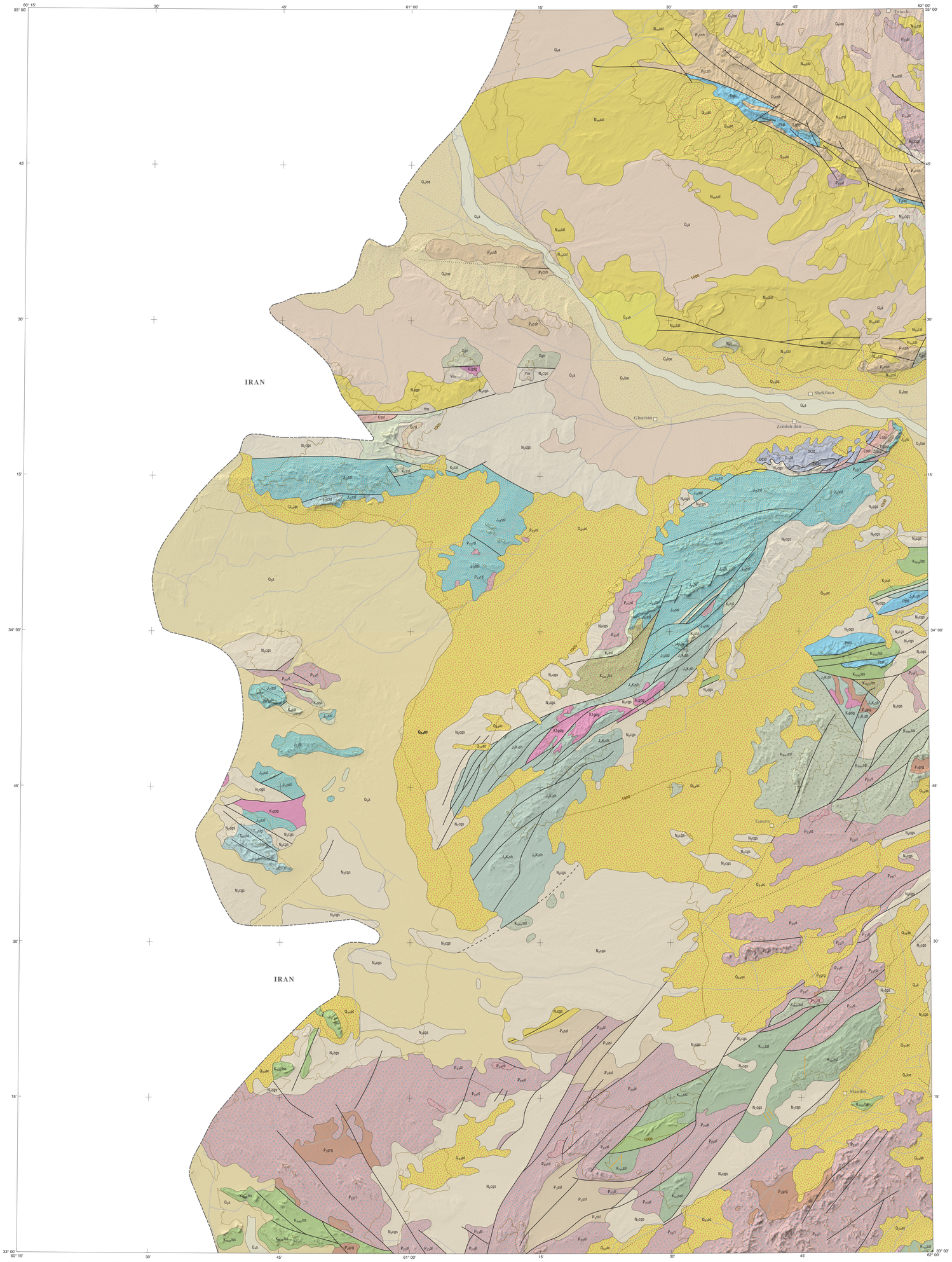
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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

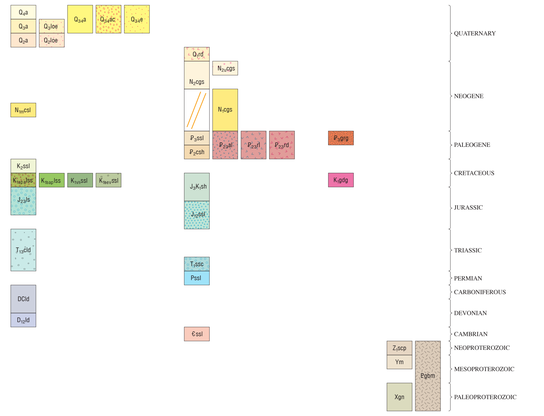
USGS OPEN-FILE REPORT 2005-1103-A
AGS OPEN-FILE REPORT (407/408/413/414) 2005-1103-A
USGS Afghanistan Project Product No. 003



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

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

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

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

Qₑₗe — **Eolian deposits (Holocene and late Pleistocene)**—Sand

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

Qₐa — **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

Qₐa — **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

Q₁rd — **Rhyodacite (early Pleistocene)**—Rhyodacite (liparite-dacite)

N₂cgs — **Conglomerate and sandstone (Pliocene)**—Gray conglomerate, grit, sandstone more abundant than siltstone, clay, limestone, marl; gypsum, salt; acid to mafic volcanic rocks

