

**ORGANIC GEOCHEMISTRY, HYDROCARBON OCCURRENCE,
 AND STRATIGRAPHY OF GOVERNMENT-DRILLED WELLS,
 NORTH SLOPE, ALASKA**

By
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INTRODUCTION

The basic data for evaluation of the petroleum source-rock potential in the National Petroleum Reserve in Alaska are summarized on the accompanying 39 plates. These data consist of organic geochemical analyses and observed hydrocarbon occurrences in 63 government-drilled wells located in and adjacent to NPRA (pl. 19-1, A). To relate the geochemistry to the geology, we have also included geophysical well logs, lithology, rock units, paleontologic zones, and ages. Two additional wells, Iko Bay No. 1 and East Teshekpuk No. 1, are included here even though they lack geochemical data because they were drilled during the latest exploration program and provide information on subsurface geology and hydrocarbon occurrences.

These displays, in addition to being the culmination of a considerable team effort, also demonstrate the capabilities of the NPRA computer system (see paper by Wilcox and others, chapter 39 of this volume). All of the data displayed are stored in various computerized "files." All data were computer-plotted except for the columns showing age, paleontologic zones, and stratigraphic names. Magoon and Claypool are responsible for the geochemical data and plate format design, Bird for the geologic and paleontologic summary, Weitzman for the computer programming and file construction, and Thompson for the data on hydrocarbon occurrence.

GEOCHEMICAL DATA

These data are discussed and interpreted in papers in this volume by Baylis and Magoon, chapter 20; Magoon and Bird, chapter 17; Magoon and Claypool, chapter 21, and Claypool, chapter 18. The petroleum geochemical data are available from NOAA (National Oceanic and Atmospheric Administration), National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. 80303, and Petroleum Information Corporation, P.O. Box 2612, Denver, Colo. 80201.

PALEONTOLOGIC DATA

The geologic ages for most wells are based on the study of microfossils reported in Witmer and others (1981) and Haga and Mickey (1983a, b). Biostratigraphic zones based on foraminifers (F and Z zones) and pollen, spores, and dinoflagellates (PM and PT zones) are shown in relation to ages in B. For each well, the basic paleontologic data consisting of distribution charts of fossil identifications and abundances are available from NOAA. Paleontologic data for wells lacking zone determinations may be found in Bergquist (1966). Samples studied for microfossils include drill cuttings, sidewall cores, and conventional cores. Although not shown on the displays, the sampling interval employed was 30 ft for foraminiferal analysis and 90 ft for pollen, spore, and dinoflagellate analysis. An interval of slanted lines, C, illustrates differences in age boundary placement resulting from the use of the two zonation schemes. Ages shown here may differ somewhat from those previously published for some rock units. Such discrepancies may be the result of the relatively broad sampling interval, contamination, or actual age differences. We are presenting the zone determinations and interpreted ages but are not proposing changes in ages of any of the rock units based on these displays.

ROCK UNITS

The stratigraphic nomenclature and depths are from Bird, chapter 15, this volume.

GEOPHYSICAL WELL LOGS AND LITHOLOGY

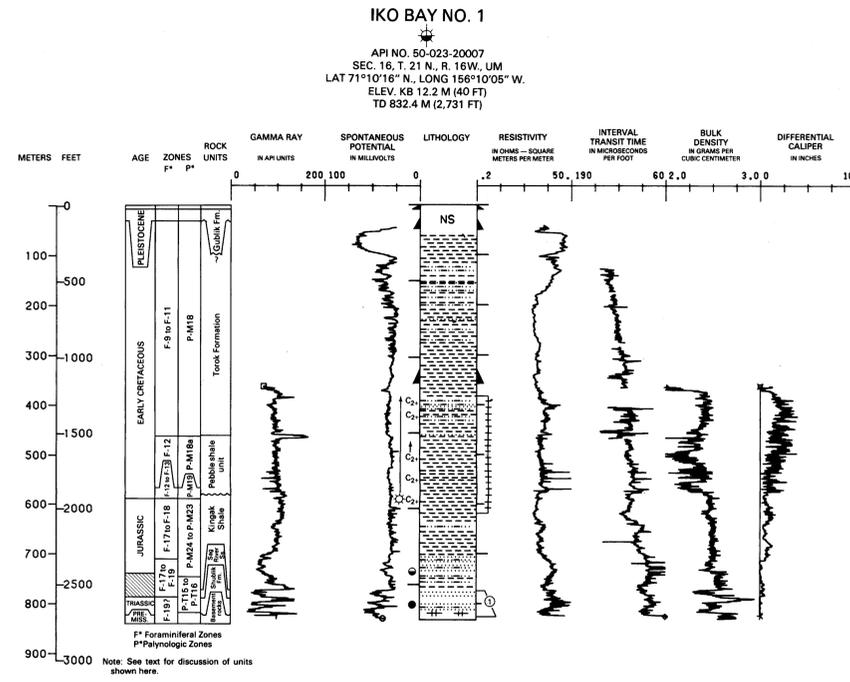
The well log curves and lithologies are from the reports by Bird (1981a, b, c, d, e, and 1982). The basic well logs are also available from NOAA as well as commercial well log distributors. The lithologic symbols are explained in D.

