BEDROCK GEOLOGY OF THE EASTERN GILA BEND MOUNTAINS, MARICOPA COUNTY, ARIZONA

by

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INTRODUCTION

The eastern Gila Bend Mountains, Maricopa County, Arizona, are composed of Early Proterozoic crystalline rocks and overlying mid-Tertiary continental clastic and volcanic rocks of the Sil Murk Formation. Slightly more than half of the bedrock in the eastern Gila Bend Mountains is composed of granitic rocks, mainly located in the eastern and northern part of the map area. Except for a few scattered exposures, the Tertiary continental clastic and volcanic rocks crop out in the southwest part of the map area.

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PREVIOUS INVESTIGATIONS

The first detailed geologic study of the eastern Gila Bend Mountains was by Heindl and Armstrong (1963), who mapped the geology and studied the water resources of the southern part of the map area. Studies by Eberly and Stanley (1978) and Scarborough and Wilt (1979) yielded important stratigraphic and geochronological data. The northwest part of the map adjoins and overlaps the 1:40,000-scale geologic map of the Woolsey Peak Wilderness Study Area by Peterson and others (1989b).

DESCRIPTION OF ROCK UNITS

EARLY PROTEROZOIC ROCKS

Metamorphic rocks (Xgn)

The oldest rocks in the map area are lenticular septa of medium- to fine-grained pelitic and psammitic gneiss with trend and internal foliation generally parallel to the regional foliation of the enclosing plutonic rocks. The original detrital mineralogy of parental quartzo-feldspathic pelites and psammites consists primarily of quartz (2/3) and feldspar (1/3), but rocks of this map unit now contain metamorphic muscovite +/- biotite +/- garnet +/- staurolite, and secondary hematite. The weak to strong foliation in the gneiss is defined by layers of varying grain size, or by hematite laminae.

In the north part of the map area a single outcrop of light gray marble 1.5 m wide is included in Proterozoic granite.

Plutonic rocks

There are three major suites of plutonic rock in the map area: (1) an older coarse-grained granite, (2) a younger fine-grained granite, and (3) quartz diorite and quartz gabbro that overlap in emplacement age with both of the granites. The granite bodies correlate closely with the units described by DeWitt and Reynolds (in press) 10 km to the east in the Maricopa Mountains, and their terminology is used in this report.

Maricopa Granite (Xm, Xmm, Xma)

The oldest granite suite is correlated with the Maricopa Granite of DeWitt and Reynolds (in press). In the eastern Gila Bend Mountains, the Maricopa Granite can be subdivided into three mappable phases: a medium to coarse-grained, generally porphyritic main phase (Xm), an altered main phase (Xma), and very coarse-grained, megacrystic granite porphyry (Xmm). The Maricopa Granite typically is brown- to yellow-brown weathering, and composed of a medium- to coarse-grained groundmass of quartz (30-50%), microcline (20-45%), oligoclase (10-30%), biotite (10-15%) and trace amounts of opaque iron oxides (<5%). Oligoclase commonly exhibits myrmekitic intergrowths with quartz. Accessory minerals include muscovite and sphene (both commonly intergrown with biotite) and apatite. Sphene locally comprises up to 5 percent of the rock. Phenocrysts of coarse-grained microcline, perthite, and rare oligoclase comprise up to 40 percent of the rock, and typically form 10-20% of the rock. Trace amounts of secondary epidote and white mica have replaced feldspars. Local, mafic variants of Maricopa Granite contain up to 30 percent biotite.

NNE-trending zones of altered Maricopa Granite (Xma) in the north part of the map area typically are white or light-yellow weathering, and a mappable color contrast is present between the altered and unaltered Maricopa Granite that reflects the replacement of biotite by chlorite and epidote. In the megacrystic granite porphyry (Xmm) microcline, perthite, and quartz phenocrysts 1-2 cm long comprise 40-75 percent of the rock.

