PLATE 1

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GEOLOGIC MAP OF SELECTED AREAS OF THE SHIRAK REGION, NORTHWESTERN ARMENIA

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Map Explanation

Qal — Quaternary alluvium (Recent-Pleistocene) - alluvium and colluvium deposits consisting of boulders, gravel, sand, silt, and clay.

Qls — Quaternary landslide deposits - consists of brecciated landslide material from older units.

Qvt — Quaternary ash-flow tuff - brown to black, mafic, dense, welded, vesicle-poor. Potentially flows from Aragats Volcanic Field (~700,000 yBP).

Qs — Quaternary lacustrine rocks (Pleistocene) - white, tan, and light yellow mudstone, siltstone, and sandstone.

Tv — Tertiary volcanic rocks (Pliocene - Miocene) - andesitic tuff breccia, tuff, and lava. Contains rocks of the Jajur suite.

Tb — Tertiary fault breccia (Miocene?) - brecciated blocks of limestone, sandstone, ophiolite, and other material derived within thrust zone.

Tp — Tertiary paleosol (Miocene? - late Eocene?) - yellow, green and red clay, silt, and sand, iron-oxidized, contains calcite veins, commonly mottled.

Tl — Tertiary limestone (late Eocene? or possibly Late Cretaceous?) - orangish tan, recrystallized, contains relic fossil casts, commonly contains calcite vein mineralization near fault zones. Occurs as dislocated blocks overlying Tvu and near the base of Kmo.

Tvu — Tertiary volcanogenic undivided rocks (early to late Eocene) - dark green, lime-green, greenish brown, black, and yellowish brown volcanogenic and marine sediments: volcanogenic rocks consist of tuff breccia, tuff sandstone, tuff siltstone, basalt, porphyritic basalt, and andesine basalt; marine rocks consist of finely crystalline, slightly siliceous, limestone containing microfauna (identifiable in thin-section) - foraminifera possibly *Nummulites sp.* and volcaniclastic sandstone and siltstone. Contains rocks of the Maralsar, Shirak, and Panbak suites.

- **Tbs** - Tertiary black shale unit (late? Eocene) - white, gray, black, tan, yellow, and greenish-brown claystone, siltstone, sandstone, locally contains thin beds and lenses of coal (lignite to sub-bituminous), locally carbonaceous, contains minor conglomerate and volcaniclastic siltstone and sandstone, contains small, gray, slightly recrystallized fossiliferous limestone with forms of Mollusca, Bryozoa(?), Cnidaria, Echinodermata, and Brachiopoda. Unit occurs near top of Eocene section. Jajur mine sediments are tentatively correlated with this unit.
- **Tva** - Tertiary andesite lava (middle to late? Eocene) - black with clear crystals, porphyritic - large (~0.5 cm) phenocrysts of plagioclase and smaller pyroxene.

Ki — Late Cretaceous (?) intrusive rock - black and white peppered diorite to gabbro intrusive rock.

Kmu — Marine undivided rocks (Maastrichtian to Turonian) - white, green, greenish brown, lime green, light pink, tan and purple limestone, sandstone, mudstone, and tuffaceous clastic rocks. Contains rocks of the Sepasar and Gorgaran suites.

- **Kms** - Sandstone (Late Cretaceous) - light green, green, and green and white sandstone, very fine- to coarse-grained, siliceous, chlorite-rich, weakly thin-bedded. Contact difficult to determine, may be multiple beds in some locations, commonly occurs above a white limestone unit and below a dense purple limestone unit within Kmu.

Kmo — Ophiolite complex (Late? Cretaceous) - black, dark gray and black peppered peridotite, serpentinite, and gabbro, pyroxene- and plagioclase-rich.

Map Symbols

- Strike and dip of sedimentary unit; Vertical dipping bed
- Foliation on ash flow tuff
- Thrust fault - approximated location, commonly associated with a zone of brecciated rock - gray area (Tb)
- Strike-slip fault zone inferred, direction of slip inferred
- Contact - solid line, approximately located - no line, edge of mapped area (extent of unit not determined)
- Fossil locality
- USGS4 — USGS measured section locality
- Topographic contour line
- Road - improved dirt or pavement
- Stream, river, ephemeral wash, or irrigation canal
- City, town, or community
- 2130.0 — Surveyed point from topographic base map
- Mine location

Scale 1:25,000

0.5 0 1 2 Kilometers

Contour Interval 25 meters

N

Lernagyugh, Bashgyugh, Palutli, Jajur Mine, Pokrashen, Mets Sariyar, Krashen, Keti, Karmrakar, Lernut, Jajur Station, Jajur, Maissian, Hatsik, Shirak

40°57' 40°55' 40°54' 40°53' 40°52' 40°51' 40°50'

43°51' 43°53' 43°55' 43°57' 43°59'