

Oceanside-Capistrano Basin

The following is an excerpt from a Minerals Management Service report, entitled
*1995 National Assessment of United States Oil and Gas Resources
Assessment of the Pacific Outer Continental Shelf Region.*

A copy of this report may be obtained upon request, as follows:

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Oceanside-Capistrano Basin

by Frank W. Victor

Location

The Oceanside-Capistrano basin is the southernmost basin in the Inner Borderland province (fig. 1). Most of the basin is located offshore; however, a small, partly exhumed portion of the basin exists onshore near Dana Point (fig. 2). This onshore area is referred to as the Capistrano syncline; it is bounded on the north by the Coast Ranges and extends about 10 miles in width from the San Joaquin Hills eastward to a generally north-south-trending boundary along which Cretaceous strata are exposed in outcrop. Offshore, the basin is bounded on the northwest by the Dana Point sill and extends southerly about 50 miles to the vicinity of La Jolla; it is bounded to the west by the Thirtymile bank and extends about 30 miles east into State waters. The entire basin is about 50 miles long and averages 30 miles in width and occupies an area of about 1,500 square miles. Water depth in the basin ranges from 0 (coastline) to about 3,000 feet.

Although the onshore and State offshore portions of the Oceanside-Capistrano basin lie outside the Federal offshore assessment province, the entire basin was assessed and is discussed herein.

Geologic Setting

The Oceanside-Capistrano basin is an asymmetrical structural trough filled with up to 11,000 feet of Cretaceous and Tertiary marine and nonmarine clastic rocks. The northwest-trending Newport-Inglewood fault zone lies offshore near the eastern margin of the basin (fig. 2); the fault has been a major feature in the tectonic and structural evolution of the basin. Large, compressional fault-bound anticlines, faulted homoclines, and stratigraphic pinchouts west of the fault zone are evident on seismic-reflection profiles. Most of these structures are located in the Federal offshore area, but a few extend into the State offshore area; these structures are numerous and large enough to contain significant quantities of oil and gas. The Newport-Inglewood structural trend has major petroleum significance in the Oceanside-Capistrano basin since this is the same fault and structural trend along which several prolific oil fields exist in the onshore Los Angeles basin.

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The Capistrano syncline is a flat-bottomed, north-south-trending structural trough formed by downwarping of the eastern part of the San Joaquin Hills on the west and down-to-the-west displacement of the Cristianitos fault zone on the east. The syncline is separated from the Los Angeles basin proper by the structurally high San Joaquin Hills and its northward extension into the subsurface. Up to 3,700 feet of middle and upper Miocene marine rocks overlie schist breccia and Paleogene and Cretaceous strata within the syncline (Wright, 1991).

Exploration

Exploration within the offshore part of the basin has been limited. Only two boreholes (the Mobil San Clemente #1 and Shell Oceanside #1 coreholes) have been drilled offshore. The coreholes were drilled as stratigraphic tests in the 1960's and did not encounter any oil or gas. The Mobil San Clemente corehole penetrated Pliocene and Miocene rocks (presumably of the Capistrano and Monterey Formations, and the San Onofre Breccia). The Shell Oceanside corehole penetrated Pliocene rocks (presumably of the Capistrano Formation). No deep exploratory wells have been drilled in the basin.

A number of high-quality seismic-reflection surveys have been recorded offshore. Many of the profiles from these surveys extend into State waters.

Onshore, more than 60 exploratory wells have been drilled from the early 1950's to 1984. Two fields—the San Clemente and Cristianitos Creek fields—have been discovered. Collectively, these fields produced a very small quantity (less than 5 Mbbl) of high-gravity (45 to 54 °API) oil from the Upper Cretaceous Williams Formation in the late 1950's. Both fields were considered to be subcommercial and have been abandoned. One of the last significant wells was drilled in 1981 as an extension to the San Clemente field, and it was dry.

