OCS Report
MMS 2000-034

CONOCO LYDONIA CANYON BLOCK 145 No. 1 WELL

Geological and Operational Summary

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ABBREVIATIONS

API	--	American Petroleum Institute
bbl	--	barrels
BOP	--	Blow out preventer
CNL	--	Compensated neutron log
CPI	--	Carbon Preference Index
COST	--	Continental Offshore Stratigraphic Test
DST	--	drill stem test
EQMW	--	equivalent mud weight
FDC	--	compensated formation density log
FEL	--	from east line
FNL	--	from north line
FSL	--	from south line
FWL	--	from west line
k	--	permeability
KB	--	kelly bushing
LS	--	limestone
m	--	meter (s)
md	--	millidarcy
MYBP	--	million years before present
OCS	--	Outer Continental Shelf
ppf	--	pounds per foot
ppg	--	pounds per gallon
ppm	--	parts per million
psi	--	pounds per square inch
R_O	--	vitrinite reflectance
SS	--	sandstone
Sw	--	water saturation
TAI	--	thermal alteration index
TD	--	total depth
TIOG	--	threshold of intense oil generation
TOC	--	total organic carbon
UTM	--	Universal Transverse Mercator
ϕ	--	porosity

INTRODUCTION

The Conoco Lydonia Canyon (LC) Block 145 No. 1 well was the seventh to be spudded and sixth to be completed of the eight industry wildcat wells drilled on Georges Bank. Spudded on May 13, 1982, this is the northeasternmost of the Georges Bank wells. It is about 11 miles east of the Continental Offshore Stratigraphic Test (COST) G-2 well and is about on trend with the Tenneco LC Block 187 No. 1, Mobil LC Block 273 No. 1, and Shell LC Block 357 No. 1 wells. The geologic trend of the continental shelf is northeast-southwest. The Conoco well was drilled by a semi-submersible rig in 300 feet of water on the shelf about 143 miles east-southeast of Nantucket Island and 20 miles from the shelf edge.

Conoco Inc. was the designated operator for the well, and the company identified two drilling targets in its Exploration Plan, each marked by a strong seismic amplitude anomaly. Conoco inferred that the upper anomaly, at 2.05 seconds, two-way travel time, is associated with a lower Upper Jurassic "...porous shelf-edge calcarenite..." at about 9,100 feet deposited on a paleogeographic high. The deeper target, at 2.40 seconds, was interpreted to be at a depth of about 11,800 feet in Middle Jurassic carbonates. The company stated that dry gas should be the most likely hydrocarbon, trapped by a diagenetic permeability barrier on a southwest-plunging nose.

No specific lithologic or petrophysical properties were identified from well data to account for the seismic anomalies.

There were two gas shows during drilling, of 85 and 121 units, and 62 repeat formation tests were attempted but were not successful. The well bottomed in Middle Jurassic (Callovian to Bathonian) rocks, according to a company-submitted paleontological report. The well was plugged as a dry hole on August 12, 1982.

This report relies on geologic and geophysical data provided to the Minerals Management Service (MMS) by Conoco, according to Outer Continental Shelf (OCS) regulations and lease stipulations. The data were released to the public after the Conoco LC Block 145 lease No. OCS-A-0179 was relinquished on January 15, 1985. Interpretations of the data contained in this report are those of MMS and may differ from those of Conoco. Well depths are measured from kelly bushing unless otherwise stated.

The material contained in this report is from unpublished, undated MMS internal interpretations. No attempt has been made to provide more recent geologic, geochemical, or geophysical interpretations or data, published or unpublished.

This report is initially released on the Minerals Management Service Internet site **http://www.gomr.mms.gov**, and, together with the other Georges Bank well reports, on a single compact disk (CD). At a later date, additional technical data, including well "electric" logs will be added to the CD.

OPERATIONAL SUMMARY

The Conoco Lydonia Canyon (LC) Block No. 1 well (figures 1 and 2) was drilled by the Keydrill *Aleutian Key* semi-submersible drilling rig to a total depth of 14,500 feet. The well was spudded on May 13, 1982, in 300 feet of water. Daily drilling progress is shown for the well in figure 3 and well statistics are presented in table 1. The geological objectives of the well were an Upper Jurassic reef and Lower Jurassic carbonates.

A 26-inch hole was drilled to 675 feet and then opened to 36 inches. A 30-inch grade B casing was set at 677 feet with 1,390 sacks of class H cement; 940 sacks were mixed with 12-percent gel, and 450 sacks were mixed with 2-percent $CaCl_2$. The casing program is shown in figure 4.

The interval from 650 to 1,350 feet was drilled in 14 hours with a single HTC J-22 bit. Rates of penetration averaged between 70 and 75 feet per hour. This section consisted predominately of soft clays and poorly sorted sand. Background gas averaged between 5 and 10 units with no connection gas. A gelled seawater mud system was used for drilling with weights ranging from 8.7 to 9.7 pounds per gallon. A 20-inch Grade J-55 Vetco 194-pounds-per-foot casing was run to 1,299 feet. The casing was cemented with 2,679 sacks of class H cement but was not tested. The lead slurry was 12 percent gelled and the tail slurry was neat.

The interval from 1,350 feet to 4,898 feet was drilled in 85 hours using four bits. Rates of penetration ranged from 25 to 50 feet per hour in unconsolidated clastics, shales, and limestones. Background gas ranged from 2 to 5 units. A gelled seawater mud system was used in this section with mud weights between 9.3 and 9.5 pounds per gallon. The grade N-80, 72 lbs/ft, 13 3/8-inch casing was set at 4,860 feet. The casing was cemented with 2,679 sacks of class H cement consisting of 1,860 sacks of 12 percent gelled and 819 sacks neat. The formation was tested to 2,150 psi with a 9.5-pounds-per-gallon mud weight.

The interval from 4,898 feet to the total depth of 14,500 feet was drilled in 768 hours using 24 bits. Rates of penetration ranged from 10 feet per hour in clastics to 25 feet per hour in carbonates. Three conventional cores were taken in this interval, 9,191 to 9,227, 10,622 to 10,652, and 12,419 to 12,448 feet. A small increase in background gas to 85 units between 9,165 to 9,180 feet was noted. A second increase, 121 units, occurred at 13,360 to 13,380 feet. Trip gas increased to 275 units at 13,365 feet. Otherwise, background gas was one to two units through the interval.

A gelled seawater and Drispac mud system was used in drilling the entire well. Mud weight was gradually increased to 10.6 pounds per gallon at 13,300 feet. After the high gas reading was encountered at 13,360 feet, the mud weight was raised to 11.2 pounds per gallon. At 13,750 feet mud weight was again increased to 11.7 pounds per gallon to TD, 14,500 feet.

Well abandonment is shown in figure 4. Open-hole plugs were placed at 9,000 to 9,300 feet and 13,200 to 13,500 feet,

