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

ابحاث جيولوجية مختلفة
خريطة رقم I- ٢٠١ A
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-201 A

GEOLOGIC EXPLANATION

التفسير الجيولوجي

Symbols queried where indentification doubtful. Fractional symbols Qdc/Qu, Qdc/Ka, Tsm/Tu, and Tu/Ka indicate both formations present but not separated; color of fractional-symbol area indicates dominant formation

QUATERNARY

Qes — الرمال المتكونة بفعل الرياح
Eolian sand
Mostly mobile. See legend for description of sand-terrain types

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

Qs, Qg, Qu — الطمي والحصاة
Silt and gravel
Silt and associated fine sediments including caliche-like and gypsiferous deposits in undrained depressions, Qs; lag and other gravels of local origin, commonly the lag from originally extensive gravel sheets and trains, Qg; unconsolidated surficial deposits of silt, sand, and gravel, may include unrecognized equivalents of other units of Quaternary age, Qu

Qdc — الصلبية الارضية الكلسية
Calcareous duricrust
Discontinuous mantle of red, brown, gray, tan, and yellow, usually hard, sandy limestone, commonly containing imbedded fragments of underlying rocks; ranges in thickness from a few centimeters to 3 or 4 meters. Coarse frosted quartz sand grains are usually present, also a few fresh water mollusks. In many places the resistant duricrust carapace masks underlying rocks and, where extensive, hides underlying structure. Duricrust partially covers Aruma formation in the Al Labbah area, Qdc/Ka; approximately equal distribution of duricrust with silt and gravel occurs in Wādī al Mu'ayy, Qu/Qdc; south of Al Jawf duricrust forms a narrow flat regolith plain along the north edge of the Great Nefud

TERTIARY AND QUATERNARY

QTb — البازلت
Basalt
Olivine basalt with local thin aplite dikes; in places scoriaceous and vesicular; includes bedded pyroclastics, plugs, and cones. Thin lava fields discontinuously cover underlying rocks

TERTIARY

Tg — الحصاة
Gravel
Mostly well-rounded white quartz gravel

Tsm (Miocene and Pliocene) — حجر الرمل والمرل وحجر الكلس
Sandstone, marl, and limestone
Red, brown, and gray marly to calcareous sandstone with occasional conglomerate lenses; sandy marl with minor red sandy shale; white, gray, and brown sandy limestone at top

Tlc (Eocene) — حجر الكلس البلوري والصوانى
Crystalline cherty limestone
Cream, white, gray, buff to tan, crystalline nummulite-bearing limestone with coquina, black to tan chert, and siliceous beds near top; gray, tan, and yellowish-brown marl and shale with impure sandy limestone containing geodal calcite and quartz zones. Dark chert residuum, including some limestone and other gravel, covers parts of the Al Ḩamād plains area

Tu (Paleocene and Eocene) — تكوين منطقة أم الرضمة
Umm er Radhuma formation
Gray, brown, and white chalky marl and granular dolomite overlain by gray and yellowish- to reddish-brown dolomite with black chert and siliceous dolomite lenses; formation thickens southeastward. At northeast corner of map Tsm discontinuously overlies Umm er Radhuma, Tsm/Tu

CRETACEOUS

Ka (Upper Cretaceous) — تكوين منطقة العرمة
Aruma formation
Gray, buff, white, and tan limestone, marly limestone, and dolomite with light gray, buff, yellowish-brown dolomitic marl, shaly marl, and chalky limestone near top; fossiliferous limestone, thin coquina, and siliceous and geodal quartz zones at several levels; a Loftusia (coral) zone in upper part. At Khashm Zallūm, gray to brown, variegated, massive sandstone grades southeastward through sandy dolomitic marl to yellow and brown marly dolomite and limestone; formation thickens southeastward, wedges out westward near Al Jawf. Of Campanian(?) and Maestrichtian age

