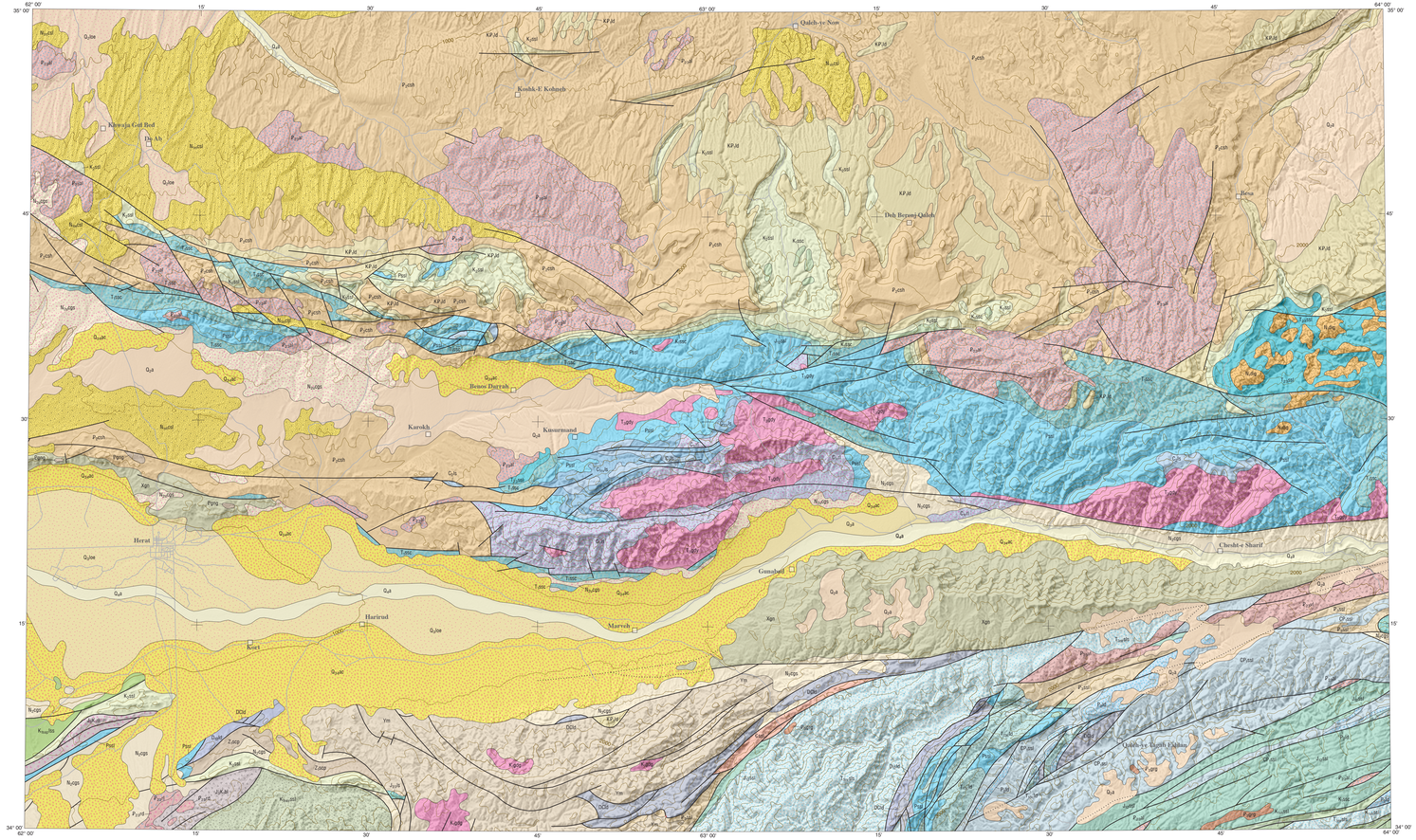
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

AFGHAN GEOLOGICAL SURVEY
Prepared in cooperation with the U.S. Geological Survey and the Afghanistan Geodesy and Cartography Head Office
Under the auspices of the U.S. Agency for International Development and the U.S. Trade and Development Agency

