volume (bbl)	Average Water Injection Rate (bpd)
Beta	0	0	7,631,528	20,910
Carpinteria	28,878	80	0	0
Dos Cuadras	0	0	8,405,289	24,080
Hondo	5,228,513	23,585	0	0
Pescado	6,793,340	18,780	0	0
Pt. Pedernales	837,861	2,305	0	0
Santa Clara	0	0	2,580,215	7,343
Sockeye	0	0	1,253,871	4,215

Drilling History and Production Rates

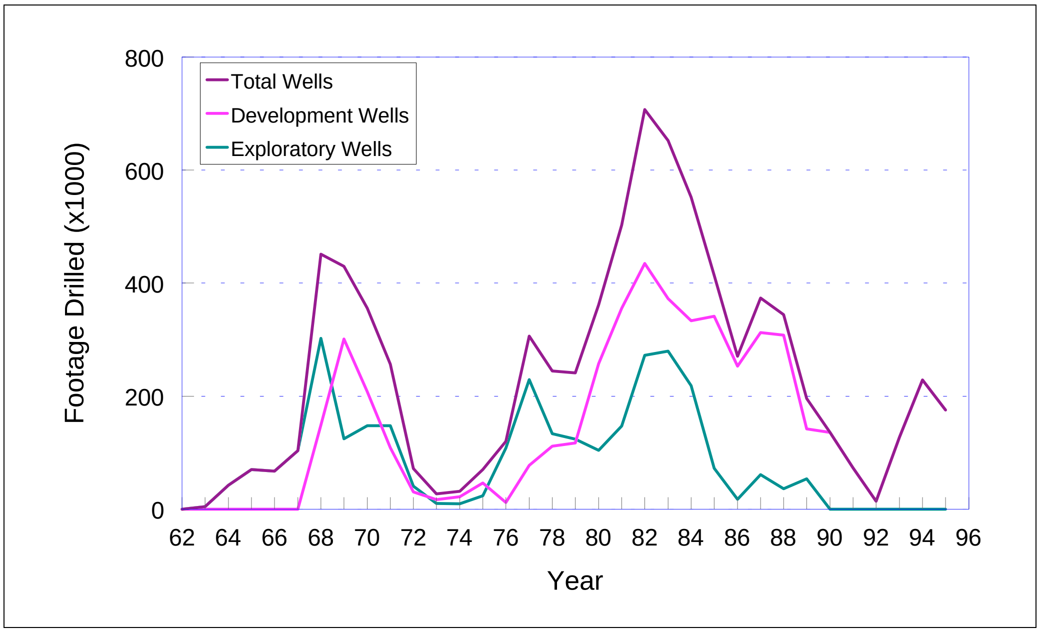
There have been 329 exploratory wells and 784 development wells spudded as of December 31, 1995. For the sixth consecutive year, no exploratory wells were drilled in the Pacific OCS. Eighteen development wells and redrills were drilled during 1995, in five fields. Total footage drilled in these wells exceeded 175,000 feet. Drilled footage by year for all wells in the Pacific OCS is displayed in figure 11. Additional exploratory and delineation wells are anticipated in many of the Pacific OCS fields as the operators seek to define productive limits and optimize oil and gas recovery.

Oil production from the Pacific OCS increased markedly during 1995. Annual production exceeded 72 MMbbl of oil, a record volume for the region. Over five-sixths of the oil was produced from Monterey Formation reservoirs. Most of the other oil production was obtained from reservoirs in rocks younger than the Monterey Formation. The 11 producing fields contributed over one-sixth of the Nation's total OCS oil production. Point Arguello and Pescado Fields each accounted for almost one-third of the region's oil production, and the two fields produced about one-tenth of the national OCS total.

Net gas production from the 11 producing fields increased slightly during 1995, with the total exceeding 51 Bcf by yearend. Only one gas field was producing at yearend; over five-sixths of the gas production was associated gas obtained from oil reservoirs. Almost two-thirds of the gas was produced from Monterey Formation oil reservoirs.

Cumulative production reached approximately 750 MMbbl of oil and 702 Bcf of gas in 1995. Over one-half of the oil and gas production in the Pacific OCS to date has been from Post-Monterey aged reservoirs. This proportion will decline, however, as production from Monterey Formation reservoirs continues to increase. Additional oil and gas production volume and rate data for the Pacific OCS are presented in appendix D.

Figure 11. Annual drilled footage for wells in the Pacific OCS.



Oil and Gas Sales Prices, Volumes, and Gravities

During 1995, 11 of the 38 fields in the Pacific OCS produced oil and gas. Sales volumes of oil and gas produced from these fields totaled 71.15 MMbbl and 39.45 Bcf, respectively. The weighted average sales prices of oil and natural gas during 1995 were $10.86 per barrel and $1.50 per thousand cubic feet, respectively.

Total sales of crude oil from each field during 1995 are shown in table 7. Point Arguello Field is the largest field in the Pacific OCS in terms of oil sales volumes. Point Arguello and Pescado Fields accounted for over one-half of all Pacific OCS crude oil sold.

Total sales of natural gas from each field during 1995 are shown in table 8. Differences between sales volumes and produced gas volumes are due primarily to lease use, flaring, and injection. Pitas Point Field is the only producing gas field in the Pacific OCS, but produced less than one-fifth of all Pacific OCS natural gas sold. Hondo Field produces more natural gas than any other single field in the region. Hondo and Point Arguello Fields account for over one-half of all Pacific OCS natural gas sold.

Oil sales gravities range from 12 to 32 °API. Oil produced from some reservoirs also contains substantial quantities of sulfur and metals. These factors have produced average prices for Pacific OCS crudes that are generally lower than the national average (fig. 12).

Table 7.
Oil sales volumes, Pacific OCS, 1995.

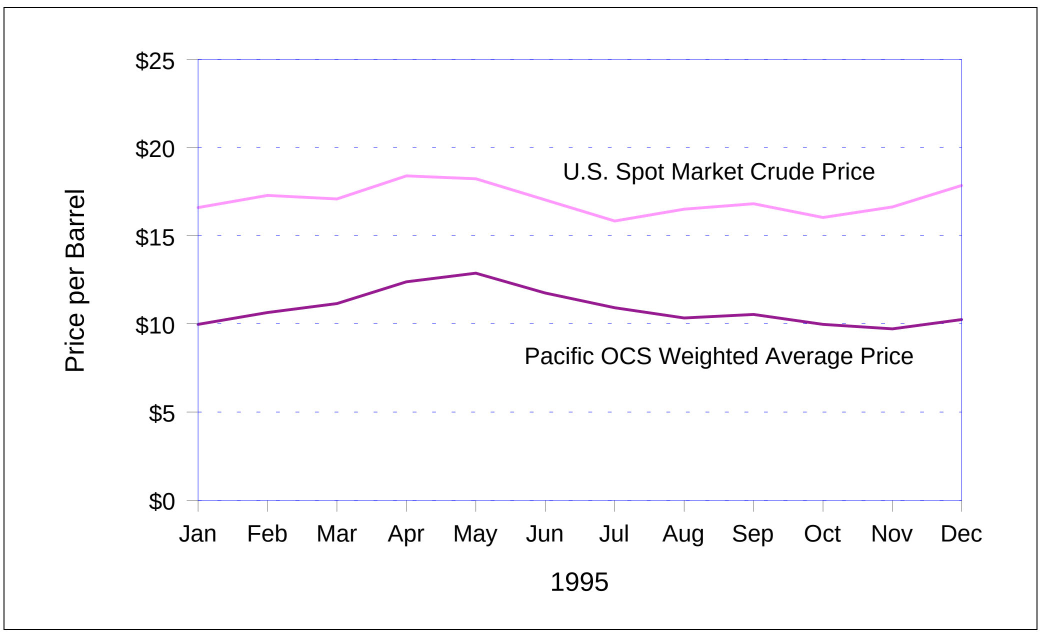
Field	Oil Sales Volume (MMbbl)	Percent of Total Sales
Point Arguello	21.50	30.22
Pescado	20.29	28.52
Hondo	12.20	17.15
Point Pedernales	5.52	7.76
Beta	3.08	4.32
Dos Cuadras	3.05	4.29
Sockeye	2.93	4.12
Santa Clara	1.38	1.94
Carpinteria Offshore	0.85	1.19
Hueneme	0.35	0.49
Total	71.15	100.00

Table 8.
Natural gas sales volumes, Pacific OCS, 1995.

Field	Natural Gas Sales Volume (Bcf)	Percent of Total Sales
Hondo	12.36	31.33
Point Arguello	8.82	22.36
Pitas Point	6.37	16.15
Sockeye	5.60	14.20
Dos Cuadras	2.46	6.24
Santa Clara	1.09	2.76
Pescado	1.08	2.74
Point Pedernales	0.77	1.29
Hueneme	0.39	0.99
Carpinteria Offshore	0.37	0.94
Beta	0.14	0.34
Total	39.45	100.00

Figure 12.
Average monthly crude oil price for Pacific OCS and Standard West Texas Intermediate Crude (U.S. Spot Market).

Source: Energy Information Administration *Petroleum Marketing Monthly*, July, 1996.



Conclusions

As of December 31, 1995, the total original recoverable reserves in 38 fields in the Pacific OCS, offshore California, are estimated to be 2,055 MMbbl of oil and 3,136 Bcf of gas. The remaining proved reserves in 12 oil and gas fields are estimated to be 662 MMbbl of oil and 1,657 Bcf of gas. Unproved reserves in 26 oil and gas fields in the Pacific OCS are estimated to be 643 MMbbl of oil and 776 Bcf of gas. Total remaining oil reserves have decreased by 71 MMbbl, and gas reserves have increased by 40 Bcf, as compared with previously published estimates.

Oil and gas were being produced from 23 platforms in 11 fields at yearend. Original recoverable gas reserves for the single producing gas field are estimated to be 239 Bcf, and remaining reserves are estimated to be 48 Bcf of gas. Estimated original recoverable reserves for the other 10 producing fields total 1,341 MMbbl of oil and 1,913 Bcf of gas. Estimated remaining reserves for these 10 fields are 591 MMbbl of oil and 1,402 Bcf of gas. Almost one-half of the remaining reserves in the Pacific OCS are contained within producing fields, and approximately three-fourths of the remaining oil and gas reserves are attributed to reservoirs in the Monterey Formation.