The Maricopa Granite is characteristically overprinted with a mylonitic foliation. In about half of the exposures the granite is massive or displays a weak foliation, with most exposures of Maricopa Granite in the northwestern part of the map area being massive. Weakly foliated rocks are characterized by thin, incipient, discontinuous (over a few centimeters) zones of high shear strain (C-surfaces) and reorientation and alignment of minerals parallel to foliation. In moderately foliated rocks this foliation is continuous on outcrop scale, and reorientation of phenocrysts together with sigmoidal mineral aggregates are characteristic. Minerals in weakly and moderately foliated rocks appear unstrained in thin section and exhibit no size reduction. Zones of high strain comprise 5-10 percent of the exposures of Maricopa Granite and are mostly located in the southeastern part of the map area. Zones of highly strained granite are up to 100 m long along strike, but are generally discontinuous and vary from 0 to 10 m in thickness. Zones of high strain are characterized by grain size reduction, incipient bands of dark gray mylonite, pervasive S-C fabrics, and mineral elongation. Contacts of high strain zones with zones of less strain may either be sharp, or grade into more massive granite over a few meters.

Eberly and Stanley (1978) reported a K-Ar biotite age of 994 Ma in Maricopa Granite from the southeast part of the map. This date, however, is interpreted as a minimum age, which permits correlation of granitic rocks in the map area with Early Proterozoic granitic rocks described by Dewitt and Reynolds (in press) in the Maricopa Mountains to the east.

Cotton Center Granite (Xc, Xca, Xp, Xmc)

The younger group of granites is correlated with the Cotton Center Granite of DeWitt and Reynolds (in press), and exhibits sharp intrusive contacts with the Maricopa Granite. Dikes of Cotton Center Granite subparallel to the regional foliation are common within the Maricopa Granite near the contacts between the two units. In the eastern Gila Bend Mountains the Cotton Center Granite is subdivided into a fine- to medium-grained main phase (Xc), an altered main phase (Xca), pegmatite dikes (Xp), and areas where the Cotton Center Granite extensively intrudes the Maricopa Granite and the two granites make up roughly equal amounts of the exposed bedrock (Xmc)

The Cotton Center Granite typically weathers light-tan, yellow, or pink, and is composed of fine- to medium-grained quartz (40-50%), microcline (20-35%), albite-oligoclase (5-20%), biotite (Trace-10%), muscovite (<5%), and iron oxide opaque minerals (<5%). Medium-grained phenocrysts of quartz, microcline and albite-oligoclase are locally present. Very fine-grained zircon and apatite are common accessory minerals, and very minor epidote has formed from alteration of feldspars.

At the southeast end of the map area, two areas of Cotton Center Granite display a distinctive light-green weathering that reflects pervasive sericite alteration (Xca). In these areas the granite is approximately 2/3 quartz and 1/3 sericite.

In several areas Cotton Center Granite has intruded Maricopa Granite forming a mixture (Xmc) composed of alternating tabular bodies of Maricopa and Cotton Center granite that were too small to map separately. The trend of individual tabular intrusions is generally parallel to the regional foliation.

Discontinuous, simple, quartz-K-feldspar-muscovite pegmatite dikes (Xp) up to 4 m thick and up to 1 km long commonly cut Maricopa and Cotton Center plutons in the central and southern part of the map. In the central part of the map there are two small stocks of pegmatitic granite and a swarm where individual dikes are too closely spaced to map separately. In the same area textures associated with pegmatites and host Cotton Center Granite suggest that the pegmatites were derived from fluids that segregated from partially consolidated granite. White quartz veins locally cut granitic rocks, but are generally too small to map. No field evidence was observed that suggested whether these veins were part of the pegmatite-forming event, or are younger.

The Cotton Center Granite displays a weak to strong flow foliation defined by parallel alignment of individual biotite crystals and biotite rich-laminae, and by parallel alignment of the long axes of phenocrysts.

Quartz Gabbro/Diorite (Xqdg)

Subordinate stocks of dark-green biotite-hornblende quartz diorite and quartz gabbro (Xqdg) intrude and are intruded by both the Maricopa and Cotton Center granites. Locally common, fine-grained quartz diorite forms scattered xenoliths within the Maricopa Granite and rare xenoliths within the Cotton Center Granite. Dikes of both Maricopa and Cotton Center granite cut quartz diorite/gabbro plutons, but in some areas quartz diorite appears to grade into biotite-rich, mafic variants of Maricopa Granite over several meters. The unit locally intrudes Maricopa Granite, commonly as dikes paired with subparallel dikes of Cotton Center Granite. Magmas of quartz diorite/gabbro were likely present throughout the emplacement of Maricopa and Cotton Center plutons, resulting in contradictory intrusive age relationships with the granitic units.