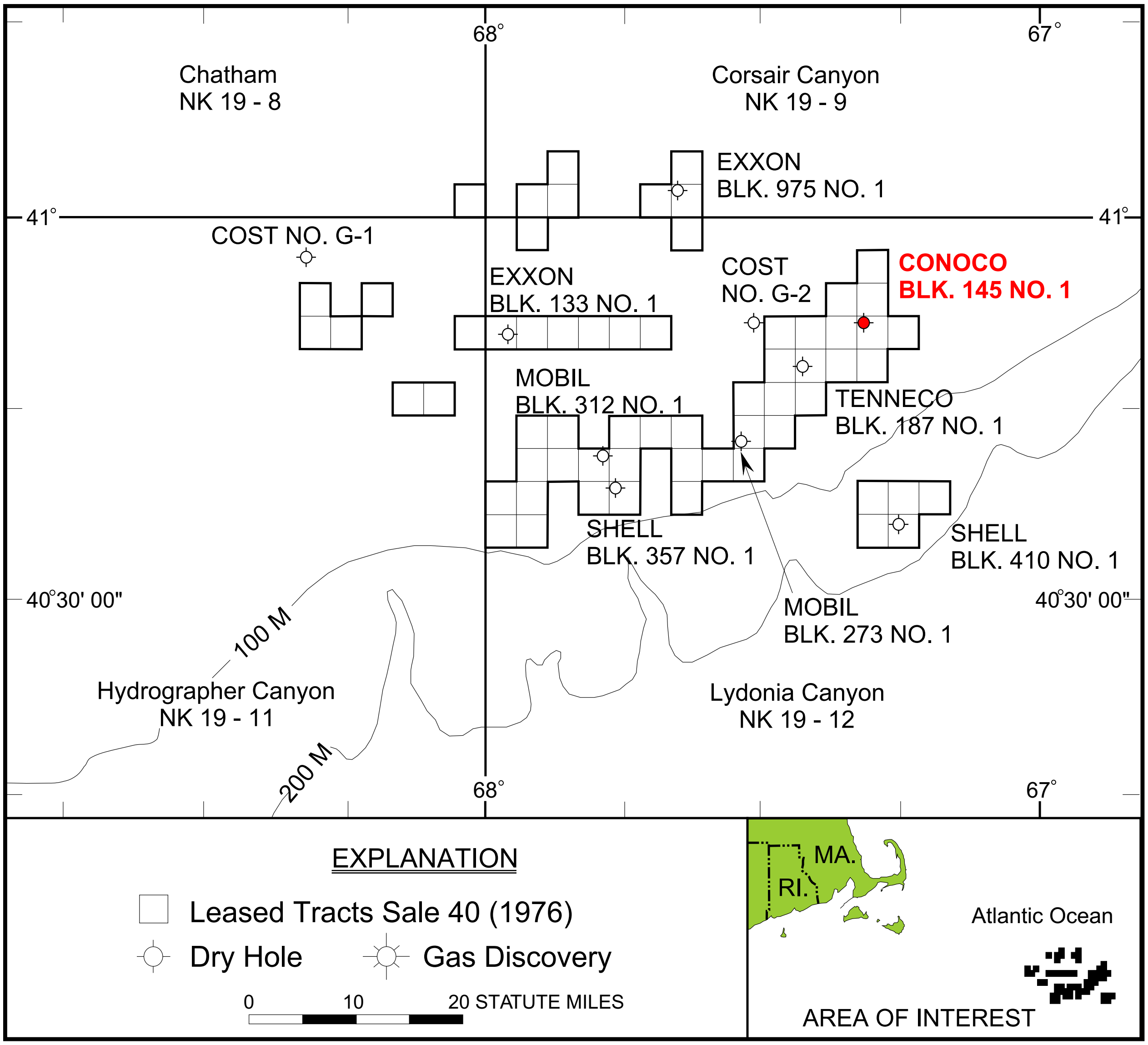

Figure 1. Map of the North Atlantic offshore area showing well locations. The Conoco Lydonia Canyon Block 145 No. 1 well is highlighted in red. Bathymetry is in meters.

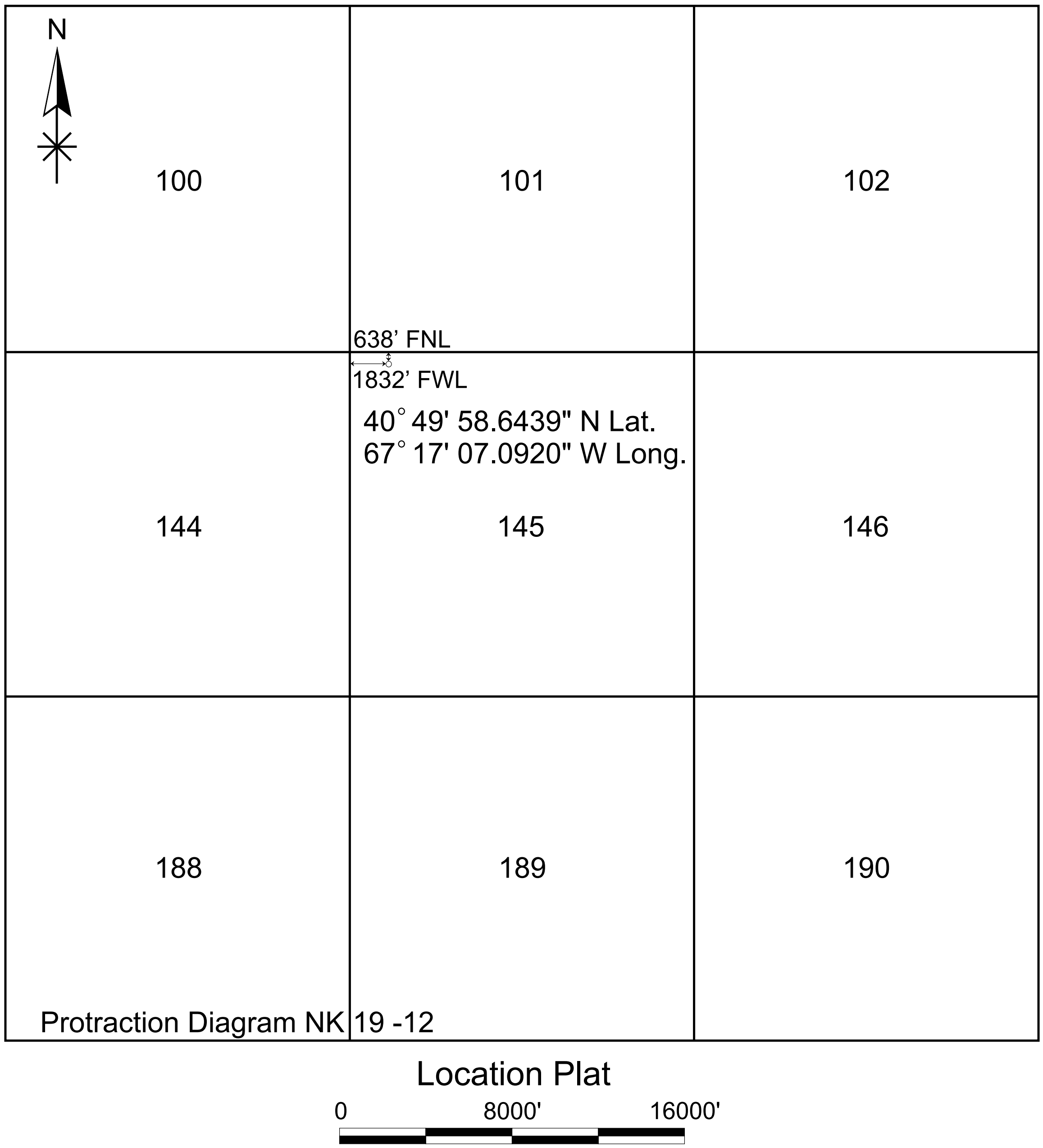

Figure 2. Location plat for the Conoco Block 145 No. 1 well on the OCS Lydonia Canyon NK 19-12 protraction diagram.