Pacific OCS oil production reached a new peak during 1995, when approximately 72 MMbbl of oil were produced. Net gas production increased slightly to over 51 Bcf. Well over three-fourths of the gas produced during the year was associated gas produced from oil reservoirs. Almost two-thirds of the natural gas produced came from oil reservoirs in the Monterey Formation. Cumulative production from fields in the Pacific OCS has reached 750 MMbbl of oil and 703 Bcf of gas since production began in 1968.

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Appendixes: Reserves, Production, and Development Summaries

The following appendixes provide information on estimated oil and gas resources and reserves, oil and gas production volumes and rates, and annual development activities in the Pacific OCS. This information has been obtained primarily from MMS interpretations of geophysical, geological, and other data. Such interpretations form the basis of MMS resource and reserve estimates in the Pacific OCS.

Appendixes

Appendix A - Annual Estimates of Oil and Gas Reserves

The first oil field extending into Federal waters in the Pacific OCS was discovered in 1965. Estimates of original recoverable oil and gas reserves in the region have increased since that time, largely due to the discovery of new oil and gas fields and often due to the reevaluation of known fields. Estimates of remaining reserves have generally increased as well, for the same reasons. The continued production of oil and gas, however, following the cessation of leasing and exploratory drilling, has initiated a downward trend in estimates of remaining reserves.

Estimates of Original Recoverable Reserves

Since the discovery of Carpinteria Offshore Field in 1965, estimates of original recoverable oil and gas reserves in the Pacific OCS have increased substantially (fig. A-1 and table A-1). The primary cause for this increase has been the discovery of additional oil and gas fields, many of which are of significant size. Other factors that can increase estimates of original recoverable reserves are the analysis of new data from known fields and the reevaluation of old data in combination with new technology. Past reevaluations of known fields have caused significant increases in estimates of original recoverable reserves.

It should be noted, however, that such studies may result in decreased reserves estimates as well. Some annual estimates of original recoverable oil and gas reserves in the Pacific OCS have decreased, as compared with estimates published in previous years (fig. A-1). The cessation of leasing and exploratory drilling in the Pacific OCS have made the reevaluation of known fields the only factor that continues to change estimates of original recoverable oil and gas reserves.

Estimates of Remaining Reserves

Five of the 38 known fields in the region have been ranked among the top 100 U.S. oil fields in terms of remaining proved reserves; 4 of the 5 have been ranked among the top 50 fields, and 2 of the 5 are in the top 20. One of these fields is also ranked among the 50 largest U.S. gas fields. These 5 fields contain over one-third of the remaining oil reserves and about one-half of the remaining gas reserves in the region. Other Pacific OCS fields may eventually prove to be sufficiently large to be included in the Nation's top 100.

Historically, the average volumes of oil and gas produced annually in the Pacific OCS have been about 1 percent of current estimated original recoverable oil and gas reserves. Such production rates have not caused extreme annual variations between estimated original recoverable reserves and remaining reserves. As a result, annual estimates of remaining oil and gas reserves have generally increased or decreased in step with the annual estimates of original recoverable reserves (figs. A-1 and A-2). The divergence between original recoverable reserves and remaining reserves has increased in recent years, however, as production rates in the Pacific OCS have repeatedly climbed to record-setting levels.

Table A-1. Annual estimates of original recoverable reserves with source publication numbers.

Original Recoverable Reserves			
Year	Publication	Oil (MMbbl)	Gas (Bcf)
1976	OFR 78-384	829	1,530
1977	OFR 79-345	843	1,546
1978	OFR 80-477	875	1,665
1979	OFR 80-1042	920	1,845
1980	OFR 81-623	988	1,853
1981	OFR 82-37	1,082	1,847
1982	OFR 83-559	1,217	1,983
1983	MMS 84-0024	1,433	2,298
1984	MMS 85-0041	1,515	2,400
1985	MMS 86-0066	1,599	2,334
1986	MMS 87-0045	1,670	2,461
1987	MMS 88-0047	1,727	2,501
1988	MMS 89-0085	1,729	2,467
1989	MMS 90-0086	1,987	2,723
1990	MMS 91-0087	1,988	2,684
1991	MMS 92-0073	1,990	2,762
1992	MMS 94-0008	2,055	3,121
1993	MMS 94-0059	2,050	3,129
1994	MMS 95-0062	2,053	3,132
1995	MMS 96-0060	2,055	3,136

Figure A-1. Annual estimates of original recoverable reserves from known fields.

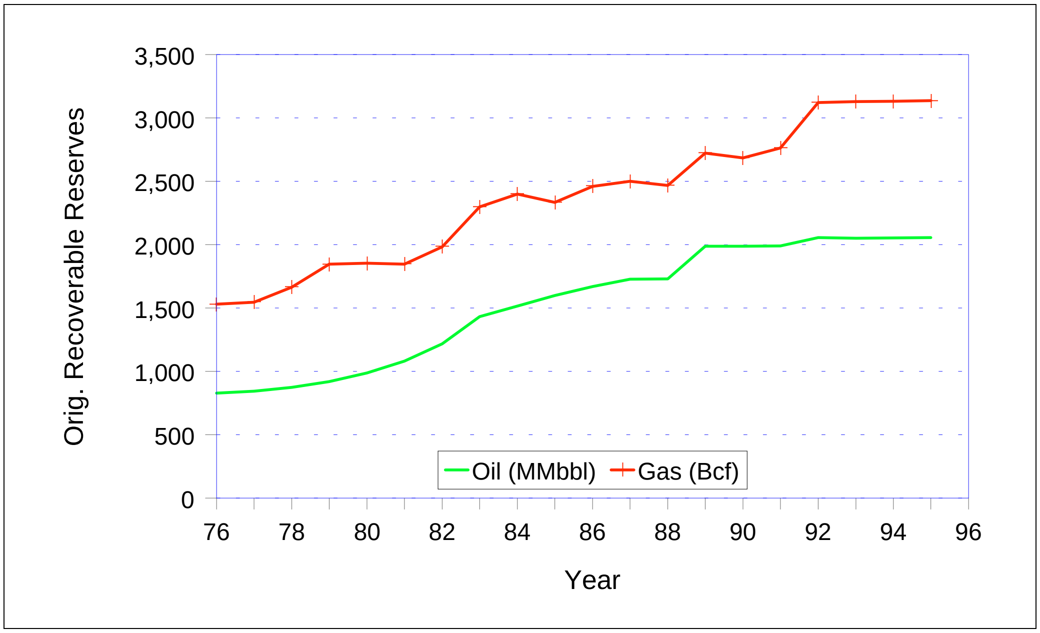
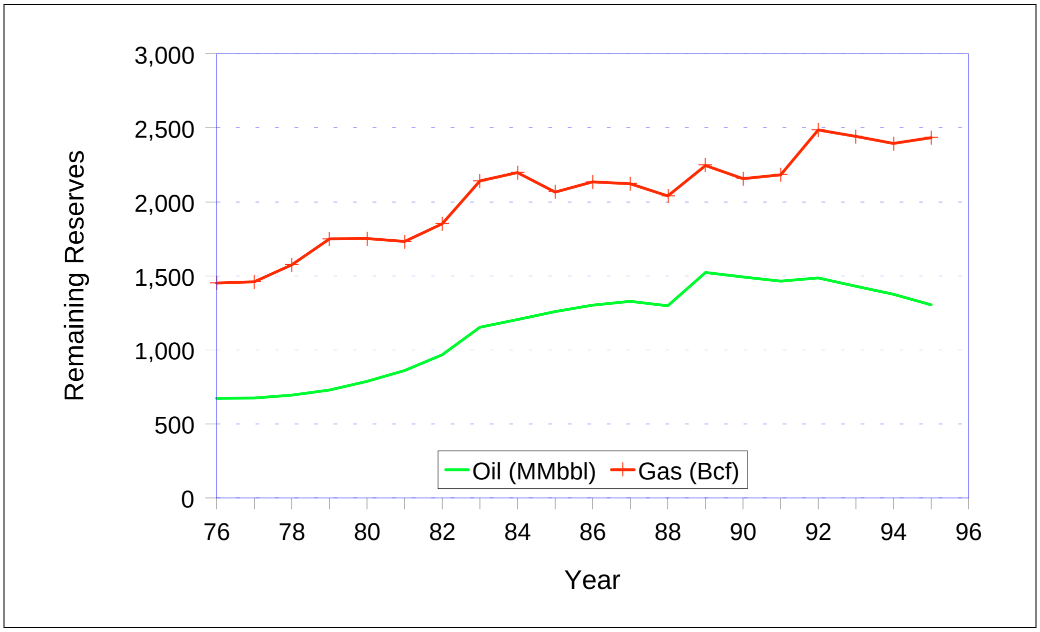


Figure A-2. Annual estimates of remaining recoverable reserves from known fields.



Appendix B - Field Size Distributions for Santa Barbara-Ventura and Santa Maria Basins

Field size distributions within petroleum producing regions have long been used to gauge undiscovered petroleum potential. In basins with mature production histories, distributions can characterize the size, frequency, and probability of the known accumulations. It is believed that those factors are influenced by the geologic history, structure, and stratigraphy of the area.

It is also widely believed that resources within a basin (or play) are lognormally distributed. If so, then a log probability plot of all of the known accumulations within a basin or play would exhibit a straight line fit. Further, mature basin or play distributions could be used as analogues for frontier areas with similar geologic characteristics.

The statistical model for the two distributions presented in this appendix was developed as part of the 1995 National Assessment of Undiscovered Oil and Gas Resources conducted by the Minerals Management Service (MMS) and the U.S. Geological Survey. The reader is invited to refer to MMS, 1996a, for more information concerning the National Assessment and to MMS, 1996b (in press), for a more detailed description of the petroleum geology of the Santa Barbara-Ventura and Santa Maria basins.

