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

USGS OPEN-FILE REPORT 2006-1038
AGS OPEN-FILE REPORT 2006-1038
Version 2
USGS Afghanistan Project Product No. 073

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

GEOLOGIC AND MINERAL RESOURCE MAP OF AFGHANISTAN

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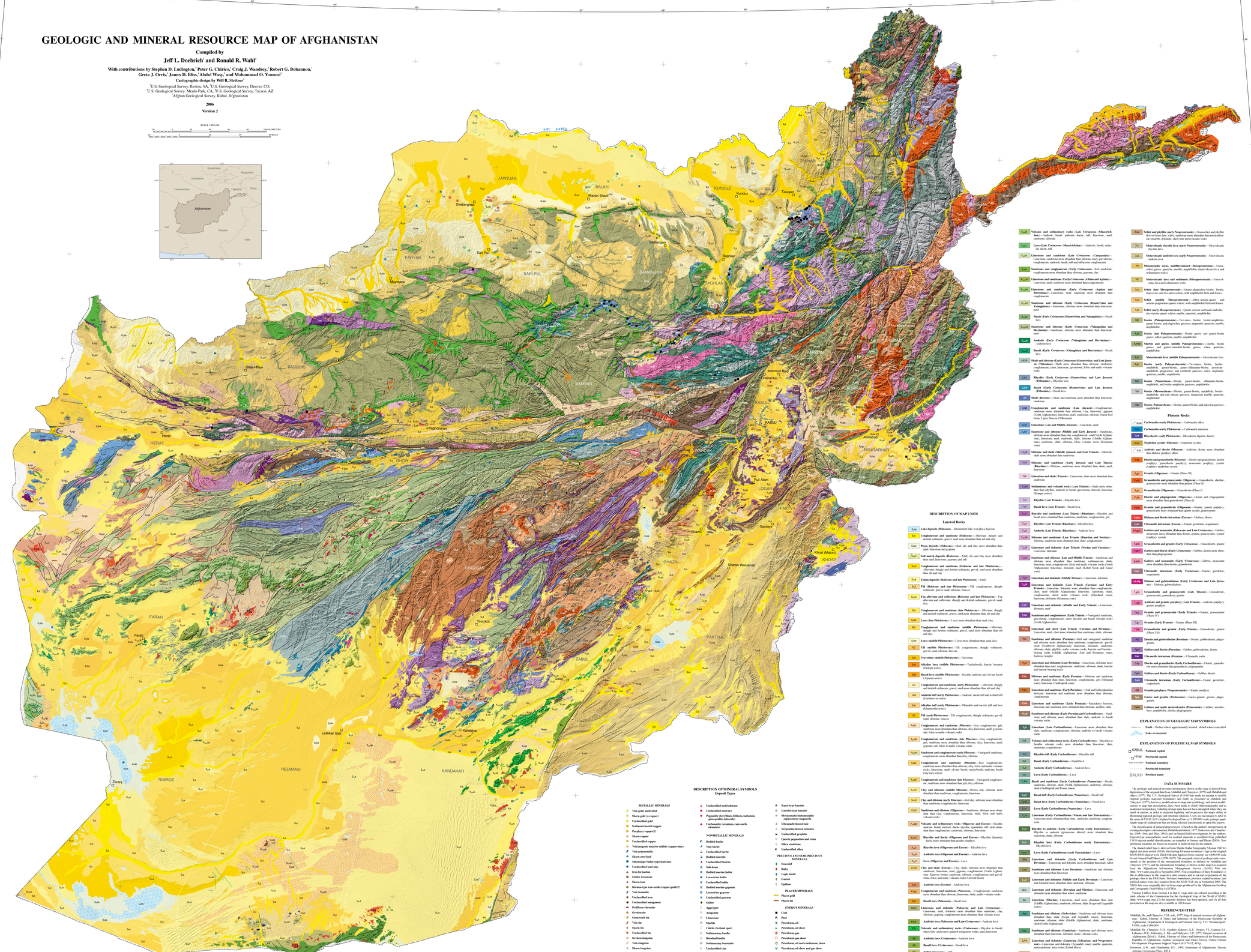
2006

Version 2

SCALE 1:850 000



DESCRIPTION OF MAP UNITS

Layered Rocks

Qlb **Lake deposits (Holocene)**—Intermittent lake, wet playa deposits

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

Qp **Playa deposits (Holocene)**—Mud, silt, and clay more abundant than sand; limestone and gypsum