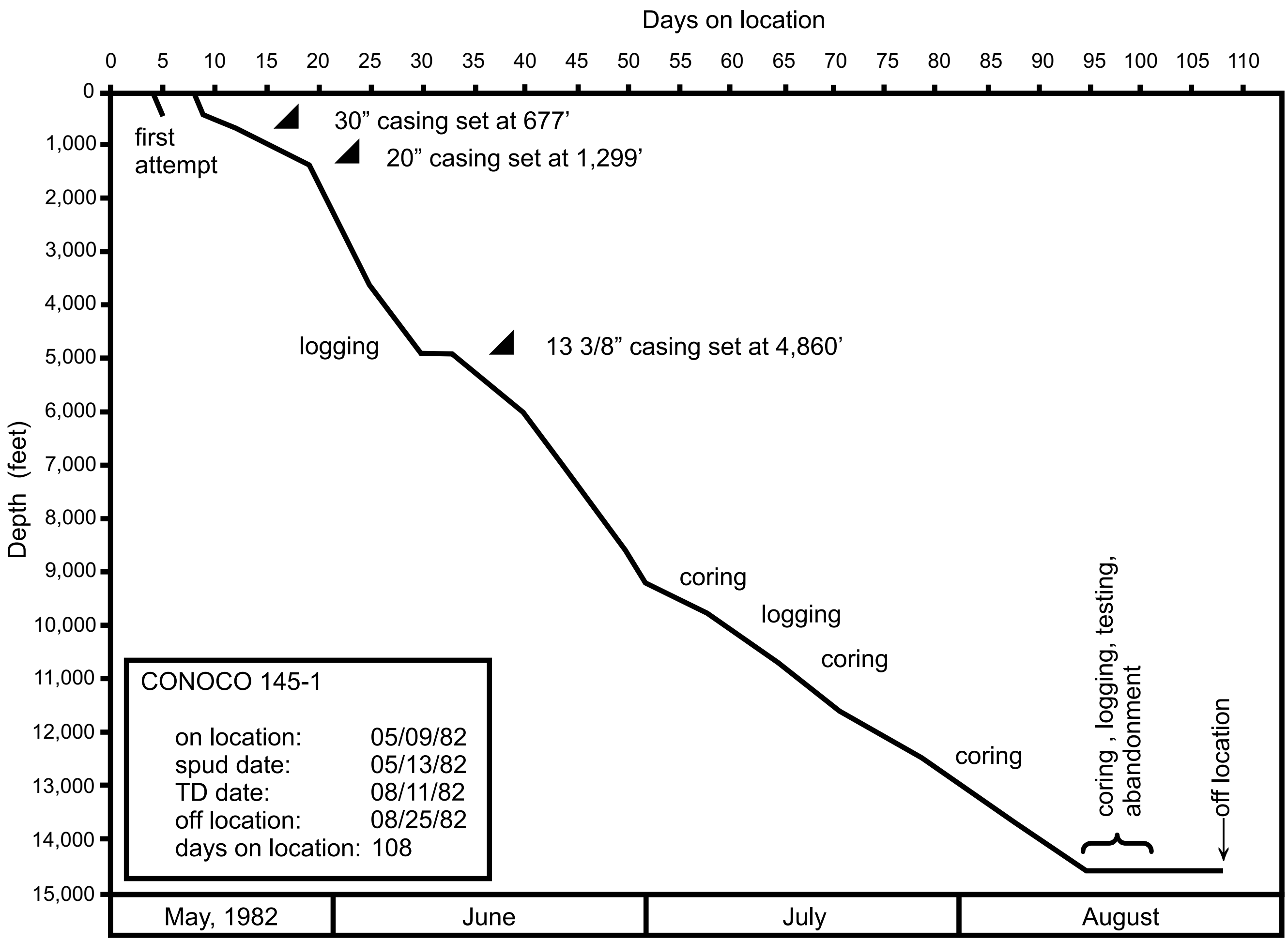

Figure 3. Daily drilling progress for the Conoco Lydonia Canyon Block 145 No. 1 well.

Table 1. Well statistics

Well Identification:	API No. 61-040-00007 Lease No. OCS-A-0179
Surface location:	Lydonia Canyon NK 19-12 LC Block 145 638 feet from North Line 1,832 feet from West Line Latitude 40° 49' 58.6439" N Longitude 67° 17' 07.0920" W UTM coordinates: X = 644,507.12m Y = 4,521,417.12m
Bottomhole location:	61.6 feet N and 70 feet E of surface location
Proposed total depth:	12,000 feet amended to 14,500 feet
Measured depth:	14,500 feet
True vertical depth:	14,398 feet
Kelly bushing elevation:	85 feet
Water depth:	300 feet
Spud date:	May 13, 1982
Reached TD:	August 11, 1982
Off location:	August 25, 1982
Final well status:	Plugged and abandoned

Note: All well depths indicated in this report are measured from the kelly bushing (measured depths), unless otherwise indicated. Mean sea level is the datum for the water depth.

using 400 and 450 sacks, respectively, of Class H cement. A cast iron bridge plug was set at 4,800 feet and 200 sacks of Class H cement were squeezed below the plug to 5,000 feet and 50 sacks were spotted above the plug to 4,750 feet. A pressure test was conducted and a surface plug was placed at 500 to 690 feet with 150 sacks of Class H cement. All three casings were cut 8 feet below mud line. Casing stubs, wellhead, and guide base were recovered and the *Aleutian Key* was off location on August 25, 1982.

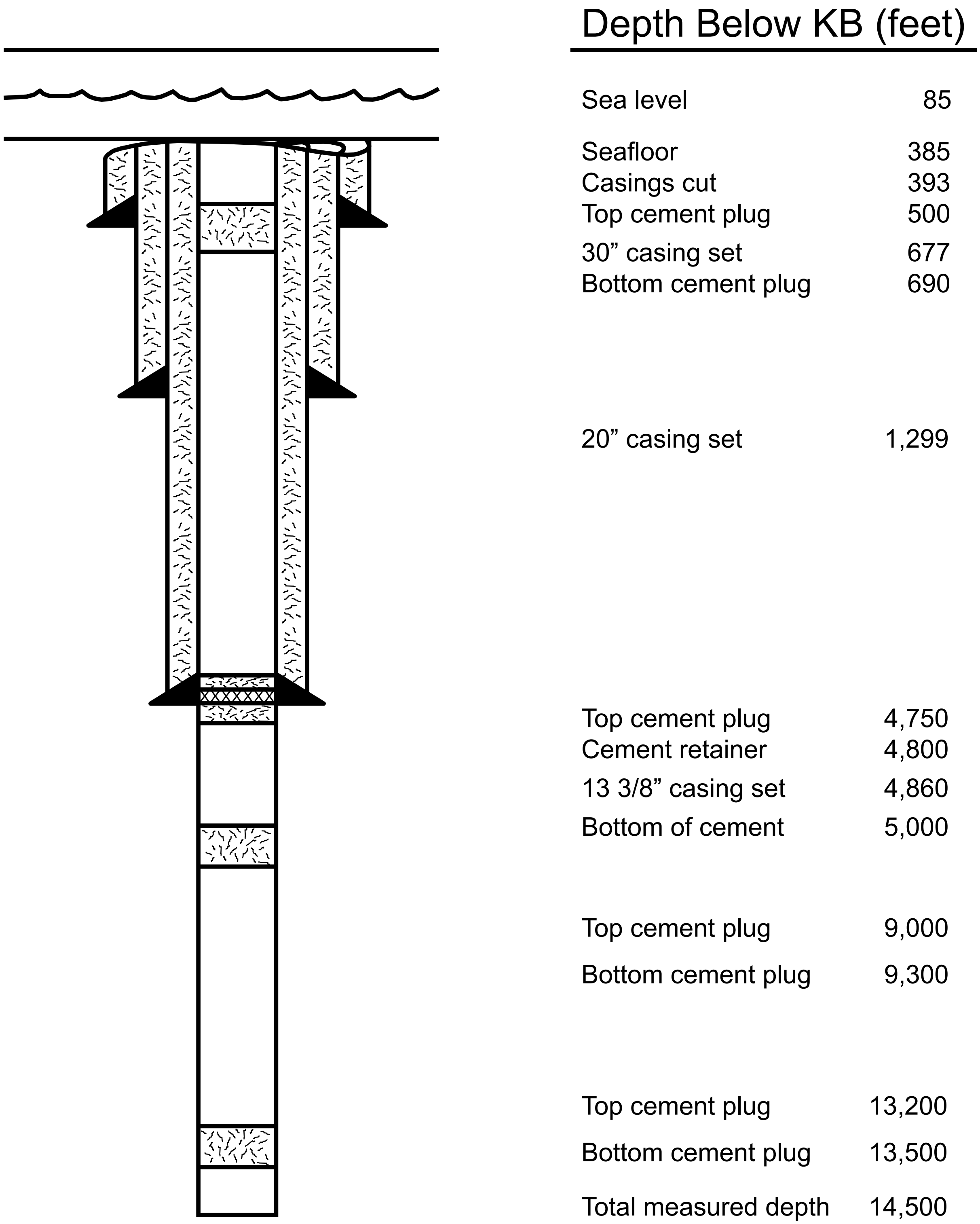

Figure 4. Casing diagram for the Conoco Lydonia Canyon Block 145 No. 1 well.

WELL VELOCITY PROFILE

Birdwell Division, Seismograph Service Corporation, ran a velocity checkshot survey between 300 and 14,395 feet in the Conoco LC Block 145 No. 1 well. The checkshot data, together with that for the other nine wells drilled on Georges Bank, were given to Velocity Databank, Inc. at their request after all leases had been relinquished or had expired. Velocity Databank calculated interval, average, and RMS velocities, plotted time-depth curves, and tabulated the data. Table 2 presents well depth, two-way travel time and the calculated velocities for the Conoco LC Block 145 No. 1 well. Figures 5 and 6 show interval velocity, average velocity, and RMS velocity plotted against depth and against two-way travel time, respectively. Well depths are subsea.

