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Afghan Geological Survey
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These maps are a redrafted and modified version of the *Geological map of the area of the Ahankashan-Rakhna basin*, scale 1:50,000 and *Geological map of the Ahankashan area with data on mineral resources*, scale 1:12,000 (Shcherbina and others, 1974). The original maps and cross sections are contained in an unpublished Soviet report (no. 0822), prepared in cooperation with the Ministry of Mines and Industries of the Republic of Afghanistan in Kabul during 1974. The redrafted maps and cross sections illustrate the geology of the Ahankashan and Rakhna basins, located within Badghis, Ghor, and Herat Provinces.

The Ahankashan and Rakhna prospect area is one of several gold and copper deposits within west-central Afghanistan. Here, various felsic to intermediate igneous porphyries intrude Lower Triassic to lower Paleogene sedimentary rocks, producing mineral and ore-bearing zones related to hydrothermal alteration, skarns, silicification, and crushing (brecciation). Mineralized skarns contain assemblages such as magnetite, magnetite-hematite, epidote-hematite, and epidote-garnet, as well as disseminations of chalcopyrite, covellite, chalcocite, cuprite, malachite, and azurite. Gold mineralization is mainly associated with zones of crushing along faults, and with small silicified igneous veins within granite and quartz porphyry of the so-called "second phase" Miocene intrusive rocks, primarily located in the southern part of the Ahankashan pluton (maps ***A*** and ***B***). Ores associated with the Miocene "first phase" porphyries, mainly in the northern lobe of the Ahankashan pluton, are less common than those associated with the "second phase" porphyries (map ***B***). Gold and copper mineralization, of "second phase" porphyries, is spatially associated with zones of hydrothermal alteration and intense crushing, where rocks have been silicified, pyritized, limonitized, and kaolinitized. Gold-bearing zones of the Ahankashan pluton are mainly in the northeastern and southwestern portions of the intrusion and are up to 1.5 kilometers in length and 800 meters in width (Shcherbina and others, 1974). Gold concentrations determined from skarn samples commonly range from 0.2 to 5.0 grams per ton (g/t), with some samples as high as 32.2 g/t (Shcherbina and others, 1974). Also, from skarn samples, copper concentrations were determined to be as high as 3.6 weight percent, but more commonly less than 1.0 weight percent. All skarn samples also contained lead, zinc, and molybdenum, although lead and zinc concentrations were generally less than 0.4 weight percent, and molybdenum less than 0.05 weight percent (Shcherbina and others, 1974).

The redrafted maps and cross sections reproduce the topology of rock units, contacts, faults, and so forth, of the original Soviet maps and cross sections, and they include modifications based on our examination of the originals and our observations made during a brief flyover in 2010. Further, we have attempted to translate the original Russian terminology and rock classifications into modern English geologic usage as literally as possible without changing any genetic or process-oriented implications in the original descriptions. We also use the age designations from the original maps. However, the rock unit colors on the maps and cross sections differ from the colors shown on the original version. Colors were selected according to the color and pattern scheme of the Commission for the Geological Map of the World (CGMW) (http://www.cgm.org).

Elevations on the cross sections are derived from the original Soviet topography and may not match the Global Digital Elevation Model (GDEM) topography used on the redrafted maps of this report. Hydrography derived from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) may not fit alluvial deposits shown from the unmodified original compilations.

Aerial photographs were taken by R.D. Tucker and W.R. Stettner of the U.S. Geological Survey during their flyover in 2010 (figs. 1–11). Photograph locations are shown on the maps by symbols keyed to figure numbers.