Qsm **Salt marsh deposits (Holocene)**—Mud, silt, and clay more abundant than sand; limestone, gypsum, and salt

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

Qe,d **Eolian deposits (Holocene and late Pleistocene)**—Sand

Qt,l **Till (Holocene and late Pleistocene)**—Till: conglomerate, shingly sediments, gravel, sand, siltstone, breccia

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

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

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

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

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

Qt **Till (middle Pleistocene)**—Till: conglomerate, shingly sediments, gravel, sand, siltstone, breccia

Qtr **Travertine (middle Pleistocene)**—Travertine

Qab **Alkaline lava (middle Pleistocene)**—Trachybasalt, leucite basanite (Dadiqh series)

Qtb **Basalt lava (middle Pleistocene)**—Basaltic andesite and olivine basalt (Ungum series)

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

Qtd **Andesite tuff (early Pleistocene)**—Andesite, dacite tuff and welded tuff (Dashtewar series)

Qab **Alkaline tuff (early Pleistocene)**—Phonolite and sodalite tuff and lava (Khanneshin series)

Qt **Till (early Pleistocene)**—Till: conglomerate, shingly sediments, gravel, sand, siltstone, breccia

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

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

Tc,ms **Sandstone and conglomerate (early Pliocene)**—Variegated sandstone, conglomerate more abundant than clay, siltstone

Tcsp **Conglomerate and sandstone (Miocene)**—Red conglomerate, sandstone more abundant than siltstone, clay; felsic and mafic volcanic rocks; limestone, marl; olivine basalt, trachybasalt, andesitic basalt (Tegwara series)

Tc,ms **Conglomerate and sandstone (late Miocene)**—Variegated conglomerate, sandstone more abundant than grit, clay, siltstone

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

Tc,sl **Clay and siltstone (early Miocene)**—Red clay, siltstone more abundant than sandstone, conglomerate, limestone

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

Tl,sm **Volcanic and sedimentary rocks (Oligocene and Eocene)**—Basaltic andesite, andesite, dacite, rhyolite; sandstone, siltstone more abundant than conglomerate, limestone

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

Tr,d **Rhyolite lava (Oligocene and Eocene)**—Rhyolite lava

Ta,d **Andesite lava (Oligocene and Eocene)**—Andesite lava

Tl,d **Lava (Oligocene and Eocene)**—Lava

Ts,sh **Clay and shale (Eocene)**—Clay, shale, siltstone more abundant than sandstone, limestone, marl; gypsum, conglomerate (North Afghanistan: Katawaz basin); sandstone, siltstone, conglomerate and gravel-stone; felsic and mafic volcanic rocks (Central basin)

Ta,d **Andesite lava (Eocene)**—Andesite lava

Tcgp **Conglomerate and sandstone (Paleocene)**—Conglomerate, sandstone more abundant than siltstone, limestone, shale; mafic volcanic rocks

Tl,sp **Limestone and dolomite (Paleocene and Late Cretaceous)**—Limestone, dolomite more abundant than shale, siltstone, marl; gypsum, conglomerate more abundant than volcanic rocks

Kl,a **Andesite lava (Paleocene and Late Cretaceous)**—Andesite lava

Kv **Volcanic and sedimentary rocks (Cretaceous)**—Rhyolite to basalt; chert, fine- and coarse-grained tuffaceous rocks; marl, lime-stone

Ka **Andesite lava (Cretaceous)**—Andesite lava

Kb **Basalt lava (Cretaceous)**—Basalt lava

Kd **Tuff (Cretaceous)**—Tuff

Kscm **Sandstone and siltstone (Late Cretaceous)**—Sandstone, siltstone more abundant than clay, limestone, marl; conglomerate; gypsum (North Afghanistan): limestone (Middle Afghanistan); siltstone, sandstone, conglomerate (Khalchal zone)

Kvsm **Volcanic and sedimentary rocks (Late Cretaceous (Maastrichtian))**—Andesite, basalt, andesitic dacite, tuff; limestone, marl, sandstone, siltstone

Kavl **Lava (Late Cretaceous (Maastrichtian))**—Andesite, basalt, andesitic dacite, tuff

