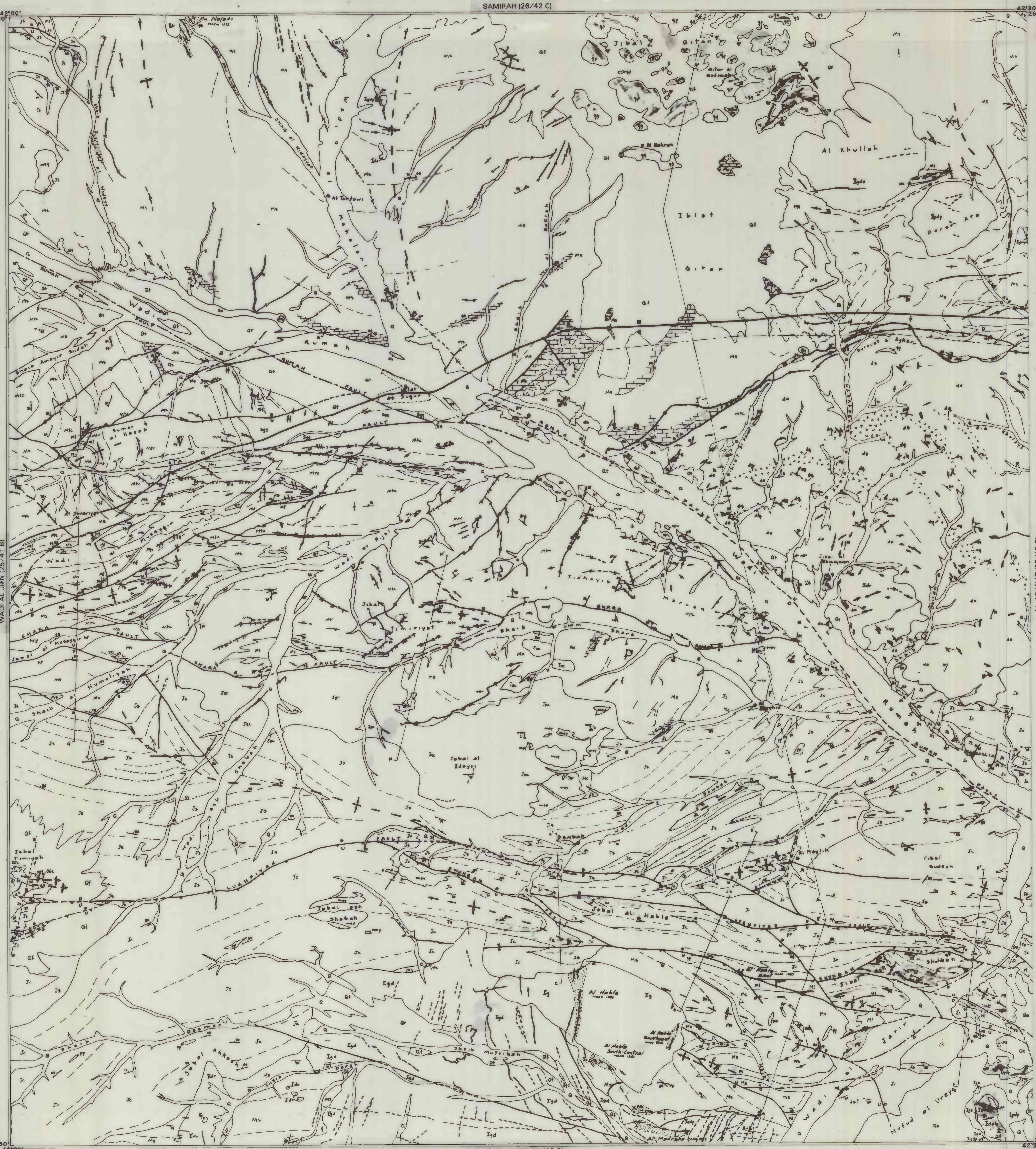
U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, PREPARED FOR

MINISTRY OF PETROLEUM AND MINERAL RESOURCES
DEPUTY MINISTRY FOR MINERAL RESOURCES

KINGDOM OF SAUDI ARABIA

OPEN-FILE REPORT 85-723
PLATE 1



Aerial photography 1956 and controlled photomosaic 1959 Aero Services Corporation, Philadelphia, Penn., U. S. A.