Santa Barbara-Ventura Basin

Oil, tar, and natural gas have been important commodities in the Santa Barbara-Ventura basin of southern California since prehistoric times. Archeological and anthropological evidence shows that Native Americans exploited surface seepages of petroleum. Their use of tar, in particular, is well-documented in the accounts of several European explorers.

Development History

The nascent oil industry of California had its roots in the Santa Barbara-Ventura basin, with the establishment of primitive distilleries and refineries in the late 1850's and early 1860's to process and refine seepage oil and tar. Early uses of refined petroleum products included lubricants, heating oil, and lighting oil. Indeed, one early impetus for development of sources of "rock oil" was the dwindling supply of whale oil.

As early as 1861, "oil tunnels" (adits) were driven into the south flanks of Sulphur Mountain, near the town of Santa Paula, to tap at depth the reservoir strata suspected of feeding the surficial seeps. It should be remembered that in the decade of the 1860's the science of petroleum geology did not yet exist. Therefore, the employment of mining technology is not at all surprising. In fact, the oldest fields in the basin were developed under rules promulgated by "petroleum mining districts." Several of these earliest-discovered fields are still in production today, their present lease boundaries having been based on petroleum claims and patents. A few wells and oil tunnels have produced oil sporadically for over 100 years.

Since 1861, at least 155 oil and gas fields have been discovered in the Santa Barbara-Ventura basin. The term "field" here refers to an accumulation that has been commercially exploited (for at least 6 months under informal California Division of Oil, Gas, and Geothermal Resources (CDOGGR) guidelines) or has been identified as being capable of commercial production but has not yet been fully developed. The size of these fields ranges from several hundred barrels oil equivalent (BOE) to over one billion BOE.

Prior to 1901, thirty-three fields had been discovered within the basin. Given the drilling technology of the day, all were relatively shallow discoveries (< 4,000 feet drilled depth). It is of interest to note that only five of these thirty-three old fields may ultimately produce over 10 million BOE; and that all five were augmented by later discovered deep production.

Advancements in exploration and production technology, particularly after World War II, allowed for greater development of the basin than had previously been possible. These technological advancements included the advent of rotary drilling with fluid circulation (to drill deeper wells in higher reservoir pressure situations), the use of enhanced recovery processes (to increase yield), early directional drilling techniques (to reach heretofore unreachable portions of fields), and the invention of offshore drilling vessels and production technology.

It must be kept in mind that about half of the Santa Barbara-Ventura basin is submerged. Although offshore drilling technology was pioneered as early as 1894, at Summerland along the north coast of the Santa Barbara Channel, only that portion of the offshore that could be reached from wells drilled from piers, from upland sites, or from artificial islands was capable of being exploited. Therefore, vast areas of the basin were out of the reach of petroleum explorationists.

It was not until the 1950's that exploration of much of the offshore area began in earnest. Even then, water depth imposed a great barrier to offshore drilling vessels, which could not work in depths greater than 600 feet (due to anchoring and marine riser considerations). Deep water drilling did not become common until "dynamic positioning" technology was introduced in the early 1970's. In addition to physical and technological barriers to petroleum exploration and production, regulatory barriers have played a key role in the development of the basin. Many areas of the basin have been effectively withdrawn from exploration consideration.

Field Size Distribution

Unlike many petroleum productive basins worldwide, the largest fields in the Santa Barbara-Ventura basin were not located early in the discovery sequence. For a basin that has produced petroleum since 1861, it is unusual to note that the largest field was not located until 1919 and that the second largest field was not discovered until 1969, over 100 years after the initial field discovery! As a result of over 130 years of petroleum exploration, at least 12 major fields (>100 million BOE) have been identified; 1 of which has produced over 1 billion BOE (fig. B-1).

The probability distribution presented for this basin is a model of geographically distinct accumulations (fig. B-2). The term “field” is somewhat ill-defined. Because the purpose of this distribution was to model undiscovered accumulations, it was necessary to re-evaluate and re-define some of the known fields. For example, the "Newhall field" in CDOGGR terminology is reported herein as nine separate, geographically or geologically isolated fields. On the other hand, the giant Ventura Avenue-San Miguelito-Rincon Field, which is divided into three fields by CDOGGR, is considered herein to be one conterminous accumulation.

The data points plot as a reasonably straight line suggesting lognormality for the data set. Note that the histogram (fig. B-1), as plotted, exhibits a nearly normal (Gaussian) curve.

Production records, especially for very old fields and for isolated marginal wells, were not always available to the author. Several small satellite accumulations were necessarily lumped into larger nearby fields because of these statistical shortcomings. Furthermore, even the most precise field studies contain geological, geophysical, and engineering assumptions that time and additional exploration may prove to be substantially invalid. Therefore, the 155 fields listed in this distribution should be considered a minimum, but the listing provides a reasonable and accurate state of knowledge about the basin upon which this model can be based (table B-1).

Several public sources of information were used in developing this data set. Unpublished Federal Government and private industry sources were also extensively used. As a last resort, the author calculated reserves when existing sources of data were insufficient. Reserves estimates for partially or wholly undeveloped fields can be highly speculative.

Figure B-1.
Histogram of Original Recoverable Reserves from 155 known fields in the Santa Barbara - Ventura Basin.

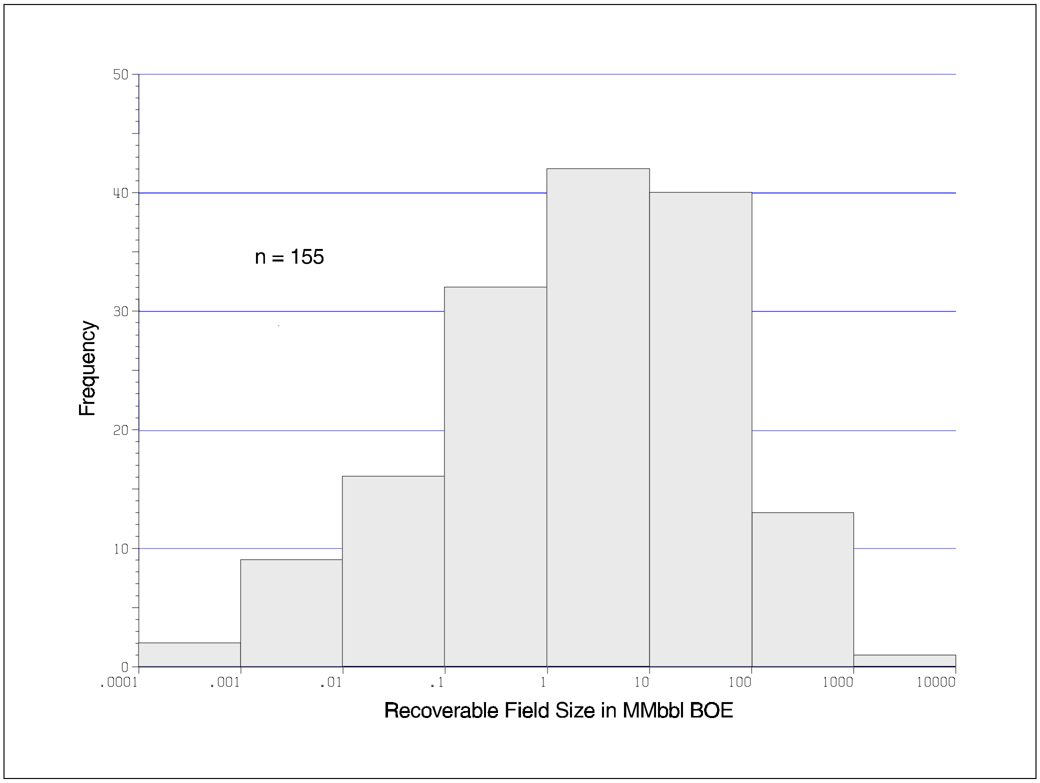


Figure B-2.
Log probability plot of Original Recoverable Reserves from 155 known fields in the Santa Barbara-Ventura Basin.

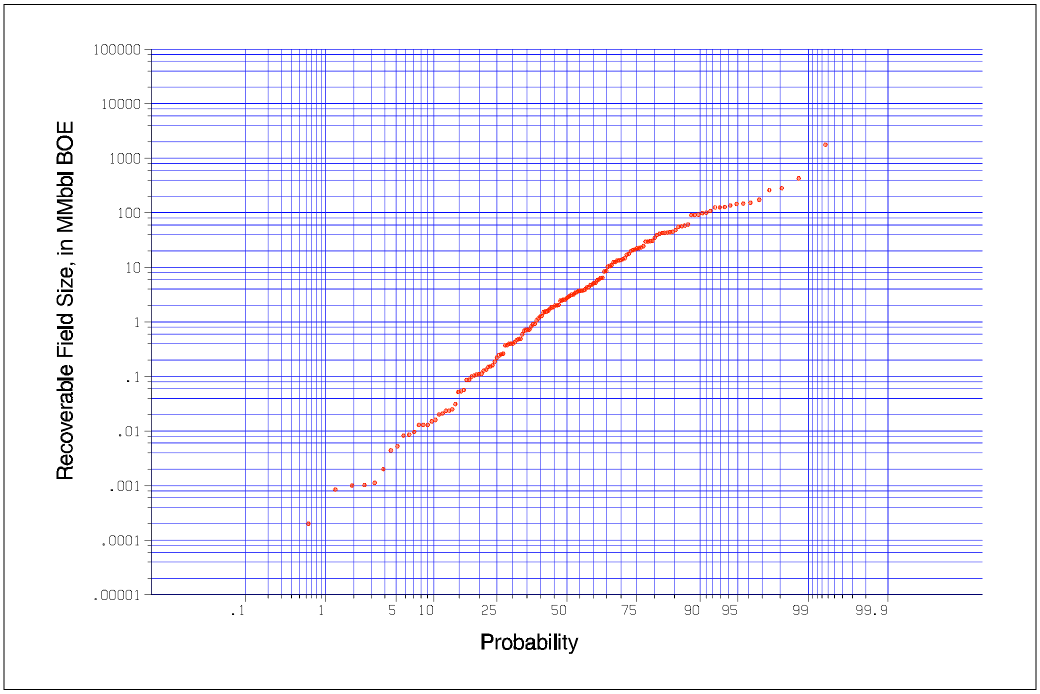


Table B-1. Original Recoverable Reserves for 155 known fields in the Santa Barbara-Ventura Basin.