Kcls **Limestone and sandstone (Late Cretaceous (Campanian))**—Limestone more abundant than siltstone, sandstone, marl; conglomerate, andesitic basalt, tuff and tuffaceous conglomerate

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

Kcls,m **Limestone and sandstone (Early Cretaceous (Albian and Aptian))**—Limestone, marl, sandstone more abundant than conglomerate

Kcs,m **Limestone and sandstone (Early Cretaceous (Aptian and Barremian))**—Limestone, marl, sandstone more abundant than conglomerate

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

Kcls **Basalt (Early Cretaceous (Hauterivian and Valanginian))**—Basalt lava

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

Kavl **Andesite (Early Cretaceous (Valanginian and Berriasian))**—Andesite lava

Kcls **Basalt (Early Cretaceous (Valanginian and Berriasian))**—Basalt lava

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

JKrl **Rhyolite (Early Cretaceous (Hauterivian) and Late Jurassic (Tithonian))**—Rhyolite lava

JKbl **Basalt (Early Cretaceous (Hauterivian) and Late Jurassic (Tithonian))**—Basalt lava

Js **Shale (Jurassic)**—Shale and mudstone more abundant than limestone, sandstone

JKsgc **Conglomerate and sandstone (Late Jurassic)**—Conglomerate, sandstone more abundant than siltstone, clay, limestone, gypsum (North Afghanistan); limestone, marl, sandstone, siltstone (Tarak Red basin, Upper Jurassic (Tithonian))

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

JKsm **Sandstone and siltstone (Middle and Early Jurassic)**—Sandstone, siltstone more abundant than conglomerate, limestone, marl, chert (Aalenian-Bajocian); limestone, marl, sandstone, shale, siltstone (Middle Afghanistan); sandstone, shale, siltstone, felsic volcanic rocks (Kermanan zone)

TJsh **Siltstone and shale (Middle Jurassic and Late Triassic)**—Siltstone, shale more abundant than sandstone

TJsh **Siltstone and sandstone (Early Jurassic and Late Triassic (Rhaetian))**—Siltstone, sandstone more abundant than shale, marl, limestone

TJsl **Limestone and shale (Triassic)**—Limestone, shale more abundant than sandstone

TJsm **Sedimentary and volcanic rocks (Late Triassic)**—Shale more abundant than phyllite, andesite to basalt (greenstone abundt), limestone (Ghorgai series)

TJrl **Rhyolite (Late Triassic)**—Rhyolite lava

TJbl **Basalt lava (Late Triassic)**—Basalt lava

TJr,tf **Rhyolite and sandstone (Late Triassic (Rhaetian))**—Rhyolite and basalt more abundant than sandstone, sandstone, conglomerate, grit

TJr,rl **Rhyolite (Late Triassic (Rhaetian))**—Rhyolite lava

TJa,rl **Andesite (Late Triassic (Rhaetian))**—Andesite lava

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

TJc,sd **Limestone and dolomite (Late Triassic (Norian and Carnian))**—Limestone, dolomite

TJs,mt **Sandstone and siltstone (Late and Middle Triassic)**—Sandstone and siltstone more abundant than sandstone, carbonaceous shale, limestone, marl, conglomerate; felsic and mafic volcanic rocks (North Afghanistan); limestone, dolomite, marl (Kabul block and Kunar zone)

TJd **Limestone and dolomite (Middle Triassic)**—Limestone, dolomite

TJsm **Limestone and dolomite (Late Triassic (Carnian) and Early Triassic)**—Limestone, dolomite more abundant than conglomerate, sandstone, shale; sandstone, siltstone, conglomerate, shale, conglomerate, chert, mafic volcanic rocks (Khalchal zone); limestone, dolomite (Kermanan zone)

TJsm **Limestone and dolomite (Middle and Early Triassic)**—Limestone, dolomite, marl

TJsm **Sandstone and conglomerate (Early Triassic)**—Variegated sandstone, grawacke, conglomerate, chert, rhyolite and basalt volcanic rocks (North Afghanistan)

PCsl **Limestone and chert (Late Triassic (Carnian) and Permian)**—Limestone, marl, chert more abundant than sandstone, shale, siltstone

