GEOLOGIC EXPLANATION

QUATERNARY

Qu — **Gravel, sand, silt, and clay, undifferentiated**
In fan and terrace deposits and on coastal salt mud flats; includes slightly elevated coral reefs

Qb — **Basalt**
Olivine basalt, slightly eroded cinder cones and lava fields

TERTIARY

Miocene and Pliocene

Tb — **Basalt**
Olivine basalt; eroded and dissected

Ta — **Andesite and diabase**
Hypabyssal igneous complex of glomeroporphyritic and porphyritic andesite, diabase, felsite, aplite, and olivine basalt; includes septa and screens of older rocks, mostly gabbro

Miocene(?)

Tba — **Baid formation**
Gray, red, and green siliceous and tuffaceous shale, and brecciated limestone

NONCONFORMITY(?)

PRE-PERMIAN

Dikes of rhyolite, diabase, and andesite
Includes some aplite, pegmatite, and gabbro

ag — **Albite-muscovite granite**
Coarse-grained with much simple pegmatite; surrounded by halos of biotite and garnet-bearing rocks

gp, sy — **Granite and syenite**
Granite, pink, gp, includes calc- and per-alkalic facies, seldom metamorphosed, locally porphyritic with phenocrysts of microcline. Generally includes quartz veins and aplite or pegmatite dikes. Syenite, sy, dark- to light-gray, unmetamorphosed; nordmarkite type in part

gr — **Granite**
Gray or pink calc-alkalic rock, generally non lineated; tends to be porphyritic with large microcline or orthoclase crystals especially in border facies; quartz commonly has bluish cast; pegmatite, quartz veins, and aplite rare; may include some per-alkalic granite (gp)

dc — **Diorite, gabbro, amphibolite, and green schist complex**
Brecciated; intruded and metamorphosed by younger granite; complex structure due in part to movements within rift zone

qd — **Quartz diorite**
Gray, biotite-rich, feldspars somewhat saussuritized

gg — **Granite and granodiorite**
Gray, gneissic, often sheared with strained quartz, includes simple pegmatites, and diabase and other dike rocks

d, gb — **Diorite and gabbro**
Gray and pinkish gray diorite, d, biotite and antiperthite common, generally of hybrid type; gabbro and other related basic igneous rocks, gb; probably includes basic igneous rocks younger than gg

dg — **Diorite and granodiorite**
Dark-gray complex, mostly diorite and granodiorite, considerably metamorphosed and brecciated; minor granite and aplite dikes and sills

md — **Metadiorite**
Biotite-rich, generally low quartz tonalite-like hybrid rocks, banded gray and pinkish gray. Includes other metamorphosed basic igneous rocks and some paraschists; generally altered and disturbed by later diastrophism

g, ga, gs — **Greenstone, amphibolitized greenstone, and schistose greenstone**
Greenstone derived from basic fine-grained igneous rocks, g, with local pillow lava structure; includes some massive beds of metadiorite, minor phyllite and slate, and small granitic intrusives. Amphibolitized greenstone, ga, includes quartz, aplite, granite, and pegmatite dikes, sills, or irregular masses; schistose greenstone, gs

sc — **Chlorite and sericite schist**
Locally carbonaceous, calcareous, and quartzose; largely of sedimentary origin

mq — **Marble and quartzite**
Tan, gray, and purple; includes minor, tan to purple schist and phyllite

qs — **Quartz-feldspar schist**
Some mylonite, derived in part from intermediate igneous rocks