Plays

Four petroleum geologic plays within the basin have been defined; the plays are defined on the basis of reservoir rock stratigraphy (fig. 3). The plays (and corresponding reservoir rock formations) include (1) the Upper Miocene Sandstone play (Capistrano Formation), (2) the Monterey Fractured play (Monterey Formation), (3) the Lower Miocene Sandstone play (San Onofre Breccia, Topanga and Vaqueros Formations),

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and (4) the Paleogene-Cretaceous Sandstone play (Williams, Silverado, Santiago, and Sespe(?) Formations). The Upper Miocene Sandstone, Monterey Fractured, and Lower Miocene Sandstone plays are restricted to the offshore area of the basin; these plays are considered to be conceptual plays based on the absence of directly detected hydrocarbons. The Paleogene-Cretaceous Sandstone play exists onshore and offshore and is an established play because hydrocarbon accumulations have been discovered in the play onshore.

Resource Estimates

Undiscovered Conventionally Recoverable Resources

Play-specific estimates of undiscovered conventionally recoverable resources have been developed using the subjective assessment method, and these estimates have been statistically aggregated to estimate the total volume of resources in the basin. Select data used to develop the resource estimates are shown in appendix C.

Estimates of the volume of resources in the Federal offshore, State offshore, and onshore portions of each play were subsequently calculated using subjective judgment, and the area-specific play estimates have been summed to estimate the total volume of resources in each area of the basin.

As a result of this assessment, the total volume of undiscovered conventionally recoverable oil and gas resources in the entire Oceanside-Capistrano basin is estimated to be 1.11 Bbbl of oil and 1.30 Tcf of associated gas (mean estimates). This volume may exist in 51 fields with sizes ranging from approximately 90 Mbbl to 450 MMbbl of combined oil-equivalent resources ([fig. 4](#)). The low, mean, and high estimates of resources in the basin are listed in [table 1](#) and illustrated in [figure 5](#).

The Federal offshore portion of the basin is expected to contain the majority of these fields and resources, or approximately 1.07 Bbbl of oil and 1.25 Tcf of associated gas ([table 2](#)). The State offshore portion of the basin is estimated to contain approximately 47 MMbbl of oil and 57 Bcf of associated gas. A negligible volume of resources (less than 100 Mbbl of combined oil-equivalent resources) is expected to exist in the onshore portion of the basin.

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Undiscovered Economically Recoverable Resources

Estimates of undiscovered conventionally recoverable resources in the basin that may be economically recoverable under various economic scenarios have been developed using the economic assessment method. Select data used to develop the resource estimates are shown in appendix D.

As a result of this assessment, 743 MMbbl of oil and 869 Bcf of associated gas are expected to be economically recoverable from the Oceanside-Capistrano basin under economic conditions existing as of this assessment (i.e., the \$18-per-barrel economic scenario) (table 3). Larger volumes of resources are expected to be economically recoverable under increasingly favorable economic conditions (fig. 6).

The majority of undiscovered economically recoverable resources in the basin are expected to exist in the Federal and State offshore portions of the basin.

Total Resource Endowment

As of this assessment, cumulative production from the onshore portion of the basin was 4.6 Mbbl of oil and 11 MMcf of gas; remaining reserves were estimated to be negligible. These discovered resources (all of which are from the Paleogene-Cretaceous Sandstone play) and the aforementioned undiscovered conventionally recoverable resources collectively compose the basin's estimated total resource endowment of 1.11 Bbbl of oil and 1.30 Tcf of gas (table 4).