Psl **Sandstone and siltstone (Permian)**—Red and variegated sandstone more abundant than conglomerate, limestone, marl; conglomerate, shale (Northwest Afghanistan); limestone, dolomite, sandstone, siltstone, shale, phyllite; mafic volcanic rocks, barytic and barite-bearing rocks (Middle Afghanistan: Zam and Kermanan zones, Katawaz trough)

PCsl **Limestone and dolomite (Late Permian)**—Limestone, dolomite more abundant than marl, conglomerate, sandstone, siltstone, shale; barytic and barite-bearing rocks

PCls **Siltstone and sandstone (Early Permian)**—Siltstone and sandstone more abundant than shale, limestone, conglomerate, grit (Helmand zone); limestone (Ceridwynian zone)

PCsm **Limestone and sandstone (Early Permian)**—Tirah and Kohsoghandian horizons; limestone and sandstone more abundant than siltstone, conglomerate

PCsm **Limestone and sandstone (Early Permian)**—Karacharty horizon; limestone and sandstone more abundant than siltstone, argillite, slate

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

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

CPv **Volcanic and sedimentary rocks (Early Carboniferous)**—Rhyolite to basalts; volcanic rocks more abundant than limestone, slate; sandstone, conglomerate

CPrl **Rhyolite tuff (Early Carboniferous)**—Rhyolite tuff

CPbl **Basalt (Early Carboniferous)**—Basalt lava

CPa **Andesite (Early Carboniferous)**—Andesite lava

CPl **Lava (Early Carboniferous)**—Lava

CPsm **Basalt and sandstone (Early Carboniferous (Namurian))**—Basalt, andesite more abundant than sandstone, shale (Afghanistan); sandstone, siltstone, shale (Tashkorgoon and Kunar zones)

CPrtf **Basalt tuff (Early Carboniferous (Namurian))**—Basalt tuff

CPrl **Basalt lava (Early Carboniferous (Namurian))**—Basalt lava

CPal **Lava (Early Carboniferous (Namurian))**—Lava

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

CPsh **Rhyolite to andesite (Early Carboniferous (early Tournaisian))**—Rhyolite to andesite (greenstone abundt) more abundant than sandstone, shale, siltstone

CPrl **Rhyolite lava (Early Carboniferous (early Tournaisian))**—Rhyolite lava

CPal **Lava (Early Carboniferous (early Tournaisian))**—Lava

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

Dsm **Sandstone and siltstone (Late Devonian)**—Sandstone and siltstone more abundant than limestone

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

SDsl **Limestone and dolomite (Devonian and Silurian)**—Limestone and dolomite more abundant than schist, sandstone

Ss **Limestone (Silurian)**—Limestone, marl more abundant than slate (Middle Afghanistan); sandstone, siltstone, shale (Logar and Argandab zones)

Ssm **Sandstone and siltstone (Ordovician)**—Sandstone and siltstone more abundant than shale (Logar and Argandab zones); limestone, sandstone, siltstone, shale (Middle Afghanistan); shale, sandstone, chert (North Afghanistan)

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

Zcls **Limestone and dolomite (Cambrian–Ediacaran) and Neoproterozoic**—Limestone and dolomite (Argandab zone); marble, quartzite, metasandstone, mica schist (Kabul block)

Zrl **Metavolcanic rhyolite and andesite (late Neoproterozoic)**—Red altered rhyolite and andesite volcanic rocks more abundant than sandstone, siltstone, limestone, dolomite

Zal **Lava (late Neoproterozoic)**—Lava

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

Ljl,rl **Metavolcanic rhyolite lava (early Neoproterozoic)**—Metavolcanic rhyolite lava

Ljl **Metavolcanic andesite lava (early Neoproterozoic)**—Metavolcanic andesite lava

Ym **Metamorphic rocks, undifferentiated (Mesoproterozoic)**—Gneiss, schist, gneiss, quartzite, marble, amphibolite (metavolcanic lava and sedimentary rocks)

Ml,rl **Metavolcanic lava and sediments (Mesoproterozoic)**—Metavolcanic lava and sedimentary rocks

Ysm **Schist (late Mesoproterozoic)**—Quartz plagioclase biotite, biotite, muscovite, and two-mica schists, with amphibolite beds and lenses

Ysm **Schist (middle Mesoproterozoic)**—Albite-sericite-quartz and sericite plagioclase-quartz schists, with amphibolite beds and lenses