Table 2. Well velocity data

Depth (feet)	Two-way Travel Time (seconds)	Interval Velocity (feet/sec.)	Average Velocity (feet/sec.)	RMS Velocity (feet/sec.)
300	0.120	5,000	5,000	5,000
915	0.334	5,747	5,490	5,479
1,415	0.506	5,813	5,602	5,592
1,915	0.654	6,756	5,883	5,856
2,415	0.790	7,352	6,160	6,113
2,915	0.914	8,064	6,452	6,378
3,415	1.034	8,333	6,697	6,605
3,915	1.146	8,928	6,947	6,832
4,415	1.244	10,204	7,256	7,098
4,915	1.350	9,433	7,450	7,281
5,415	1.438	11,363	7,747	7,531
5,915	1.524	11,627	8,016	7,762
6,415	1.612	11,363	8,234	7,959
6,915	1.692	12,499	8,484	8,173
7,415	1.776	11,904	8,676	8,350
7,915	1.858	12,195	8,861	8,519
8,415	1.938	12,500	9,040	8,684
8,665	1.974	13,888	9,151	8,779
8,915	2.012	13,157	9,243	8,861
9,165	2.046	14,705	9,360	8,958
9,415	2.078	15,624	9,488	9,061
9,665	2.110	15,625	9,610	9,161
9,915	2.136	19,230	9,784	9,283
10,165	2.178	11,904	9,829	9,334
10,415	2.208	16,666	9,954	9,433

continued

Table 2. Well velocity data--*continued*

Depth (feet)	Two-way Travel Time (seconds)	Interval Velocity (feet/sec.)	Average Velocity (feet/sec.)	RMS Velocity (feet/sec.)
10,665	2.232	20,833	10,133	9,556
10,915	2.262	16,666	10,247	9,650
11,165	2.294	15,625	10,341	9,734
11,415	2.318	20,833	10,504	9,849
11,665	2.352	14,705	10,576	9,919
11,915	2.376	20,833	10,729	10,029
12,165	2.404	17,857	10,839	10,120
12,415	2.434	16,666	10,930	10,201
12,665	2.468	14,705	10,991	10,263
12,915	2.490	22,727	11,149	10,373
13,165	2.512	22,727	11,302	10,481
13,415	2.536	20,833	11,429	10,579
13,665	2.554	27,777	11,625	10,700
13,915	2.580	19,230	11,726	10,786
14,165	2.612	15,624	11,782	10,846
14,395	2.632	23,000	11,907	10,938

A lithologic column is also shown in figure 5, together with biostratigraphic subdivision of the section, based on a company-submitted peleontological report.

Five velocity intervals are indicated, which generally correlate with five lithologic intervals penetrated by the well:

Table 3. Well velocity intervals

Interval	Depth Range (feet)	Interval Velocity Range (feet/second)	Average Interval Velocity (feet/second)
I	0-1,500	5,000-5,813	5,520
II	1,500-5,200	6,756-10,204	8,438
III	5,200-8,500	11,363-12,500	11,921
IV	8,500-9,800	13,157-15,625	14,600
V	9,800-14,395	11,904-27,777	18,865

Interval I The first shot, at 300 feet is at or near the seafloor, and the interval velocity of 5,000 feet per second is for seawater. Two more shots are within this interval and are low velocities (together averaging 5,780 feet per second), appropriate to mudstones and sediments at shallow depth.

Interval II This interval is identified on the basis of intermediate interval velocities, which increase with depth, reflecting transitions from mudstone to siltstone and then to siliciclastics

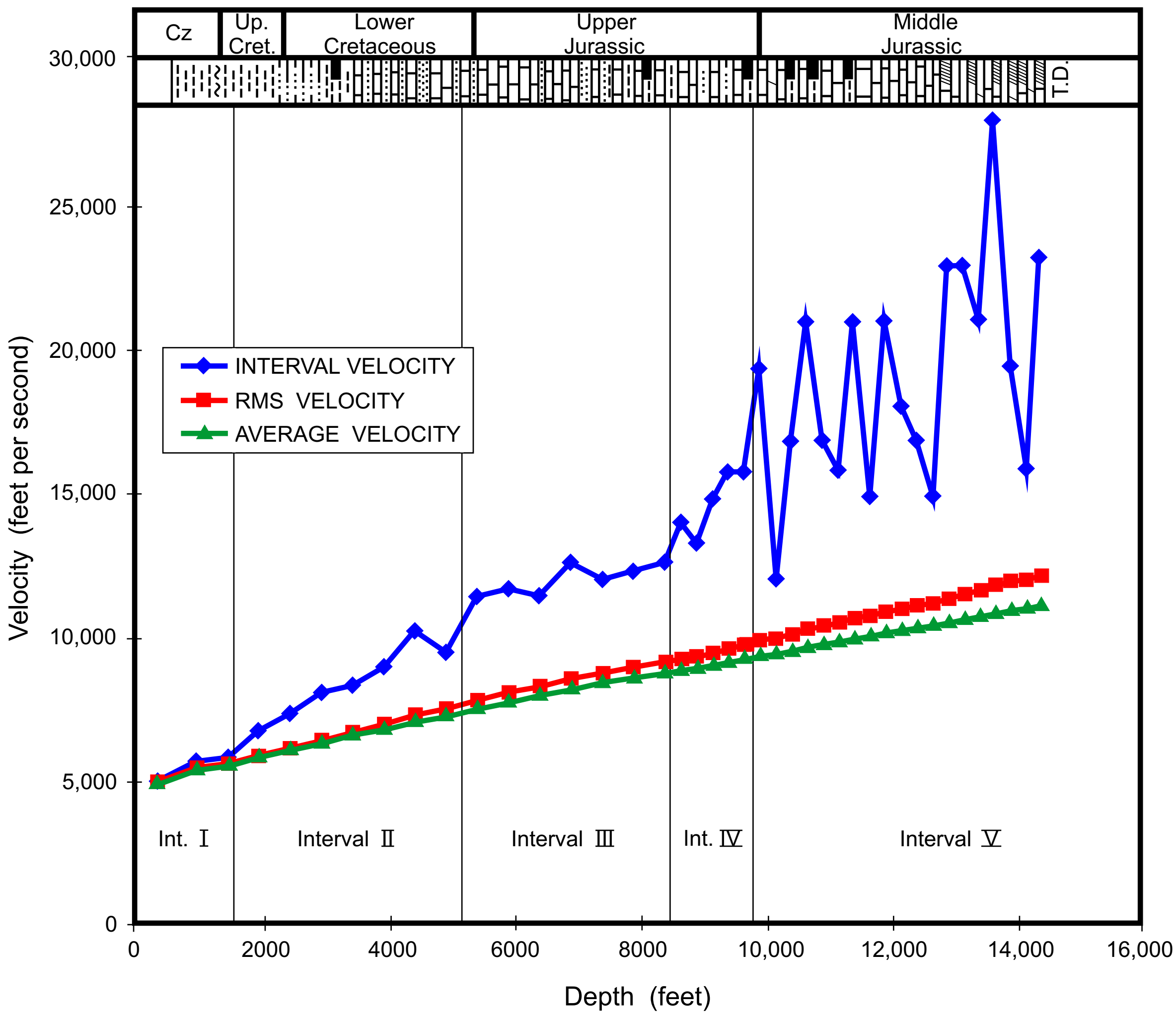

Figure 5. Well velocity profile for the Conoco Lydonia Canyon Block 145 No.1 well, plotted against depth, with biostratigraphic ages and generalized lithologies. Intervals are explained in text.