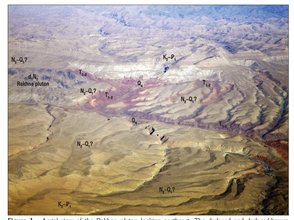
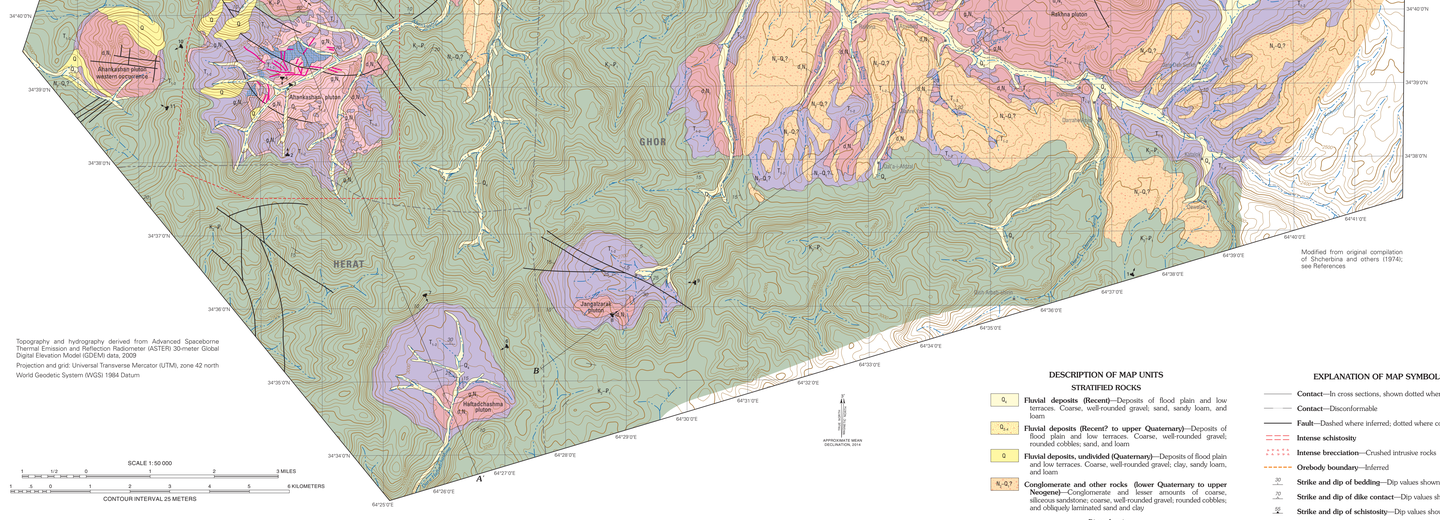
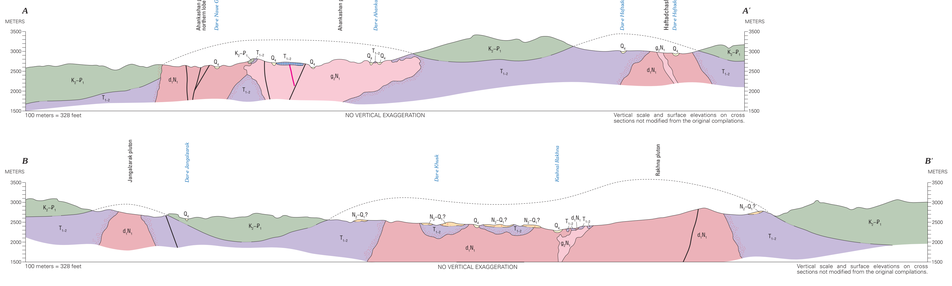


Figure 1.—Aerial view of the Rakhna pluton looking northeast. The dark-red and dark-red-brown exposures are identified as Lower to Middle Triassic sedimentary rocks (T_{1-3}), and the white escarpment as Upper Cretaceous to lower Paleogene rocks (K_2–P_1).



A.—Geologic map of the Ahankashan and Rakhna basins and plutons.



DESCRIPTION OF MAP UNITS

STRATIFIED ROCKS

Q_h **Fluvial deposits (Recent)**—Deposits of flood plain and low terraces. Coarse, well-rounded gravel; sand, sandy loam, and loam

Q_{h-p} **Fluvial deposits (Recent? to upper Quaternary)**—Deposits of flood plain and low terraces. Coarse, well-rounded gravel; rounded cobbles; sand, and loam

Q **Fluvial deposits, undivided (Quaternary)**—Deposits of flood plain and low terraces. Coarse, well-rounded gravel; clay, sandy loam, and loam

N_1–Q_1? **Conglomerate and other rocks (lower Quaternary to upper Neogene)**—Conglomerate and lesser amounts of coarse, siliceous sandstone; coarse, well-rounded gravel; rounded cobbles; and obliquely laminated sand and clay

Disconformity

K_2–P_1 **Limestone and other rocks (lower Paleogene to Upper Cretaceous)**—Limestone and lesser amounts of marl, quartz sandstone, and conglomerate

Disconformity

T_{1-3} **Sandstone and other rocks (Middle to Lower Triassic)**—Sandstone and lesser amounts of coarse-grained siliceous sandstone; siltstone, limestone, volcanogenic rock, and tuffaceous sandstone

INTRUSIVE ROCKS

Miocene Intrusive Complex

Dikes of diorite porphyry, granodiorite porphyry, monzonite porphyry, and syenite porphyry, undifferentiated

Second phase

gN **Granite porphyry, quartz porphyry, and plagiogranite porphyry, undifferentiated**

First phase

dN **Diorite porphyry, granodiorite porphyry, monzonite porphyry, and syenite porphyry, undifferentiated**

ZONES OF ALTERATION

Hornfels

Silicification, pyritization, limonitization, and (or) kaolinization

Skarns

Magnetite

Magnetite-hematite

Epidote, epidote-hematite, garnet, epidote-garnet

Gold-bearing zone

EXPLANATION OF MAP SYMBOLS

Contact—In cross sections, shown dotted where inferred

Contact—Disconformable

Fault—Dashed where inferred; dotted where concealed

Intense schistosity

Intense brecciation—Crushed intrusive rocks

Orebody boundary—Inferred

Strike and dip of bedding—Dip values shown where known

Strike and dip of dike contact—Dip values shown where known

Strike and dip of schistosity—Dip values shown where known

Fossil location—Brachiopods, pelecypods, ammonoids

Trench and number—tg indicates trench dug by Herat group in 1971 (see Dronov and others, 1972)