Acknowledgments

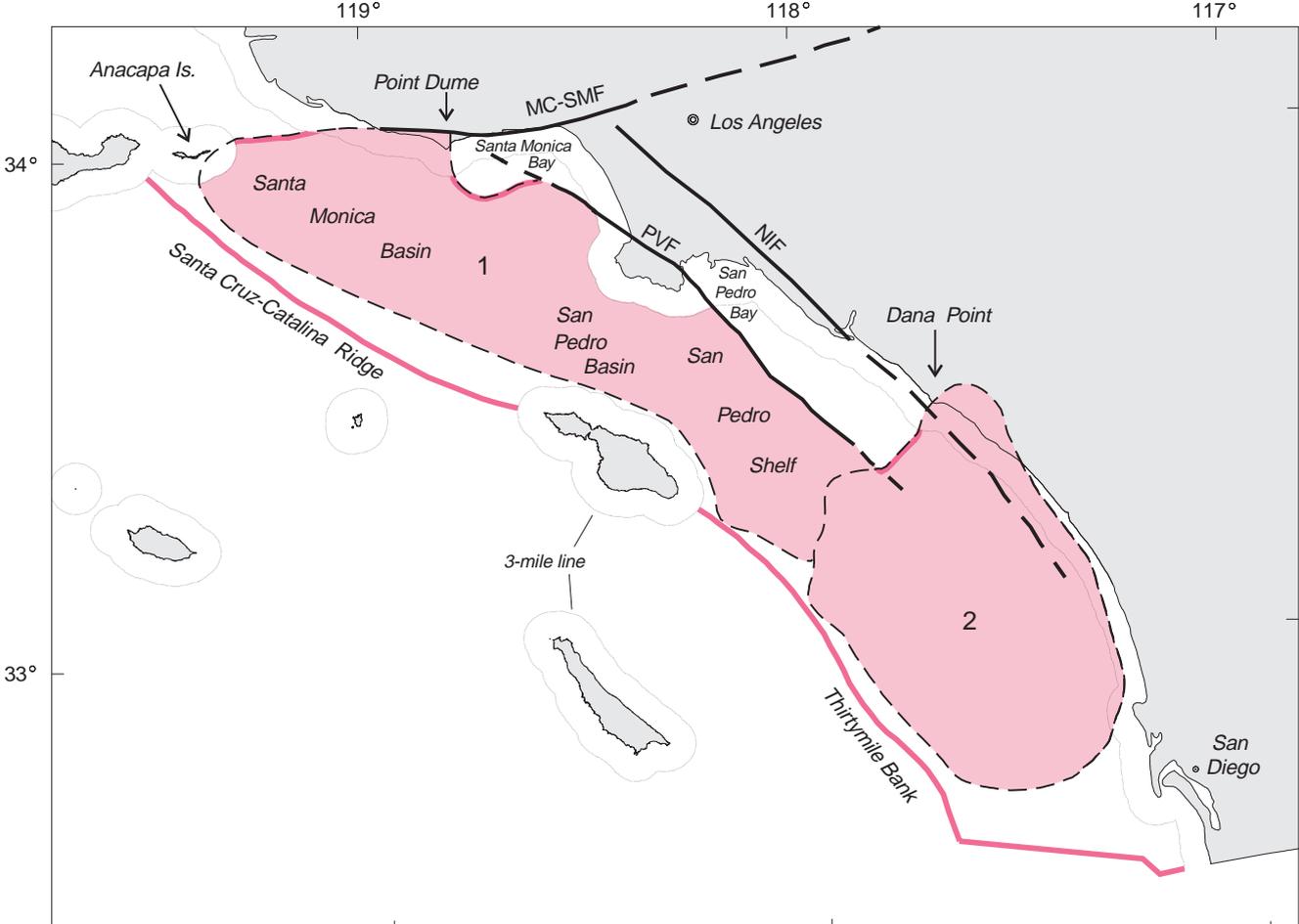
Jim Crouch is acknowledged for sharing his knowledge and insight regarding the Oceanside-Capistrano basin. Larry Beyer was helpful in providing onshore information. Acknowledgment is also due to Bill Kou who performed the seismic interpretive mapping of the offshore part of the basin.

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Selected References

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LEGEND

- | | | | |
|--|---------------------------------|---|--|
|  | Province boundary |  | Major fault zone (dashed where inferred) |
|  | Geologic basin or area boundary | MC-SMF | Malibu Coast-Santa Monica Fault |
| | 1 Santa Monica-San Pedro Area | NIF | Newport-Inglewood Fault |
| | 2 Oceanside-Capistrano Basin | PVF | Palos Verdes Fault |
| | |  | Assessed area |



Figure 1. Map of the Inner Borderland province showing geologic basins and areas, and assessed areas.