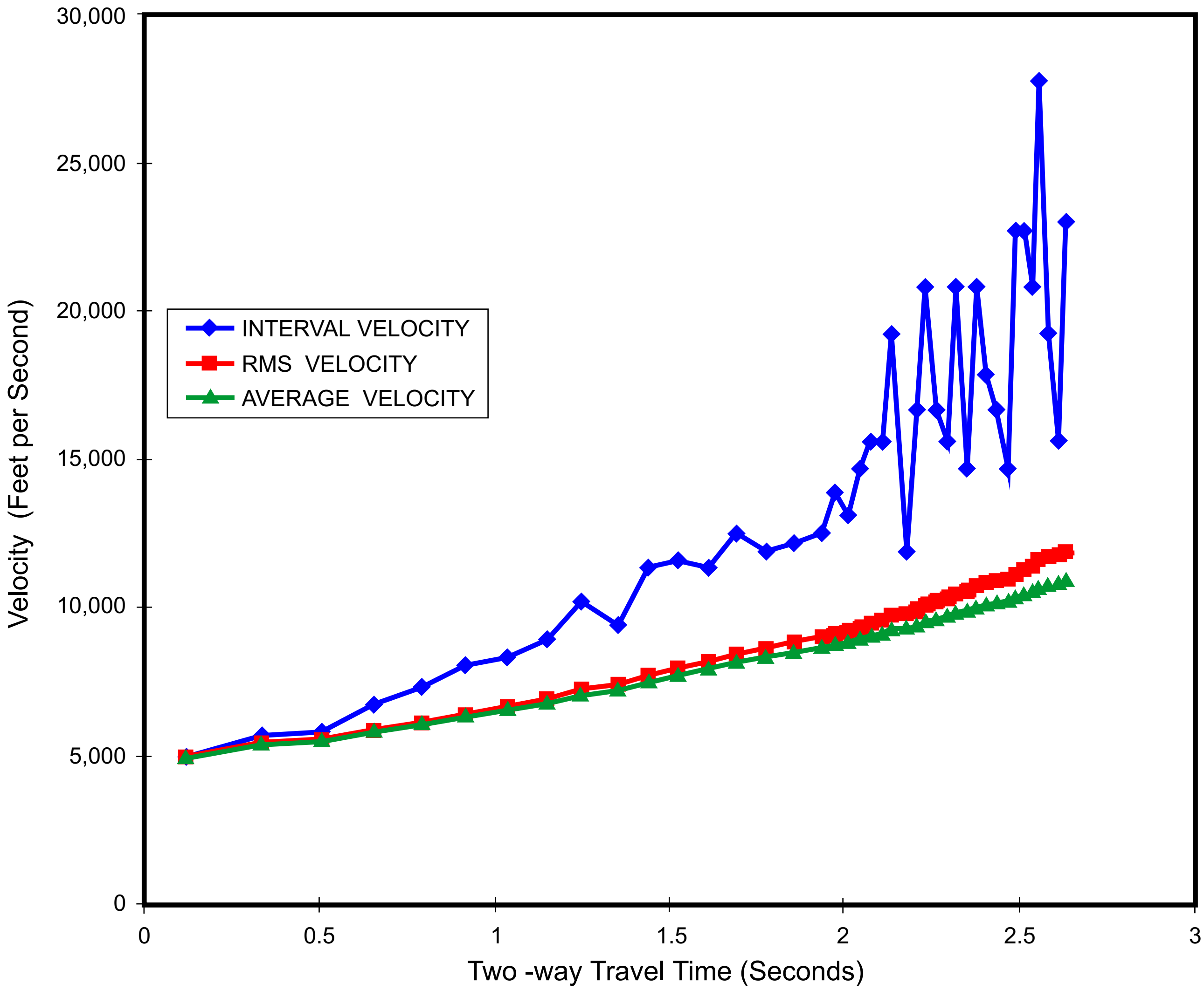

Figure 6. Well velocity profile for the Conoco Lydonia Canyon Block 145 No. 1 well, plotted against two-way travel time.

interbedded with limestones. This interval is Upper and Lower Cretaceous.

Interval III This interval is identified on the basis of a slightly higher interval velocity trend, which may be a consequence of more abundant limestone interbeds in the lowermost Lower Cretaceous and upper portion of the Upper Jurassic.

Interval IV This interval is identified on the basis of moderately high interval velocities in the lower portion of the Upper Jurassic and upper portion of the Middle Jurassic. Rock types are siliciclastics interbedded with limestones.

Interval V This interval is identified on the basis of high and very high interval velocities alternating with moderately low (for this depth range) velocities. As with other Georges Bank wells, the data are appropriate to interbedded siliciclastic lithologies, limestone, dolomite, and anhydrite, (and halite in some other wells). According to a company-submitted report, this interval is Middle Jurassic.

LITHOLOGIC INTERPRETATION

Taken and adapted from R. Smith, MMS internal report

Well cuttings from the Conoco LC Block 145 No. 1 well were collected at 30-foot intervals from 675 to 14,500 feet (TD). Additional lithologic control was provided by conventional and sidewall cores. The lithologic descriptions of this report are based on examination of drill cutting samples with a binocular microscope, on conventional and sidewall core descriptions, and on the formation evaluation "mud" log. Depths of lithologic units are adjusted with reference to electric logs. All depths are from kelly bushing. Lithologic intervals are shown in figure 7.

The interval from 675 to 2,230 feet consists of unconsolidated, gray to black, slightly calcareous clay with abundant fossil fragments, bedded and disseminated glauconite, trace pyrite, lignite, calcite, and siliciclastic silt and sand grains. A glauconite bed exists at 1,360 feet near the Cretaceous-Tertiary boundary. A Cretaceous-Tertiary glauconite bed is a distinct regional marker also seen in the Mobil LC Block 312 No. 1 and the Exxon CO Block 975 No. 1 wells. Below the glauconite bed is a slightly calcareous, poor to moderately sorted sand, having subrounded to subangular and translucent to clear grains. Within the sand are traces of glauconite, fossil fragments, and pyrite.

The interval from 2,230 to 4,900 feet consists of siltstone, mudstone, limestone, and sandstone. The upper third of the interval is light- to dark-gray, calcareous, variably fossiliferous, sandy siltstone with a trace of glauconite. The middle third is moderately consolidated, slightly calcareous mudstone or claystone with sparse glauconite, underlain by calcareous, sandy siltstone. The bottom third is gray to buff, silty limestone interbedded with slightly fossiliferous sands. The sands are poorly sorted, with subrounded to rounded and medium to coarse grains. Glauconite, pyrite, and lignite are present in trace amounts.

The section between 4,900 and 6,920 feet is massive, blocky, white to gray, granular to microcrystalline, and soft to firm limestone with some chalky portions, shale breaks, and sandstone interbeds. The upper 100 feet is argillaceous and slightly sandy.

The interval from 6,920 to 8,630 feet consists of silty, variably oolitic, light- to medium-gray, soft to firm, microcrystalline limestone interbedded with light-gray, very fine-grained calcareous sandstone, light-gray siltstone, and dark gray, calcareous shale. Siliciclastic beds contain trace amounts of mica, pyrite, and glauconite.

The interval from 8,630 to 10,810 feet is massive, shaley, oolitic limestone with some silt and shale interbeds. The limestone is white to gray, soft to firm, and microcrystalline; the siliciclastic interbeds have traces of fossil fragments, pyrite, and lignite.

The interval from 10,810 to 12,600 feet is massive, white to gray, firm, coarsely crystalline to microcrystalline, variably oolitic limestone with thin shale partings, becoming sandy in the bottom 300 feet.

Figure 7. Columnar chart of the lithology, biostratigraphy, and paleobathymetry of the Conoco Lydonia Canyon Block 145 No. 1 well. Lithologic interpretations from examination of cuttings; lithologic breaks picked from well logs. Stage tops and paleobathymetry from Conoco.

Traces of pyrite, lignite, quartz, and anhydrite are also present.

The section between 12,600 and 12,700 feet is a sandstone bed bounded above and below by gradational contacts with the massive carbonates. The sandstone is slightly calcareous, variably shaley, poorly consolidated, and poorly sorted, with subrounded to subangular, and fine to medium grains. The sandstone contains traces of mica and pyrite.

The interval from 12,700 to 14,500 feet (TD) is sandy to shaley limestone with sparse anhydrite in the upper half and with dolomite and abundant anhydrite interbeds in the lower half. The limestone is gray to brown, hard, and microcrystalline. The dolomite is white to brown, slightly calcareous, and microcrystalline. The anhydrite is white to light brown, soft to firm, and blocky to nodular.

POTENTIAL RESERVOIR ROCKS

Data from well log analysis (table 6), analysis of 73 sidewall cores (table 7), and analysis of three conventional cores (table 8) show generally decreasing porosity from 5,000 feet to total depth, 14,500 feet, in rocks penetrated by the Conoco LC Block 145 No. 1 well. According to well log interpretation, most porosities of "potential reservoir intervals" are better than 20 percent above 7,500 feet and poorer than 10 percent below 9,500 feet.