HYDROCARBON OCCURRENCES AND WELL SYMBOLS

Occurrences of oil or gas in a well are loosely referred to as "shows." These shows may be observed in the samples, in the drilling mud, or actually measured in a test. The criteria we employed in determining significant from insignificant hydrocarbon occurrences are shown in E. The basic observations or test results are reported on the mud log, the lithology log, and in the well history. These logs and histories are available from NOAA. A set of well symbols has been designed by Bird to show the status of the well and the nature of any hydrocarbon occurrences. These are utilized in the title block of each well in these displays and explained in E.

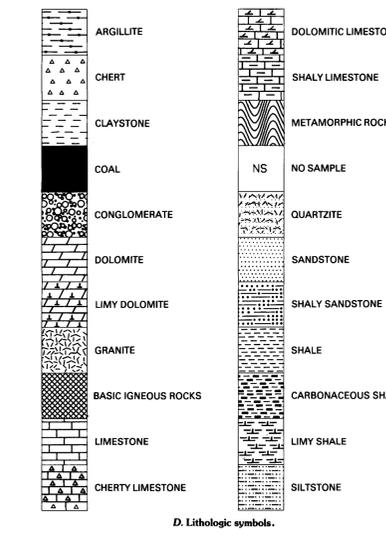
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 1981b, Machine-generated displays of well logs and lithology from selected well on the North Slope of Alaska: 26 wells from the northern part of National Petroleum Reserve in Alaska (NPRA); U.S. Geological Survey Open-File Report 81-1033, 6 p., 26 pl.
 1981c, Machine-generated displays of well logs and lithology from selected wells on the North Slope of Alaska: 11 wells from the north-eastern part of National Petroleum Reserve in Alaska (NPRA); U.S. Geological Survey Open-File Report 81-1034, 6 p., 11 pl.
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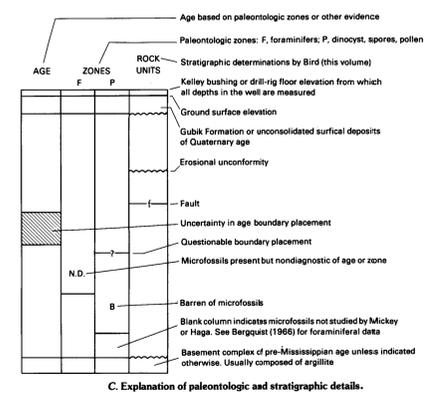
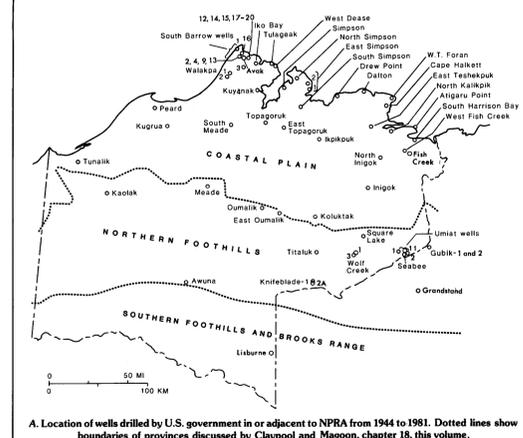
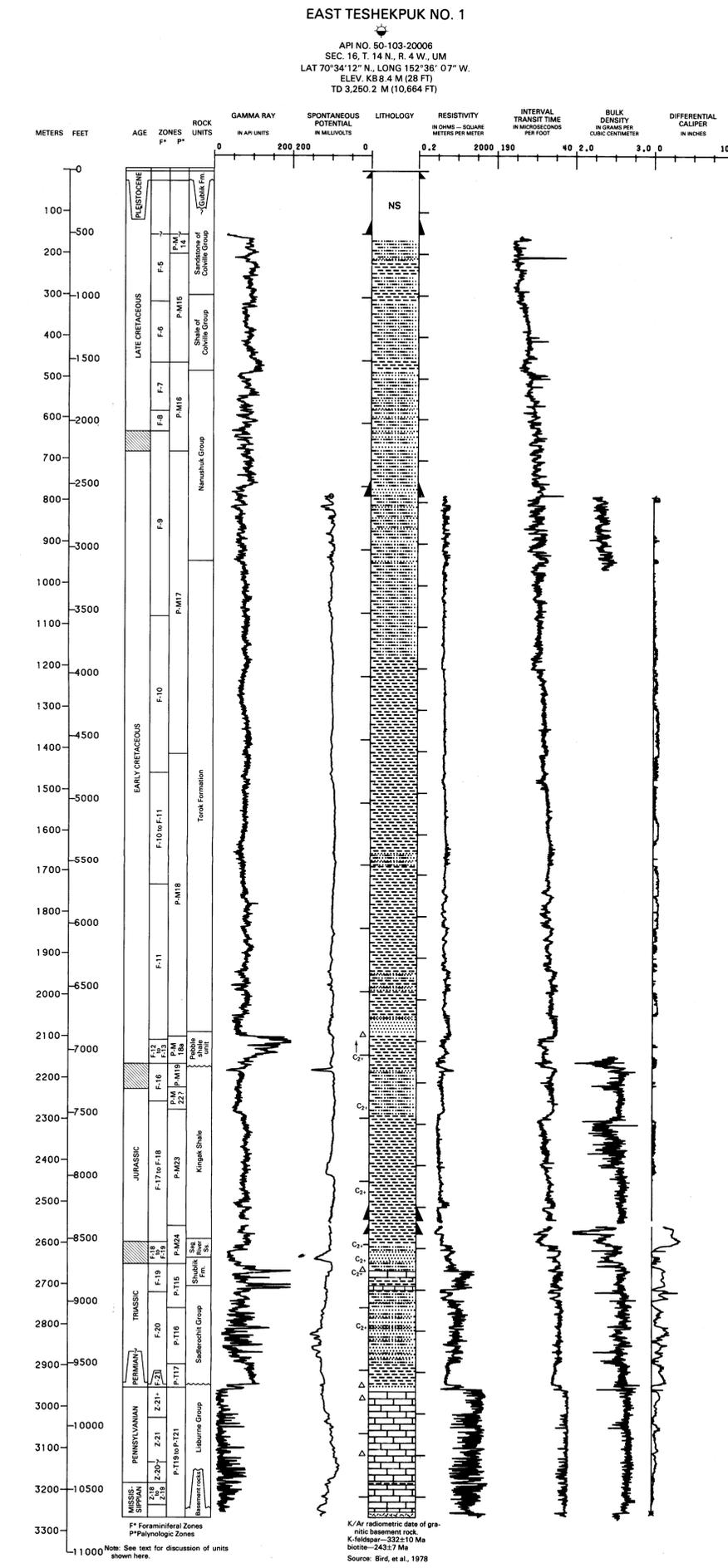
B. Relationship of geologic age to paleontologic zones (Adapted from Witmer and others, 1981).

