وزارة الداخلية
مصلحة المساحة الجيولوجية الامريكية
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

المملكة العربية السعودية
وزارة المالية والاقتصاد الوطني
المديرية العامة لشؤون الزيت والمعادن
KINGDOM OF SAUDI ARABIA
MINISTRY OF FINANCE AND NATIONAL ECONOMY
DIRECTORATE GENERAL OF PETROLEUM AND MINERAL AFFAIRS

ابحاث جيولوجية مختلفة
خريطة رقم ٢٠٩ A I-
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-209 A

التفسير الجيولوجي
GEOLOGIC EXPLANATION

SEDIMENTARY ROCKS

QUATERNARY

Qes — Eolian sand
See map legend for description of sand terrain types

Qsb — Sabkhah deposits
Silt, clay, and muddy sand, commonly saline, underlying coastal and inland playas; locally, partly consolidated crossbedded sands form a few hills and discontinuous cover along Arabian coastal area. Qatar coastal sabkhah at places partly covered by sand dune, Qes/Qsb

Qs, Qu — Silt and gravel
Silt and associated fine sediments including caliche-like and gypsiferous deposits in undrained depressions, Qs; unconsolidated surficial deposits of silt, sand, and gravel composed chiefly of limestone and other rocks of local origin, includes older gravels in some areas Qu; may include unrecognized equivalents of other units of Quaternary age

Qg₁, Qg₂ — Gravel
Limestone, quartz, or mixed limestone and quartz gravel obviously related to present or recent drainage; includes some complex debris in terrace deposits on Ṣir Banī Yās island and jabal Aẓ Ẓannah Qg_1; quartz gravel as sheets and trains with varying proportions of limestone and basement complex pebbles, Qg_2; probably for the most part near its original relative altitude

Qtc — Beach gravel and sand
Deposits in marine terraces and raised shelly beaches. Only large known areas are shown

TERTIARY — Miocene and Pliocene

Thf, Td, Tsm — Hofuf and Dam formations
Hofuf formation, Thf, cream and white sandy marl, cream and tan rubbly sandy limestone with minor calcareous sandstone and shale; in some areas marly quartz gravel layers in lower part; no marine fossils; of Pliocene (?) age.
Dam formation, Td, pink, white, and gray marl and red, green, and olive clay; minor sandstone, white and cream marly and chalky limestone, and coquina; marine fossils at many horizons; of Miocene age.
Where Hofuf and Dam formations are not divided, equivalent beds of white, cream, tan, pink, and brown marly sandstone, sandy marl, and sandy limestone mapped as Tsm. These beds are undifferentiated lateral equivalents of Hofuf and Dam formations of the Western Persian Gulf quadrangle

Eocene — Lower and Middle Eocene; Lower Eocene

Tdm, Tr, Tdr — Dammam and Rus formations
Dammam formation, Tdm, brown and gray dolomite; limestone of various types; white and buff marl; and gray, blue, and brown shale. Dolomite and porous limestone are dominant in upper and shale in lower part; fossiliferous at many horizons.
Rus formation, Tr, cream and light-gray marl, thin chalky limestone, and gypsum, all dolomitic in varying amounts; chert and geodal quartz locally common in basal beds; undivided Dammam and Rus formations, Tdr, only on Qatar Peninsula where the Rus formation, Tr, occurs only in scattered depressions

AGE UNKNOWN

s, i, b — Sedimentary and igneous rocks in dome complex
Laminated indurated siltstones and shales interbedded with thin limestone and possibly chert, abundant eolian calcarenite, and minor dolomite, s; discontinuous red, green, or purple masses of rhyolite, black and brown quartzite, and green chlorite schist, i; undifferentiated sedimentary and igneous rocks, mostly breccia, b.
Raised ovate areas of irregular relief, including some Persian Gulf islands, are believed to be piercement-type domes reflecting deep-seated salt movement as at Ṣir Banī Yās and Aẓ Ẓannah. Isolated masses of varicolored igneous rocks form prominent peaks and mounds; shattered, altered, older sedimentary rocks form areas of lower relief with remnants of younger Tertiary (?) sediments draped over the complex. White, orange, and violet anhydrite and gypsum partly mantle Aẓ Ẓannah, forming contorted fracture fill with sulfur filling occasional vugs; specular hematite and psilomelane occur in minor amounts in the sandstones and siltstones, which include rare unidentifiable Foraminifera, Unio and Viviparus.
Abundant Quaternary (?) eolian calcarenite discontinuously plasters the complex; incised gravel fans of local recent materials radiate, at places, from the complex and terminate along the coast with low marine terraces. Similar occurrences are reported by G. M. Lees, R. A. Bramkamp, D. A. Holm, and others, on islands in Persian Gulf mapped as b