Field Name	Discovery Year	Original Recoverable Reserves (MBOE)
Santa Paula, Wheeler Canyon	1861	722
Ojai, Silverthread	1866	30,050
Santa Paula, Adams Canyon	1875	914
Newhall, Pico Canyon	1876	3,824
Newhall, De Witt Canyon	1882	25. *
North Tapo	1882	1,285
Newhall, Towsley Canyon	1883	87
Hopper Canyon	1884	3,748
Newhall, Wiley Canyon	1884	692
Toro Canyon	1885	15. *
Sespe, Tar Creek/Topatopa	1887	56,631
Santa Paula, Salt Marsh	1888	370
Sespe, Little Sespe Creek	1888	3,025
North Hopper Canyon	1889	100
Timber Canyon, Main	1889	10,178
Torrey Canyon	1889	29,438
Newhall, Elsmere	1891	1,065
Sespe, Foot of the Hills	1891	4,800
Simi, Cañada de la Brea	1891	2,875
Bardsdale	1892	29,342
Conejo	1892	112
Santa Paula, Santa Paula Canyon	1892	486
Eureka Canyon	1893	900
Newhall, Whitney Canyon	1893	400
Ojai, Lion Mountain	1893	852
Summerland	1894	3,527
Piru, Modelo Canyon	1897	492
Newhall, Rice Canyon	1899	132
Sespe, Section 23 & 26	1899	53. *
Newhall, Tunnel	1900	2,542
Ojai, Sisar Creek	1900	3,175
Piru, Warring Canyon	1900	16
Simi, Old	1900	1,532
Santa Paula, Aliso Canyon	1901	396
Sespe, Upper Sespe	1911	20. *
Shiells Canyon	1911	41,111
South Mountain (excluding Bridge Pool)	1916	153,000
Ojai, North Sulphur Mountain	1917	14,618
Ojai, Tip Top	1918	244
Ventura Avenue - San Miguelito - Rincon	1919	1,769,549
Placerita	1920	61,047
Temescal	1924	8,569
Goleta	1927	151
Ojai, Sulphur Mountain	1927	466

Ellwood	1928	125,291
Mesa, Palisades	1929	21
Capitan	1929	22,533
La Goleta Gas	1929	8,421
Mesa, Main	1930	3,705
Ojai, Oakview	1935	1. *
Oxnard	1937	48,073
Newhall-Potrero	1937	97,735
Aliso Canyon	1938	91,952
Del Valle, Main	1940	43,281
Oak Canyon	1941	19,751
Holser	1942	1,749
Ramona	1943	30,396
Hasley Canyon	1944	3,189
Las Llajas	1945	104
North Ramona	1946	13
Oat Mountain	1946	2,044
West Mountain	1946	5,137
Refugio Cove Gas	1946	187
West Montalvo, McGrath	1947	10,872
Coal Oil Point, Old	1947	4
Castaic Junction	1950	42,743
Del Valle, Kinler	1950	255
South Tapo Canyon	1950	6,383
Honor Rancho, Main	1950	13,996
West Montalvo, Colonia	1951	39,179
Newhall, Townsite	1951	160
Ojai, Weldon Canyon	1951	1,160
Del Valle, South	1951	1,999
Castaic Hills	1951	12,414
Canoga Park	1952	1
Horse Meadows	1952	152
Oakridge	1952	17,529
Mission	1953	591
Simi, Strathearn	1953	13
Timber Canyon, Loel-Maxwell	1953	715
Elizabeth Canyon	1954	1
Fillmore	1954	17
Cascade	1954	2,476
Somis	1955	2
Oakview	1955	<1
Moorpark	1955	31
Saticoy-Bridge	1955	90,803
West Montalvo, Laubacher	1955	400
Cañada Larga	1955	128
Honor Rancho, Southeast	1956	24,466
Long Canyon	1956	24
Piru Creek	1956	14

Summerland Offshore	1957	44,964
Tapia	1957	1,619
Las Varas Canyon	1957	56
Saugus	1957	711
Canton Creek	1957	24
El Rio	1958	424
Charlie Canyon	1958	<1
Bouquet Canyon	1958	9
Glen Annie Gas	1958	87
Alegria	1958	10
Gaviota Offshore Gas	1960	12,448
Cuarta Offshore	1961	3,953
Naples Offshore Gas	1961	4,260
Conception Offshore	1961	23,126
Coal Oil Point Offshore - Devereaux	1961	172,685. ** ##
Alegria Offshore	1962	1,826
Wayside Canyon	1962	3,444
Molino Offshore	1962	125,714. **
Caliente Offshore Gas	1962	5,803
Cojo Offshore	1963	44,093. ***
Santa Susana	1963	10,581
Point Conception	1965	1,560
Carpinteria Offshore (State + OCS)	1966	127,476
Big Mountain	1966	2,441
South Ellwood Offshore	1966	145,045. ** ##
Las Posas	1967	52
Dos Cuadras (OCS)	1968	281,284
Pitas Point Gas (OCS)	1968	42,836
Government Point (OCS)	1968	> 10,000. *** #
Lyon Canyon	1969	374
Hueneme (OCS)	1969	11
Hondo (OCS)	1969	427,302. **
Oak Park	1969	1,999
Pescado (OCS)	1970	147,912. **
Sacate (OCS)	1970	> 100,000. ***#
Sockeye (OCS)	1970	100,050. **
“West Sacate” P-0195 (OCS)	1970	> 1,000. ***#
Simi, Alamos	1971	221
Santa Clara (OCS)	1971	89,294. **
Santa Paula, Willoughby	1971	5
Santa Clara Avenue	1972	6,445
Tapo Ridge	1974	110
Pacoima	1974	5,179
West Moorpark	1976	261
“San Miguel” P-0176 (OCS)	1977	> 10,000. ***#
Santa Rosa Gas (OCS)	1978	> 1,000. ***#
Ojai, Sulphur Crest	1979	2,743
Chaffee Canyon	1980	1,492

“Horsefish” P-0318 (OCS)	1981	> 10. *** #
Castle Rock P-0324 (OCS)	1981	> 1,000. *** #
“North Croaker” P-0335 (OCS)	1981	> 10,000. *** #
Rincon Creek	1982	108
Sword (OCS)	1983	> 10,000. *** #
“Chucklehead” P-0358 (OCS)	1983	> 1,000. *** #
Castle Rock P-0321 (OCS)	1983	> 10,000. *** #
Wilson Rock (OCS)	1983	> 10,000. *** #
Anacapa (OCS)	1984	> 1,000. *** #
“West Hueneme” P-0203 (OCS)	1985	> 1,000. *** #
Embarcadero Offshore	1985	135,925. *** ##
Gato Canyon (OCS)	1985	> 10,000. *** #
Smugglers Cove (OCS)	1985	> 100,000. *** #
“Seabass” P-0479 (OCS)	1987	> 10,000. *** #
“Proteus” P-0512 (OCS)	1989	> 1,000. *** #

* No published production or reserves information; author’s calculation

** Partially developed field

*** Undeveloped field

Unpublished estimate

Estimate derived from Coal Oil Point Project EIR

Santa Maria Basin

The Santa Maria basin has undergone petroleum development since the early 1900's. Although numerous breas and tar seeps were known to the Native Americans and early settlers of the region, the petroleum development of this basin lagged somewhat behind that of the nearby Santa Barbara-Ventura and San Joaquin basins.

Development History

The earliest known wildcat oil wells in the basin date to 1887-88. Not until 1900 did exploration begin on a widespread basis, and by 1901 the first commercial discovery was made at the Orcutt oil field. Several other important discoveries were made during the first decade of the century in the areas of Lompoc (1903), Casmalia (1905), West Cat Canyon (1908), and East/Central Cat Canyon (1909). These oldest fields account for most of the petroleum production in the onshore portion of the basin to date. Since 1910, only two onshore fields larger than 50 million BOE have been discovered in the basin.

Drillers of the early 1900's recognized that the reservoir rocks of these fields were not typically oil sands but rather shales. It was also surmised that the oil was being produced from fractures in the shales ("crevice oil"). Many operators reported that it was not unusual for one or two wells in a field to produce at very high initial rates (in excess of 10,000 barrels per day) while nearby wells produced at rates several orders of magnitude lower. Another unusual trait common to many basin wells was the sudden "encroachment" of water, thereby ruining the productivity of the well. Lastly, the oil produced in the basin tended toward the heavy, asphaltic type.

Production practices of the day, in hindsight, can only be described as primitive. Lease boundary "wars" were common, leading to inefficient well spacing and excessively high production rates. Most early wells were drilled with cable tool methods and completed open hole. Reservoir gas pressure was quickly bled off during drilling and production. These poor production practices tended to lower the yield in these older fields.

The exploration and production experience in the Santa Barbara Channel, at places like Summerland, Ellwood, and Rincon, and farther south at Huntington Beach, proved that oil and gas could be produced in the near shore environment. The discovery, in 1948, of the Guadalupe oil field along the Pacific coast of the Santa Maria basin helped confirm the belief that additional undiscovered hydrocarbon resources may exist in the nearby offshore areas.

By the early 1960's, it was clear from submarine geological and geophysical mapping that several structural trends existed similar to those seen in the onshore basin and in the nearby Santa Barbara Channel. The 1963 Federal Lease Sale (LS) P1 resulted in several leases in the offshore Santa Maria basin and other basins along the central California coast. In the Santa Maria basin, one offshore well, "Oceano #1", was drilled, but at the time it was not considered to be a commercially successful well. By 1968, all of the P1 leases had been relinquished and the offshore area abandoned.

