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

المملكة العربية السعودية
وزارة البترول والثروة المعدنية
KINGDOM OF SAUDI ARABIA
MINISTRY OF PETROLEUM AND MINERAL RESOURCES

أبحاث جيولوجية مختلفة
خريطة رقم A ٢١٥ - I
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-215A

GEOLOGIC EXPLANATION

التفسير الجيولوجي

QUATERNARY

Qes — **Eolian sand**
Mostly mobile. (See legend for description of sand terrain types)

Qsb — **Sabkhah deposits**
Silt, clay, and muddy sand, commonly saline, underlying coastal and inland playas

Qu — **Silt, gravel, and alluvium**
Unconsolidated surficial deposits of silt, sand, gravel, and alluvium; may include unrecognized equivalents of other units of Quaternary age

QTga — **Gravel and alluvium**
Recent deposits of gravel and alluvium partially masking Miocene rocks. Includes extensive coarse gravel and conglomerate above proven marine Miocene at Jubayl Fuhūd and extending along mountain pediment; of Miocene and Pliocene age

TERTIARY

Tl — **Limestone, chalk, marl and evaporites** (Miocene)
Upper part: predominantly detrital limestone and evaporites (extensively masked by gravel north of Umm Samim) equivalent to the Lower Fars of Qatar Peninsula and Trucial Coast. Lower part: limestone, chalk, and marl of Burdigalian age extending south and southwestward into Dhofar

Tsm — **Sandstone, marl, and limestone** (Miocene and Pliocene)
Marly sandstone, sandy marl, and sandy limestone; in Al Jiwā' area may include soft marl, marly sandstone with subordinate sandy limestone, locally with fresh water mollusks and Chara, mapped as QTm in Northeastern Rub al Khali quadrangle, I-214A. Distribution of Tsm incompletely known in northwestern part of map

Tdm — **Dammam formation** (Lower and middle Eocene)
White, buff, light yellow, gray and tan, fine-grained, hard, dense to occasionally vuggy limestone; locally recrystallized and dolomitized with siliceous zones of tan, white and reddish-brown, commonly nummulitic chert; siliceous limestone and chert in places weathered to tripolite

Tml — **Marl and limestone** (Paleocene and Eocene)
Upper part: Clastic rocks and limestone with abundant Nummulites north of 'Ibrī and typically at Al Buraymī; middle part: yellow marl and rubbly limestone with abundant Nummulites, top part removed by erosion; lower part: chalky marl and limestone, gypsiferous shale, dolomite, and dolomitic marl; Paleocene part: yellow marl with abundant Lockhartia haimei (Davies) overlying massive, nodular and boulder-weathering limestone equivalent to the Umm er Radhuma formation of Saudi Arabia

CRETACEOUS

Kse — **Semail igneous complex**
Ophiolite suite, predominantly serpentinite including variable occurrences of pillow lavas (some with columnar structure), gabbro, and diorite with some other ultrabasic rock types