Geologic contact — *Dashed where approximately located; short dashed where indefinite*
Fault
Anticline

الاصطلاحات الجيولوجية لايران
LEGEND FOR IRANIAN GEOLOGY

Symbol	Unit	Age
Q	Scree, gravel fans, terraces, and alluvium	
17 (16–17)	Upper Bachtiari, conglomerates and corresponding deposits	Pliocene
16 (15–16)	Lower Bachtiari	Pliocene
15 (14–15)	Upper Fars	Miocene
14 (13–14)	Middle Fars and Argillaceous series of Gulf area	Miocene
13	Lower Fars and Gypseous series of Gulf area	Miocene
12 (11–12)	Asmari limestone	Miocene
11 (10–12, 10–11)	Oligocene	
10	Eocene	
9 (8–9, 7–9)	Maestrichtian	Upper Cretaceous
8	Senonian	Upper Cretaceous
7	Middle Cretaceous	
6	Lower Cretaceous	
5	Jurassic	
1	Salt plug (Cambrian and associated rocks)	

Prepared by the U. S. Geological Survey and the Arabian American Oil Company under the joint sponsorship of the Kingdom of Saudi Arabia and the U. S. Department of State.

Lambert conformal conic projection; standard parallels 17° and 33°

اصطلاحات الخريطة
MAP LEGEND

POPULATED PLACES
- City or town
- Village
- Village, name not given
- Fort
- Ruins

TRANSPORTATION
- Major road, surfaced
- Major road, unsurfaced
- Secondary road
- Road of questionable permanency
- Trail
- Airport
- Landing field

HYDROGRAPHIC FEATURES
Only isolated wells are shown
- Drilled well
- Dug well
- Intermittent stream
- Sabkhah
- Reef
- Bathymetric contour in meters *(geologic interpretation; not intended for navigational purposes.)*
- Silt flat
- Swamps and marshes

HYPSOGRAPHIC FEATURES
- Generalized relief
- Sand

Dense stipple represents mobile sand cover consisting primarily of dunes, linear ridges, and other individual sand forms, that are shown where map scale permits; moderately dense stipple represents more stabilized continuous sand cover; open stipple represents discontinuous sand cover.

Types of sand terrain

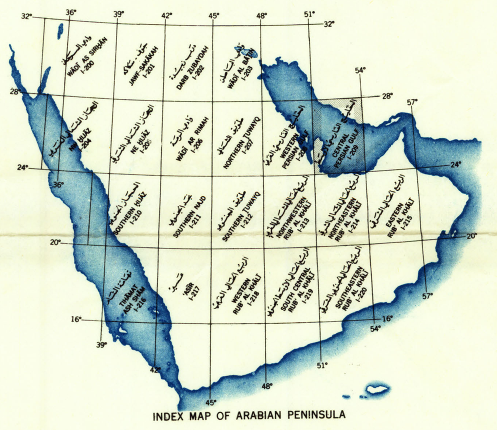
I — Transverse. *Predominantly simple and compound barchan dunes in areas of more mobile sand, and/or simple rounded ridges, both oriented transverse to the prevailing wind direction.*

II — Longitudinal. *Primarily dikākah and various types of undulating sand sheets, in general characterized by elongation of the individual topographic forms parallel to the prevailing wind direction, often partially stabilized by sparse vegetation.*

III — 'Urūq. *Various forms of long, nearly parallel, sharp crested narrow sand ridges and dune chains separated by broad sand valleys usually including elements of type I sand terrain. These are the resultant of a system of two dominant wind directions and are identical to the sayf dunes of North Africa.*