In the early 1970's, several factors led to the re-evaluation of the petroleum potential of the offshore Santa Maria basin. One key factor was the sudden increase in the price of oil engineered by the OPEC cartel. This increase changed the production economics of the marginal, heavy crude oil of the Monterey Formation, which was thought to be reservoired offshore. Another key factor was the discovery and successful production (or production tests) of Monterey oils at the South Ellwood Offshore, Hondo, Pescado, Sacate, and Sockeye oil fields in the Santa Barbara Channel. This showed that Monterey oil could be commercially produced offshore.

In 1979, Federal Lease Sale 48 was held. Although it was primarily focused on the Santa Barbara Channel and the Southern California Borderland, the extreme southern portion of the Santa Maria basin was also included. In 1981, a large field discovery was made on LS 48 tract P-0316. It was evident that at least one of the structural trends in the offshore Santa Maria basin was productive.

Lease Sale 53, conducted in mid-1981 for the offshore Santa Maria basin, resulted in the issuance of 60 leases, including some areas previously leased in Lease Sale P1. Record high bids were tendered at LS 53.

From LS 53 tracts, a number of new field discoveries, on several different trends, were made. Delineation drilling on P-0450 proved up the northern half of the P-0316 discovery, later named the Point Arguello field. The Point Pedernales field, now in production, was also discovered on LS 53 tracts.

In addition to these two producing fields, several other medium (25-50 million BOE) to large (50 -100 million BOE) field discoveries have been made, which are not yet in production. Given the geological and regulatory difficulties encountered by the operators of the offshore Santa Maria basin fields, the pace of development in the region has slowed dramatically. Therefore, production plans for many of the offshore fields remain in the preliminary stage. However, unlike the experience of the mid-1960's (P1 leases), many of the LS 53 lessees have retained the rights to these leases.

Field Size Distribution

The onshore portion of the Santa Maria basin follows a normal discovery sequence. The largest onshore accumulation was located first, and most of the large accumulations were located early in the sequence. Only one of the nine accumulations discovered in the past 25 years will ultimately produce over 1 million BOE.

The offshore discovery sequence is quite different from onshore and has been controlled by the lease sale process. On Federal OCS lands, 12 of the 13 discoveries were made over a short 3-year period (1981-84) following LS 48 and LS 53. To date, State Tidelands and other large areas of the offshore basin have not been available for lease, although potential there has long been recognized.

Like the field size distribution developed for the Santa Barbara-Ventura basin, emphasis was put on modeling distinct accumulations. Therefore, “fields” were re-defined and re-evaluated when necessary. In particular, this affected the Cat Canyon and Santa Maria Valley “fields” significantly (11 rather than 2 fields). In several cases, conterminous “producing areas” were combined as a single accumulation (i.e., Cat Canyon East and Central). Small outlying pools were necessarily lumped with larger productive areas due to the lack of specific production records.

The histogram of the 47 Santa Maria basin accumulations is markedly skewed (fig. B-3). A lognormal distribution would plot as a normal (bell-shaped) curve. This histogram shows a relative abundance of fields in the 10 to 100 million BOE size range.

The log probability plot for the basin also shows this deviation from strict lognormality (fig. B-4). One interpretation of this plot is that it represents two different lognormal populations. It may be that the structural geology or geologic history of the offshore portion of the basin differs enough from the onshore area to produce the observed deviation. Alternatively, it may be that a statistically insufficient sample of the basin’s population has been identified to date. Future discoveries, or greater precision in developing the data, might modify the data set enough to show lognormality.

The field listing and original recoverable reserves data are presented in table B-2. Data sources were similar to those for the Santa Barbara-Ventura. Where the listing herein differs from the published public information sources, original recoverable reserves were sometimes re-estimated.

Figure B-3. Histogram of Original Recoverable Reserves from 47 known fields in the Santa Maria basin.

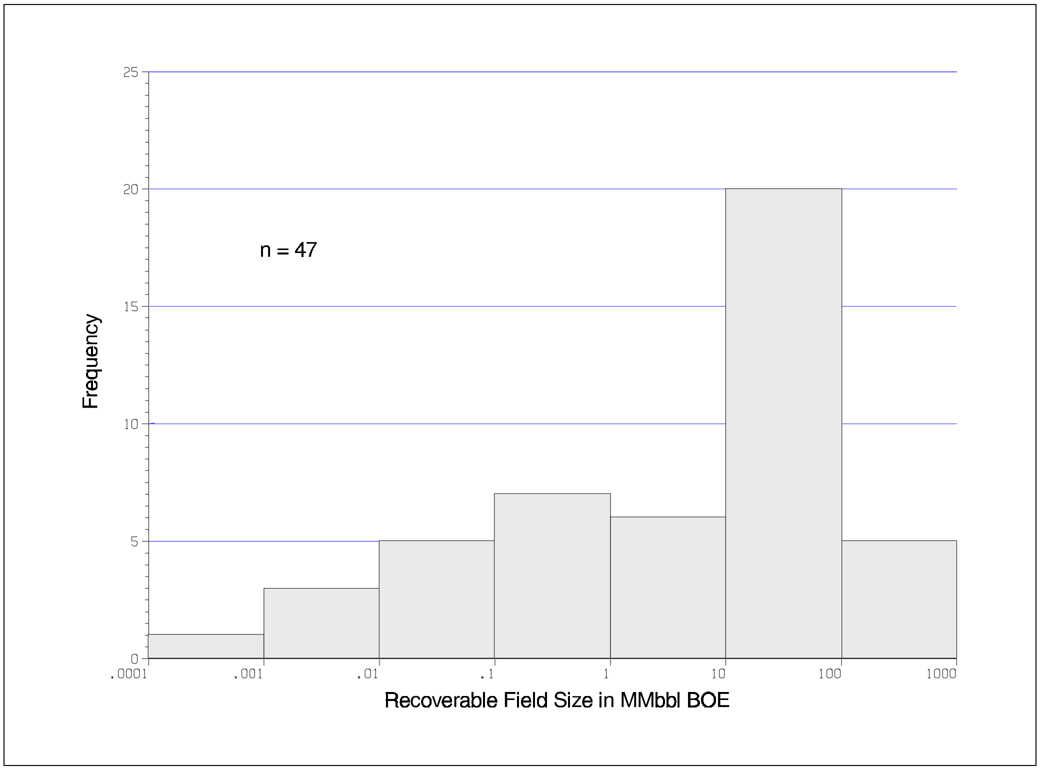


Figure B-4 . Log probability plot of Original Recoverable Reserves from 47 known fields in the Santa Maria basin.

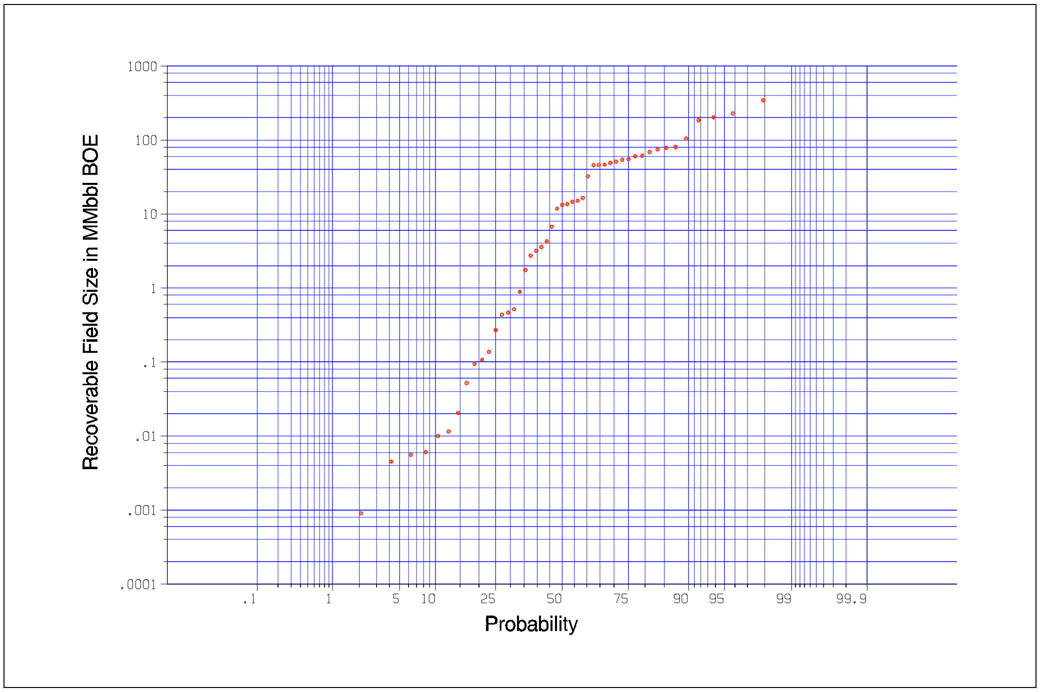


Table B-2. Original Recoverable Reserves for 47 known fields in the Santa Maria basin.