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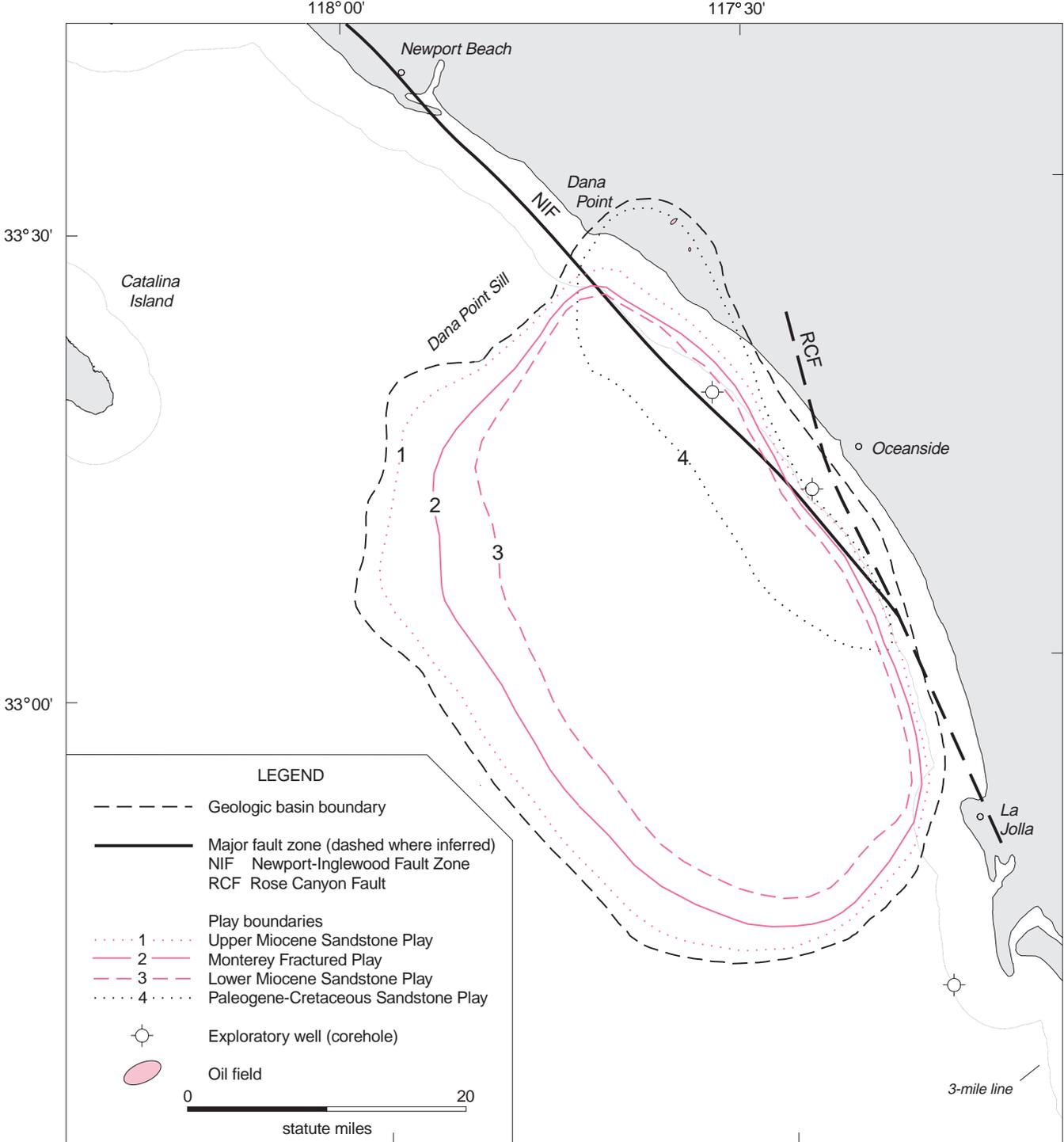


Figure 2. Map of the Oceanside-Capistrano basin showing plays, wells, and fields.