PALEOZOIC OR MESOZOIC

MzPzs — الحجر الرملي التابع لسكاكة
Sakaka sandstone
Tan, white, gray, dark brown to black weathering locally conglomeratic, crossbedded, usually friable sandstone; reddish-tan, crossbedded, commonly micaceous sandstone in upper and lower part; local maroon silty shale and marl at base; abundant fossil wood west of Sakākah of doubtful derivation. New formation; age not established beyond pre-Cretaceous and post-Devonian

DEVONIAN

Dj — تكوين منطقة الجوف
Jauf formation
Cream, tan, and gray, finely crystalline limestone with dolomitized algal zones at several levels, interbedded with gray-green, red, silty shale and subordinate interbedded, commonly micaceous, sandstone. Interbedded gray-green silty shale and impure limestone, and crossbedded sandstone at top of upper member. Banded, red, greenish-gray, and gray silty shale with subordinate partially micaceous sandstone and siltstone common in upper and lower parts of middle member. Gray-tan, steel-gray, locally reddish-brown, saccharoidal to finely crystalline limestone with prominent algal or coral-reef mounds interbedded with yellow and tan siltstone. Grayish-green, silty shale interbedded with thin maroon shale and red weathering silty limestone in lower part of lower member. New fossil evidence places all of this formation in the Devonian; lower part previously considered as of questionable Silurian age. A few well developed dikes of diabase texture and dioritic composition occur north of Al Jawf and in south end of Jaww Nayṣūbah

ORDOVICIAN SILURIAN AND DEVONIAN

DSOt, Dtw — تكوين منطقة تبوك
Tabuk formation
Buff, tan, gray and reddish-brown, rarely white, dark brown to black weathering, very fine- to medium-grained, commonly silty and micaceous, non-crossbedded, quartz sandstone; abundant Scolithus (Tigillites) and worm trails, uppermost part of formation probably of Devonian age. Tawil sandstone member, Dtw, at top; buff, light brown to white, locally gray, red, yellow, purple, dark brown to black weathering, medium- to coarse-grained, strongly crossbedded sandstone; common quartz pebble zones, and thin interbedded, discontinuous, gray and maroon shaly siltstone horizons. Formerly Tawil sandstone was considered a separate formation; for first time here considered as member of the Tabuk formation. Includes concretionary ironstone at several levels in lower part; of Devonian age