Field Name	Discovery Year	Original Recoverable Reserves (MBOE)
Orcutt, Main	1901	228,713
Lompoc, Main	1903	55,078
Casmalia, Main	1905	53,751
Arroyo Grande, Tiber	1906	13,604
Cat Canyon, West	1908	185,457. *
Cat Canyon, East and Central	1909	46,421. *
Cat Canyon, Gato Ridge	1915	49,216. *
Huasna, Tar Springs	1928	11
Arroyo Grande, Oak Park	1929	887
Santa Maria Valley, Main (includes outliers)	1934	202,185. *
Orcutt, Careaga	1937	107
Santa Maria Valley, Southeast	1941	15,085. *
Zaca, Main (includes "Hathaway" Area)	1942	32,248
Barham Ranch, Old	1943	268
Cat Canyon, Olivera Canyon	1944	6,726. *
Cat Canyon, Sisquoc-Bradley Canyon (includes 2 outlying areas)	1944	68,550. *
Cat Canyon, Tinaquaic	1945	137. *
Four Deer	1947	3,177
Guadalupe	1948	46,077
Jesus Maria, Main and West	1948	465
Santa Maria Valley, West (includes outliers)	1953	3,577. *
Lopez Canyon	1963	6
Santa Maria Valley, North	1965	1
Huasna, Lavoie-Hadley	1965	20
Santa Maria Valley, Clark and Bradley (includes 2 outlying areas)	1968	45,530. *
Los Alamos	1972	515
Careaga Canyon, Old	1976	96
Sisquoc Ranch	1980	6
Point Arguello (OCS)	1981	343,813. **
Jalama (OCS)	1981	>10,000. *** #
"Sugar Maple" P-0443 (OCS)	1983	>10,000. *** #
Santa Maria (OCS)	1982	>1,000. *** #
Northwest Harris Canyon	1983	10
San Miguel-Lion Rock (OCS)	1983	>10,000. *** #
Point Pedernales (OCS)	1983	80,325. **
Bonito (OCS)	1983	>10,000. *** #
Rocky Point (OCS)	1983	>100,000. *** #
Electra (OCS)	1983	>10,000. *** #
Purisima Point (OCS)	1983	>10,000. *** #
"Calliope" P-0395 (OCS)	1983	>10,000. *** #
Barham Ranch, La Laguna	1983	4,262
Careaga Canyon, San Antonio Creek	1983	436

Lompoc, Northwest	1983	2,731
Point Sal (OCS)	1984	>10,000. *** #
Jesus Maria, East	1985	52
Orcutt, West Careaga	1988	4
“Trout” P-0435 (OCS)	1989	>10,000. *** #

* Modified from CDOGGR estimates

** Partially developed field

*** Undeveloped field

\# Unpublished estimate

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Appendix C - Annual Development Activities

The pace of development activities in the Pacific OCS slowed during 1995. Twenty-one new wells and 5 redrills reached total depth by the end of 1994, but only 18 new wells and redrills were drilled in 1995 (tables C-1 and C-2). The number of wells completed or recompleted by yearend decreased markedly, from 44 in 1994 to 24 during 1995. Other work was completed at each of the 11 producing fields.

Field Activities

Beta Field

Beta Field is the only producing Pacific OCS field in the Los Angeles Basin. One new development well was drilled in the field during 1995, and another well was sidetracked. Some 23 electric submersible pump changes were performed. Additional work included two sand control repairs and four injection packer changes. Waterflood operations continued in Leases OCS-P 0300 and 0301. Maximum oil production for the year was 9,397 bpd in May; gas production peaked at 2,681 Mcfpd the same month. Annual oil and gas production decreased, continuing the downward trend established over the previous 10 years.

Carpinteria Offshore Field

There were no new development wells drilled at Carpinteria Offshore Field during 1995, but three workovers were conducted by yearend. Workovers included changing one well from gas lift to progressive cavity pump, converting another gas lift well to rod pump, and a single acid stimulation. Oil and gas production for the year peaked at 2,527 bpd and 2,036 Mcfpd, respectively, in January. A study of the feasibility of using extended reach drilling to increase productivity and ultimate recovery is continuing.

Dos Cuadras Field

Technological advances, including the completion of trilateral horizontal wells, have allowed the operator to temporarily offset the natural production decline at Dos Cuadras Field. Although five wells (including four trilateral wells) were drilled in 1993, no new wells were drilled during 1994 or 1995. Pump conversions or changes were performed in four wells, six received acid or solvent stimulations, and four wells received bridge plugs. In addition, one well was converted to water injection, and one well was recompleted. Although oil production in 1991 averaged only 8,500 bpd, the completion of the trilateral wells had pushed production up to 10,600 bpd by December 1993. Peak oil production during 1995 occurred in January, with an average rate of 8,632 bpd; gas production for the year peaked at 8,698 Mcfpd in May.

Hondo Field

The development of Hondo Field continued in 1995 with the drilling of six additional wells from Platform Harmony. A number of workovers were also performed. Seven acid jobs were completed, and perforations were added in seven wells. No wells were drilled from Platform Hondo in Lease OCS-P 0188. Annual oil production from Hondo Field approached 13.5 MMbbl in 1982, but subsequently declined to 7.4 MMbbl in 1993. Production from the western portion of the field commenced from Platform Harmony in December 1993; average daily oil production rates reached 46,379 bpd in August 1995. Gas production during 1995 peaked at 73,328 Mcfpd the same month. Oil and gas production from Hondo Field reached record levels during 1995 of 14.9 MMbbl and 21.4 Bcf, respectively.

Hueneme Field

No new wells were drilled in Hueneme Field during 1995. Tubing repairs were carried out in two producing wells, however. Monthly oil production in 1995 peaked in August at 1,209 bpd, produced through electric submersible pumps in conjunction with the active water drive. Gas production peaked in December at 2,353 Mcfpd. Annual oil production increased slightly to approximately 361 Mbbl, while gas production for the year reached a near record level of over 392 MMcf.

Pescado Field

Pescado Field became the eleventh producing field in the Pacific OCS in December 1993. Ten new development wells and sidetracks were drilled from Platform Heritage during 1995. All use gas lift to produce heavy oil from completions in the Monterey Formation. A number of workovers were also performed, including four acid jobs, one perforation job, and plugging back one well. Annual oil production totaled almost 18.7 MMbbl. Most of the almost 7.1 Bcf of gas produced during 1995 was reinjected, leaving net gas production for the year at just 313,748 Mcf. Oil production rates reached 61,739 bpd in October; gross gas production rates peaked at 26,876 Mcfpd in December.

Pitas Point Field

Pitas Point Field is the only producing gas field in the Pacific OCS. No new wells or redrills were drilled in the field during 1995. Two completions were performed during the year. Peak gas production for 1995 occurred in January, when daily production averaged 20,412 Mcfpd. Condensate production reached a maximum rate of 14 bpd the same month.

Point Arguello Field

Only one redrill was completed in Point Arguello Field during 1995. Two additional wells received new completion strings, and the operator installed an electric submersible pump in another well. Fourteen wells had perforations added in the Monterey Formation, while 13 wells had perforations plugged back. Twelve wells in Point Arguello Field were acidized. One well was temporarily abandoned, and the producing intervals in two other wells were abandoned in preparation for redrills. Average daily oil production for the year reached a peak of 71,468 bpd in January; peak gas production of 37,947 Mcfpd occurred in December.

Point Pedernales Field

Two new development wells were drilled in Point Pedernales Field during the year. Electric submersible pumps were changed in four wells, and one well was deepened. Oil and gas production from Point Pedernales Field increased during 1995, peaking in April at 17,038 bpd and 9,413 Mcfpd, respectively. Gas production for the year reached a record high of 2.6 Bcf.

Santa Clara Field

There was no drilling activity in Santa Clara Field during 1995. Acid jobs were performed on 12 wells, 11 of which were injection wells. Two wells received pump changes, and one well received additional perforations. The operator shut-in one well in preparation for a redrill and temporarily abandoned two shut-in production wells. Oil and gas production from the field continued to decline. Peak oil production for the year occurred in May, when an average rate of 4,142 bpd was attained. Gas production rates peaked in April at 3,828 Mcfpd.

Sockeye Field

No new development wells were drilled from Platform Gail in Sockeye Field during 1995. Two shut-in wells were converted to injectors. Perforations were added in four wells in the Monterey, Sespe, or Juncal Formations. Two producing wells and two injection wells were acidized. The operator also used coiled tubing to remove sand from two wells. Peak oil and gas production for the year occurred in January, when average daily rates reached 9,715 bpd and 23,917 Mcfpd, respectively. Annual oil production increased to a near record level of over 2.9 MMbbl, although gas production during 1995 declined to approximately 6.5 Bcf.

Table C-1. Summary of development well borehole status at yearend, 1995.

Platform Name	APD	ACT	DSI	COM	PA	ST	TA	**Total**
A				50		15		65
B				53	1	21		75
C				34			0	34
Edith				18		1	2	21
Ellen	1			61	4	5		71
Eureka				47	1	1		49
Gail				19	1			20
Gilda	1			60	3	7	2	73
Gina				12		2		14
Grace				23	2	6	3	34
Habitat				18	1		2	21
Harmony		1		14				15
Harvest				18			1	19
Henry				23	1	1		25
Heritage		1		17		1		19
Hermosa				13	1			14
Hidalgo				10	1			11
Hillhouse				47		4		51
Hogan				36	4	10		50
Hondo				28		9		37
Houchin				32	3	7	1	43
Irene				21	2	3	1	27
Total	2	2	0	654	25	93	12	788

Table C-2.
Summary of development well completion status at yearend, 1995.

Platform Name	POW	GLO	PGW	OSI	GSI	GIW	WIW	WDW	WSW	**Total**
A	36			9			8			53
B	37			11			9			57
C	24			4			11			39
Edith	15			3						18
Ellen	23		1	11	1		21	1	3	61
Eureka	29		1	1			16			47
Gail	5	17		2			2			26
Gilda	31		1	9	3		19			63
Gina	5		1	1			5			12
Grace		7		12	4		1			24
Habitat			12		8					20
Harmony		12		1		1				14
Harvest	6	7		5						18
Henry	21			2						23
Heritage		15		1		1				17
Hermosa	2	8		3						13
Hidalgo		10								10
Hillhouse	32			14			1	1		48
Hogan	12			20		1		3		36
Hondo	6	15		4		2	1	1		29
Houchin	14			18						32
Irene	2	13		5		1				21
Total	300	104	16	136	16	6	94	6	3	681

Appendix D - Annual and Cumulative Oil and Gas Production

Oil and gas production from the Pacific OCS began in June 1968 from Carpinteria Offshore Field. By December 31, 1995, 10 additional fields were producing oil and gas. Peak gas production in the region occurred in 1985, when nearly 64 Bcf of gas were produced. The most oil produced from the Pacific OCS in a single year was over 72 MMbbl, in 1995. To date, approximately 750 MMbbl of oil and 703 Bcf of gas have been produced from 11 fields. Cumulative production equals over one-third of the original recoverable oil reserves and almost one-fourth of the original recoverable gas reserves.