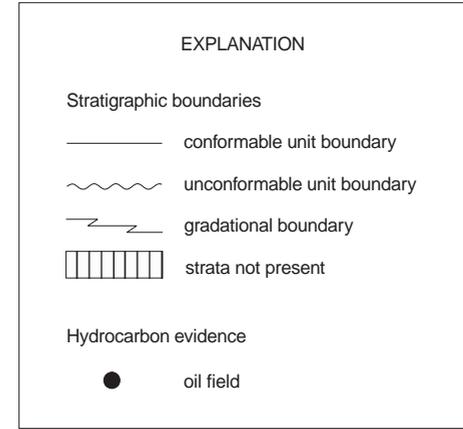
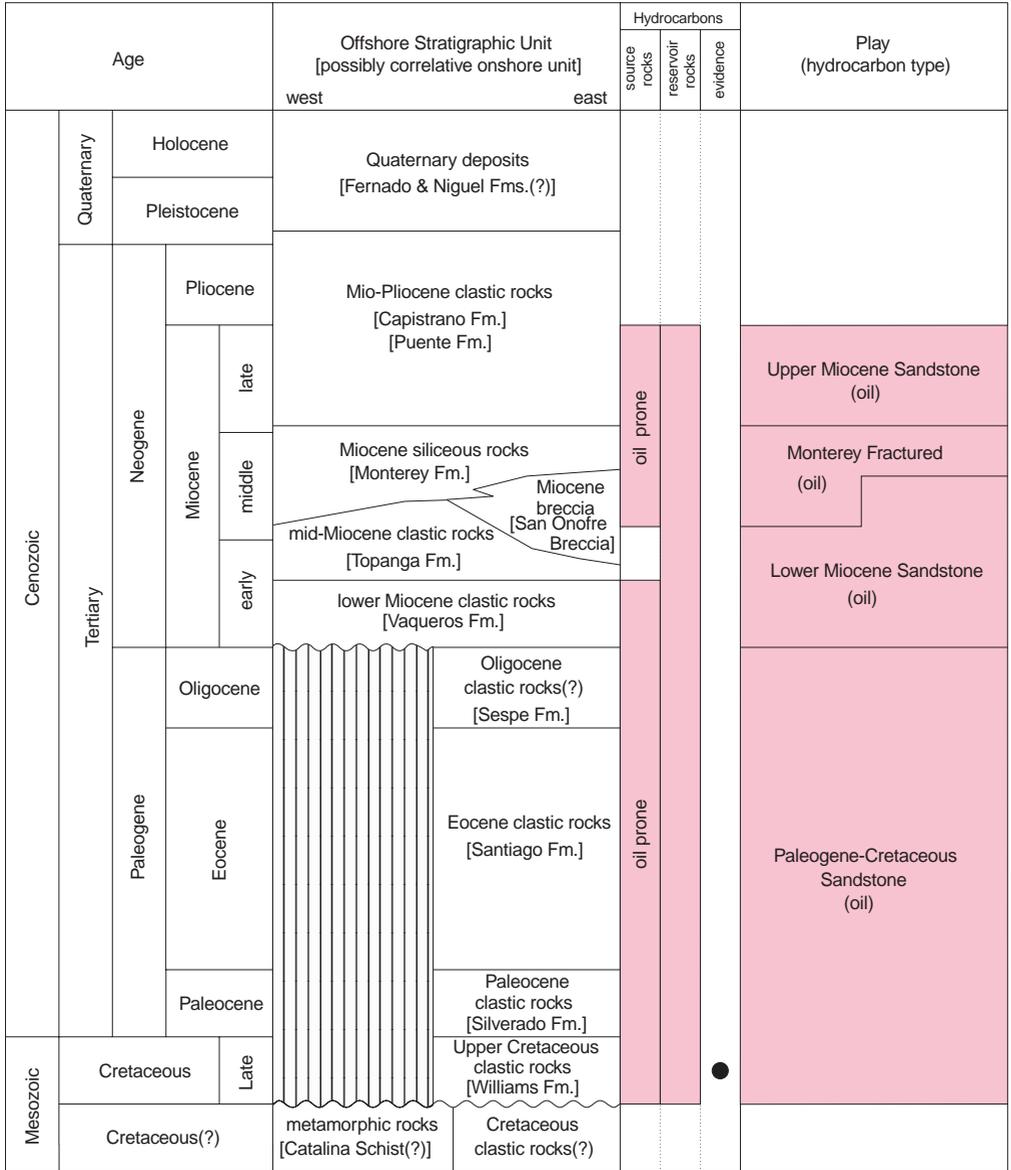


Figure 3. Stratigraphic column of the Oceanside-Capistrano basin showing stratigraphic units, hydrocarbon attributes, and plays.