USGS OPEN-FILE REPORT 2005-1104-A
AGS OPEN-FILE REPORT (409/410) 2005-1104-A
USGS Afghanistan Project Product No. 034



Base from Shuttle Radar Topography Mission (SRTM) 85-meter digital data
Cultural data from digital files from AIMS Web site (http://www.aims.org.af)
Projection: Universal Transverse Mercator, zone 41, WGS 84 Datum

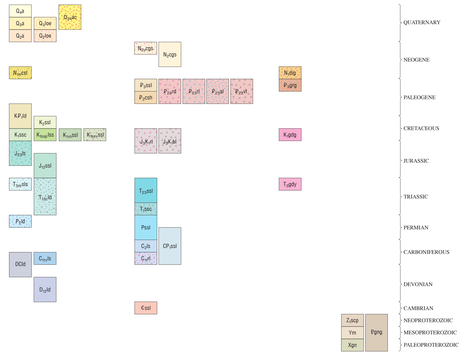
SCALE 1:250 000
5 0 5 10 15 20 25 30 35 40 KILOMETERS
5 0 5 10 15 20 MILES
CONTOUR INTERVAL 250 METERS

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

GEOLOGIC MAP OF QUADRANGLE 3462, HERAT (409) AND CHESHT-SHARIF (410) QUADRANGLES, AFGHANISTAN

Compiled by
Robert G. Bohannon and Charles R. Lindsay
2005

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa **Conglomerate and sandstone (Holocene)**—Alluvium: shingly and detrital sediments, gravel, sand more abundant than silt and clay

Qaalc **Fan alluvium and colluvium (Holocene and late Pleistocene)**—Fan alluvium and colluvium: shingly and detrital sediments, gravel, sand, clay

Qa **Conglomerate and sandstone (late Pleistocene)**—Alluvium: shingly and detrital sediments, gravel, sand more abundant than silt and clay

Qloe **Loess (late Pleistocene)**—Loess more abundant than sand, clay

Qa **Conglomerate and sandstone (middle Pleistocene)**—Alluvium: shingly and detrital sediments, gravel, sand more abundant than silt and clay

Qloe **Loess (middle Pleistocene)**—Loess more abundant than sand, clay

Ngs **Conglomerate and sandstone (late Pliocene)**—Gray conglomerate, grit, sandstone more abundant than siltstone, clay, limestone, marl; gypsum, salt; felsic to mafic volcanic rocks

Ngs **Conglomerate and sandstone (Pliocene)**—Gray conglomerate, grit, sandstone more abundant than siltstone, clay, limestone, marl; gypsum, salt; felsic to mafic volcanic rocks

Nmsh **Clay and siltstone (middle Miocene)**—Brown clay, siltstone more abundant than sandstone, conglomerate, limestone

Nd **Diorite and granodiorite (Miocene)**—Dietite porphyry, granodiorite porphyry, monzonite porphyry, syenite porphyry, nepheline syenite

Pss **Sandstone and siltstone (Oligocene)**—Sandstone, siltstone more abundant than clay, conglomerate, limestone, marl; felsic and mafic volcanic rocks

Pgp **Granite and granodiorite (Oligocene)**—Granite, granite porphyry, granodiorite more abundant than quartz syenite, granosyenite

Pvf **Rhyolite and dacite (Oligocene and Eocene)**—Rhyolite (liparite), dacite more abundant than granite porphyry

Pvf **Rhyolite lava (Oligocene and Eocene)**—Rhyolite lava more abundant than basaltic andesite, basalt, trachyte, dacite, ignimbrite, tuff; conglomerate, sandstone, siltstone, limestone

Pva **Andesite lava (Oligocene and Eocene)**—Andesite lava more abundant than basaltic andesite, basalt, trachyte, dacite, rhyolite, ignimbrite, tuff; conglomerate, sandstone, siltstone, limestone

Pvf **Lava (Oligocene and Eocene)**—Basaltic andesite, basalt, trachyte, dacite, rhyolite, ignimbrite, tuff; conglomerate, sandstone, siltstone, limestone