Among sidewall cores, permeabilities decrease with depth except for specific permeable (and porous) beds, such as a water-saturated sandstone at 13,358 to 13,366 feet, which has porosities of 17.2 to 25.8 percent and permeabilities of 12 to 116 md (based on three sidewall cores).

No optical kerogen nor molecular geochemical analyses were done by MMS for this well. However, an organic geochemical analysis report by Geochem Laboratories, Inc., of Houston, was submitted to MMS by Conoco. A summary table in the report refers to rocks above 7,690 feet as "moderately immature, poor oil and associated gas source potential." Rocks from 7,690 to 9,940 feet are "moderately mature, poor oil and associated gas source character." Rocks from 9,940 to TD of 14,500 feet are "mature, poor oil and associated gas source character."

In summary, the best porosities and permeabilities are found in the shallow, thermally immature section, above 7,500 feet, in the Conoco LC Block 145 No. 1 well. However, rocks within the moderately mature and mature part of the section are organically lean and have poor oil and gas generating potential.

BIOSTRATIGRAPHY

This biostratigraphic and paleoenvironmental summary is taken from a report done for Conoco by International Biostratigraphers Inc. for the Conoco LC Block 145 No. 1 well. No MMS paleontological interpretations are available.

Table 4. Biostratigraphy and depositional environments

Series	Age	Depth Interval (feet)	Environment of Deposition (depths in feet)
Miocene	Middle Miocene	675-1,360	Outer shelf
Eocene	Middle Eocene	1,360-1,390	
Late Cretaceous	Santonian	1,390-1,660	
	Coniacian	1,660-1,870	
	Turonian	1,870-2,110	
	Cenomanian	2,110-2,350	
Early Cretaceous	Albian	2,350-2,830	Inner shelf
	Aptian	2,830-3,730	Inner shelf (2,830-3,400 Middle shelf (3,400-3,700)
	Barremian	3,730-5,000	Inner shelf to marginal marine
	Hauterivian to Berriasian	5,000-5,440	Middle shelf
Late Jurassic	Tithonian to Late Kimmeridgian	5,440-6,430	
	Early Kimmeridgian to ?Oxfordian	6,430-8,410	Middle shelf (6,430-7,400) Inner shelf (7,400-8,410)
	Oxfordian	8,410-9,600	Inner shelf
Middle Jurassic	Callovian to Bathonian	9,600-14,500	Inner shelf to marginal marine

FORMATION EVALUATION

Taken and adapted from R. Nichols, MMS internal report

Schlumberger Ltd. ran the following "electric" logs in the Conoco LC Block 145 No. 1 well to provide information for stratigraphic correlation and for evaluation of formation fluids, porosity, and lithology:

Table 5. Well logs

Log Type	Depth Interval (feet below KB)
DISFL/Sonic (dual induction spherically focused log/sonic)	1,300-14,482
CNL/FDC (compensated neutron log/compensated formation density)	1,300-14,485
HDT (high resolution dipmeter)	4,866-14,485
CYBERDIP	9,600-14,485
RFT (repeat formation tester)	9,159-14,460
CYBERLOOK	4,672-14,482
CORIBAND	4,875-9,750

Exploration Logging, Inc. provided a formation evaluation "mud" log, which included a rate of penetration curve, sample description, and a graphic presentation of any hydrocarbon shows encountered (1,350 to 14,500 feet). In addition, a delta chloride log (4,800-14,500 feet), a drilling data pressure log (1,350 to 14,500 feet), and a pressure evaluation log (600 to 14,500 feet) were included.

The electric logs, together with the mud log and other available data, were analyzed in detail to determine the thickness of potential reservoirs, average porosities, and feet of hydrocarbon present. Reservoir rocks with porosities less than 5 percent were disregarded.
A combination of logs was used in the analysis, but a detailed lithologic and reservoir property determination from samples, conventional cores, and sidewall cores, in addition to full consideration of any test results, is necessary to substantiate the following estimates as shown in table 6. The electric logs were of poor quality, probably due to poor hole condition. Substantial hole enlargement occurs from 2,620 to 3,220 feet, 4,120 to 4,390 feet, 8,210 to 10,530 feet, 10,750 to 12,220 feet, and 12,780 to 14,450 feet. The SP was cyclic and of poor character over the entire interval. The hole enlargement also had considerable impact on other log responses. The DISFL exhibited a false "annulus" appearance over much of the section, with suspiciously low IL_m readings. The porosity logs were undoubtedly affected by the washouts as well.

Seventy-three successful sidewall cores were taken in the well, and their petrophysical properties are summarized in table 7. Sidewall core porosities compare favorably to FDC porosities in many cases. However,

Table 6. Well log interpretation summary

Series	Depth Interval (feet)	Potential Reservoir[1] (feet)	Ave ϕ	SW %	Feet of Hydrocarbon
UK-LK	2,254-2,422	97 (?)	35	NC*	NC*
LK	2,635-2,790	75 (?)	35	"	"
	2,866-3,124	62 (?)	35	"	"
	3,658-4,050	139 (?)	34	"	"
	4,222-4,342	86	29	"	"
	4,432-4,505	73	26	"	"
	4,551-4,570	11	30	"	"
	4,623-4,985	202	33	"	"
	5,235-5,263	28	16	66	"
UJ	5,515-5,538	23	25	NC*	"
	5,937-5,954	15 (?)	25	"	"
	6,632-6,650	15 (?)	24	"	"
	7,052-7,080	28	22	"	"
	7,173-7,184	11	22	"	"
	7,514-7,524	10	20	"	"
	7,992-8,010	16	17	"	"
	8,990-9,010	17	15	58	"
	9,148-9,182	17	10	19	17[2](?)
MJ	9,604-9,633	24	8	NC*	NC*
	10,620-10,632	12	9	"	"
	10,658-10,670	12	9	"	"
	13,356-13,402	24	8[3]	67	"

*Not calculated

[1]Generally in beds > 10 feet thick and > five percent.

[2]Total gas reading = 85 units (C_{1-2-3}), but no show in samples or SWC

[3]Indicated porosity is probably too high; the zone is washed out. Total Gas reading = (C_1 only)

below 9,200 feet, the sidewall core porosities are closer to those recorded by the Sonic Log.

Three conventional cores were taken in the well. A detailed petrologic examination was performed and the results are shown in table 8.

The porosities derived from the sonic and density logs compare favorably to the core analysis for core No. 1 and the porosities derived from sonic, density, and neutron logs compare favorably to the core analysis for core No. 2. However, all log-derived porosities (6 to 9 percent) are substantially higher than the core analysis indicates for core No. 3. The substantial difference could be caused by increased circulation time for hole conditioning prior to the coring operation. This could have induced deep invasion and erratic

Table 7. Sidewall core summary

Depth Interval feet)	Number of Cores	Lithology	Porosity (%)		Permeability (md)	
			Range	Ave.	Range	Ave.
5,270.0-6,992.0	8	SS	16.9-23.8	21.3	2.2-74.0	31.3
7,028.0-8,997.0	21	SS/LS	8.6-24.5	17.7	< 0.1-45.0	9.7
9,000.0-10,699.0	20	LS/SS	12.5-22.7	16.6	< 0.1-37.0	7.1
11,747.0-12,878.0	5	LS	8.3-13.5	11.0	< 0.1-0.8	0.4
13,208.0-13,972.0	19	SS/LS	13.3-25.8	18.5	2.7-116.0	18.4

Table 8. Conventional core summary

Core No.	Depth Interval (feet)	Lithology	Porosity (%)		Permeability (md)		Gas % Bulk
			Range	Ave.	Range	Ave.	
1	9,191.0-9,226.5	LS	1.5-6.1	2.9	< 0.01-0.13	0.04	< 5
2*	10,622.0-10,652.3	LS	2.1-13.4	7.7	< 0.01-172.0	19.0	0.6-9.5
3	12,419.0-12,448.0	SiS	1.6-3.3	2.4	< 0.01-0.23	0.09	< 5

*Log analysis results show ϕ = 1-3 %, SW = 42%. Total gas reading on the mud log = 0.

washouts. If so, the fluid absorption and increased borehole size may have resulted in higher porosity readings for the sonic, density, and neutron logs.