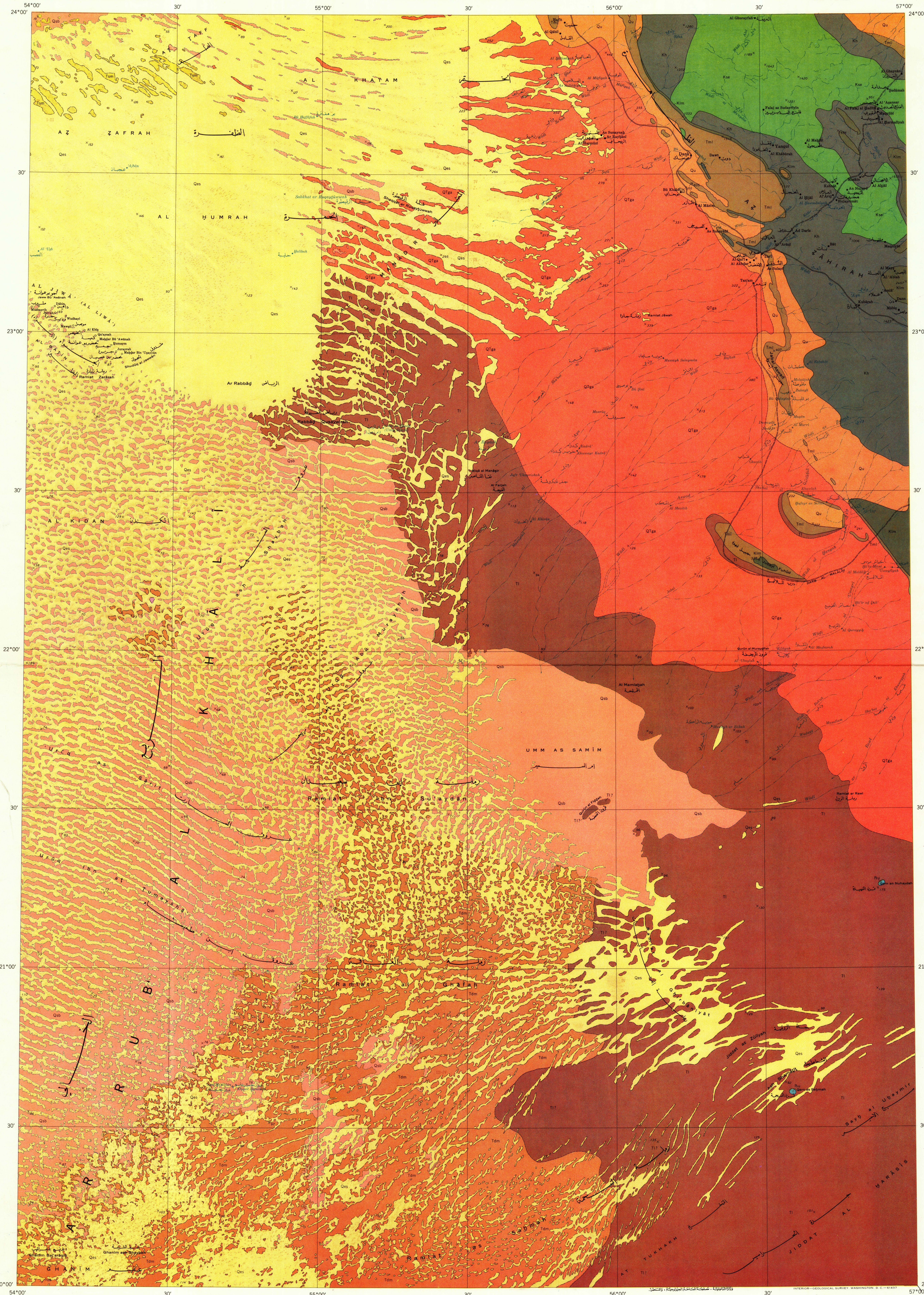
Kh — **Hawasina complex** (Upper Cretaceous)
Predominantly a radiolarite series with thick chert. Also includes, with varying distribution, finely detrital limestone, silicified mudstone and microconglomerate with rare Globotruncana sp., and reworked Cretaceous to Permian faunas; marl and sandy marl grade into breccia and conglomerate in basal part; in places also includes some massive blue limestone, gray, yellow, brown, green, purple and pink shale, and subordinate sandstone, green chert with dark olive-green chalcedonic chert. Entire unit commonly chaotically slumped and contorted; includes minor basic igneous intrusions. Huge slumped masses of Permian to Jurassic rocks common in upper part

Klm — **Limestone, marl, and sandstone**
Upper part: marly limestone, local reef limestone, and marl, at Jubayl Fuhūd; includes a basal sandstone to the southeast. Middle part: marly limestone and marl with a thin basal sandstone. Lower part: chalky limestone and porous dolomitic and pellety limestone. In mountain zone north of latitude 23° at Al Jabal al Akhḍar: middle part consists of massive limestone with rudistids in basal part, pellety limestone, and marly silty limestone; lower part consist of marly, massive, pellety limestone and dolomitic limestone with radiolarian limestone in basal part. Along mountain front partially masked by Qu, mainly reworked gravel

PALEOZOIC

Pzu — **Dolomite, limestone, and shale**
In mountain zone, Permian and Triassic represented by dolomite and dolomitic limestone in upper part, with clastic developement in lower part. Triassic absent in southeastern desert; Permian limestone caps hills and overlies sandstone and shale sequence of Early Permian age. This rests unconformably on clastic sequence of believed Cambrian and Ordovician age, which is also unconformable on an interbedded dolomite-clastic series

------ **Geologic contact**
Dashed where approximately located; short dashed where indefinite



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°

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—61437

MAP LEGEND

اصطلاحات الخريطة

POPULATED PLACES
- Town or village
- Semi-permanent Village (*Occupied mainly in hot season*)
- Fort

TRANSPORTATION
- Major road, unpaved
- Secondary road
- Landing field

HYDROGRAPHIC FEATURES
Only isolated wells are shown
- Dug well
- Drilled water well
- Daḥl *(see glossary)*
- Intermittent stream
- Sabkhah
- Silt flat