This report has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

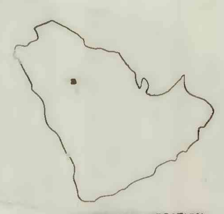
TRUE NORTH

SCALE 1 : 100 000

2 0 2 4 6 8 10 KILOMETERS

2 0 2 4 6 8 10 MILES

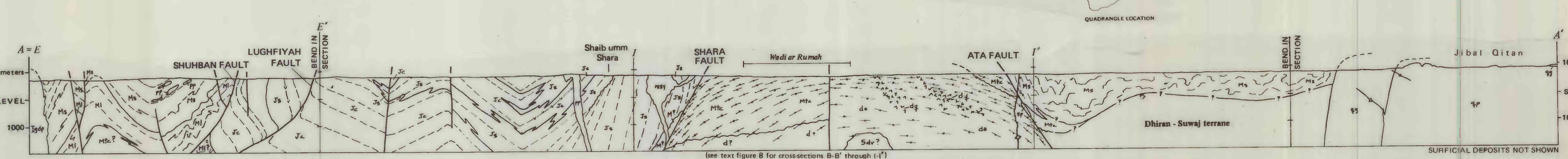
DATUM IS MEAN SEA LEVEL



QUADRANGLE LOCATION

Geology mapped in February - April 1981 and November - December 1983.

Geographic names revised 1984 from data released by the Aerial Survey Department, Ministry of Petroleum and Mineral Resources, Saudi Arabia; Arabic names conform to the official transliteration of the Kingdom of Saudi Arabia.



(see text figure 8 for cross-sections B-B' through I-I')

SYMBOLS

(Planar and (or) linear symbols may be combined at point of observation)

CONTACT--Showing dip where known; dotted where concealed

FAULT--Showing dip, sense of vertical or lateral offset; dashed where inferred from geology

HIGH-ANGLE REVERSE FAULT--Showing dip and sense of vertical offset; teeth on upper plate

FAULT (inferred from magnetic data)

BASE OF LANDSLIDE BLOCK of Saq Sandstone

ANTICLINE--Showing trace of crest and plunge direction

SYNCLINE--Showing trace of trough line and plunge direction

RECLINED SYNCLINE

STRIKE AND DIP OF BEDS
- Inclined--Showing dip
- Inclined--Showing dip direction
- Average attitude of folded beds
- Vertical
- Horizontal
- Overturned
- Tops known from sedimentary/volcanic features
- Trend lines--Showing trace of bedding

PRIMARY IGNEOUS FEATURES
- Primary igneous layering (trachytic foliation)
- Attitude of pegmatite/aplite sheet

MINERAL SCHISTOSITY
- Inclined--Showing dip
- Inclined--Showing dip direction
- Vertical
- Mineral schistosity parallel to bedding
- Schistosity depicted in cross-section

FRACTURE CLEAVAGE
- Inclined--Showing dip
- Inclined--Showing dip direction
- Vertical

CATACLASTIC FLUXION STRUCTURE (foliation)
- Inclined--Showing dip

LINEATION
- Mineral lineation or axis of elongate clast
  - Inclined--Showing plunge
  - Horizontal
- Axis of minor fold
- Axis of minor antiform
- Axis of minor synform
- Intersection of schistosities in plicated beds
- Cataclastic streaking lineation or slickensides

QUARTZ VEIN OR PLUG--Consists of quartz-calcite-granular chlorite-hematite throughout most of Ata-Shara block; quartz-pyrite-chalcopyrite-(hematite-gold) typical near mineral occurrences; rare quartz-tourmaline-fluorite veins located 2 km north of Jibal al Khusayyayn