CAMBRIAN AND ORDOVICIAN

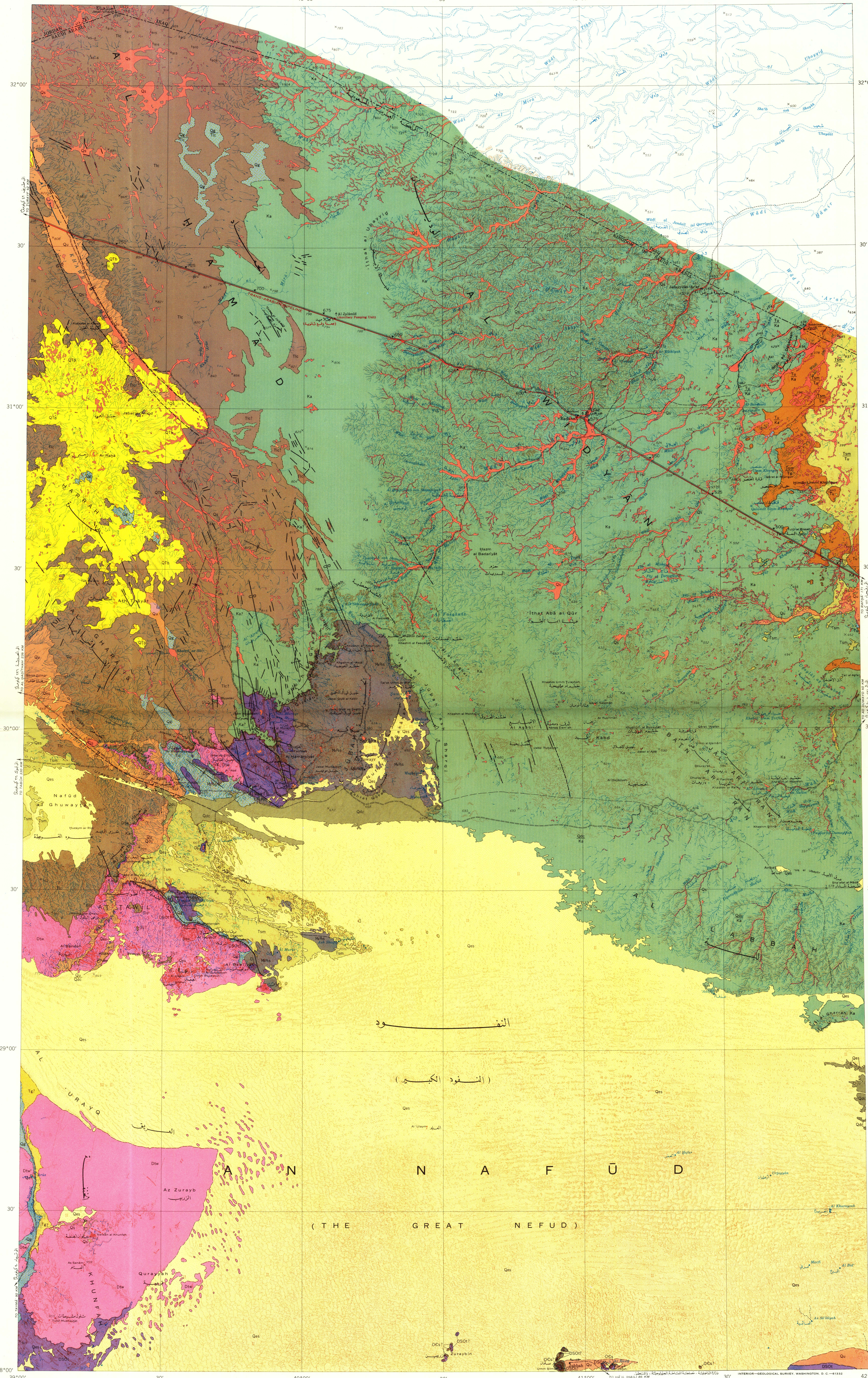
O€s — حجر الرمل في منطقة ساق
Saq sandstone
Massive, crossbedded sandstone; occurrences at Zuraybīn and Jubbah incompletely known. Now assigned to Cambrian and Ordovician age; previously in literature assigned a questionable Cambrian age

الاتصال الجيولوجي
Geologic contact
Dashed where approximately located; short dashed where indefinite

صدع
Fault
Dashed where approximately located. U, upthrown side; D, downthrown side

التواء الطبقات الصخرية القوسي
Anticline

التواء الطبقات الصخرية الجوفي
Syncline



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°

Indicated positions of boundary lines not demarcated on the ground are not necessarily definitive.

MAP LEGEND

اصطلاحات الخريطة

POPULATED PLACES
- City or town — مدينة أو بلدة
- Village — قرية

TRANSPORTATION
- Major road, unpaved — طريق رئيسية غير معبدة
- Secondary road — طريق اعتيادية
- Road of questionable permanency — طريق غير ثابتة
- Trail — مسلك ، درب
- Landing field — أرض للنزول

HYDROGRAPHIC FEATURES
Only isolated wells are shown
- Dug well — بئر محفورة باليد
- Drilled water well — بئر محفورة بآلة الحفر
- Intermittent stream — جدول متقطع
- Khabrā and Wādī floor, some with gravel