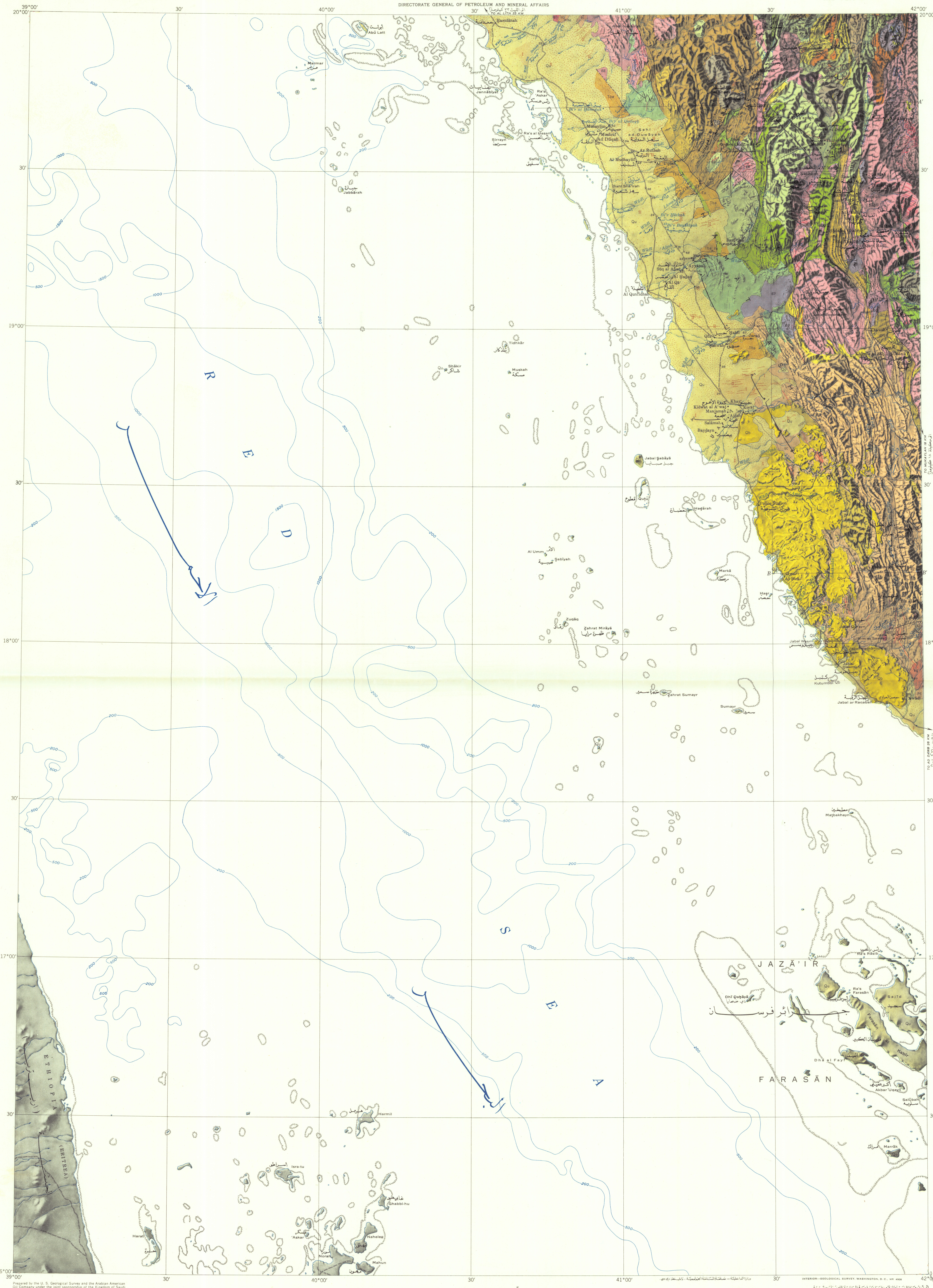
Trend lines
Showing lineation in basement rocks

Geologic contact
Dashed where approximately located; short dashed where indefinite

Fault or shear zone
Dashed where approximately located

Anticline

Syncline



MAP LEGEND

POPULATED PLACES
- Town
- Village
- Village, name not given
- Ruins

TRANSPORTATION
- Major road
- Secondary road
- Road of questionable permanency
- Camel trail

HYDROGRAPHIC FEATURES
Only isolated wells are shown
- Dug well
- Drilled water well
- Intermittent stream
- Reef