IV — "Sand mountains." *Dominated by large sand massifs commonly cresting 50 to 300 meters above the substratum, often with superimposed dune patterns consisting of various types of complex barchans. Common forms are giant barchans spanning several kilometers from horn to horn; giant bisigmoidal and pyramidal sand peaks as well as other less common peak forms; and giant oval to elongate sand mounds.*

MISCELLANEOUS FEATURES
- Oil well
- Abandoned oil well
- Oil pipeline
- Water pipeline
- Underground irrigation canal
- Benchmark (PBM-M4 × 53 meters)
- Triangulation station (964 △ 77 meters)
- Spot elevation (× 33 meters)



ايضاحات
GLOSSARY

Arabic	Term	Meaning
عين جمع عيون	'Ayn; pl., 'Uyūn	Spring, solution pit, or well
بندر (بالفارسية)	Bandar (Persian)	Harbor
دوحة	Dawḥah(t)	Bay or inlet
حالة	Ḥālah(t)	Islet or sandy reef
جبل	Jabal	Hill or mountain
جال	Jāl	Rocky escarpment, low cliff or side of a valley
جوب	Jawb	Sand-floored valley open at one end
جو	Jaww	Pronounced sandy-bottomed depression or basin with gentle slopes
جزيرة	Jazīrah(t)	Island
جزيره (بالفارسية)	Jazīreh (Persian)	Island
خليج	Khalīj	Bay, gulf
خور	Khawr	Saline bay or inlet
نقيان مفردها نقا	Niqyān; pl. of Naqā	Isolated large prominent sand dunes
قعايد مفردها قاعدة	Qa'āyid; pl. of qā'idah	Raised sand areas
قلعه (بالفارسية)	Qal'eh (Persian)	Fort
رملة	Ramlah(t)	Sand area
راس	Ra's	Tip of cape or headland protruding into the sea
رود (بالفارسية)	Rūd (Persian)	Stream
سبخة	Sabkhah(t)	Silt, clay, and sand flats, often with saline incrustation
سر (بالفارسية)	Sar (Persian)	Cape
عقلة	'Uqlah(t)	Shallow sand well
وادي	Wādī	Valley or dry water course

مصادر المجموعات الاساسية
SOURCES OF BASE COMPILATION

Compilation and topographic representation by the Arabian American Oil Company: A, land surface and adjusted aerial photographic surveys; B, reconnaissance land surface and unadjusted aerial photographic surveys; C, published materials; D, bathymetry interpreted for geologic purposes from U. S. Hydrographic Office Chart 3647, 2nd edition, Dec. 31, 1956, revised Aug. 30, 1958; and E, from published USAF Aeronautical Approach Chart 1:250 000 scale series. Topographic representation by L. F. Ramirez, Arabian American Oil Company

مصادر المجموعات الجيولوجية
SOURCES OF GEOLOGIC COMPILATION

Geologic mapping by the Arabian American Oil Company compiled under the direction of R. A. Bramkamp from: A, field surveys by T. F. Harriss, T.C. Barger and D.A. Holm, et al, and aerial photography; B, reconnaissance field work by D. A. Holm, et al, and aerial photography; C, published material; D, enlarged from the 1:1,000,000 map Sheet NG-39 Tahiri published in "Geological Maps and Sections of South-West Persia" XX International Geological Congress, Mexico, 1956, with the permission of the copyright owners, The British Petroleum Company, Limited, London"

This map printed in two sheets: Sheet A, geology and geography combined; Sheet B, geography only. Available at the Directorate General of Petroleum and Mineral Affairs, Ministry of Finance and National Economy, Jiddah and Ad Dammām, Saudi Arabia, and at the U. S. Geological Survey, Washington, D. C., U. S. A.

المقياس ١ : ٥٠٠٠٠٠
Scale 1:500 000

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GEOLOGY OF THE CENTRAL PERSIAN GULF QUADRANGLE, KINGDOM OF SAUDI ARABIA

By
Richard A. Bramkamp and Leon F. Ramirez

خريطة جيولوجية للوحة الخليج الفارسي الاوسط بالمملكة العربية السعودية

وضع
ريتشارد برمكامب وليون راميرز

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