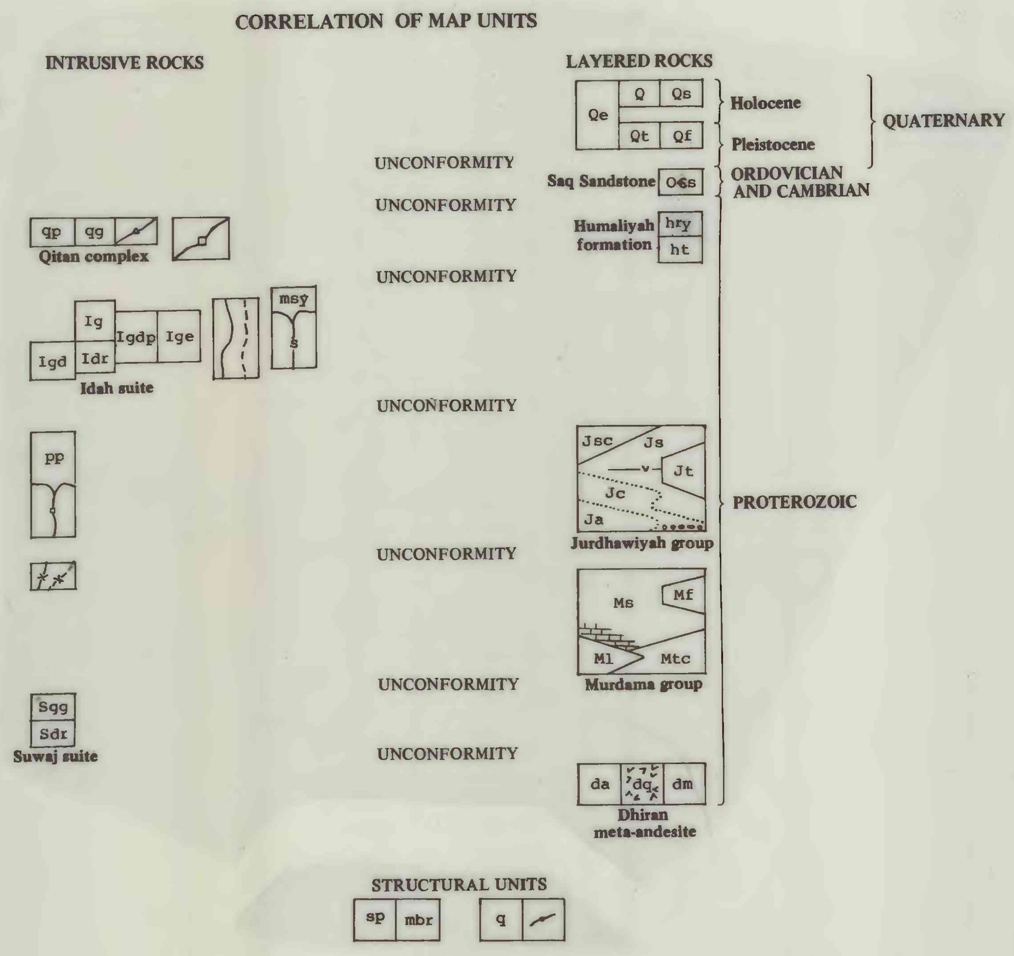
MINERAL OCCURRENCE (showing MODS record number)
- An Najadi MODS 1272 Ancient working--Largest of a related group of workings
- Area of extensive ancient excavation
- Minor ancient working

GEOGRAPHIC AND CULTURAL FEATURES
- Town
- Village or settlement
- Paved highway
- High-voltage power line
- P.S. Power system sub-station
- Communication tower

STROMATOLITE FOSSIL LOCALITY

SAMPLE LOCALITY FOR RADIOMETRIC AGE DETERMINATION (Stuckless and others, 1984)

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

(see text for discussion of stated ages)

LAYERED ROCKS

QUATERNARY DEPOSITS

Q — ALLUVIUM (Holocene)--Sand and gravel in modern drainage channels

Qs — SABKHAH DEPOSITS (Holocene)--Saline silt and sand

Qe — EOLIAN SAND DEPOSITS (Holocene and Pleistocene)

Qt — TERRACE GRAVEL DEPOSITS (Pleistocene)--Gravel and sand adjacent to modern drainage channels; weak to moderate, oxidized, clayey soil

Qf — ALLUVIAL FAN AND APRON DEPOSITS (Pleistocene)--Gravel, sand, and boulders adjacent to high mountains; weak, oxidized, clayey soil

PROTEROZOIC AND PALEOZOIC ROCKS

O€s — SAQ SANDSTONE (Cambrian and Lower Ordovician)--Tan, well bedded quartz arenite; medium-grained, cross-bedded

hry, ht — HUMALIYAH FORMATION (585 to 570 Ma)--Rhyolite member (hry), orange to tan, weakly peralkaline flow rock with 30 to 40 percent quartz and sanidine phenocrysts; Tuff breccia member (ht), red-orange pyroclastic breccia and moderately welded lapilli tuff