Pcsh **Clay and shale (Eocene)**—Clay, shale, siltstone more abundant than sandstone, limestone, marl, gypsum, conglomerate (North Afghanistan); sandstone, siltstone, conglomerate and gravelstone; felsic and mafic volcanic rocks (Gerirud basin)

KPld **Limestone and dolomite (Paleocene and Late Cretaceous)**—Limestone, marl, dolomite more abundant than sandstone, clay, siltstone, gypsum, conglomerate

Kssl **Sandstone and siltstone (Late Cretaceous)**—Sandstone, siltstone more abundant than clay, limestone, marl, conglomerate, gypsum (North Afghanistan); limestone (Middle Afghanistan)

Kssc **Sandstone and conglomerate (Early Cretaceous)**—Red sandstone, conglomerate more abundant than siltstone, gypsum, clay

Kgdg **Granodiorite and granite (Early Cretaceous)**—Granodiorite, granite

Kssa/Kss **Limestone and sandstone (Early Cretaceous (Aptian and Barremian))**—Limestone, marl, sandstone more abundant than conglomerate

Kss/Jssl **Sandstone and siltstone (Early Cretaceous (Hauterivian and Valanginian))**—Sandstone, siltstone more abundant than limestone, marl

Kss/Jssl **Sandstone and siltstone (Early Cretaceous (Valanginian and Berriasian))**—Sandstone, siltstone more abundant than limestone, marl

JvKvf **Rhyolite lava (Early Cretaceous (Hauterivian) and Late Jurassic (Tithonian))**—Rhyolite lava more abundant than shale, siltstone, sandstone, conglomerate, chert, limestone, greenstone, felsic volcanic rocks

JvKvbf **Basalt lava (Early Cretaceous (Hauterivian) and Late Jurassic (Tithonian))**—Basalt lava more abundant than shale, siltstone, sandstone, conglomerate, chert, limestone, greenstone, felsic volcanic rocks

Jvlb **Limestone (Late and Middle Jurassic)**—Limestone, marl

Jss **Sandstone and siltstone (Middle and Early Jurassic)**—Sandstone, siltstone more abundant than clay, conglomerate, coal (North Afghanistan); limestone, marl, sandstone, shale, siltstone (Middle Afghanistan)

TJss **Siltstone and sandstone (Late Triassic (Rhaetian and Norian))**—Siltstone, sandstone more abundant than shale, conglomerate

TgdPg **Granodiorite and granosyenite (Late Triassic)**—Granodiorite, granosyenite, granophyre, granite

TJssl **Sandstone and siltstone (Late and Middle Triassic)**—Sandstone and siltstone more abundant than mudstone, carbonaceous shale, limestone, marl, conglomerate, felsic and mafic volcanic rocks

TJslc **Limestone and dolomite (Late Triassic (Carnian) to Early Triassic)**—Limestone, dolomite more abundant than conglomerate, chert, marl (Middle Afghanistan)

TJssc **Sandstone and conglomerate (Early Triassic)**—Variegated sandstone, gravelstone, conglomerate, chert, rhyolite and basalt volcanic rocks

PJslf **Limestone and dolomite (Late Permian)**—Limestone, dolomite more abundant than marl, conglomerate, sandstone, siltstone, shale, bauxite and bauxite-bearing rocks

Pssl **Sandstone and siltstone (Permian)**—Red and variegated sandstone and siltstone more abundant than mudstone, conglomerate, gravelstone (Northwest Afghanistan); limestone, dolomite, sandstone, siltstone, shale, phyllite, mafic volcanic rocks, bauxite and bauxite-bearing rocks (Middle Afghanistan: Zuri and Kismaran zones)

CPssl **Sandstone and siltstone (Early Permian and Carboniferous)**—Sandstone and siltstone more abundant than slate, andesite to basalt volcanic rocks

CJls **Limestone (Late Carboniferous)**—Limestone more abundant than slate, sandstone, conglomerate, siltstone, andesite to basalt volcanic rocks

CvJls **Limestone (Early Carboniferous (Visean and late Tournaisian))**—Limestone more abundant than slate, sandstone, mudstone, conglomerate