HYPSOGRAPHIC FEATURES
- Generalized relief — ارتفاع عمومي
- Sand — الرمل

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.*

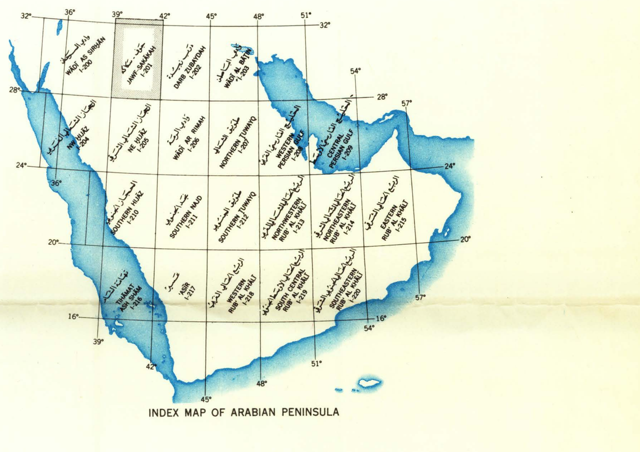
II — Longitudinal. *Primarily dikākah and various types of undulating sand sheets, in general characterized by elongation of the individual topographic forms parallel to the prevailing wind direction, often partially stabilized by sparse vegetation.*

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.*

"The Great Nefud". *A strongly undulating sand sheet with marked linear elements trending easterly and southeasterly, and consisting of large asymmetrical oval mounds and deflation hollows. Individual components crest up to 100 meters and commonly span two kilometers. The brushy, partially stabilized hollows are often linked by irregular barchan-like slip faces whose leeward slopes face eastward or northeastward. Low hills 6 to 10 meters high are exposed in some of the hollows. Widespread perennial brush is augmented by annual vegetation normally exceeding that of the surrounding rocky desert.*

MISCELLANEOUS FEATURES — أوصاف مختلفة
- Oil pipeline with pumping station
- Kilometer post — *Measured from Al Qayṣūmah*
- Spot elevation — ×600 meters
- Border survey triangulation station
- International boundary



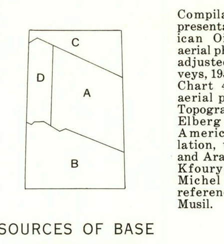
INDEX MAP OF ARABIAN PENINSULA

GLOSSARY

ايضاحات

ابرق	Abraq	Rocky hill with sand on slopes
برقاء	Barqā'	Broad rocky hill with sand on slopes; larger than abraq
بطين	Baṭīn	Gradually sloping area
بطن	Baṭn	Depression or hollow, usually elongate
دويخلة	Duwaykhilah(t)	Sha'īb that enters a larger wādī
فاج	Fāj	Wide, elongated hollow or valley with no continuous wādī-channel
فيضة	Fayḑah(t)	Closed basin with firm, flat, vegetation-covered mud surface, occasionally rocky and sandy
غار ج غيران	Ghār; pl., Ghīrān	Sheltering recess of overhang in the side of any steep elevation
حماد	Ḩamād; (refer to Al Ḩamād on map)	Stony upland plain
حرة	Ḩarrah(t); (refer to Al Ḩarrah on map)	Area of lava flow and volcanic debris
حزم ج حزوم	Ḩazm; pl., Ḩuzūm	Elevated rocky terrain
عرق مصغر عريق	'Irq; dim., 'Urayq	Long linear sand ridge
عيثة ج عيثات وعيث	'Ithah(t); pl., 'Ithāt, 'Iyath	Stony area with shallow sands
جبل ج جبال	Jabal; pl., Jibāl	Hill or mountain
جال ج جيلان	Jāl; pl., Jīlān	Rocky escarpment, low cliff, or side of a valley
جو	Jaww	Pronounced sandy-bottomed depression or basin with gentle slopes
خبراء	Khabra'	Closed basin with firm, flat mud and silt surface, commonly barren and lacking vegetation
خشم ج خشوم	Khashm; pl., Khushūm	Head land or promontory along a cliff or mountain
خور	Khawr	Saline bay or inlet; valley, long depression
خر	Khirr	Wādī or sha'īb with natural dikes partially impeding its course
كتيفة	Kutayfah(t)	Small jabal
محير	Maḩīr	Terminal drainage basin, usually with taller brush or trees
نفود مصغر نفيد	Nafūd (Nefud) dim., Nufayyid	Large area of sand dunes
قلمة	Qalamah(t)	Drilled water well equipped with pipe
قارة	Qārah(t)	Flat-topped hill, usually rounded
رجلة	Rijlah(t)	Small tributary sha'īb
سبخة	Sabkhah(t)	Silt, clay, and sand flats, often with saline incrustations
شعفة	Sha'afah(t)	Brushy, partially sand covered peak or mound with exposed rocky windows and rocky debris; usually low
شعيب	Sha'īb	Same as wādī; usually smaller
سهلة ج سهال	Sihlah(t) (Sahlah); pl. Sihāl	Small plain
تلعة	Tal'ah(t)	Small sha'īb from a steep elevation
تل ج تلول	Tall; pl., Tulūl	Hill, mound
عقلة ج عقل المصغر عقيلات	'Uqlah(t); pl., 'Uqal; dim. pl., 'Uqaylāt	Shallow well usually of constant supply
وادي ج وديان	Wādī; pl., Widyān	Valley or dry water course