Sample transect and number

Sample location and number

Sample data—Top number, thickness of mineralized zone in meters; bottom number, average gold concentration in grams per ton (g/t)

Site of photograph—Tip of arrow indicates direction of view; number keyed to figure

Ephemeral stream

Province boundary

Road or trail

Village

B.—Geologic map of the Ahankashan pluton and northern lobe showing gold deposits and trenches. The area is outlined in red on ***A***.

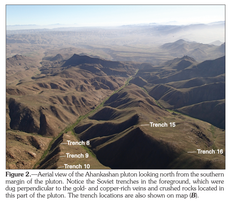


Figure 2.—Aerial view of the Ahankashan pluton looking north from the southern margin of the pluton. Notice the Soviet trenches in the foreground, which were dug perpendicular to the gold- and copper-rich veins and crushed rocks located in this part of the pluton. The trench locations are also shown on map (***B***).

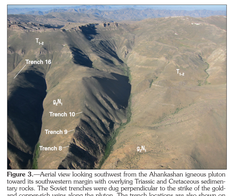


Figure 3.—Aerial view looking southwest from the Ahankashan igneous pluton toward its southwestern margin with overlying Triassic and Cretaceous sedimentary rocks. The Soviet trenches were dug perpendicular to the strike of the gold- and copper-rich veins along the pluton. The trench locations are also shown on map (***B***).

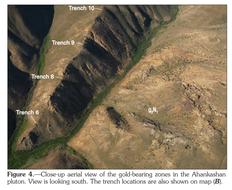


Figure 4.—Close-up aerial view of the gold-bearing zones in the Ahankashan pluton. View is looking south. The trench locations are also shown on map (***B***).

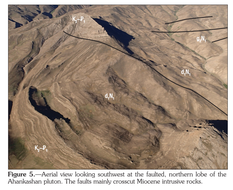


Figure 5.—Aerial view looking southwest at the faulted, northern lobe of the Ahankashan pluton. The faults mainly crosscut Miocene intrusive rocks.

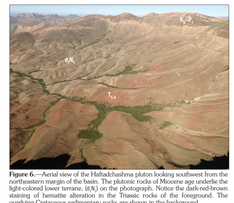


Figure 6.—Aerial view of the Hallodchashma pluton looking southwest from the northeastern margin of the basin. The plutonic rocks of Miocene age underlie the light-colored lower terrace, (gN) on the photograph. Notice the dark-red-brown staining of hematite alteration in the Triassic rocks of the foreground. The overlying Cretaceous sedimentary rocks are shown in the background.

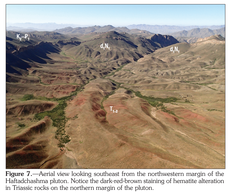


Figure 7.—Aerial view looking southeast from the northwestern margin of the Hallodchashma pluton. Notice the dark-red-brown staining of hematite alteration in Triassic rocks on the northern margin of the pluton.

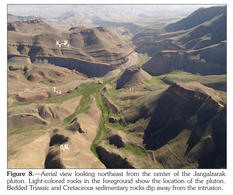


Figure 8.—Aerial view looking northeast from the center of the Jangalcarak pluton. Light-colored rocks in the foreground show the location of the pluton. Bedded Triassic and Cretaceous sedimentary rocks dip away from the intrusion.

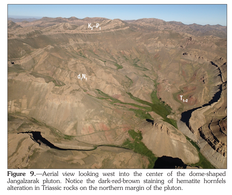


Figure 9.—Aerial view looking west into the center of the dome-shaped Jangalcarak pluton. Notice the dark-red-brown staining of hematite hornfels alteration in Triassic rocks on the northern margin of the pluton.

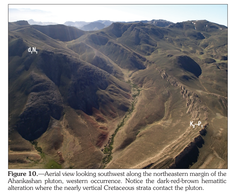


Figure 10.—Aerial view looking southwest along the northeastern margin of the Ahankashan pluton, western occurrence. Notice the dark-red-brown hematitic alteration along the northwestern margin of the pluton. The plutonic rocks underlie the foreground in the photograph.

Figure 11.—Aerial view looking northwest along the southern margin of the Ahankashan pluton, western occurrence. Notice the dark-red-brown hematitic alteration along the southwestern margin of the pluton. The plutonic rocks underlie the foreground in the photograph.

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Geologic Map of the Ahankashan-Rakhna Basin, Badghis, Ghor, and Herat Provinces, Afghanistan, Modified from the 1974 Original Map Compilation of Y. I. Shcherbina and Others

Compiled by
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