Mineralogically the quartz diorite/gabbro unit is medium-grained and typically contains hornblende

(20-50%), plagioclase (20-40%), quartz (10-20%), biotite (trace-15%), and epidote (trace-5%), together with trace amounts of opaque iron-oxide minerals, apatite, and sphene. Quartz diorite/gabbro is locally porphyritic, with coarse-grained hornblende phenocrysts set in a medium-grained groundmass. The unit ranges from massive to strongly foliated, with foliation being defined by parallel alignment of hornblende and hornblende laminae. The larger bodies in the southeast part of the map area display strongly foliated margins and massive cores.

SIL MURK FORMATION

Mid-Tertiary nonmarine clastic and volcanic rocks are exposed in the southwest part of the map area and in several small areas in the southeastern and northern part of the map. The mid-Tertiary continental clastic rocks in the northwest part of the map area are the eastern edge of more extensive exposures of these rocks to the west (Peterson and others, 1989b). Mid-Tertiary clastic and volcanic rocks in the southern part of the map area were named the Sil Murk Formation by Heindl and Armstrong (1963), who subdivided the formation into a lower clastic member and an upper volcanic member. These members correlate with the lower and middle subunits of Unit I of Eberly and Stanley (1978) and the Whitetail Assemblage of Scarborough (1989).

Sedimentary Member (Ts, Tcg, Ttcg, Tscg,)

The present study confirms the general stratigraphic subdivisions of Heindl and Armstrong (1963). Within the map area, the lower sedimentary member of the Sil Murk Formation is subdivided into four facies: (1) a sandstone facies (Ts), (2) a conglomerate facies (Tcg), (3) a sandstone and conglomerate facies (Tscg), and (4) a tuffaceous conglomerate facies (Ttcg). The first three facies listed above are locally in depositional contact with weathered Early Proterozoic granitic rocks. The sedimentary member appears to be draped over present ridge spurs of the granitic highlands, which, in part, reflect relict topography.

The sandstone facies (Ts) is exposed along Red Rock Canyon and the valley separating the two major upland areas in the southern part of the map area. The sandstone is brick red, medium to coarse grained, subangular, and arkosic. Large-scale, eolian, trough, cross bedding is characteristic of the unit. The sandstone unit generally forms the basal part of the Sil Murk Formation, although rare eolian sandstone beds are present higher in the section. The unit ranges from 0 to 130 m in thickness. Exposures of eolian sandstone grade upward through several meters of interbedded fluvial conglomerate and eolian sandstone to massive fluvial conglomerate or debris flows, or the sandstone is in sharp contact with channels of overlying debris flows. The sandstone interfingers with coarse, clastic facies.

Volumetrically, most of the Sil Murk Formation is composed of a conglomerate facies (Tcg) made up of crudely stratified lenticular beds of granule to boulder conglomerate and pebbly sandstone and roughly equal amounts of massive debris-flow deposits. Minor, discontinuous beds of white felsic tuff are present locally. The debris flows contain cobbles and boulders up to 4 m across of Proterozoic granitic rocks in a matrix of siltstone, sandstone, and granule conglomerate. Clasts within the conglomerate and debris-flow beds are derived from the adjoining crystalline uplands, and are generally subangular. The largest granite boulders, however, are rounded to subrounded. Field observations indicate that the rounding of the large boulders was caused by spheroidal weathering of granitic bedrock rather than by transport processes. On the basis of outcrop width and dips, the conglomerate unit is approximately 900 to 1600 m thick, but it grades laterally into the sandstone and conglomerate facies in the south-central part of the map. The conglomerate is overlain with a sharp contact by the volcanic member of the Sil Murk formation.

In the west-central part of the map area approximately 1 km^2 of the conglomerate facies contains a minor amount of white, fine-grained ash within the matrix of the debris flow deposits and as clasts within conglomerate beds. Individual beds of tuff were not observed in the field, but they may be present. This tuff-bearing conglomerate facies (Ttcg) weathers more easily than the surrounding clastic units and indicates that volcanism and alluvial sedimentation were, in part, contemporaneous.