N₂₋₁cgs — **Conglomerate and sandstone (late Pliocene)**—Gray conglomerate, grit, sandstone more abundant than siltstone, clay, limestone, marl; gypsum, salt; acid to mafic volcanic rocks

N₁cgs — **Conglomerate and sandstone (Miocene)**—Red conglomerate, sandstone more abundant than siltstone, clay; acid and mafic volcanic rocks; limestone, marl; olivine basalt, trachybasalt, andesitic basalt (Taywara Series)

Andesite and diorite (Miocene)—Andesite, diorite more abundant than diabase porphyry, dikes and veins

N₂₋₁cst — **Clay and siltstone (middle Miocene)**—Brown clay, siltstone more abundant than sandstone, conglomerate, limestone

P₃grg — **Granite and granodiorite (Oligocene)**—Granite, granite porphyry, granodiorite more abundant than quartz syenite, granosyenite

P₃cst — **Sandstone and siltstone (Oligocene)**—Sandstone, siltstone more abundant than clay, conglomerate, limestone, marl; acid and mafic volcanic rocks

P₃₂rd — **Rhyolite and dacite (Oligocene and Eocene)**—Rhyolite (liparite), dacite more abundant than granite porphyry

P₃₂rl — **Rhyolite lava (Oligocene and Eocene)**—Basaltic andesite, basalt, trachyte, dacite, rhyolite, ignimbrite, tuff; conglomerate, sandstone, siltstone, limestone

P₃₂al — **Andesite lava (Oligocene and Eocene)**—Basaltic andesite, basalt, trachyte, dacite, rhyolite, ignimbrite, tuff; conglomerate, sandstone, siltstone, limestone

P₂csh — **Clay and shale (Eocene)**—Sandstone, siltstone, conglomerate and gravelstone, acid and mafic volcanic rocks

K₂cst — **Sandstone and siltstone (Late Cretaceous)**—Sandstone, siltstone, limestone

K₂gdg — **Granodiorite and granite (Early Cretaceous)**—Granodiorite, granite

K₁₋₂ls — **Limestone and sandstone (Early Cretaceous (Albian and Aptian))**—Limestone, marl, sandstone more abundant than conglomerate

K₁₋₂ls — **Limestone and sandstone (Early Cretaceous (Aptian and Barremian))**—Limestone, marl, sandstone more abundant than conglomerate

K₁₋₂st — **Sandstone and siltstone (Early Cretaceous (Hauterivian and Valanginian))**—Sandstone, siltstone more abundant than limestone, marl

K₁₋₂st — **Sandstone and siltstone (Early Cretaceous (Valanginian and Berriasian))**—Sandstone, siltstone more abundant than limestone, marl

J₃K₁sh — **Shale and siltstone (Early Cretaceous (Hauterivian) and Late Jurassic (Tithonian))**—Shale more abundant than siltstone, sandstone, conglomerate, chert, limestone, greenstone, acid and mafic volcanic rocks

J₃ls — **Limestone (Late and Middle Jurassic)**—Limestone, marl

J₂₋₃st — **Sandstone and siltstone (Middle and Early Jurassic)**—Sandstone, siltstone more abundant than clay, conglomerate, coal (North Afghanistan); limestone, marl, sandstone, shale, siltstone (Middle Afghanistan)

T₃cld — **Limestone and dolomite (Late Triassic (Carnian) to Early Triassic)**—Limestone, dolomite more abundant than conglomerate, chert, marl (Middle Afghanistan); limestone, dolomite (Kismaran tectonic zone)

T₁cgc — **Sandstone and conglomerate (Early Triassic)**—Variegated sandstone, gravelstone, conglomerate, chert, rhyolite and basalt volcanic rocks

Pzsl — **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)

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

D₂ld — **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

Z₂scp — **Schist and phyllite (early Neoproterozoic)**—Greenschist and phyllite derived from slate, schist, sandstone more abundant than metacarbonates (marble, dolomite, chert) and metavolcanic rocks

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

Pgbm — **Gabbro and mafic metavolcanics (Proterozoic)**—Gabbro, metadiabase, amphibolite, diorite, plagiogranite

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[1] 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).

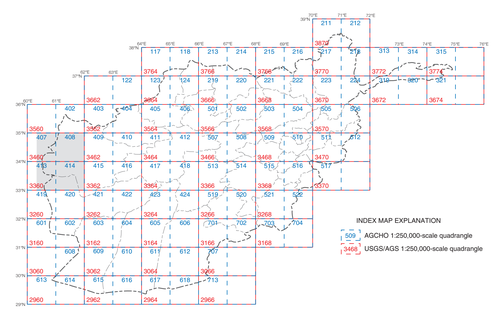
It is the primary intent of the U.S. Geological Survey (USGS) to present the geologic data in a useful format while making them publicly available. These data represent the state of geologic mapping in Afghanistan as of 2005, although the original map was released in the late 1970s (Abdullah and Chmyriov, 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.

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



GEOLOGIC MAP OF QUADRANGLES 3460 AND 3360, KOL-I-NAMAKSAR (407), GHURYAN (408), KAWIR-I-NAIZAR (413), AND KOHE-MAHMUDO-ESMAILJAN (414) QUADRANGLES, AFGHANISTAN

Compiled by
Van S. Williams
2005

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