Jsc, Js, Jt, Jc, Ja — JURDHAWIYAH GROUP (640(?) to 620 Ma)--Preserved in two major basins; thickness and depositional order variable within and between basins. Shara conglomerate (Jsc), red-brown, poorly bedded polymict conglomerate (deformed Timiriyat clasts distinctive); Lapilli tuff member (Jt,-v—v-), red and gray, andesitic to rhyodacitic crystal-lapilli tuff (variably welded); Volcaniclastic sandstone (Js), brown-green, well bedded coarse sandstone with minor pebble conglomerate; Polymict conglomerate member (oooooo), sparse boulder and cobble conglomerate (Dhiran-Suwaj clasts distinctive); Volcaniclastic conglomerate (Jc), poorly sorted, thick-bedded, cobble and boulder conglomerate (dominantly Andesite and Plagioclase porphyry clasts) with minor volcaniclastic sandstone lenses; and Andesite (Ja), dark-green flow rock and flow breccia, locally amygdaloidal, with prominent phenocrysts of plagioclase, augite, hornblende, hypersthene, and or magnetite

Ms, Mf, Ml, Mtc — MURDAMA GROUP (670(?) to 650(?) Ma)--Preserved in three major basins; thickness and internal stratigraphy moderately variable within and between basins. Felsophyre member (Mf), tan to pale orange, well bedded, leucocratic, reworked volcanic ash(?) with sparse sodic plagioclase phenocrysts; Sandstone (Ms), green, thin-bedded, medium- to fine-grained volcanic arenite and feldspathic volcanic arenite (disseminated pyrite and 10 percent detrital quartz distinctive), calcite-cemented (brick pattern indicates presence of 20 to 40 percent limestone beds); Limestone (Ml), tan to brown to blue-white, thin-bedded, locally oolitic or stromatolitic, micrite and siliceous sandy micrite; and Timiriyat conglomerate (Mtc), varicolored, poorly sorted cobble and boulder polymict conglomerate (Dhiran-Suwaj clasts distinctive)

da, dq, dm — DHIRAN META-ANDESITE (greater than 690 Ma)--Weakly bedded, locally cataclastic, dark-green to epidote-green, andesitic flow rock and flow breccia (da); locally amygdaloidal, contains sparse pyribole(?) phenocrysts, interbedded with rare biotite-hornblende schist; metamorphosed to assemblages of quartz, plagioclase, epidote, actinolite, chlorite, sericite, sphene, and calcite. Sodic metadacite member (dq), brown-gray, schistose, richly porphyritic metadacite with 30 to 40 percent phenocrysts of oligoclase and (variable) quartz (contact with Meta-andesite structurally transposed, approximately located by distribution of caret pattern). Marble member (dm), white to tan, indistinctly bedded, calcite marble in discontinuous pods

PROTEROZOIC INTRUSIVE ROCKS

SANIDINE PORPHYRY (585 to 570 Ma)--Bright-orange to brick-red, richly porphyritic, weakly peralkaline rhyolite porphyry with 30 to 50 percent phenocrysts of sanidine, quartz, albite, and sparse, green biotite; intruded as prominent dikes (2- to 5-m-thick) with N. 50° E. trend

qp, qg — QITAN COMPLEX (579±4 Ma)--Weakly zoned, sub-circular composite intrusion with flat roof; external contact and boundary between members dip steeply outward; biotite-cordierite-fluorite contact hornfelses. Dikes (—△—), gray, biotite granite porphyry with 40 percent phenocrysts of orthoclase, albite, quartz, and minor biotite (quartz-orthoclase-muscovite-biotite-fluorite pegmatite-aplite dikes not shown within complex); Granite porphyry member (qp; core phase), white to pale-gray, medium-grained, biotite albite-orthoclase granite porphyry with 10 to 30 percent phenocrysts of orthoclase and quartz, 7 percent brown biotite, and minor fluorite and muscovite; Biotite granite member (qg; rim phase), pale-pink to orange, coarse-grained, equigranular biotite albite-orthoclase granite, with 2 to 5 percent green biotite and minor fluorite

msy — SODIC MICROSYENITE (approximately 620 to 615 Ma)--Mottled pale-orange, -red, and tan, very fine grained, leucocratic microsyenite that contains more than 80 percent oligoclase, less than 15 percent quartz, and sparse biotite, magnetite, apatite, and sphene; local, contorted, faint banding; intrudes Jurdhawiyah group near and above major faults plane