Poorly sorted, crudely stratified, granule to boulder conglomerate and pebbly sandstone (Tscg) are a lateral facies equivalent of facies Tcg in the south-central part of the map area. The facies also forms a transition between the conglomerate and the sandstone facies in the southern part of the map area, and, locally forms the basal part of the Sil Murk Formation. The sandstone and conglomerate facies is very similar to the conglomerate facies, except it generally lacks debris flows with large boulders several meters across. From a distance exposures of this facies lack the surface lag of large boulders that is characteristic of the conglomerate facies.

Volcanic Member (Td, Tts, Tb, Tcgsv)

The volcanic member of the Sil Murk Formation crops out at the south end of the map area, where it was previously described by Heindl and Armstrong (1963), and 4-7 km to the north along the west side of the map area. In both areas the volcanic rocks form prominent hills and cuestas. Tuff and tuffaceous sandstone, dacitic welded ash-flow tuff, and olivine basalt comprise the great majority of the volcanic member, but in two areas granule to boulder conglomerate and sandstone are interbedded with volcanic rocks. The volcanic member apparently rests in gentle unconformity on the underlying sedimentary member (facies Tcg, Ttcg, and Tscg); the volcanic rocks generally dip about 10 degrees less than the underlying sedimentary beds. This difference, however, may simply reflect the difference in initial dip between gently-dipping coalescing alluvial fan deposits of the sedimentary member and the subhorizontal-dipping volcanic air fall and flow deposits of the volcanic member.

The basal part of the volcanic member commonly consists of white- to buff-weathering, fine- to coarse-grained crystal-vitric tuff and tuffaceous sandstone (Tts). White tuff beds are present in minor amounts higher in the member, and, as discussed earlier, comprise a minor component of the sedimentary member (also shown as Tts on the map). The tuff is composed of subangular fragments of fine-grained quartz, feldspar, and minor biotite set in a devitrified groundmass. Subangular fragments and crystals from mafic and intermediate volcanic rocks comprise the clasts of tuffaceous sandstone beds. Calcite commonly cements the tuffaceous sandstone clasts. The tuffaceous sandstone displays fluvial bedding structures and rarely displays eolian, trough crossbedding. The basal tuffaceous sandstone and tuff is up to 20 m thick along the base of the volcanic member.

Most of the volcanic member is rust- to lavender-weathering, welded dacitic ash-flow tuff (Td). Heindl and Armstrong (1963) and Scarborough and Wilt (1979) described these rocks as dacitic, and their terminology is followed in this report. According to the chemical classification of volcanic rocks recommended by the International Union of Geological Sciences (Le Bas and others, 1986), however, the two analyzed samples are classified as trachytes (Table 1; Fig. 1); their chemistry is also consistent with the average from rhyolites of the mid-Tertiary RAD clan as described by Damon (1989).

The dacitic tuff contains fine- to coarse-grained crystals of plagioclase (25-30%), biotite (5-10%), and opaque minerals (5%) set in a groundmass of generally devitrified welded glass shards (60-65%). Crystal fragments and welded tuff shards are aligned parallel to bedding in the tuff. The bases of thick, dacitic tuff beds are commonly only partially devitrified, and fresh welded tuff is exposed as black vitrophyre at the base of a thick bed at the south end of the map area (Heindl and Armstrong, 1963). At the south end of the map area, two separate dacitic tuff layers are separated by conglomerate and sandstone. As measured by Heindl and Armstrong (1963), the lower layer ranges from 6 to 17 meters thick and the upper layer is about 3 meters thick. In the south-central part of the map, the three areas underlain by dacitic tuff may represent several beds of dacitic tuff, or repetition of one or more major beds along buried faults.

Dark-gray to black olivine basalt (Tb) comprises the third volcanic component of the volcanic member of the Sil Murk Formation. The basalt is interbedded with dacitic welded tuff at the south end and southwest side of the map area. The basalt is locally vesicular and forms flows up to 3 m thick. In the southern part of the map area, dikes of basalt cut the lower sedimentary member of the Sil Murk Formation. The basalt is composed of phenocrysts (20-30%) of olivine (or iddingsite) and minor clinopyroxene and plagioclase set in a trachytic groundmass (70-80%) that contains plagioclase laths and minor clinopyroxene and opaque minerals. The single analyzed basalt sample (Table 1; Fig. 1) lacks the normative nepheline of alkaline basalts (Le Bas, 1986), but its elevated total alkali content is typical of mid-Tertiary basalts in southern Arizona (Damon, 1989; Nealy and Sheridan, 1989).