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

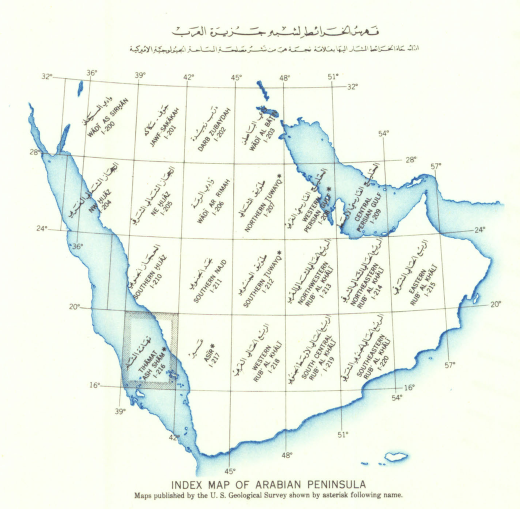
I — Transverse. *Predominantly simple and compound barchan dunes in areas of more mobile sand, and / or simple rounded ridges, both oriented transverse to the prevailing wind direction*

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
- ×420 Spot elevation in meters
  Elevations on top of escarpment after W. Thesiger
- Bathymetric contour, in meters
- Mine



INDEX MAP OF ARABIAN PENINSULA

ايضاحات
GLOSSARY

عين	'Ayn	Spring, solution pit, or well
بئر	Bi'r	Dug well
دكاكة	Dikākah (t)	Eolian sand terrain dominated by hummocks accumulated about small bushes and grass clumps
حرة	Ḥarrah (t)	Fields of lava and volcanic ejecta
حصن	Ḥiṣn	Fort
جبل ج جبال	Jabal; pl., Jibāl	Hill or mountain
جزائر	Jazā'ir	Islands
راس	Ra's	Cape
سهل	Sahl	Plain
سوق	Sūq	Market place
وادي	Wādī	Valley or dry water course

مصادر المجموعات الاساسية

A، جمعت من صور جوية عمودية ١٩٥٣-١٩٥١؛ B، جمعت من صور جوية ترايمتروغونية ١٩٤٥؛ و C، التفاصيل المقابلة للشاطئ اخذت بعد تعديلات لازمة عن خريطة ٢٨١٤، الطبعة الخامسة، آب ١٩٥٠ وخريطة رقم ٢٨١٥، الطبعة الثامنة، تموز ١٩٣٨. من مكتب الهيدروغرافيا التابع للبحرية الامريكية. الرسم الطوبوغرافي من قبل القسم الطوبوغرافي التابع لمصلحة المساحة الجيولوجية الامريكية.

A, compilation from vertical photography, 1951-1953; B, compilation from trimetrogon photography, 1945; and C, offshore detail modified from U. S. Navy H. O. Chart No. 2814, 5th edition, August 1950, and H. O. Chart No. 2815, 8th edition, July 1938. Topographic representation by the Topographic Division, U. S. Geological Survey.

SOURCES OF BASE COMPILATION

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Geologic mapping based on field survey supplemented by photo interpretation by G. F. Brown and R. O. Jackson, U. S. Geological Survey, 1951-56.

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

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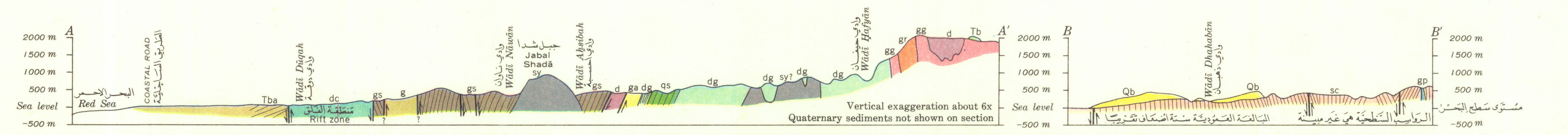
Prepared by the U. S. Geological Survey and the Arabian American Oil Company under the joint sponsorship of the Kingdom of Saudi Arabia and the U. S. Department of State.

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



INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—MR 4906

GEOLOGY OF THE TIHAMAT ASH SHAM QUADRANGLE, KINGDOM OF SAUDI ARABIA

By

Glen F. Brown and Roy O. Jackson

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