ERA	PERIOD	EPOCH	STAGE	FORAM ZONES	DINOZYST ZONES	SPORE-POLLEN ZONES	
CENOZOIC	QUATERNARY	HOLOCENE	PLEISTOCENE	F-1			
				F-2			
				F-3			
				F-4			
	TERTIARY	PALEOGENE	Eocene	MAASTRICHTIAN	F-5	P-M11	P-T10
					F-6	P-M12	P-T11
					F-7	P-M13	P-T12
					F-8	P-M14	
					F-9	P-M15	
					F-10	P-M16	
F-11					P-M17		
F-12					P-M18		
F-13					P-M19		
F-14					P-M20		
MESOZOIC	CRETACEOUS	EARLY	TURONIAN	F-15	P-M21		
				F-16	P-M22		
				F-17	P-M23		
				F-18	P-M24		
				F-19	P-M25		
				F-20	P-M26		
				F-21	P-M27		
				F-22	P-M28		
				F-23	P-M29		
				F-24	P-M30		
JURASSIC	MIDDLE	MAMMOT ZONES	MAMMOT ZONES	F-25	P-M31		
				F-26	P-M32		
				F-27	P-M33		
				F-28	P-M34		
				F-29	P-M35		
				F-30	P-M36		
				F-31	P-M37		
				F-32	P-M38		
				F-33	P-M39		
				F-34	P-M40		
TRIASIC	EARLY	MAMMOT ZONES	MAMMOT ZONES	F-35	P-M41		
				F-36	P-M42		
				F-37	P-M43		
				F-38	P-M44		
				F-39	P-M45		
				F-40	P-M46		
				F-41	P-M47		
				F-42	P-M48		
				F-43	P-M49		
				F-44	P-M50		
PERMIAN	EARLY	MAMMOT ZONES	MAMMOT ZONES	F-45	P-M51		
				F-46	P-M52		
				F-47	P-M53		
				F-48	P-M54		
				F-49	P-M55		
				F-50	P-M56		
				F-51	P-M57		
				F-52	P-M58		
				F-53	P-M59		
				F-54	P-M60		
DEVONIAN	EARLY	MAMMOT ZONES	MAMMOT ZONES	F-55	P-M61		
				F-56	P-M62		
				F-57	P-M63		
				F-58	P-M64		
				F-59	P-M65		
				F-60	P-M66		
				F-61	P-M67		
				F-62	P-M68		
				F-63	P-M69		
				F-64	P-M70		