At the southern end of the map area, one exposure of the volcanic member contains an approximately 23 m thick interval of buff-weathering granule to boulder conglomerate interbedded with lenses of lenticular arkosic sandstone (Tcgsv) up to 25 cm thick. Clasts are mainly granitic, as in clastic rocks from the lower sedimentary member, but about 15 percent are from welded dacitic tuff and mafic and intermediate volcanic rocks. In the south-central part of the map area similar conglomerates overlie dacitic tuff and are apparently interbedded with yellow- to buff-weathering, very coarse grained, poorly sorted, arkosic sandstone in beds up to 25 cm thick. Sandstone clasts are about 95 percent granitic, but scattered clasts of dacitic tuff are present. The conglomerate and sandstone interbedded with volcanic beds further imply that volcanic and alluvial deposition occurred concurrently.

Scattered throughout the map area discontinuous felsic and mafic dikes up to several meters thick cut Early Proterozoic crystalline rocks. Felsic dikes (Tdf) are probably related to the volcanic member of the Sil Murk Formation, whereas mafic dikes (Tdm) may be connected either to the volcanic member or to younger mafic volcanic units.

Three potassium-argon ages indicate that the volcanic member of the Sil Murk Formation is late Oligocene in age. Eberly and Stanley (1978) report a K-Ar whole-rock age of 27.7 Ma on welded tuff along the west-central side of the map, and Shafiqullah and others (1980) report K-Ar ages of 27.41 Ma (whole-rock) on basalt and 29.4 Ma (biotite) on tuff from the small exposure of Sil Murk clastic and volcanic rocks at the north end of the map. The interbedded volcanic and coarse clastic facies of the Sil Murk Formation are evidence for concurrent volcanism and faulting during mid-Tertiary tectonism.

OTHER TERTIARY VOLCANIC ROCKS (Tww, Twp, Tgb)

Two volcanic units described by Peterson and others (1989b) are exposed in the northwestern part of the map area. The oldest unit, the basalt of Woolsey Wash (Tww), crops out along the northwest edge of the map area, but is more extensive directly to the west (Peterson and others, 1989b). This unit is a lavender-gray-weathering, dark-gray to black, porphyritic basalt with phenocrysts of olivine altered to iddingsite and less common pyroxene and plagioclase (Peterson and others, 1989b). Peterson and others (1989b) suggest that this basalt may correlate with the volcanic member of the Sil Murk Formation, but they indicate that it stratigraphically underlies clastic deposits of the lower sedimentary member of the Sil Murk Formation.

A younger unit, the basalt of Woolsey Peak (Twp), caps ridges in the west central part of the map area and is extensively exposed to the west (Peterson and others, 1989b). The unit is a locally vesicular, light-gray weathering, medium-gray to black, porphyritic basalt with phenocrysts of olivine altered to iddingsite, less common pyroxene, and rare plagioclase. Individual flows are about 3 m thick (Peterson and others, 1989b). The volcanic stratigraphy determined by Peterson and others (1989b) indicates that this basalt is younger than 21 Ma.

The northern part of the map area contains the south edge of the Gillespie basalt field. Potassium-

Argon ages for the Gillespie basalt (Tgb) range from 1.35 Ma to 6.2 Ma (Eberly and Stanley, 1978; Schoustra and others, 1976). Flat-lying Gillespie basalt unconformably overlies Maricopa Granite and unconsolidated late Tertiary and Quaternary alluvial deposits.

UNCONSOLIDATED DEPOSITS (QTs)

Much of the lowland portion of the map area is underlain by unconsolidated late Tertiary and Quaternary alluvial and colluvial deposits (QTs). These deposits are mapped and described by (Demsey, 1989), and were not studied in detail in this study. All late Tertiary and Quaternary alluvial and colluvial deposits are combined into one unit on the map.

STRUCTURE

Crystalline bedrock units in the map area are mylonitized and fractured. The Sil Murk Formation is warped by a broad fold, and high-angle faults cut both mid-Tertiary and older rocks.