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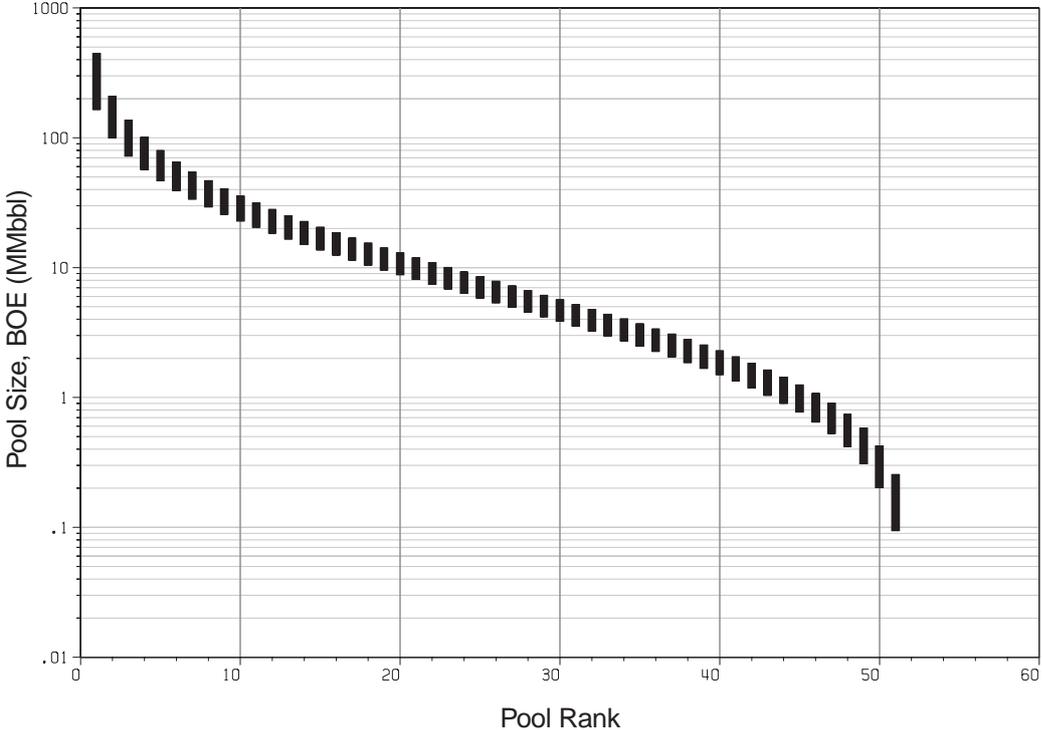


Figure 4. Field-size rank plot of estimated undiscovered conventionally recoverable resources of the Oceanside-Capistrano basin. Sizes of undiscovered fields are shown by bars; the top and bottom of a bar represent the 25th and 75th percentile values of a probability distribution, respectively.