CvJvf **Rhyolite lava (Early Carboniferous (early Tournaisian))**—Rhyolite to andesite (greenstone altered) more abundant than sandstone, shale, siltstone

DClsl **Limestone and dolomite (Early Carboniferous and Late Devonian)**—Limestone and dolomite more abundant than marl, schist

DvJld **Limestone and dolomite (Middle and Early Devonian)**—Limestone and dolomite more abundant than sandstone, siltstone

Cssl **Sandstone and siltstone (Cambrian)**—Sandstone and siltstone more abundant than limestone, dolomite, mafic volcanic rocks

Zcsp **Schist and phyllite (Early Neoproterozoic)**—Greenschist and phyllite derived from slate, schist, sandstone more abundant than metacarbonates (marble, dolomite, chert) and metavolcanic rocks

Pgng **Gneiss and granite (Proterozoic)**—Gneiss-granite, granite, plagiogranite

Ym **Metamorphic rocks, undivided (Mesoproterozoic)**—Greenschist, gneiss, quartzite, marble, amphibolite (metavolcanic lava and sedimentary rocks)

Xgn **Gneiss (Paleoproterozoic)**—Two-mica, biotite, biotite-amphibole, garnet-biotite, and plagioclase gneiss; migmatite, quartzite, marble, amphibolite

EXPLANATION OF MAP SYMBOLS

Contact

Fault—Dashed where approximately located; dotted where concealed

DATA SUMMARY

This map was produced from several larger digital datasets. Topography was derived from Shuttle Radar Topography Mission (SRTM) 85-meter digital data. Gaps in the original dataset were filled with data digitized from contours on 1:200,000-scale Soviet General Staff Sheets (1978–1997). Contours were generated by cubic convolution averaged over four pixels using TNTmips® surface-modeling capabilities. Cultural data were extracted from files downloaded from the Afghanistan Information Management Service (AIMS) Web site (http://www.aims.org.af). The AIMS files were originally derived from maps produced by the Afghanistan Geodesy and Cartography Head Office (AGCHO). Geologic data and the international boundary of Afghanistan were taken directly from Abdullah and Chmyriov (1977).

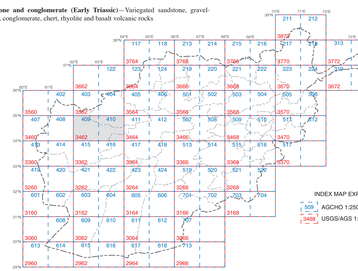
It is the primary intent of the U.S. Geological Survey (USGS) to present the geologic data in a useful format while making them publicly available. These data represent the state of geologic mapping in Afghanistan as of 2005, although the original map was released in the late 1970s (Abdullah and Chmyriov, 1977). The USGS has made no attempt to modify original geologic map-unit boundaries and faults; however, modifications to map-unit symbology, and minor modifications to map-unit descriptions, have been made to clarify lithostratigraphy and to modernize terminology. The generation of a Correlation of Map Units (CMU) diagram required interpretation of the original data, because no CMU diagram was presented by Abdullah and Chmyriov (1977).

This map is part of a series that includes a geologic map, a topographic map, a Landsat natural-color-image map, and a Landsat false-color-image map for the USGS/AGS (Afghan Geological Survey) quadrangles shown on the index map. The maps for any given quadrangle have the same open-file number but a different letter suffix, namely, -A, -B, -C, and -D for the geologic, topographic, Landsat natural-color, and Landsat false-color maps, respectively. The present map series is to be followed by a second series, in which the geology is reinterpreted on the basis of analysis of remote-sensing data, limited fieldwork, and library research. The second series is to be produced by the USGS in cooperation with the AGS and AGCHO.

REFERENCE CITED

Abdullah, Sh., and Chmyriov, V.M., eds., 1977, Map of mineral resources of Afghanistan: Kabul, Ministry of Mines and Industries of the Democratic Republic of Afghanistan, Department of Geological and Mineral Survey, V/O "Technoexport" USSR, scale 1:500,000.

[Geospatial analysis software developed by MicroImages, Inc., Lincoln, NE 68508. 2010.



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