In general mylonitic and flow foliation trends NNE with steep northwest dips, but in the southern part of the map area dips vary from steep to the northwest to steep to the southeast. In the northernmost part of the map area very weak foliation trends are less consistent, but generally trend north-south with very steep east or west dips. Reorientation of megacrysts and phenocrysts in moderately and strongly foliated Maricopa Granite, together with S-C fabrics and sigmoidal structures in mylonitic zones, reflect dip-slip movement with east and southeast sides up (Fig. 2A). The rake of lineations, 75°-90° north, may indicate a minor component of horizontal slip during shearing, or reorientation of dip-slip slip lines during uplift and rotation of basement blocks in Phanerozoic time.

Pegmatite dikes that cut Early Proterozoic granite trend from 350 to 035 and dip 45° to 65° west, with an average orientation of 004°, 55°W (Fig. 2B). This orientation suggests that the pegmatites intruded fractures that developed at the end of an episode of ductile shear that produced mylonitic foliation and stretching lineations in Maricopa Granite. Measured joint surfaces in Early Proterozoic crystalline rocks show wide scatter (Fig. 2C).

Folds are absent in the map area except for a broad, gently southwest-plunging open fold outlined by attitudes of Sil Murk Formation and exposures of underlying crystalline rock in the south central part of the map (Cross section C-C'). The fold may be related to warping that occurred during mid-Tertiary extension in southwestern Arizona (Spencer and Reynolds, 1989), or during late Cenozoic block faulting.

At least five northeast- and northwest-trending, high-angle faults cut Early Proterozoic and mid-Tertiary rocks in the southern part of the map area. The two northwest-trending faults and the southernmost northeast-trending fault likely reflect late Cenozoic extension and block faulting (Menges and Pearthree, 1989). In rare good exposures these faults appear as zones up to 2 m thick of fault breccia, and fault traces are commonly marked by zones of iron-staining and hematitic alteration. The eastern northwest-trending fault is part of the high-angle fault system that bounds the west side of the northwest-trending fault trough between the Maricopa and Gila Bend Mountains (Heindl and Armstrong, 1963; Eberly and Stanley, 1978). Minimum vertical separation on this fault is 400 meters, down on the northeast.

The base of the Sil Murk Formation is offset approximately 3 km in a right-lateral sense by a prominent ENE-trending fault that crosses the southern part of the map area, but it is not known if this apparent offset is due to strike-slip, dip-slip, or both. In one good exposure this fault is marked by 10 m wide zone of shattered Maricopa Granite on the south juxtaposed against a 10 m wide zone of tectonically brecciated Sil Murk conglomerate on the north. The fault zone contains at least one zone of mylonite up to 1 cm thick. Air photos suggest that the fault may displace Quaternary deposits a few kilometers to the southwest along strike. The fault truncates a trough-bounding, northwest-trending, high-angle fault on the east side of the map area.

MINERAL RESOURCES

The map area lies 19 km east of the Painted Rock Mining District, where copper, lead, molybdenum, silver, and gold were produced from quartz and barite veins in Tertiary volcanic rocks, and it lies 4 km southeast of the Webb Mining District where copper, silver, and gold was produced from quartz veins in Precambrian schist (McDonnel, 1986). Recent studies of the mineral resources of the Woolsey Peak Wilderness study area examined the mineral resources of the northern part of the map area (McDonnel, 1986; Peterson and others, 1989a). This area is covered by numerous unpatented mining claims, and sampling of 28 prospects within the northern part of the map area (McDonnel, 1986), together with geophysical and geochemical indicators, suggests that the area has low potential for barite, copper, molybdenum, lead, zinc, silver, and gold in epithermal veins and low potential for uranium, thorium, and rare-earth elements in pegmatites and granitic rocks (Peterson and others, 1989a).

In the southern part of the map area Scarborough and Wilt (1979) studied the uranium favorability of the Sil Murk formation and discovered no radioactive anomalies. The present study sampled eight prospects in crystalline rocks in the southern part of the map area. The reported analyses indicate the presence of anomalous concentrations of several elements in vein occurrences (Table 2).