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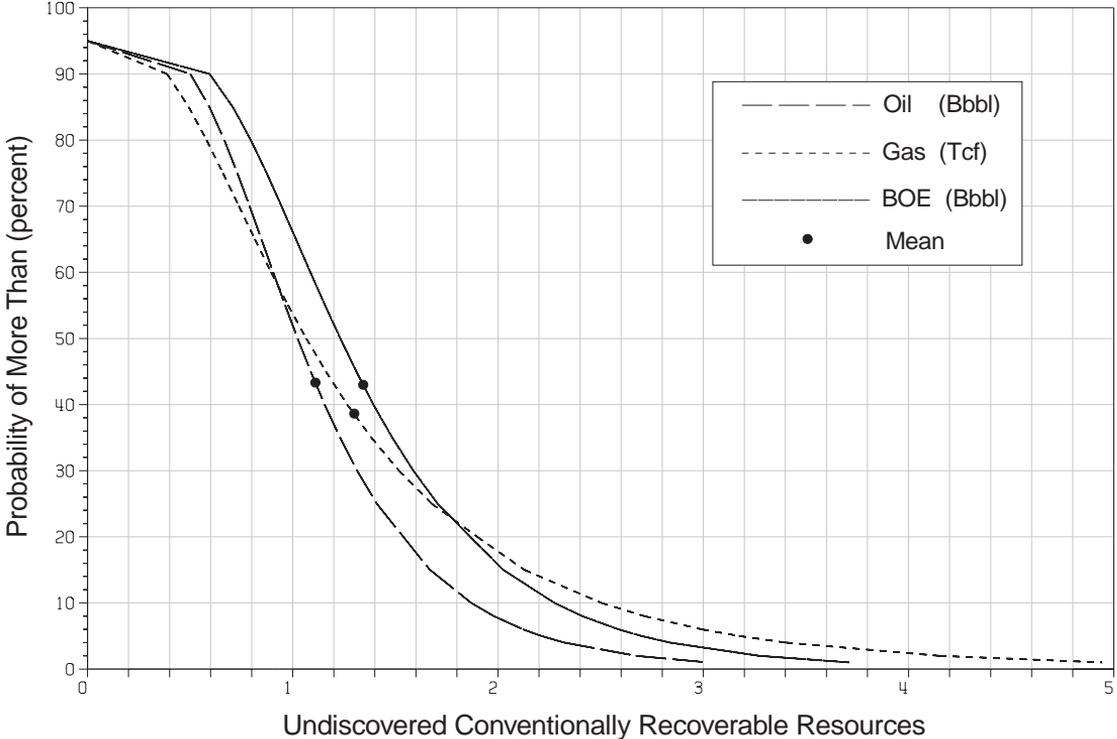


Figure 5. Cumulative probability plot of estimated undiscovered conventionally recoverable resources of the Oceanside-Capistrano basin.

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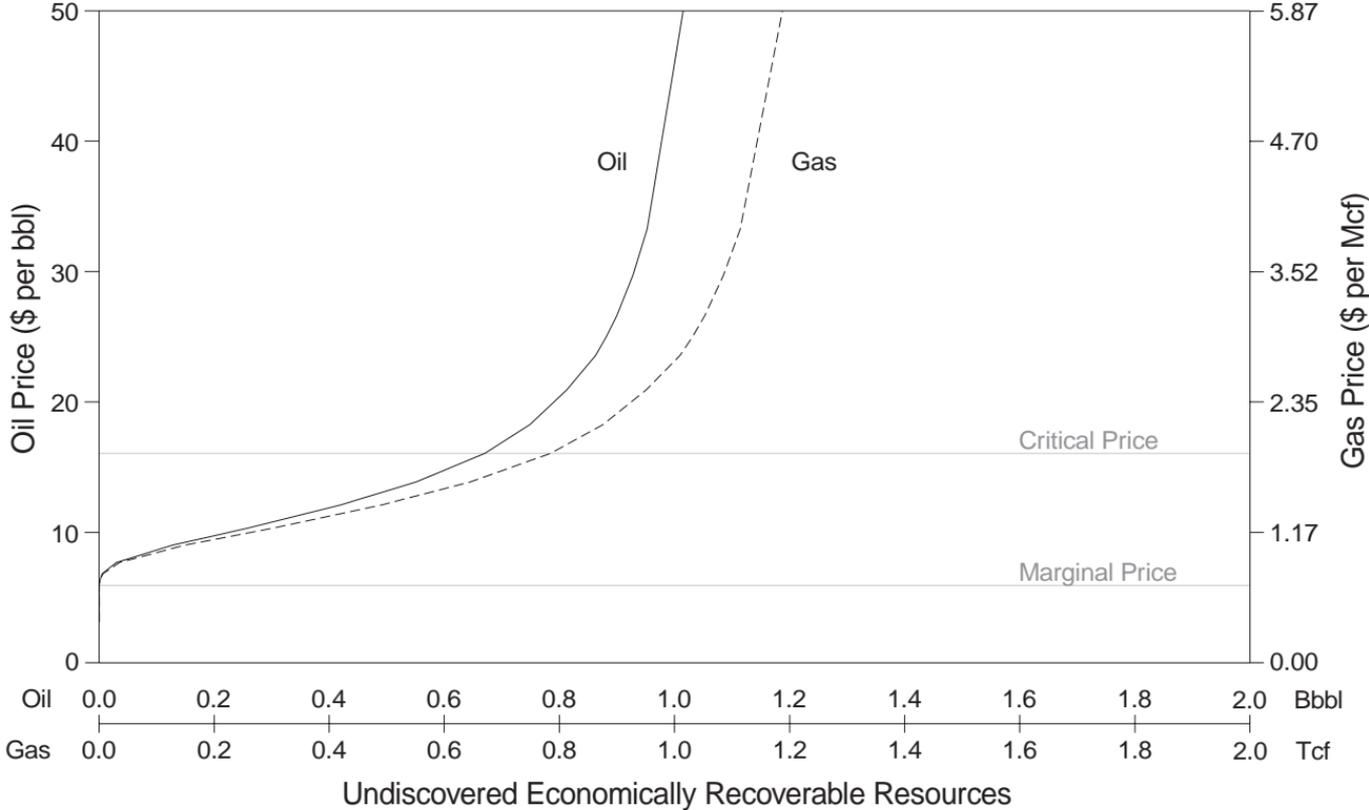