IDAH SUITE (620 to 615 Ma)--Calc-alkaline granodiorite, diorite, and syenogranite in composite batholiths and slightly younger elliptical plutons and plugs; characterized by discoid cognate mafic inclusions, locally abundant cogenetic dikes, contact hornfelses, annular magnetic anomalies, and association with gold deposits

Dikes--Mafic rocks — — — — — —, chiefly diabase; felsic rocks ————— include aplite and leucocratic granite porphyry

Ig — Granite--Pale-pink to tan, medium-grained, leucocratic, seriate-porphyritic biotite syenogranite with 60 to 70 percent phenocrysts of quartz, oligoclase, and orthoclase, and 3 percent biotite; western lobe and southern border is red, finer-grained, and contains pegmatite-aplite bodies

Ige, Igdp — Granodiorite porphyry (Igdp)--Gray, medium-grained, seriate-porphyritic biotite-hornblende granodiorite with about 20 percent phenocrysts of zoned andesine-oligoclase; mafic minerals (15 to 20 percent) consist of subequal hornblende and biotite and minor magnetite; Granophyre member (Ige), brick-red, fine-grained, biotite quartz monzonite with oligoclase phenocrysts; micro-granophyric groundmass; 10 percent mafic minerals include some hornblende; forms contact phase beneath flat roof contact at Jabal Idah

Idr — Diorite--Dark-gray, medium-grained, melanocratic hornblende diorite with 65 percent zoned andesine, 28 to as much as 39 percent hornblende and minor magnetite and biotite; quartz interstitial, orthoclase poikilitic

Igd — Granodiorite--Light-gray to pale-pink or -orange, medium-grained, equigranular, leucocratic biotite-hornblende granodiorite with 13 percent mafic minerals (hornblende generally exceeds biotite); weakly cataclastic near faults

pp — PLAGIOCLASE PORPHYRY (640(?) to 620 Ma)--Red-brown to dark green, structureless, richly porphyritic andesite (abundant) to dacite (rare) that contain about 25 percent phenocrysts of zoned andesine, augite, hornblende, hypersthene, magnetite and or biotite (rare); forms dikes and plugs, locally gradational to Jurdhawiyah andesite, in Idayri basin; subvolcanic conduit intrusions.

DEFORMED AND ALTERED DIKE ROCKS (pre-Jurdhawiyah group)--Locally granulated or schistose, intensely altered to chlorite, epidote, actinolite, sericite, and calcite, and contain abundant quartz veins. Mafic rocks —x— — —x—chiefly diabase (andesite-basalt) with sparse mafic phenocrysts; felsic rocks —x———x— chiefly aphanitic aplite with sparse oligoclase phenocrysts

SUWAJ SUITE (690 to at least 680 Ma)--Thoroughly altered and locally cataclastic; granophyric textures common, cogenetic dikes rare; characterized by low potassium content at all levels of silica content, and by short-wavelength, high-amplitude magnetic anomalies

Sgg — Granodiorite granophyre--Pale-pink to -orange, medium-grained, porphyritic hornblende(?) granodiorite (19 percent relict mafic grains) and local perthite granite (3 percent sphene and minor magnetite); coarsely granophyric groundmass (visible with hand lens) typical

Sdr — Microdiorite--Dark-gray, fine-grained, equigranular hornblende diorite with 24 percent relics of hornblende; micrographic groundmass

STRUCTURAL UNITS

(exposed only along eastern trace of Ata fault)

mbr — CATACLASTIC MEGABRECCIA--Gray-green to dark-green, heterogeneous structural mixture of about 75 percent lensoid blocks (10 to 20 m in length) in locally foliated serpentine-rich matrix; lensoid blocks consist of intensely cataclastic and altered Dhiran meta-andesite, diorite, hornblende gneiss, and Murdama(?) sandstone

sp — SERPENTINITE--Black to green-black, heterogeneous structural mixture of 20 to 40 percent blocks and pods (1 to 2 m in length) in moderately foliated serpentinite matrix; serpentine textures suggest dunite and harzburgite protoliths but only dark-red-brown spinel grains preserved; blocks similar to those in Cataclastic megabreccia

RECONNAISSANCE GEOLOGIC MAP OF THE UQLAT AS SUQUR QUADRANGLE, SHEET 25/42 A, KINGDOM OF SAUDI ARABIA

by
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1985