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Table 1. Major element-oxide analyses and CIPW normative mineralogy for volcanic rocks of Sil Murk Formation, southeastern Gila Bend Mountains, Tucson, Arizona

Map no.		A	B	C
Sample no.		90WG330	90WG122	90WG311
MAJOR OXIDE (%)	SiO_2	63.20	66.00	48.60
	TiO_2	0.38	0.38	1.00
	Al_2O_3	15.00	15.00	15.00
	FeO	<0.05	0.20	5.30
	Fe_2O_3	2.90	2.50	3.30
	MnO	0.06	0.06	0.15
	MgO	0.45	0.56	8.30
	CaO	4.40	2.40	10.00
	Na_2O	2.50	4.20	2.80
	K_2O	9.70	5.70	1.80
	P_2O_5	0.19	0.06	0.52
	LOI	3.20	1.20	0.40
	H_2O	0.22	0.09	0.06
	CO_2	2.20	0.60	<0.10
	Total	99.78	97.06	96.77

CIPW NORMS	Qtz	5.62	15.77	-
	Or	57.43	34.70	10.99
	Alb	21.19	36.61	24.48
	An	3.80	5.40	23.81
	Wo	5.32	0.90	-
	Di	2.42	3.10	19.10
	Hy	-	-	1.82
	Ol	-	-	11.64
	He	2.91	2.58	-
	Mag	-	-	4.94
	Ilm	0.19	0.57	1.96
	Sph	0.69	0.23	-
	Ap	0.44	0.14	1.24
	Total	100.00	100.00	100.00

Analyses by Skyline Labs, Inc., Tucson, Arizona.

Table 2. Geochemical analyses from selected prospects, southeastern Gila Bend Mountains, Arizona

Map No.	Sample No.	Au (ppm)	Ag (ppm)	As (ppm)	Bi (ppm)	Cu (ppm)	Pb (ppm)	Sb (ppm)	Sn (ppm)	Te (ppm)	W (ppm)	Zn (ppm)	Comments
1	90WG364	0.230	0.800	15.000	435.000	13000.000	100.000	0.500	<2.000	24.000	<2.0	185.000	Ml-st Xm
2	90WG351	0.030	4.400	28.000	13.000	9900.000	4450.000	7.500	<2.000	0.800	18.000	430.000	Shaft w Fe-st, sheared Xm w qtz-carbonate-graphitic alteration
3	90WG346	0.065	0.350	280.000	0.300	160.000	1600.000	0.600	<2.000	0.500	22.000	2050.000	Adit in sheared Xc dike in Xmm. Pale green alteration
4	90WG270	0.320	4.000	24.000	1.300	520.000	180.000	0.375	<2.000	7.500	42.000	690.000	Dacite dike in sheared, yellow, fe-st Xm w qtz veins
5	90WG243	0.840	22.000	17.000	100.000	60000.000	125.000	0.700	<2.000	1200.000	<2.000	125.000	Trench and adit w ml-st, sheared Xqdg at contact w Xc
6	90WG274	0.030	0.250	0.600	0.200	120.000	6.000	0.200	<2.000	1.000	<2.000	34.000	Light green Xca
7	90WG273	2.500	0.900	1.800	2.800	6600.000	22.000	0.400	<2.000	3.500	<2.000	14.000	Pit in Xc w ml-ep-hem veinlets
8	90WG263	0.005	0.450	1.200	0.700	630.000	6.000	<.100	<2.000	12.000	<2.000	14.000	Mg-bearing Xqdg in Xm

Analyses by Skyline Labs, Tucson, Arizona. Method of analysis by , except Au is by combination of fire assay and atomic absorption.