Results of the HDT survey were recorded on a dipmeter arrow plot from 4,866 to 14,485 feet. Possible structural anomalies may be present at 6,275, 9,475, 12,750, and 13,325 feet. From 6,500 to 10,900 feet, the dip is essentially westward at 2 to 4 degrees. From 10,900 to 12,400 feet, the dip decreases to 1 to 3 degrees; from 12,400 to 13,100 feet, the dips increase in magnitude (10 to 30 degrees) and change to a predominantly eastward direction. Below 13,100 feet, the dips become more erratic in both direction and magnitude. From 14,200 to 14,500 feet, the dips range from 1 to 16 degrees and are predominantly westward again.

Table 9 lists all shows of hydrocarbon encountered in this well. None of the shows encountered were judged to be significant. Table 10 shows the well test results. Pressures appeared normal, but no formation fluids were recovered.

A normal pressure gradient (approx 9.0 ppg eqmw) was encountered to a depth of 8,800 feet. The estimated pore pressure increased to 9.4 ppg eqmw at 9,200 feet. The increase in pore pressure was accompanied by decreasing D_{xc} values, slightly increasing chlorides, and an increase in background gas. Between 13,000 and 14,500 feet, the pore pressure was estimated to have increased at a moderate rate from 9.4 ppg to 11.0 ppg. Changes in flowline temperature and magnitude of trip gas accompanied the increasing pore pressure.

Table 9. Hydrocarbon shows

Depth Interval	Drilling Break (feet/hour)	Sample Description (Mud Log)	Total gas b.g.	Total gas	Chromatograph	Cuttings Gas	Conventional Cores						Sidewall cores						Well Log Interpretation			Well Tests
								Ø	K	O_p	O_b	G_b		Ø	K	O_p	O_b	G_b		Ø	SW	
9,148 - 9,182	12' - 42'	LS, dull yel flu, no cut	3	85	$C_{1\text{-}2\text{-}3}$	1	-						9,166 - 9,171	14	.2				9,148 - 9,182	10	19	12 RFT attempts (mud sets)
10,632 - 10,660	-	LS, dull yel flu, no cut	2	2	C_1	1	10,622 - 10,652	2.6 - 13.4	<.01 -172			.6 - 9.5	-						10,632 - 10,660	1-3	42	None
13,230 - 13,244	-	LS	2	10	$C_{1\text{-}2\text{-}3}$	1	-						-						13,230 - 13,244	0-1	39	None
13,356 - 13,402	14' - 25'	LS/DOL, dull yel flu, no cut	2	121	C_1	3	-						-						13,356 - 13,402	8	67	40 RFT attempts (mud sets)

Table 10. Well tests

Run 1

Depth	HP	Min. Press.	SIP	Remarks
9,159	5,657	125	159	
9,161	5,660			
9,163	5,661			
9,165	5,663			
9,175	5,689	1,063	4,167	
9,178	5,560	4,147	4,158	
9,180	5,652	3,767	4,179	
9,182	5,664	4,068	4,168	
9,187	5,690	4,088	4,157	
9,192	5,677			
9,194	5,682			
9,195	5,677	310	332	
12,600	7,740			Hole size prevented tool setting
12,603	8,502			"
12,603	7,746			"
13,390	8,261			"
13,392	8,260			"
13,395	8,261			"
13,810	8,501			"
13,812	8,940			"
14,190	8,761			"
14,210	8,760			"
14,460	8,739			"

Run 2

Depth	HP	Min. Press.	SIP	Remarks
9,178	5,536			Mud Set
9,515		2,397	4,333	
9,564	-			Mud Set
9,615	5,806			"
9,615	-			
9,615		4,322	4,334	
12,600	7,636			Mud Set
13,344.5	-			"
13,356	8,155			"
13,358	8,151			"

continued

Table 10. Well tests, Run 2--*continued*

Depth	HP	Min. Press.	SIP	Remarks
13,360	8,156			Mud Set
13,362	8,158			"
13,364	8,156			"
13,364	8,140			"
13,364.5	8,139			"
13,366	8,156			"
13,367	8,134			"
13,367.5	8,144			"
13,368	8,142			"
13,368	8,155			"
13,368	8,163			"
13,370	8,166			"
13,370	8,142			"
13,370	8,159			"
13,370.5	8,157			"
13,371	8,156			"
13,372	8,157			"
13,374	8,148			"
13,374	8,156			"
13,376	8,154			"
13,378	8,160			"
13,379	8,153			"
13,380	8,161			"
13,382	8,160			"
13,384	8,164			"
13,386	8,162			"
13,388	8,164			"
13,390	8,166			"
13,392	8,169			"
13,392	8,150			"
13,394	8,158			"
13,408	-			"
13,410	-			"
13,410	8,182			"
13,412	-			"
13.416	-			"
13,570	8,266			"
13,952	8,503			"

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GEOTHERMAL GRADIENT

Figure 8 shows bottomhole temperatures for three logging runs in the Conoco LC Block 145 No.1 well plotted against depth. A temperature of 60 ^{o}F is assumed at the seafloor at an indicated depth of 385 feet (300-foot water depth plus 85-foot kelly bushing elevation). Shown also is a straight-line graph between the seafloor and total-depth temperatures in order to represent an overall geothermal gradient for the well, which is 1.06 ^{0}F/100 ft., the lowest gradient among the Georges Bank wells. Gradients for the other wells range from 1.14 ^{0}F/100 ft. (COST G-1) to 1.40 ^{0}F/100 ft. (COST G-2).

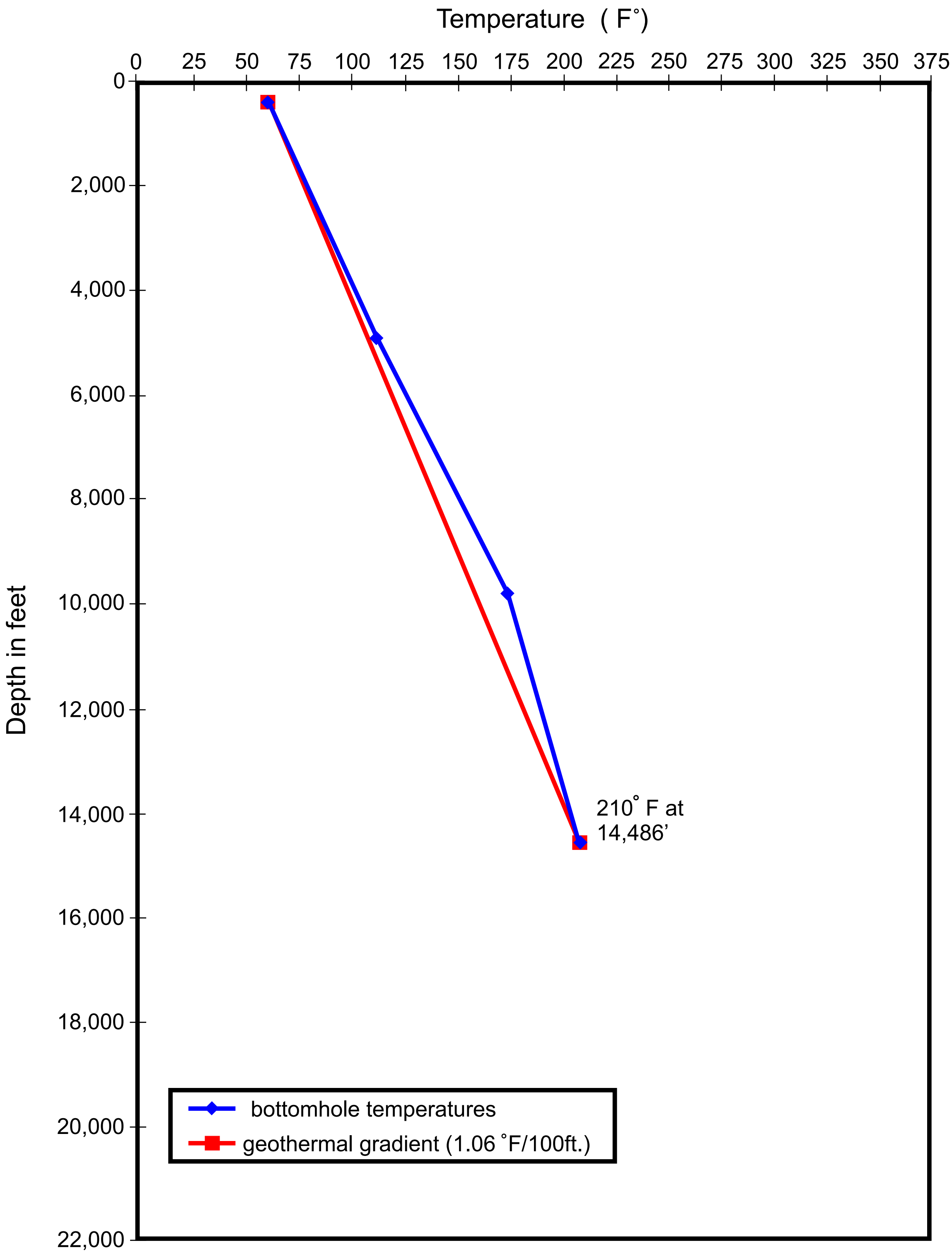

Figure 8. Well temperatures and geothermal gradient for the Conoco Lydonia Canyon Block 145 No. 1 well. Well temperatures from bottomhole temperatures of logging runs. Geothermal gradient based on bottomhole temperature of deepest logging run.