مصادر المجموعات الاساسية



SOURCES OF BASE COMPILATION

Compilation and topographic representation by the Arabian American Oil Company; A, adjusted aerial photographic surveys, 1951; B, adjusted aerial photographic surveys, 1957–58; C, U. S. A. F. Pilotage Chart 446–B; and D, unadjusted aerial photographic surveys, 1951. Topographic representation by E. L. Elberg and L. A. Castro, Arabian American Oil Company. Translation, transliteration, calligraphy and Arabic typography by Simon H. Kfoury, Charles D. Matthews, and Michel H. Kfoury, with frequent reference to names given by Alois Musil.

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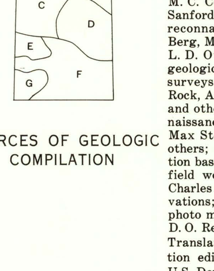

SOURCES OF GEOLOGIC COMPILATION

Geologic mapping by the Arabian American Oil Company compiled by L. F. Ramirez from: A, photogeologic interpretation by D. A. Holm, J. S. Williams, C. W. Rock and others; B, combined field mapping and photogeology by J. S. Williams and C. W. Rock, and some earlier reconnaissance field work by E. L. Berg, B. Beverly, Jr., L. D. Owens, R. A. Bramkamp and others; C, photogeologic mapping based on field surveys by A. F. Pocock, R. M. Sanford, D. A. Holm, H. W. Schneider, S. D. Bowers and others. Recent field observations by H. R. Von Gaertner (Geological Survey, Hanover, Germany) and some earlier reconnaissance field work by E. L. Berg, Max Steineke, R. A. Bramkamp and others; D, combined field mapping and photogeology by M. C. Coffield, W. H. Reiss, R. M. Sanford and others, and some earlier reconnaissance field work by E. L. Berg, Max Steineke, B. Beverly, Jr., L. D. Owens and others; E, photogeologic compilation based on field surveys by J. S. Williams, C. W. Rock, A. F. Pocock, H. W. Schneider and others, and some earlier reconnaissance field work by E. L. Berg, Max Steineke, J. W. Northrop and others; F, photogeologic interpretation based on limited reconnaissance field work by R. M. Sanford, and Charles Huber's 19th century observations; and G, reconnaissance field photo mapping by N. M. Layne, Jr., D. O. Reese and J. J. Donohue. Translation of the geologic explanation edited by Harold W. Glidden, U.S. Department of State.

GEOLOGY OF THE JAWF-SAKAKAH QUADRANGLE, KINGDOM OF SAUDI ARABIA

By

Richard A. Bramkamp, Leon F. Ramirez, Max Steineke, and William H. Reiss

خريطة جيولوجية للوحة الجوف وسكاكة بالمملكة العربية السعودية

وضع ريتشارد برامكامب وليون راميز وماكس ستاينيكي ووليم رايس

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