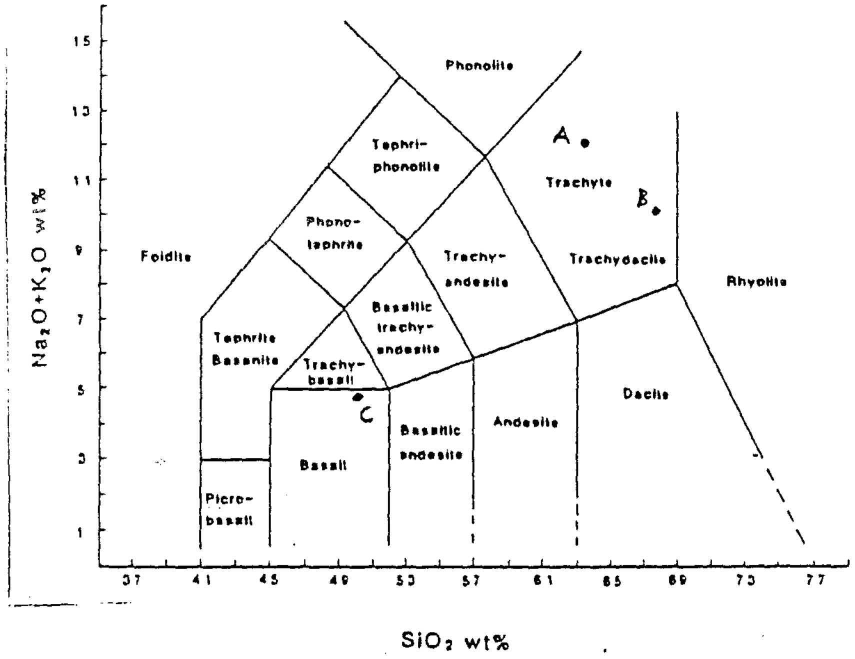

Fig. 1. Total alkalies vs. SiO2 for volcanic rocks of Sill Murk Formation. Classification scheme from Le Bas and others (1986). A-C refer to map nos. on plate and in table 1.

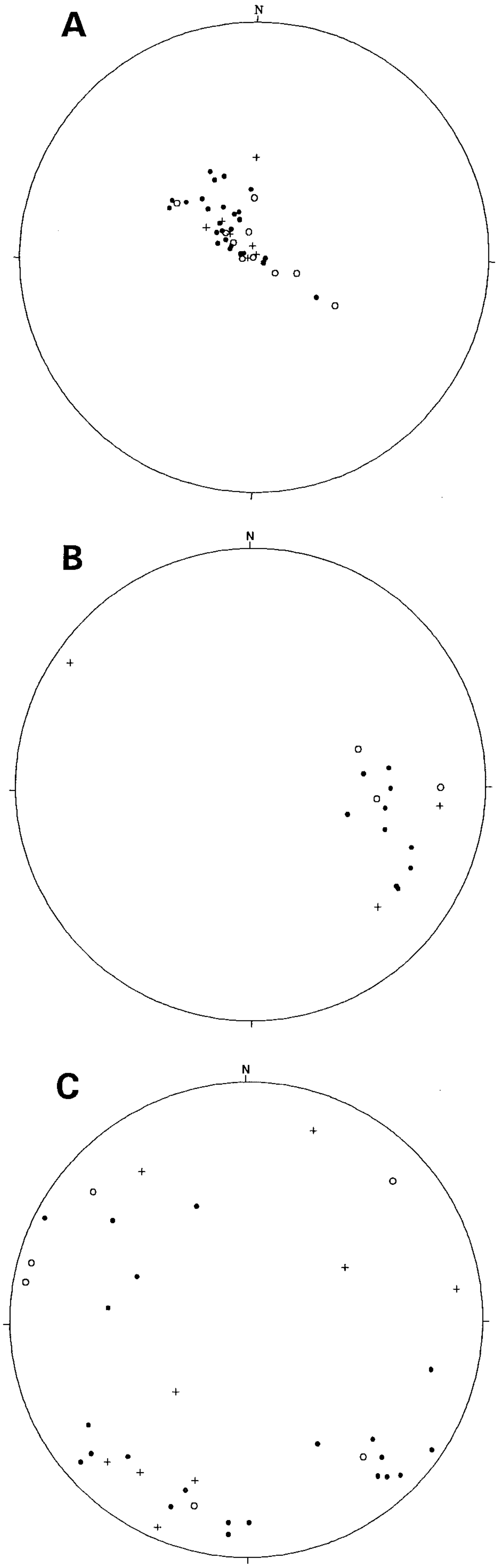

Figure 2. Lower hemisphere equal-area plots from the eastern Gila Bend Mountains. Symbols denote each of three geographic domains: (+) north of county road that crosses center of map area, (o) central area south of county road and north of prominent east-west trending fault in south-central map area, and (o) southern area south of prominent east-west trending fault in south-central map area. (A) 45 mylonitic lineations from Maricopa Granite. (B) 16 poles to pegmatite dikes. (C) 36 poles to joint surfaces.