HYPSOGRAPHIC FEATURES
- Generalized relief
- Prominent topographic features
- 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

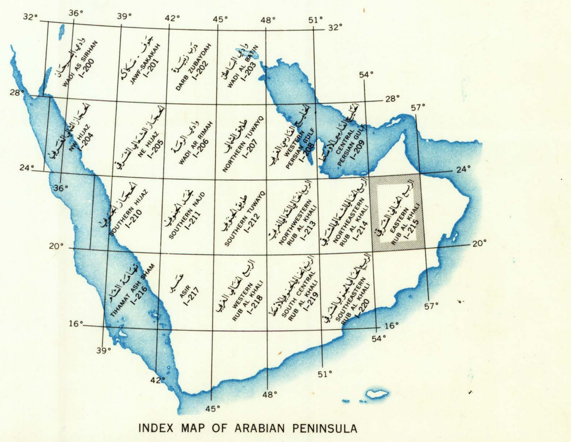
I — Transverse. *Predominantly simple and compound barchan dunes in areas of more mobile sand, and/or simple rounded ridges, both oriented transverse to the prevailing wind direction.*

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 super-imposed 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
- × 200 meters — Spot elevation



INDEX MAP OF ARABIAN PENINSULA

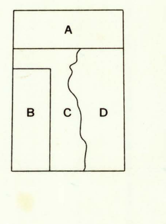
GLOSSARY

ايضاحات

عين	'Ayn	Spring, solution pit, or well
دحل	Daḥl	Deep sink hole or solution cavity
درب	Darb	Road or trail
حفير	Ḥufayr	Very shallow well
جبل تصغير جبيل	Jabal; dim., Jubayl	Hill or mountain
جو	Jaww	Pronounced sandy-bottom depression or basin with gentle slopes
جدة	Jiddah (t)	Relatively flat and featureless hard ground
جفر	Jufr	Shallow well
خور تصغير خوير ج خيران	Khawr; dim, Khuwayr., pl., Khirān	Salty or brackish well, saline bay or inlet
محضر	Maḥḍar	Semi-permanent village or settlement of palm-branch dwellings, often seasonal
نقا	Niqā	Isolated, large prominent sand dune
قرن ج قرون	Qarn; pl., Qurūn	Prominent mountain front
رملة	Ramlah (t)	Sand area
سبخة	Sabkhah (t)	Silt, clay, and sand flats, often with saline incrustations
شقة	Shaqqah (t)	Valley or depression between 'urūq
شعبة	Shu'bah (t)	Same as wādī, usually smaller
وادي تصغير وديّ	Wādī; dim., Wudayy	Valley or dry water course

مصادر المجموعات الاساسية

Compilation and topographic representation by the Arabian American Oil Company from: A, sources compiled by photoplanimetric methods; B, controlled aerial photographic surveys, 1956-57, supplemented by ground surveys; C, Semi-controlled aerial photographic surveys and recompilation from various published sources partly modified and amended from reconnaissance ground surveys; and D, recompilation from various published sources partly modified and amended from reconnaissance ground surveys. Topographic representation by L. A. Castro and G. H. Hargrove, Arabian American Oil Company. Translation, transliteration, calligraphy and Arabic typography by S. H. Kfoury, C. D. Matthews and M. H. Kfoury.

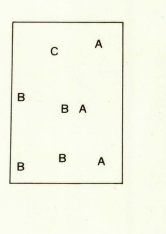


SOURCES OF BASE COMPILATION

مصادر المجموعات الجيولوجية

Geologic mapping by the Arabian American Oil Company compiled from: A, "The Geology of Oman" by D. M. Morton published by the 1959 Fifth World Petroleum Congress, supplemented by reconnaissance ground surveys in southern part of area; B, photogeologic interpretation by the Arabian American Oil Company based on reconnaissance ground surveys; and C, in part photogeologic interpretation and extension of data from areas A and B, and mapping from adjoining Northeastern Rub al Khali quadrangle, map I-214A

Translation of the geologic explanation edited by Harold W. Glidden, U.S. Department of State.



SOURCES OF GEOLOGIC COMPILATION

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

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GEOLOGY OF THE EASTERN RUB AL KHALI QUADRANGLE, KINGDOM OF SAUDI ARABIA

By

Edward L. Elberg Jr., Ruel D. Gierhart and Leon F. Ramirez

خريطة جيولوجية للوحة الربع الخالي الشرقي بالمملكة العربية السعودية

أبحاث جيولوجية مختلفة
خريطة رقم A ٢١٥ - I
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