Annual Production

Oil production from the Pacific OCS reached a new peak during 1995, when approximately 72 MMbbl of oil were produced (table D-1, and figs. D-1 and D-2). This amount, produced from only 23 platforms in 11 fields, represents over one-sixth of the Nation's OCS oil production for the year.

Point Arguello Field produced almost 22 MMbbl of oil during 1995, which amounts to almost one-third of the region's oil production. Eight of the 24 most productive oil wells in the Pacific OCS are located in Point Arguello Field; 3 of these 8 wells produced over 2 MMbbl of oil. Nine of the region’s most prolific wells produce oil from Pescado Field, with 4 of the 9 exceeding 2MMbbl during 1995. The other wells producing over 1 MMbbl of oil for the year are located in Hondo and Point Pedernales Fields (table D-2). These 24 wells accounted for over one-half of the oil produced in the region during 1995.

Net gas production from the Pacific OCS had increased slightly by yearend, to over 51 Bcf. This can be largely attributed to increasing gas production from Hondo Field. Gas production from Pitas Point Field, the only producing gas field in the region, continued to decline during 1995, as did gas production from Point Arguello and Sockeye Fields. Production from these four fields exceeded 42 Bcf, accounting for three-fourths of the gas produced in the Pacific OCS.

Six of the 12 wells that produced over 1 Bcf of gas during 1995 are located in Hondo Field (table D-3). Four of the most prolific gas wells are located in Point Arguello Field, and one produces from Pescado Field. Only 1 of the 12 is located in Pitas Point Field, the region’s single producing gas field.

During 1995, over three-fourths of the oil and about two-thirds of the gas were produced from reservoirs in the Monterey Formation (fig. D-3). Reservoirs in younger rocks were the source of most of the remaining production. The proportion of produced oil and gas obtained from Monterey Formation reservoirs will increase as production from Point Arguello, Hondo, and Pescado Fields continues, and as production from the more mature fields in the Pacific OCS declines.

Cumulative Production

Cumulative production approached 750 MMbbl of oil and 703 Bcf of gas in 1995 (table D-1 and fig. D-4). The amount of oil produced to date exceeds one-half of the proved original recoverable reserves and one-third of the total original recoverable reserves. The cumulative gas production estimate has been adjusted to reflect gas reinjection in the region; net gas production to date equals almost one-third of the proved original recoverable reserves and almost one-fourth of the total original recoverable reserves.

Dos Cuadras Field has produced more oil than any other field in the Pacific OCS. Almost one-third of the region's cumulative oil production can be attributed to Dos Cuadras Field. Over one-half of the cumulative oil production can be attributed to just two fields, Dos Cuadras and Hondo. Dos Cuadras, Hondo, Point Arguello, and Beta Fields have contributed about three-fourths of the oil produced to date.

Net gas production from Pitas Point Field, the only producing gas field in the Pacific OCS, exceeds that from any other field in the region. Hondo Field currently ranks second in terms of cumulative gas production. The combined total gas production from the two fields amounts to approximately one-half of the cumulative gas production from the region. Hondo, Pitas Point, and Dos Cuadras Fields have produced about two-thirds of the natural gas obtained from Pacific OCS fields.

Over one-half of the oil and gas produced to date can be attributed to post-Monterey reservoirs (fig. D-5). Production from Monterey Formation reservoirs continues to increase, however, and about one-third of the oil and gas produced by December 31, 1995, has been obtained from reservoirs in the Monterey Formation.

Table D-1. Annual and cumulative production for the Pacific OCS.

*** Note:** Gas volumes for 1995 have been adjusted to account for reinjected gas.

Year	Annual Oil (bbl)	Cumulative Oil (bbl)	Annual Gas (Mcf)*	Cumulative Gas (Mcf)*
1968	2,076,160	2,076,160	1,237,180	1,237,180
1969	9,942,733	12,018,893	6,016,485	7,253,665
1970	25,035,171	37,054,064	13,757,148	21,010,813
1971	31,103,681	68,157,745	17,853,055	38,863,868
1972	22,562,566	90,720,311	12,546,915	51,410,783
1973	18,818,026	109,538,337	9,157,714	60,568,497
1974	16,784,100	126,322,437	7,234,937	67,803,434
1975	15,434,507	141,756,944	5,978,959	73,782,393
1976	13,977,436	155,734,380	5,533,258	79,315,651
1977	12,258,013	167,992,393	5,366,181	84,681,832
1978	11,979,674	179,972,067	5,193,985	89,875,817
1979	10,971,013	190,943,080	5,430,689	95,306,506
1980	10,118,614	201,061,694	5,771,792	101,078,298
1981	19,619,670	220,681,364	12,769,110	113,847,408
1982	28,471,665	249,153,029	17,814,958	131,662,366
1983	30,558,866	279,711,895	23,923,258	155,585,624
1984	30,500,506	310,212,401	45,912,435	201,498,059
1985	29,673,649	339,886,050	63,523,094	265,021,153
1986	28,779,936	368,665,986	57,989,035	323,010,188
1987	31,284,618	399,950,604	54,874,298	377,884,486
1988	31,529,776	431,480,380	49,132,759	427,017,245
1989	33,067,789	464,548,169	50,872,623	477,889,868
1990	29,885,271	494,310,184	49,950,216	527,796,524
1991	31,623,014	525,896,641	52,390,640	580,197,225
1992	42,711,426	568,610,886	55,268,116	635,258,278
1993	50,656,382	619,321,164	51,832,124	687,459,521
1994	58,244,162	677,582,722	50,892,378	738,337,427
1995	72,435,648	749,972,392	51,064,173*	702,577,637*

Figure D-1.
Annual production for the Pacific OCS.

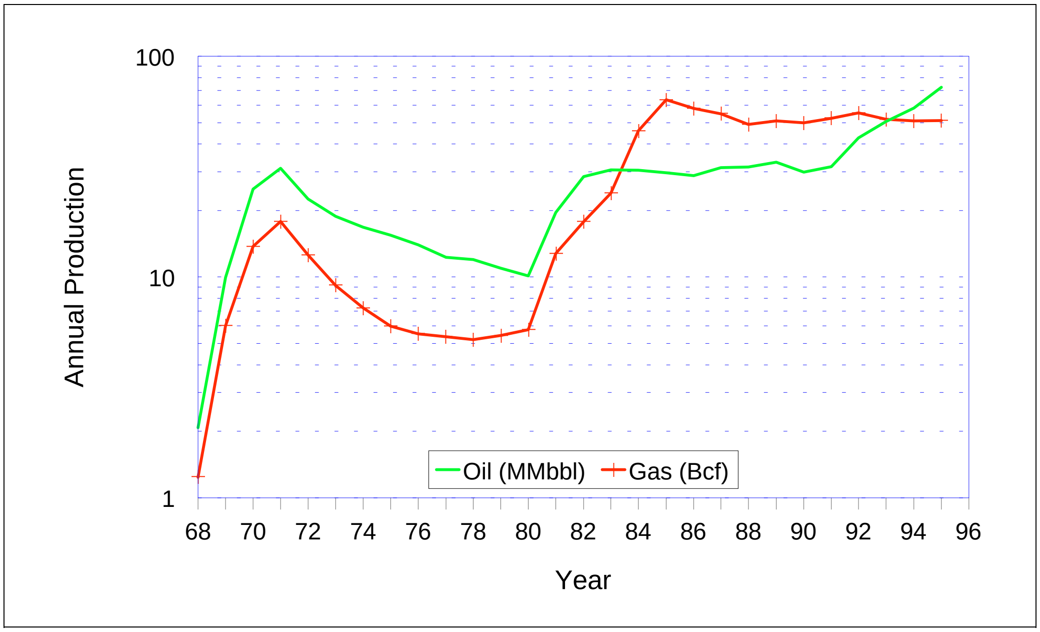


Figure D-2.
Average daily production for the Pacific OCS.

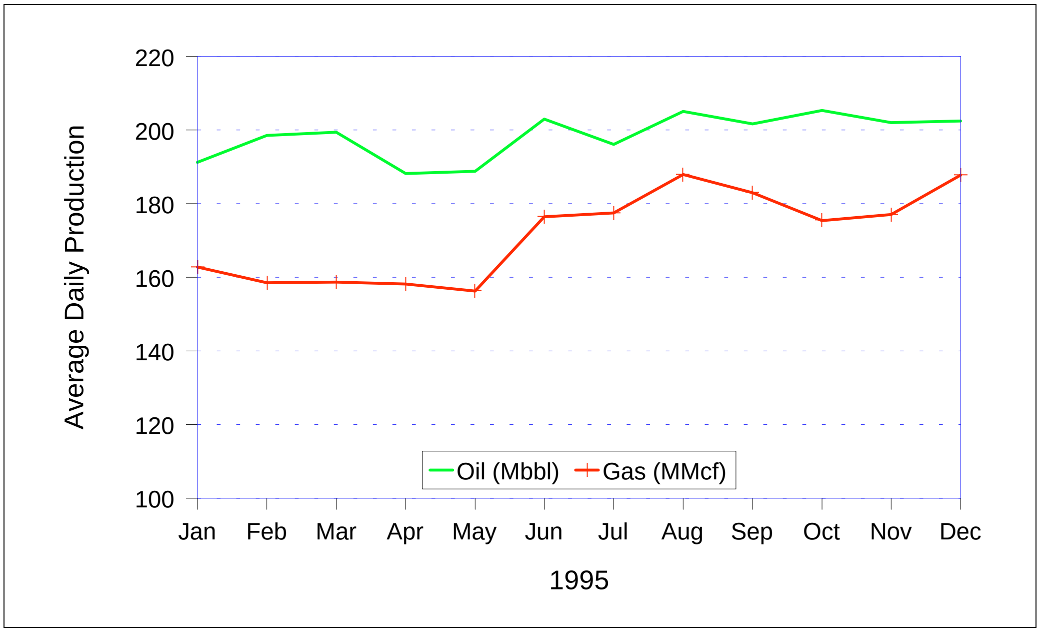


Table D-2. Wells producing over 1 MMbbl of oil, Pacific OCS.