Ysm **Schist (early Mesoproterozoic)**—Quartz-sericite carbonate and chlorite-sericite-quartz schists; marble, quartzite, amphibolite

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

Ygn **Gneiss (late Paleoproterozoic)**—Biotite gneiss and garnet-biotite gneiss, schist, quartzite, marble, amphibolite

Ymg **Marble and gneiss (middle Paleoproterozoic)**—Marble, biotite gneiss, and garnet-staurolite-biotite gneiss; schist, quartzite, amphibolite

Ym **Metavolcanic lava (middle Paleoproterozoic)**—Metavolcanic lava

Ygn **Gneiss (early Paleoproterozoic)**—Two-mica, biotite, biotite-amphibole, and garnet-biotite gneisses; migmatite, quartzite, marble, amphibolite, plagioclase, and cordierite gneisses; schist, migmatite, quartzite, marble, amphibolite

Wgl **Gneiss (Neoarchean)**—Biotite, garnet-biotite, sillimanite-biotite, amphibolite, and biotite-amphibole gneisses; amphibolite

Ygn **Gneiss (Mesoarchean)**—Biotite, garnet-biotite, amphibolite, biotite-amphibole, and calc-silicate gneisses; magnetite marble, quartzite, amphibolite

Ygn **Gneiss (Paleoarchean)**—Biotite, garnet-biotite, and injection gneisses; amphibolite

Plutonic Rocks

Ccm **Carbonatite (early Pleistocene)**—Carbonatite dikes

Kcm **Carbonatite (early Pleistocene)**—Carbonatite intrusion

Kpl **Rhyolite (early Pleistocene)**—Rhyolite (liparite dacite)

Kqm **Nepheline syenite (Miocene)**—Nepheline syenite

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

Kdq **Diorite and granodiorite (Miocene)**—Diorite and granodiorite, diorite porphyry, granodiorite porphyry, monzonite porphyry, syenite porphyry, nepheline syenite

Tgr **Granite (Oligocene)**—Granite (Phase III)

Tgd **Granodiorite and granite (Oligocene)**—Granodiorite, alaskite, granite more abundant than granite (Phase II)

Tgd **Granodiorite (Oligocene)**—Granodiorite (Phase I)

Tdp **Diorite and plagiogranite (Oligocene)**—Diorite and plagiogranite more abundant than granodiorite (Phase I)

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

Tdb **Diabase and diorite intrusions (Eocene)**—Diabase, diorite

Pum **Ultramafic intrusions (Eocene)**—Dunite, peridotite, serpentinite

MZgb **Gabbro and monzonite (Paleocene and Late Cretaceous)**—Gabbro, monzonite more abundant than diorite, granite, granosyenite, syenite porphyry, syenite

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

Kdg **Gabbro and diorite (Early Cretaceous)**—Gabbro, diorite more abundant than plagiogranite

Kgbo **Gabbro and monzonite (Early Cretaceous)**—Gabbro, monzonite more abundant than diorite, granodiorite

Kum **Ultramafic intrusions (Early Cretaceous)**—Dunite, peridotite, serpentinite

JKdb **Diabase and gabbrodiabase (Early Cretaceous and Late Jurassic)**—Diabase, gabbrodiabase

TJgr **Granodiorite and granosyenite (Late Triassic)**—Granodiorite, granosyenite

TJap **Andesite and granite porphyry (Late Triassic)**—Andesite porphyry, granite porphyry

TJgr **Granite and granosyenite (Early Triassic)**—Granite, granosyenite (Phase IV)

TJgr **Granite (Early Triassic)**—Granite (Phase III)

TJgd **Granodiorite and granite (Early Triassic)**—Granodiorite, granite (Phase I–II)

Pzu **Diorite and gabbrodiorite (Permian)**—Diorite, gabbrodiorite, plagiogranite

Pzgd **Gabbro and diorite (Permian)**—Gabbro, gabbrodiorite, diorite

Pzum **Ultramafic intrusions (Permian)**—Ultramafic rocks

Ꞓdg **Diorite and granodiorite (Early Carboniferous)**—Diorite, granodiorite more abundant than granophyre, plagiogranite

Ꞓgd **Gabbro and diorite (Early Carboniferous)**—Gabbro, diorite

Ꞓum **Ultramafic intrusions (Early Carboniferous)**—Dunite, peridotite, serpentinite