Figure 6. Price-supply plot of estimated undiscovered economically recoverable resources of the Oceanside-Capistrano basin.

Table 1. Estimates of undiscovered conventionally recoverable oil and gas resources in the Oceanside-Capistrano basin as of January 1, 1995 by play. All estimates are risked values. The low, mean, and high estimates correspond to the 95th percentile, mean, and 5th percentile values of a distribution. Percentile values are not additive; some total mean values may not equal the sum of the component values due to independent rounding.

Play	Oil (MMbbl)			Gas (Bcf)			BOE (MMbbl)		
	Low	Mean	High	Low	Mean	High	Low	Mean	High
Upper Miocene Sandstone	0	514	1,191	0	274	648	0	563	1,304
Monterey Fractured	0	387	768	0	452	983	0	467	935
Lower Miocene Sandstone	0	208	711	0	568	2,466	0	309	1,116
Paleogene-Cretaceous Sandstone	0	3	14	0	8	39	0	4	21
<i>Total</i>	<i>0</i>	<i>1,112</i>	<i>2,211</i>	<i>0</i>	<i>1,302</i>	<i>3,174</i>	<i>0</i>	<i>1,343</i>	<i>2,698</i>

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Table 2. Estimates of undiscovered conventionally recoverable oil and gas resources in the Oceanside-Capistrano basin as of January 1, 1995 by area. All estimates are risked mean values. Some total values may not equal the sum of the component values due to independent rounding.

Area	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Onshore	negligible		
State Offshore	0.05	0.06	0.06
Federal Offshore	1.07	1.25	1.29
<i>Total</i>	<i>1.11</i>	<i>1.30</i>	<i>1.34</i>

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Table 3. Estimates of undiscovered economically recoverable oil and gas resources in the Oceanside-Capistrano basin as of January 1, 1995 by economic scenario. All estimates are risked mean values. The \$18-per-barrel scenario is based on prices of \$18 per bbl of oil and \$2.11 per Mcf of gas; the \$25-per-barrel scenario is based on prices of \$25 per bbl of oil and \$2.94 per Mcf of gas; the \$50-per-barrel scenario is based on prices of \$50 per barrel of oil and \$5.87 per Mcf of gas. Some total values may not equal the sum of the component values due to independent rounding.

Economic Scenario	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
\$18 per barrel	0.74	0.87	0.90
\$25 per barrel	0.88	1.03	1.07
\$50 per barrel	1.02	1.19	1.23

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Table 4. Estimates of the total endowment of oil and gas resources in the Oceanside-Capistrano basin. Estimates of discovered resources (including cumulative production and remaining reserves) and undiscovered resources are as of January 1, 1995. Estimates of undiscovered conventionally recoverable resources are risked mean values. Some total values may not equal the sum of the component values due to independent rounding.

Resource Category	Oil (Bbbl)	Gas (Tcf)	BOE (Bbbl)
Cumulative Production	<0.01	<0.01	<0.01
Remaining Reserves	negligible		
Undiscovered Conventionally Recoverable Resources	1.11	1.30	1.34
<i>Total Resource Endowment</i>	<i>1.11</i>	<i>1.30</i>	<i>1.34</i>

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