1995 Annual Production						
Field	Lease	Well	Oil (bbl)	Gas (Mcf)	Water (bbl)	Days Prod.
PTARGL	P 0316	B-2	2,650,889	1,795,957	926,259	358
PTARGL	P 0316	B-3	2,575,354	1,347,548	387,527	357
PTARGL	P 0315	A-3	2,422,907	1,317,675	472,164	355
PESCDO	P 0182	HE-4	2,182,306	550,229	21,567	360
PESCDO	P 0182	HE-3	2,153,192	798,667	8,256	357
PESCDO	P 0183	HE-7	2,052,589	562,552	182,940	359
PESCDO	P 0182	HE-1	2,031,995	872,669	26,937	359
PESCDO	P 0182	HE-11	1,821,572	447,975	51,020	327
PESCDO	P 0182	HE-9	1,757,321	1,085,454	354,864	353
PESCDO	P 0183	HE-10	1,756,507	791,700	69,081	336
PESCDO	P 0182	HE-5	1,710,247	322,858	140,549	359
PTARGL	P 0315	A-17	1,587,905	612,028	636,141	355
HONDO	P 0190	HA-1	1,564,256	502,404	199,590	359
PESCDO	P 0182	HE-12	1,542,979	820,548	49,899	286
HONDO	P 0190	H-3	1,491,255	748,769	104,493	353
PTARGL	P 0315	A-13	1,439,930	585,208	330,656	353
HONDO	P 0190	HA-5	1,435,692	503,995	338,172	358
PTARGL	P 0316	B-6	1,415,773	868,448	976,728	356
PTARGL	P 0315	A-4	1,367,212	901,677	12,845	355
PTARGL	P 0316	B-11	1,187,812	1,031,206	910,155	340
HONDO	P 0190	HA-8	1,082,113	424,784	303,568	358
HONDO	P 0181	HA-7S	1,050,542	2,461,895	168,902	346
HONDO	P 0190	HA-3	1,018,078	2,378,467	253,677	359
PTPDNS	P 0437	A-21	1,004,584	295,510	830,258	334

Table D-3.
Wells producing over 1 Bcf of gas, Pacific OCS.

1995 Annual Production						
Field	Lease	Well	Oil (bbl)	Gas (Mcf)	Water (bbl)	Days Prod.
HONDO	P 0188	H-23	47,380	3,342,713	27,049	349
HONDO	P 0181	HA-7S	1,050,542	2,461,895	168,902	346
HONDO	P 0190	HA-10	774,896	2,410,474	21,597	260
HONDO	P 0190	HA-3	1,018,078	2,378,467	253,677	359
PTARGL	P 0316	B-2	2,650,889	1,795,957	926,259	358
HONDO	P 0188	H-12	93,837	1,514,045	27,241	332
PITSPT	P 0234	A-19	815	1,503,635	39,185	365
PTARGL	P 0316	B-3	2,575,354	1,347,548	387,527	357
HONDO	P 0188	H-5	86,527	1,341,608	60,805	356
PTARGL	P 0315	A-3	2,422,907	1,317,675	472,164	355
PESCDO	P 0183	HE-9	1,757,321	1,085,454	354,864	353
PTARGL	P 0316	B-11	1,187,812	1,031,206	910,155	340

Figure D-3.
Annual production of oil and gas by reservoir age group, Pacific OCS, Dec. 31, 1995.

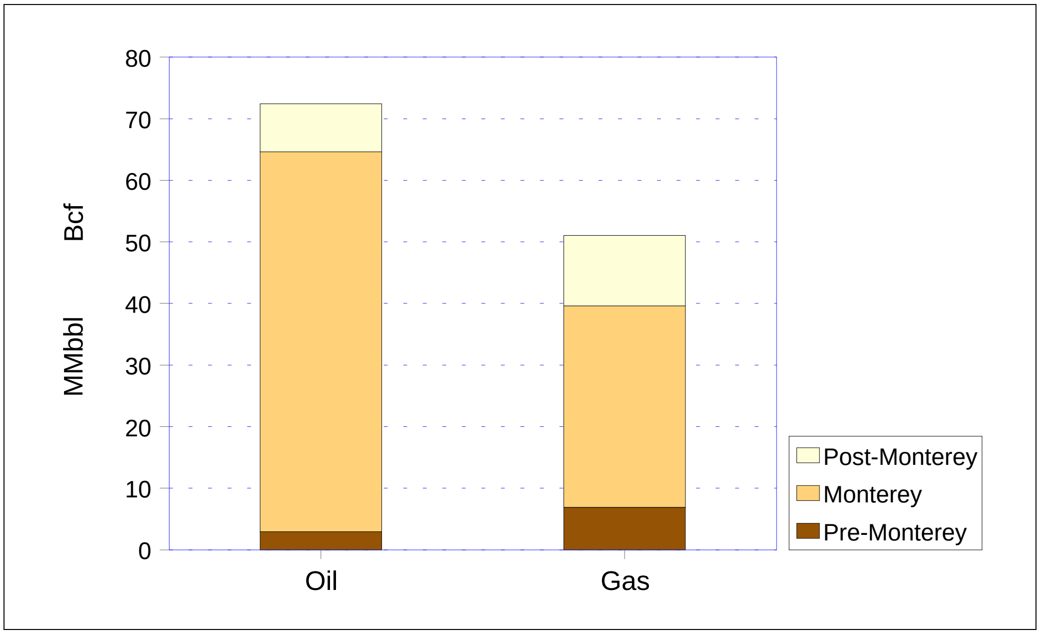


Figure D-4.
Cumulative production for the Pacific OCS.

***Note:**
Gas numbers for 1995 have been adjusted to account for reinjected gas.

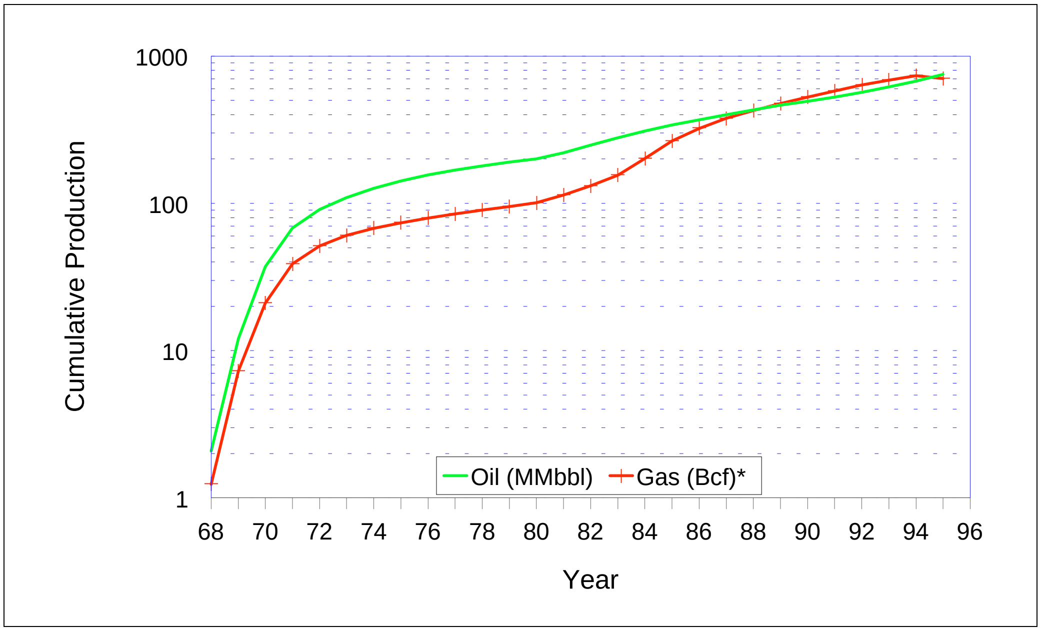
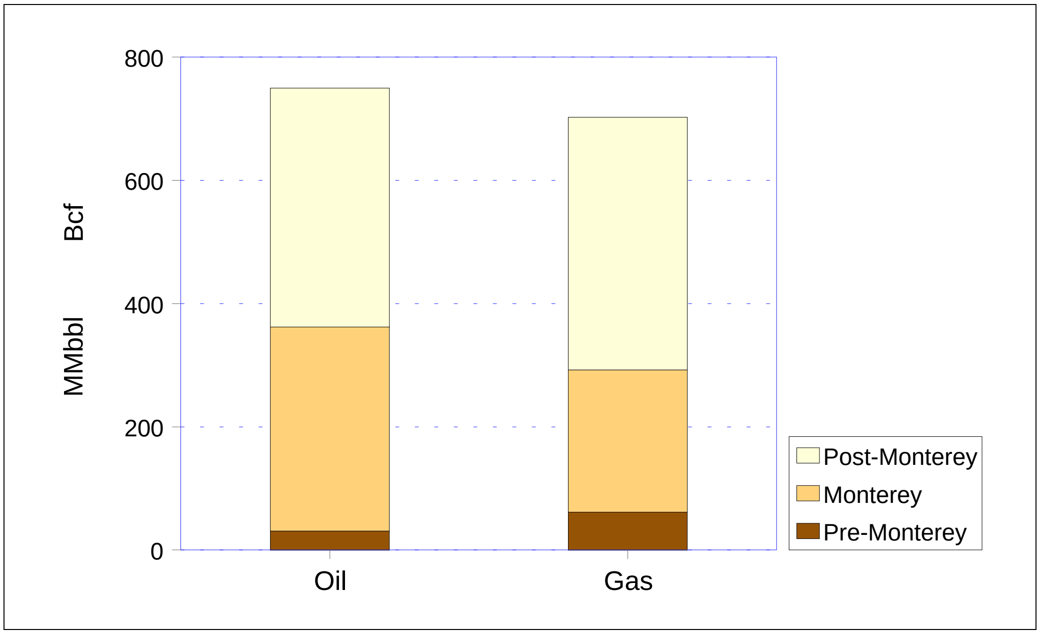


Figure D-5.
Cumulative production of oil and gas by reservoir age group, Pacific OCS, Dec. 31, 1995.



The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.