Zgr **Granite porphyry (Neoproterozoic)**—Granite porphyry

Zgn **Gneiss and granite (Proterozoic)**—Gneiss granite, granite, plagiogranite

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

EXPLANATION OF GEOLOGIC MAP SYMBOLS

Fault—Dashed where approximately located, dotted where concealed

Lake or reservoir

EXPLANATION OF POLITICAL MAP SYMBOLS

KABUL **National capital**

HERAT **Provincial capital**

National boundary

Provincial boundary

BALKH **Province name**

DATA SUMMARY

The geologic and mineral resource information shown on this map is derived from digitization of the original data from Abdullah and Chmyzov (1977) and Abdullah and others (1977). The U.S. Geological Survey (USGS) has made no attempt to modify original geologic map-unit boundaries and faults as presented in Abdullah and Chmyzov (1977), but has modified original map-unit descriptions from the original Russian cations to map-unit descriptions, have been made to clarify lithostratigraphy and to modernize terminology. Labeling of map units has not been attempted where they are small or narrow, in order to maintain legibility and to preserve the map's utility in illustrating regional geologic and structural relations. Users are encouraged to refer to the original map (Abdullah and Chmyzov, 1977) for details of map-unit distribution in single sheet of Afghanistan that are being released concurrently as open-file reports.

The classification of mineral deposit types is based on the authors' interpretation of existing descriptive information (Abdullah and others, 1977; Doebrich and Chamberlin, 1993; Ontic and Hilts, 2002) and on limited field investigations by the authors. Deposit-type nomenclature used for nonfuel minerals is modified from published USGS deposit-model classifications, as compiled in Stoeser and Heran (2004). New deposit models for gold and for rare-earth elements (Orris, 2005) are used.

The shaded-relief base is derived from Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) data having 85-meter resolution. Gaps in the original SRTM DEM dataset were filled with data digitized from contours on 1:200,000-scale Soviet General Staff Sheets (1978–1997). The marginal extent of geologic unit-contents spreads to the position of the international boundary as defined by Abdullah and Chmyzov (1977), and the international boundary as shown on this map was acquired from the U.S. Department of State, Bureau of Intelligence and Research (INR) (http://www.state.org.gis/intelligence/index.htm). Non-coincidence of these boundaries is due to differences in the respective data sources and to inexact registration of the geologic data to the DEM base. Province boundaries, province capital locations, and political names were also acquired from the ARGIS Web site in September 2005. The DEM and hillshade were produced by the Afghanistan Geodesy and Cartography Head Office (AGCHO).

Version 2 differs from Version 1 in that (1) map units are colored according to the color scheme of the Commission for the Geological Map of the World (CGMW) (http://www.ccgm.org), (2) the mineralo database has been updated, and (3) all data presented on the map are also available in GIS format.

REFERENCES CITED

Abdullah, Sh., and Chmyzov, 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 "Technopromexport" USSR, scale 1:500,000.

Abdullah, Sh., Chmyzov, V.M., Nezhdan-Alekseev, K.F., Drunov, V.I., Gannon, P.J., Lebedev, B.K., Kafarskiy, A. Kh., and Malyarov, E.P., 1977, Mineral resources of Afghanistan: Kabul, Ministry of Mines and Industries of the Democratic Republic of Afghanistan, Afghan Geological and Mines Survey, United Nations Development Programme Support Project AFG/74/12, 419 p.

Bowersox, G.W., and Chamberlin, B.E., 1995, Gemstones of Afghanistan: Tucson, Arizona, Geoscience Press, 220 p.

Orris, G.J., and Hilts, J.O., 2002, Mines and mineral occurrences of Afghanistan: U.S. Geological Survey Open-File Report 02-103, 95 p. (http://pubsdb.wr.usgs.gov/open-file.html?2103).

Stoeser, D.B., and Heran, W.D., eds., 2004, USGS mineral deposit models: U.S. Geological Survey Digital Data Series DDS-064, Version 1.0, on CD-ROM.

Base from Shuttle Radar Topography Mission (SRTM) 85-meter digital data
Hillshade derived from digital files from ARGIS Web site (http://www.arcw.org.af), acquired in September 2005

Transverse Mercator projection, WGS 84 Datum, scale factor 0.9996, longitude of central meridian 66°50' E, latitude of origin 34°30' N.

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