E. Symbols used for wells on maps and displays and for hydrocarbon occurrences on well sections.

PRELIMINARY	SUSPENDED (=SHUT IN OR TEMPORARILY ABANDONED)	PRODUCERS	ABANDONED PRODUCERS	OIL SHOWS	GAS SHOWS	WELL TESTS
○ LOCATION, PROPOSED	⊕ DRY	● OIL	⊗ OIL	● OIL recovered on a test	⊕ GAS recovered on a test	⊕ Drill-stem test: interval and number
○ LOCATION, ESTABLISHED	⊕ OIL PRODUCER	● OIL AND GAS	⊗ OIL AND GAS	○ Oil stain in cuttings or core or oil "bleeding" from core	⊕ GAS "bleeding" from core	⊕ Production test interval, open hole
○ DRILLING WELL	⊕ GAS PRODUCER	● OIL WITH GAS SHOWS	⊗ OIL WITH GAS SHOWS	⊕ Gas readings (>200ppm) from mud log	⊕ H ₂ S Hydrogen sulfide	⊕ Production test interval, cased hole, perforated
◇ NO SHOWS	⊕ OIL AND GAS PRODUCER	● OIL AND GAS SHOWS	⊗ OIL AND GAS	⊕ "Dead" oil (bitumen, tar, pyrobitumen or asphalt)	⊕ Length of show interval	
◇ OIL SHOWS	⊕ DRY WITH OIL SHOWS	● OIL WITH OIL SHOWS	⊗ OIL AND GAS			
◇ GAS SHOWS	⊕ DRY WITH GAS SHOWS	● GAS WITH OIL SHOWS	⊗ GAS			
◇ OIL AND GAS SHOWS	⊕ DRY WITH OIL AND GAS SHOWS	● GAS WITH GAS SHOWS	⊗ OIL AND GAS			
◇ OIL PRODUCER WITH GAS SHOWS	⊕ OIL PRODUCER WITH GAS SHOWS	● GAS PRODUCER WITH OIL SHOWS	⊗ GAS WITH OIL SHOWS			
◇ GAS PRODUCER WITH OIL SHOWS	⊕ GAS PRODUCER WITH OIL SHOWS	● WATER SUPPLY	⊗ WATER SUPPLY			
◇ WATER SUPPLY	⊕ WATER SUPPLY	⊕ GAS INJECTOR, DRILLED AS	⊗ GAS INJECTOR, DRILLED AS			
◇ WATER DISPOSAL	⊕ WATER DISPOSAL	⊕ GAS INJECTOR, CONVERTED OIL WELL	⊗ GAS INJECTOR, CONVERTED OIL WELL			
◇ GAS INJECTOR, DRILLED AS	⊕ GAS INJECTOR, DRILLED AS	⊕ WATER INJECTOR, DRILLED AS	⊗ WATER INJECTOR, DRILLED AS			
◇ GAS INJECTOR, CONVERTED OIL WELL	⊕ GAS INJECTOR, CONVERTED OIL WELL	⊕ WATER INJECTOR, CONVERTED OIL WELL	⊗ WATER INJECTOR, CONVERTED OIL WELL			



**EXPLANATORY INFORMATION FOR WELL SUMMARY DIAGRAMS AND GEOLOGY
 AND HYDROCARBON OCCURRENCE IN IKO BAY NO. 1 AND EAST TESHEKPUK NO. 1 WELLS,
 NORTH SLOPE, ALASKA**