BURIAL HISTORY

The burial history model for the stratigraphic section penetrated by the Conoco LC Block 145 No. 1 well (figure 9) is based on the biostratigraphic determinations of International Biostratigraphers Inc. (IBI), Houston, (figure 7) and the Cretaceous and Jurassic time scales of Van Hinte (1976a and 1976b). The burial model for this well is similar to those of the COST G-1 and G-2 wells and the other industry wildcat wells on Georges Bank. In general, they show rapid initial rift-stage (Late Triassic) subsidence and equally rapid early drift-stage (Middle Jurassic) subsidence. In the Early Cretaceous Epoch, basinal subsidence progressively decreased until some time in the Tertiary Period, when subsidence may have increased again moderately. However, using sea level as the zero datum exagerates apparent Tertiaty thickness and subsidence. For the Conoco LC Block 145 No. 1 well, no rift-stage rocks were penetrated, according to IBI. Rapid Oxfordian-Callovian burial reflects early drift-stage subsidence. The burial rate is very low in the Late Cretaceous (Santonian) and increases in the Tertiary Period (Miocene and earlier). However, the indicated Tertiary burial rate includes the water-depth effect. In constructing figure 9, no adjustments have been made for sedimentary compaction or for section removed by erosion.

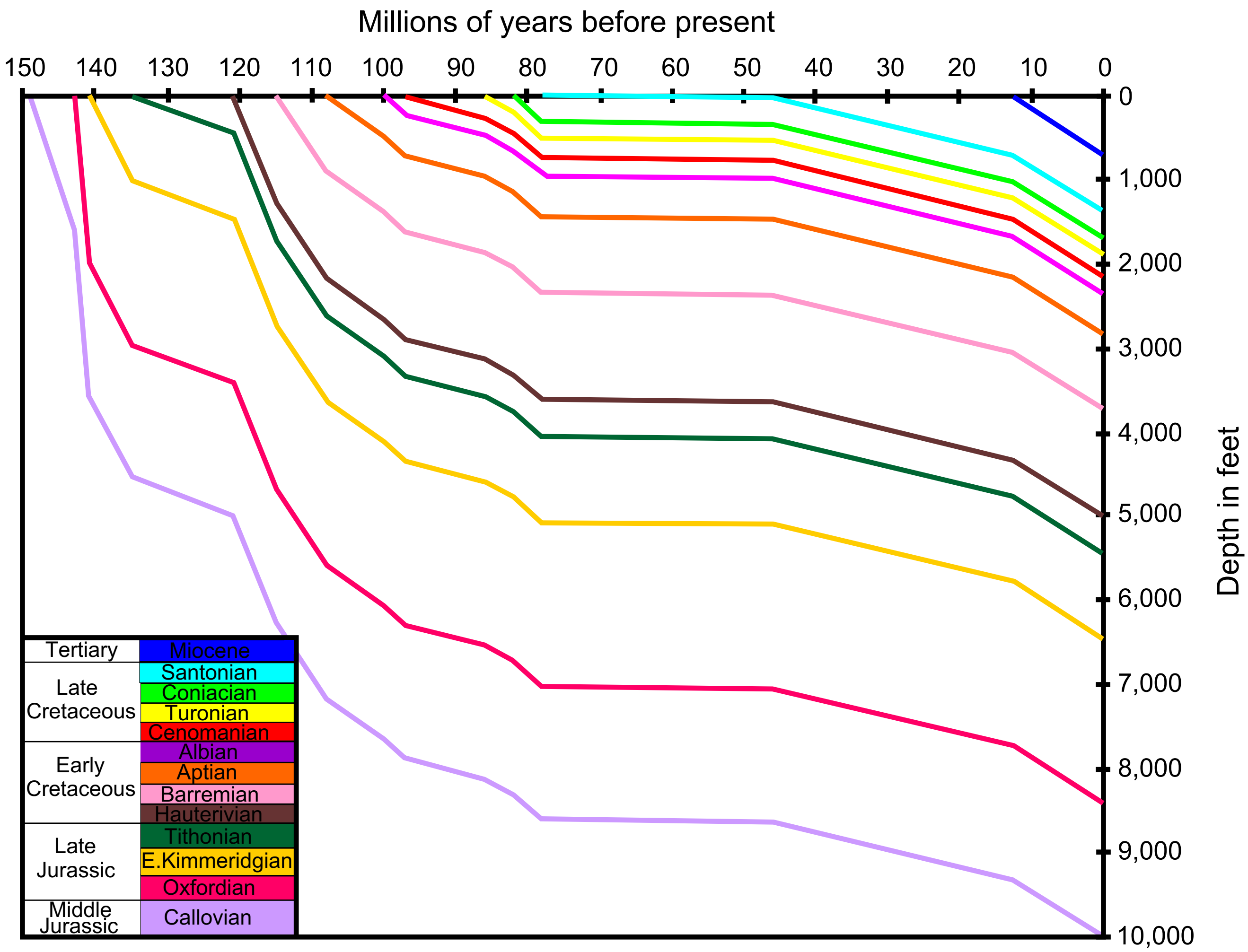

Figure 9. Burial diagram for the Conoco Lydonia Canyon Block 145 No. 1 well.
Based on stage tops from Conoco (See Figure 7).

COMPANY-SUBMITTED DATA

Data and reports were submitted by Conoco Inc. to MMS when the Conoco LC Block 145 No. 1 well was drilled, as required by Federal regulations and lease stipulations. Items of general geological, geophysical, and engineering usefulness are listed below. Items not listed include routine submittals required by regulation and detailed operations information, such as the Exploration Plan, Application for Permit to Drill, daily drilling reports, monthly reports, well location survey, and drilling pressure and temperature data logs. Well "electric" logs are listed in the **Formation Evaluation** chapter. Listed and unlisted company reports and data are available through the Public Information Unit, Minerals Management Service, Gulf of Mexico OCS Region, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394; telephone (504)736-2519 or 1-800-200-GULF, FAX (504)736-2620. Well logs are available on microfilm from the National Geophysical Data Center, 325 Broadway Street, Boulder CO 80303-3337, attn. Ms Robin Warnken; telephone (303)497-6338, FAX (303)497-6513; e-mail rwarnken@NGDC.NOAA.GOV.

At a later date, additional original technical data, including well logs, will be added to the compact disk (CD) version of the Georges Bank well reports. The CD will be available from the Gulf of Mexico OCS Region Public Information Unit.

Selected company-submitted data

Final Well Report (summaries of data and interpretations for drilling and engineering, formation pressure, geology and shows, evaluation and testing, and data inventory), Exploration Logging of U.S.A., Inc. (Exlog), undated.

Physical formation "mud" log, EXLOG, undated.

Seismic velocity survey (checkshot survey), Birdwell Division, Seismograph Service Corp., Tulsa OK, undated.

Core analysis report (sidewall and conventional cores), Core Laboratories, Inc., Dallas TX, undated.

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Geochemical analysis report (visual kerogen, total organic carbon, Rock-Eval, C_1-C_7 gas chromatograms, C_{15+} soxhlet extraction, saturate hydrocarbon analysis), Geochem Laboratories, Inc., Houston, 10/23/82.

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